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Radio's role in the world of conservation work



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A look at this comprehensive new book and accompanying website



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Supplied with:  
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• DC Car Power Plug  
• Telescopic Antenna  
• Mounting Bracket and Hardware

**£249.95**



### Ubc-125xlt

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- Inc civil/Mil Airbands
- Close Call feature

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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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500 channel AM/FM scanner

- Includes VHF FM broadcast radio
- Covers: 25 - 960MHz (w/gaps)
- Listen to PMR, Marine, Air, CB, Amateur

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Lightweight Stereo headphones - as used by our boss!

**£79.95**

## JIM M75



### Wide Band pre-amp

Low noise pre-amp with 3 band pass filters

- 24-2150MHz
- Variable gain
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## ALINCO



### DX-R8E

Communications Receiver with SDR capability

- Frequency: 150kHz-34.999MHz
- Modes: AM / FM / CW / USB / LSB
- Removable front panel (requires optional EDS17 remote kit)
- Memories: 600 channels in 3 banks
- Power: 11.7-15.8V DC
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Optional 12V DC power supply .....£15.95

## ANTENNAS

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- 50-1300MHz
- Gain: 10-12dBi

**£379.95**



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- 105-1300MHz
- Gain: 11dBi

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- Fibreglass 1.7m long, this antenna gives High Gain coverage of VHF/UHF Airband

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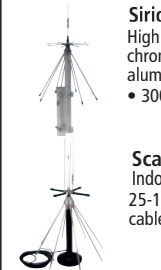


### Scanmaster HFA

Active Receive Antenna Covers: 1.8-30MHz

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



### Sirio SD-3000N Discone

High quality stainless steel, chromed brass & anodised aluminium construction

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Active wire loop.....£39.95



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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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- Kevlar Mil spec. wire
- Length: 20m

**£69.95**

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### AirsPY HF+ Discovery

Enhanced version HF/VHF SDR receiver

With Pre-selectors for improved dynamic range

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- 60MHz - 260MHz
- Use over internet
- 60 x 45 x 10 mm

**£199.95**



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- 10MHz panoramic spectrum
- 3.5 dB NF (42-1002) MHz
- Tracking RF filters

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### AIRSPY Mini

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- Covers: 24-1800MHz

**£119.95**

## SDRplay

### RSPdx SDR in metal case



- Covers: 1 kHz - 2GHz
- Now with Improved:
- Performance below 2MHz
- Pre selection Filters
- Strong signal handling

- Monitor/record up to 10MHz spectrum
- Three Software Selectable Antenna ports
- DAB notch Filter

**£194.95**

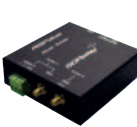
### RSP 1A Wideband Budget SDR



- Covers: 1 kHz - 2GHz
- Software upgradable
- Good dynamic range
- Calibrated 5 meter

**£99.95**

### RSP DUO Dual Tuner SDR



- Covers: 1 kHz - 2GHz
- Simultaneous - independent receive
- Software upgradable
- SDR UNO supports Diversity Tuning

**£239.95**

## WHISTLER



### Whistler TRX-2

**£479.95**



### Whistler TRX-1

**£419.95**

Two Digital Scanners with these specs:-

- 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
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- Spectrum Sweeper

## SIRIO Antennas

### Quality Antennas from Italy!



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Airband 3 element Beam

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- Gain: 7 dBi
- Boom: 1.4m

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### Quality Power Supplies 2 YEAR WARRANTY!



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- Low noise

2 YEAR WARRANTY

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- Cigar adaptor output

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- PSW-30 .....Switch mode 30A (max) 9-15V DC.....£79.95
- PSW-30H .....Switch mode 30A (max) 9-15V DC.....£69.95
- PS23-SW1 .....Switch mode 23A (max) 13.8V DC.....£59.95
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- PSW-04 .....Switch mode 5A (max) 13.8V DC.....£24.95

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- Ecoflex 15 plus per metre.....£7.99 price per 102m drum .....£759
- PL259 connector (Part: 7350).....£8.95
- N type connector (Part: 7395).....£9.95
- Ecoflex 10 per metre.....£3.79 price per 102m drum .....£359
- Ecoflex 10 Plus per metre.....£3.79 price per 102m drum .....£359
- PL259 connector (part: 7378).....£5.95
- N type connector (part: 7367).....£6.50
- Aircell 7 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
- Other 100M Coax Drums
- Westflex 103 .....Semi Air-spaced low loss .....£179.95
- RG-213 (Cabnet).....Low loss good quality .....£99.95
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- Coated flex weave Antenna wire.....£59.95



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- Lightweight
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ECOFLEX 10 Plus  
ECOFLEX 10  
ECOFLEX 15

### AIRCELL – series

- Low Loss
- Flexible
- Small bending radius
- Good to 6GHz

AIRCELL 7  
AIRCELL 5



**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



**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

Now with TETRA!



**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

AOR

AOR

BEARCAT

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



**AR8200 MkIII**  
Wideband scanner/receiver

- 530kHz-3000MHz
- AM/FM/SSB/DATA
- 1000 memories
- TCXO high stability oscillator card slot - expand to 4,000 memories
- Preselected Front End

£459.95



**AR8200D**  
Wideband scanner/receiver

Higher specification than the AR-8200 with:

- Voice recorder
- APCO25 decoding
- Voice Inversion
- Higher capacity 1800mAh batteries

RRP £679.95  
£659.95

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

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**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-R8600**  
Wideband Communications Receiver

- Coverage: 0.01-3000MHz
- Decodes D-STAR, NXDN, dPMR and APCO P25
- Large 4.3 inch TFT colour touch screen display

GENEROUS PART EXCHANGE AVAILABLE

£2499.99



**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



**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

ALINCO

ALINCO

ICOM



**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



**DJ-X3ED**  
Pocket sized Scanning Receiver

- Ideal for Airband, Marine, FM broadcast and much more!
- 100kHz-1300MHz (no gaps)
- Modes: AM/FM/WFM
- Memories: 700 channels

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**IC-R6E**  
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- 15 hours receive capability

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ISSN 1748-8117

September 2020 Vol. 15 No 9

On sale: 27 August 2020

Next issue on sale: 24th September 2020

### RadioUser

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# Radio, Safety and Homeschooling

**H**ello and welcome to the September issue of *RadioUser*. With lockdown measures returning to some parts here in the North West, it seems more important than ever for people to help each other, stay informed and take pleasure in entertainment, and radio has a significant role to play in all three of these areas and more.

Our first officially autumnal issue brings you a smorgasbord of features, reviews, news and regular columns, all of which I hope you will enjoy.

There is a particularly rich harvest of information on new products and radio-related news to bring in this month, and an important new airband frequency resource to report on. Staying with airband for a while, I hope you will take off with Part Two of David Smith's thorough survey or early aircraft communications, before you take a look, with Anne Reed, at her own way into amateur radio, and at what many may perceive as the persistently low numbers of women in the amateur radio hobby.

Chrissy Brand concludes her mini-series on Radio and the Environment, looking at what broadcasters and podcasters can do to change things for the better for our only planet.

Meanwhile, Robert Connolly has a great NAVTEX primer, ahead of a NAVTEX receiver review next month.

In other regular columns this time around, you can learn more about software for modelling a G5RV aerial, easy satellite reception, media-related radio broadcasts, and an intriguing new book about the role the Government Code and Cypher School (GCCS) at Bletchley Park played in the run-up to D-Day.

In a more historical thread of the magazine, Keith Hamer and Garry Smith introduce the early pioneers



of Television, and Scott Caldwell shows how nothing is new, and how what was known as the 'Great Marconi-Scandal' of 1912 could be seen to prefigure the controversies of our own age surrounding 'foreign' communications equipment.

In a similar vein, Chris Rolinson brings some much-needed clarity on the facts behind the debates on the safety of the scheduled 5G infrastructure for the UK before he reviews the Hytera PDC550 network radio.

Furthermore, you can explore the beginnings of Times Radio on DAB, a crowd-sourced satellite network and the future of European aviation.

To cap things off, I have put my former 'teaching-hat' back on, and I am looking at how, with a bit of initiative, you can use your radio and other gear for homeschooling in such fields as Art & Design, Science, International Relations and Social Studies.

Enjoy this issue of *RadioUser*, in print and online, stay in touch and, as always, stay safe.

[www.radioenthusiast.co.uk](http://www.radioenthusiast.co.uk)

## Georg Wiessala

Editor, *Radio User* Magazine  
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**THE FUTURE OF NETWORK RADIO?**  
We review the versatile Chinese Boxchip S900A

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**THE FUTURE OF NETWORK RADIO?**  
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at 240 years

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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](mailto:wiessala@hotmail.com)



## New SDRs

The *SWling Post* reported a new SDR receiver from China called 'RX-666'. On paper, its specs are interesting: 16bit ADC, max sample rate 32MHz (in theory one could sample the whole LW+MW+SW bands at the same time), USB-3 interface, and tuneable from 1kHz to 1.8GHz. The *SWling Post* notes that its design seems to be a derivative of Oscar Steila's (IK1XPV) BBRF103 SDR. It looks like they upgraded the ADC, made use of a better voltage regulator, and moved to a 4-layer PCB (the original was a 2-layer PCB). (Sources: *AliExpress*, *Oscar Steila*, *SWling Post*).

<https://tinyurl.com/yxfsshq>



## The RX-888 SDR

Another new Software-Defined Receiver (SDR) is the RX-888 16 bit ADC Direct Sampling SDR with 32 MHz bandwidth. Like the DragonFly RX-666 (see previous post), this SDR is based on Oscar Steila's (IK1XPV) BBRF103 device. Both share a hefty metal case. There is plenty of detailed technical information on the website link below. (Source: *AliExpress*, *SWling Post*, *EBay*, item: 124285884224).

<https://tinyurl.com/y4y8z8er>

## New from bhi

Our friends at bhi Ltd. have been kept busy during the lockdown. The firm has recently introduced the ATT2 high level to low-level audio converter. This new accessory is mainly for use on the bhi *ParaPro EQ20* Parametric Audio Equalizer range.

The ATT2 audio pad is a small passive device and converts high-level audio signals to low-level audio and was designed for use with amateur radio transceivers and receivers to enable a wider range of AF/volume adjustment on the radio equipment before the overload LED on the bhi *ParaPro EQ20* unit comes on, making it less sensitive and easier to use. The ATT2 accepts mono or stereo speaker level signals up to 1 Watt (2.828 Volts p-p into an 8Ω speaker) and will attenuate the audio down to a line level of around 1 Volt (line level at 10kΩ). The ATT2 is housed in a small ABS plastic enclosure and measures 55 x 25 x 18mm. Connections are a 3.5mm socket for the input and a 3.5mm plug lead on the output. The ATT2 is priced at £19.95; bhi has also improved the LLC1 isolated line level converter unit so that it can also be used as an isolated attenuator pad on the input side of the bhi EQ20 range by adding a small audio adapter cable, ALD-010 (3.5mm plug to 2 x phono sockets adapter lead, price £4.95). The LLC1 is still priced the same at £39.95 and would be more suitable than the ATT2 if you were experiencing any earth ground loop or RFI issues.

[www.bhi-ltd.com](http://www.bhi-ltd.com)



## Moonraker News: The Senhaix 8600 Handheld Dual Band Radio

Chris Taylor of Moonraker reports that this exciting new Senhaix transceiver has the following key features: Dual Frequency Waiting; Power-switching; Voice control function, and Voice control delay. Moreover, it offers channel encryption, 1750 relay, power-saving mode, and voltage display. The radio has a scan function and an inbuilt FM radio. It sports PTT ID and an automatic backlight function (Weight: 270g; Channels: 128; Power: 5W).

<https://www.moonraker.eu/>



For the latest news and product reviews, visit [www.radioenthusiast.co.uk](http://www.radioenthusiast.co.uk)



### IC-M803 MF/HF/SSB Marine Radio

MF/HF SSB marine radio is a vital piece of long-range communication equipment; and, unlike expensive satellite technology, once installed, all calls are free. Over many decades, Icom has been manufacturing marine HF/SSB radios. It is now introducing the all-new Icom IC-M803 MF/HF/SSB Marine Radio transceivers.

The IC-M803 is a long-range MF/HF Class E DSC radio. It features a user-friendly interface; together with its large colour-TFT LCD display, it allows for relatively simple operation. With the near-180° wide viewing angle, the screen allows various installation possibilities. The large control knob and keys provide easy access to functions such as accessing MMSI numbers, ITU channel numbers and keying individual frequencies via the easy-to-use keypad.

Much like its predecessors, the IC-M803 features a remote head that can be neatly installed near a chart table or NAV station, while the control box can mount discreetly out of the way and out of sight. The controller can be interfaced with a computer or email modem to make a complete communication system. Connections are also available for an external loudspeaker.

Other features on the IC-M803 include a distress call button, dedicated DSC receiver scanning, audio replay, GPS, two-minute instant replay audio function, and HF email capabilities. Chris Leech, Marine Product Specialist at Icom UK said, "Icom has over 50 years' experience of producing high-quality HF Transceivers, many have been a standard installation on ocean-going ships and yachts." The IC-M803 Class E DSC MF/HF radio is now available from authorised Icom marine dealers (for use outside of UK waters).

# The latest

It has been a busy month at ICOM UK, in terms of product development and new radios. RadioUser takes a closer look.

### IC-SAT100M Satellite PTT Mobile Radio

The IC-SAT100M is the world's first satellite PTT mobile radio and uses the *Iridium* satellite communication network. Designed to be used either in-building or installed in vehicles/vessels, the IC-SAT100M provides global radio service to users with the push of a PTT (Press-to-Talk) button. It can be used as a communication tool in remote and isolated areas, where there is no mobile phone or land-based radio network infrastructure. Also, if radio or cellular network infrastructure is rendered unusable by human or natural disasters, satellite communication can provide a stable and reliable backup solution. The IC-SAT100M Satellite PTT mobile radio uses

the Iridium satellite network in the same way as its handheld counterpart, the IC-SAT100 handheld. The system uses 66 Low-Earth-Orbit (LEO) Iridium satellites that provide broader, more reliable network coverage compared to Geosynchronous Equatorial Orbit (GEO) satellites. As part of a satellite two-way radio system, an organisation can get wide-area global coverage across the whole earth, including the Arctic and Antarctic. So someone at the North Pole could talk to someone at the South Pole, there is no other two way PTT system that can do this. The IC-SAT100M has been designed for use inside a building as well as in-vehicle and on vessels. Whereas the handheld can be supplied individually (e.g. first responders, engineers, security) the mobile can be used as a base radio in a building. Installation of the IC-SAT100M in a building is straightforward, and you can use LAN cable (Maximum 100m, 328ft) to its antenna. Alternatively, by using a PoE (Power over Ethernet) switch (for power supply to the antenna) and IP network, you can install the IC-SAT100M more effectively up to a maximum extension of 400 metres. The radio can also be used to support other users by being installed in a vehicle or a vessel. By attaching the AH-40 antenna on the roof, you can use the radio in a vehicle. The IC-SAT100M has Bluetooth capability allowing hands-free operation while driving. By adding a third-party antenna cover over the AH-40 you can make the whole installation look more covert. With a VE-PG4 RoIP gateway (see 2nd URL, below) the IC-SAT10M can interconnect with other two-way technologies including IP phone, WLAN, LTE, digital/analogue radios, and other communication systems. The IC-SAT100M is a perfect communication tool for governments, military, border security, coastguard, local government, disaster response teams, humanitarian, multinational, or energy-exploration organisations.



IC-SAT100M Satellite PTT Mobile radio



Enter our competitions at [www.radioenthusiast.co.uk/competitions](http://www.radioenthusiast.co.uk/competitions)



# Icom products

**IC-M423GE**  
Fixed Marine VHF Radio



**IC-M400BBE**  
Fixed Marine VHF Radio



## IC-52E D-STAR Digital Handheld Transceiver

Icom has announced details of the ID-52E D-STAR Digital Handheld Transceiver. The ID-52E VHF/UHF dual-band digital transceiver is the latest in a long line of D-STAR hand-portables from Icom and succeeds the popular ID-51EPLUS2. Two versions will be available globally, the ID-52A for the USA and ID-52E for Europe. The radio features a large 'trans-flective' colour display that makes it easy to see outdoors, even in bright sunlight. The size of the display has also been increased to 2.3 inches from the 1.7 inches adopted for the ID-51E. The ID-52E supports Bluetooth communication as standard. You can wirelessly connect to Android devices with the *ST-4001A/ST-40011 Picture Utility Software* when the *RS-MS1A Remote Control Software* installed. The optional VS-3 Bluetooth headset is also available, for hands-free operation.

## IC-705 QRP SDR Transceiver/LC-192 Backpack

With the release of the much-anticipated IC-705 QRP SDR transceiver just around the corner, Icom UK has managed to get hold of a pre-production sample and give to Bob McCreddie (G0FGX) of TX Films to put it through its paces. In the video, which can be found on ICOM UK's YouTube Channel, Bob goes through a rundown of the IC-705's many features and picks up on how simple and intuitive the IC-705 is to use. He demonstrates the compact and lightweight body of the IC-705, and the flexibility of its power supply. Furthermore, Bob also highlights its impressive, bright and intuitive, 4.3" colour touch screen display as used on other Icom SDR radios like the market-leading IC-7300 and IC-9700 models. Last but not least, he gives all radio enthusiasts a 'sneak peek' of the *LC-192 Backpack* designed especially for this radio looks like.

## IC-M423G & IC-M400BB Fixed Marine VHF

The IC-M423GE (formerly the IC-M423GE) and the IC-M400BBE (formerly the IC-M400BBE) slot back into Icom's fixed marine VHF line up. Both models are almost identical to their predecessors, except that they now feature an integrated GPS and an external GPS antenna to meet the latest ITU-R M493-14 regulations.

Both of these radios have been firm favourites with many of commercial and leisure marine users, and the reintroduction of them also means that Icom's *HM-195CMI Multi-Station Commandmic Interface* is back allowing owners and users the option of controlling the IC-M423GE and IC-M400BBE with a pair of remote Commandmics.

The IC-M423GE VHF/DSC marine radio is ideal for customers who are looking for a compact radio for their boat with advanced functions and dual station control. The radio features built-in active noise cancelling technology that provides superb audio performance. The optional COMMANDMIC

allows you to control all the functions of the IC-M423GE as well as being able to be used as an intercom with the radio. The IC-M423GE has a suggested retail price of £329.99, including VAT – The IC-M400BBE 'black-box' marine radio solution can be installed out of sight, which is important, where space is at a premium. Controlled by the Icom HM-195GB COMMANDMIC this allows operation of all radio functions including DSC, radio, foghorn, and hailer horn.

The HM-195GB COMMANDMIC utilises the same user soft key interface used on Icom's latest range of marine radios. The IC-M400BBE has suggested retail price of £479.99 SRP, including VAT – The HM-195CMI compact black-box interface transforms the IC-M400BBE Black-box VHF/DSC from a single-station to a dual-station system, and the IC-M423GE fixed VHF/DSC from a dual-station to a tri-station system. It has a suggested retail price of £240.00 SRP, including VAT.

[www.icomuk.co.uk](http://www.icomuk.co.uk)



For the latest news and product reviews, visit [www.radioenthusiast.co.uk](http://www.radioenthusiast.co.uk)



## Polish Innovation: The Silphase R1

The Silphase R1 SDR is scheduled to be a stand-alone, high-performance SDR receiver with a large screen and good-looking specifications. The receiver is portable and will measure 11.25x4.3x2.2in (285x110x55mm). Looks like the screen will be 5" which should allow for a detailed spectrum viewing area. For detail, please have a look at the company's website and product sheet at the URL below. The price is said to be (\$1199) (ca €1099) with an expected availability date at the end of 2020, at the time of this posting. From what I can gather, these are some of the specs discussed for this receiver. Watch this space:

- Expected Operational Lifetime 30 Years with One Year Warranty • 12.6V 12000 mAh, internal battery; 20dB LNA • 6 input modes buttons (attenuators, adjustable filters, AGC,

- NB, auto notch filter, NR) • AGC (slow, medium, fast) • Audio recorder (use the internal flash memory or USB 16GB external flash memory) • Battery 12000 mAh, 12.6V (3x3.7V/12000 mAh) • Clipping level -3dBm; Colour backlit 5" TFT touch screen display • Dimensions (WxHxD) 285x110x55mm; 11.25x4.3x2.2in • Direct sampling 16bit high speed 122 M/s ADC • DSP (various filters, adaptive noise reduction, automatic notch filter, notch blanker, adjustable filters (0-1KHz HPF, 0.5-6KHz LPF, 50Hz step, etc.)) • Dual VFO; Four internal speakers • Frequency coverage RX 0.1-30MHz; Frequency resolution 1Hz • Frequency stability Less than  $\pm 0.2$ ppm (-10°C to +60°C; 14°F to 140°F) • Frequency steps 1Hz to 1KHz • Ham radio hardware log; IP55 rating for water/dust protection • Magnesium

- alloy body, IP55 (in future IP 67) • Magnesium alloy body/chassis • Main filter sharpness Factor 1.05 and lower • Main optical encoder and four multifunction encoders • Modes: CW, SSB, AM, FM; • Operating temperature range -10C to +60C; 14F to 140F • Operating time 20 Hours; • OS QNX ("UNIX-like" real-time operating system) • Power consumption RX 0.6 A typical • Power supply requirement 12.6 DC  $\pm 15\%$  • Record to internal "flash memory" (unclear if audio and/or spectrum) • Sensitivity 1.8-29.999MHz, SSB/CW: (BW: 2.4kHz at 10dB S/N) - 132 dBm, 0.06V • Spurious and image rejection >90 dBm; • Telescopic antenna with F connector • USB out for recording and logging • Virtual USB audio card for OS update • Weight (approximately) 1.8kg; 4 lbs.

<https://silphase.com>

## New Vibroplex Antenna

Nevada is pleased to announce the release of a new antenna from Vibroplex USA – The HF-ALBAND-KW end-fed multi-band wire antenna. This antenna has been built to the highest standards, even using a commercial vent to prevent moisture build-up in the Balun. Covering all bands from 80 through to 10 metres, without the need for an external ATU, the antenna will handle up to 1kW of SSB and around 350W data.

The antenna is approximately 130 feet long. It can be set up in many ways, from inverted-L or inverted-V to a straight-wire configuration, with little effect on the SWR. The Vibroplex HF-ALL BAND KW antenna sells for £169.95, and it is available from exclusive UK distributors, Nevada Radio and Waters & Stanton.

[www.nevadaradio.co.uk](http://www.nevadaradio.co.uk)  
[www.hamradistore.co.uk](http://www.hamradistore.co.uk)



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## The Elad TM-2 Console for SDR Radio at MLS

The ELAD TMate 2 USB Tuning System is the one vital SDR radio accessory for the many users who cannot or will not operate without the usual knobs and a display. With knobs and buttons, multifunction colour display and USB HID interface, TMate2 allows the control of the main functions of SDR software, such as FDM-SW2, PowerSDR and Perseus. Intended mainly to allow the use of SDR software without the need to watch the screen of the PC, or when the screen of the PC is crowded by various programs such as LOG or software for DIGITAL operations or CONTEST. The specifications are as follows:

- HID USB 2.0 device (no driver required)
- Works using Vcom and CAT protocol or directly supported in software.
- Works even your SDR is not active windows.
- Main tuning knob (with push-button) for incremental step VFO tuning (user-defined).

- Two-detent encoder with push-button for various functions (factory-defined).
- Six function keys (factory defined).
- RGB custom display (colour user-defined in RGB range).
- Heavy metal ergonomic enclosure.
- Heavy metal knobs.
- No power supply required.
- Compatible with PowerSDR and Perseus (dedicated software included).
- Compatible with remote-operation (using a serial-to-TCP converter).
- Directly supported (no CAT) in FDM-SW2 ELAD software.
- Dimensions: 143mm x 78mm x 135mm (LHP).
- Weight: 780 g (without USB cable).
- Front panel inclination: 45°.
- USB (PC) powered - USB cable included.

(Source: ML&S/ ELAD)

<https://www.hamradio.co.uk>

## New at Martin Lynch & Sons



ML&S are pleased to announce their recent appointment for the distribution of the MAT (MAT) Tuner range of products. The entire range was featured in a recent ML&S "SFTW" Video on their YouTube channel, showing how beautifully constructed these new tuners are. From the miniature mAT-10 portable QRP battery powered tuner, to the mAT-40 remote wire auto-ATU, the MAT Tuner range has a product for most automatic tuning scenarios. The manufacturer has just finished designing a specific QRP tuner for the new Icom IC-705, called the 'mAT-705'; this will be available from ML&S by the end of August 2020.

One the same subject, MAT Tuners have just introduced a new miniature automatic ATU for the IC-705. The ultra-compact package is powered by a PP3 battery stored internally and is long-lasting, due to the low current design of the tuner. The aluminium shell makes it sturdy, shock-resistant and suitable for portable use. First shipments arrive with ML&S in August 2020 in time for the release of the Icom IC-705 itself. For more details, see:

[www.HamRadio.co.uk/MAT](http://www.HamRadio.co.uk/MAT)

# Thales Vector Radios in the Air

Brandon, Richard (2020):

## **Police Helicopter Operations Manual - Delivering Air Support for Law Enforcement**

Haynes Publishing 2020. £25. 180 pp. hbk. ISBN 9781785215704

The author of this remarkable title was the operational Tactical Flight Officer for many years with the Metropolitan Police Air Support Unit (ASU) and became its head. With this level of first-hand experience, he has produced a comprehensive account of how air support policing works in the UK. The story begins with pre-war trials using aircraft and autogyros, and it continues after World War

Two when helicopters were able to carry TV cameras. By the late 1970s, air policing and communications became firmly established with most forces. In 2010, the *National Police Air Service* was formed to enable collaboration between the 43 ASUs to maximise air support capability. The book concentrates on London's Met Police ASU, with details of its coverage of such events as the Olympic Games, Royal occasions, terrorist attacks, and riots. There is a chapter about vehicle pursuits, area searches and public order operations. Another section describes a police helicopter and its surveillance and communications equipment. Crew roles and teamwork are examined, as are

the control room staff and the engineers who maintain the helicopters. Of particular interest to *RadioUser* readers are several pages detailing the four *Thales Vector* radios that operate on the emergency services *Airwave* network.

These police radios are each loaded with a fleet plan that effectively creates a directory of radio talk groups available to the crew. There is a huge amount of information in this book. It is very readable and well presented, with over 300 mainly colour images, along with 30 diagrams and maps.

(Source, and thanks to *David Smith*).

[www.haynes.com](http://www.haynes.com)

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David Harris  
mydogisfinn@gmail.com

David Harris weighs up a substantial contribution to the growing body of the research literature surrounding the wartime activities at the Bletchley Park Government Code and Cypher School (GCCS).

Before 1970, Bletchley Park and its role in the World War Two (1939-1945) decoding of German signals was a closely-guarded secret. Since then, there have been many books, films and television programmes about this institution.

Dr David Kenyon is Research Historian at Bletchley Park and an associate lecturer at Brunel University. He has also written books about the First World War.

He begins this book by (rightly) stating that most other books about Bletchley Park fall into three categories: Books that focus on decoding the *Enigma* signals; biographies of Alan Turing and others involved in code breaking; and texts about the daily life at Bletchley, written by people who served there.

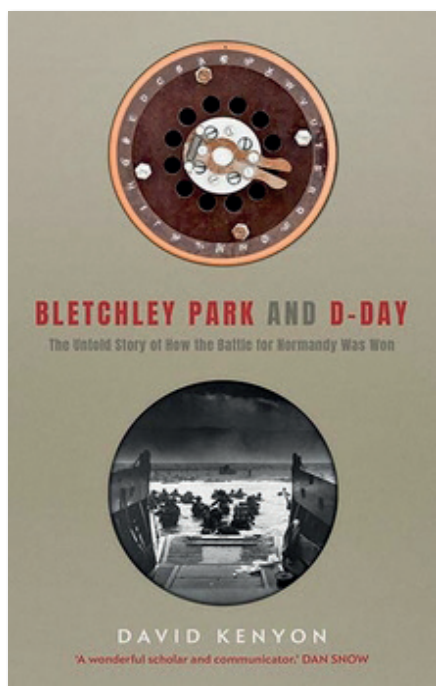
The purpose of this new book is to provide a more academic study into how the information decoded at Bletchley was categorised, passed on and used by Allied officers in the planning of D-Day. The author stresses that military intelligence is not just comprised of signal intercepts (SIGINT) but is complemented by aerial photography of enemy positions, by human intelligence gained by interrogating prisoners of war, and through reports from agents in occupied countries.

Bletchley Park was the Government Code and Cypher School (GCCS). In 1939, it relocated from London to Bletchley Park, Buckinghamshire. Initially, only around 100 people were employed. However, by 1945, there were 9,000 staff housed in a variety of hastily-erected office blocks.

Kenyon debunks the popular image of Bletchley, which is sometimes portrayed as a small number of eccentric people carrying out very complex calculations and building computers. He stresses the mundane nature of the work, the poor working and living conditions and the low morale. One aspect of the job was processing two million punch cards a week, which were then fed into an early type of computer.

The *Enigma* machine was first developed in Germany in 1918, and it was widely used by various governments. In 1920, GCCS bought a machine for research

# Bletchley, and its Role in D-Day



*Bletchley Park and D-Day. The Untold Story of How the Battle for Normandy Was Won* (2019)

by D. Kenyon

Yale University Press; 295pp.; Hbk.; £18.99

ISBN 9780300243574

[www.yalebooks.co.uk](http://www.yalebooks.co.uk)

purposes. The actual decoding of enemy signals was facilitated by the use of computers ('Bombes') which were capable of processing huge amounts of information. In addition to decoding Morse code messages received by monitoring stations, Bletchley Park also intercepted coded German teleprinter traffic. A further development was the breaking of Japanese codes, which enabled despatches from Japanese embassies, particularly in Berlin, to be read. These reports revealed a lot of detail about German planning and strategy.

Vast amounts of signals were received by Bletchley, and one of the key roles was deciding which messages were worth decoding, and, when decoded, what should be done with the information. This role was vitally important as key intelligence information has to be acted upon very

quickly, otherwise it was useless. A key role in intelligence gathering was determining the German 'Order of Battle', that is, information on where troops are deployed, who the troops are, what tanks and vehicles they have, whether they are experienced combat troops or reserves, what the command structure is, and so on. Kenyon makes the point that, when D-Day happened, the Allied forces had a very good understanding of German troop deployments in Normandy.

By 1943, it was clear to both sides that an Allied invasion would happen sooner or later somewhere in Northern Europe. The Calais area, being only 21 miles from England, was the part of occupied France that was the most heavily defended. Hitler was convinced that this was where the Allies would land but the rest of the French coast was reasonably well defended. Bletchley began preparing for D-Day from early 1943 onwards, by monitoring troop movements and replacements in France.

The work undertaken at Bletchley enabled the Allies to gain detailed knowledge of the makeup of German units in the Normandy area, including any shortages of NCOs, tanks and vehicles. The Germans had no idea where the invasion would come from; even after D-Day had been launched in Normandy, Hitler thought that it was just a 'bluff' and that the 'big' invasion would still happen at Calais.

The Allies, through the use of double-agents and fake troop encampments in Kent, helped to keep the idea of a Calais invasion alive. After D-Day, the strategic intelligence gathered by Bletchley was not of such use, as commanders on the ground could make their own appraisals of the strength of the enemy.

Kenyon puts the success of Bletchley and its contribution to D-Day down the 'industrialisation' of code breaking and the integration of all forms of intelligence.

This is a very readable, yet scholarly, book. It can be recommended to both newcomers to SIGINT and to those who have already read extensively on the subject of Bletchley Park.



# TECSUN

# World Class Radios



## Tecsun PL-880

This new Flagship SSB portable radio uses multi-conversion & DSP decoding technology

### Frequency coverage

- FM: 64 - 108 MHz
- Short Wave: 1.711 - 29.999 MHz
- Medium Wave: 522 - 1620 kHz
- Long Wave: 100 - 519 kHz

### Specifications

- 3050 station memories
- Low / Mid / High sensitivity switch for long distance reception (DX)
- Alarm clock with snooze function
- Sleep timer (1-120 minutes)
- Treble / Bass Tone selection
- Built-in charging system
- Dimensions: 192 x 33 x 113mm WDH

### Accessories supplied include:

- Extending SW antenna
- USB charging lead
- Stereo earphones
- 18650 type 2000mAh lithium battery
- Quality soft carrying case



£189.95



## Tecsun S-2000

LW/MW/FM-Stereo/Shortwave (with SSB) and Airband.

### Frequency coverage

- Shortwave: 1711 - 29999 kHz
- VHF Air band: 118 - 137 MHz
- LW: 100 - 519 kHz
- MW: 520 - 1710 kHz
- FM Stereo: 88 - 108 MHz

### Specifications

- Signal Attenuator
- Dual timer alarm
- Wide/narrow filters
- 1000 station memories
- Auto Tuning Storage for FM/AM
- Dual alarm clock function
- MP3: Aux input

£299.95

## Tecsun AN-48X

- Active loop antenna
- Effective Frequency Range
  - LW: 120-400kHz
  - MW (AM): 520-1700kHz
  - SW: 3500 20,000kHz



£39.95



## Tecsun S-8800 (GM)

Synthesized portable/desktop receiver with handheld remote control unit, SSB reception and Gun Metal tuning knob, deal for use at home or when travelling!

### Frequency coverage

- Long Wave: 100 - 519 kHz
- Medium Wave: 522 - 1620 kHz
- Short Wave: 1711 - 29999 kHz
- FM: 87 - 108MHz

### Specifications

- SSB function with LSB/USB
- 650 station memories
- Alarm & sleep/timer functions
- DX/Local antenna gain control
- Built-in battery charging feature
- Unit size: 173 x 272 x 88mm

£279.95

## Tecsun AN-200

Receiving Loop  
Simply place near radio to boost reception!

- Frequency coverage: 520kHz - 1710kHz



£29.95



## Tecsun PL-680

Portable world band receiver with SSB and full frequency coverage including VHF Airband.

### Frequency coverage

- FM, MW, SW, LW
- Civil Air band 118 - 137 MHz

### Accessories supplied include:

- Stereo earphones
- External antenna
- Mains adaptor
- Carrying case



### Specifications

- Dual conversion
- SW Single Side Band (SSB) with BFO control
- 1900 station memories
- Multi-tuning methods
- DX / Normal / Local antenna gain
- Built-in Ni-MH battery charge function
- Power sources:
  - 4 x UM3 (AA size) batteries (not supplied)
  - 230V Mains adaptor (included)
- Dimensions: 190 x 35 x 112mm WDH

£149.95

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DISTRIBUTORS OF TECSUN [www.nevadaradio.co.uk](http://www.nevadaradio.co.uk) phone 023 9231 3090

e-mail [sales@nevada.co.uk](mailto:sales@nevada.co.uk) address Unit 1 Fitzherbert Spur Farlington Portsmouth PO6 1TT







## AOR AR-8200 MkIII Wideband Scanner/ Receiver



- 530kHz-3000MHz
- AM/FM/SSB/DATA
- 1000 memories
- TCXO high stability oscillator card slot
  - expand to 4,000 memories
- Preselected Front End
- 8.33kHz airband step supported
- Step adjust, freq. offset, AFC
- Scan/Search rate max 37 steps per second
- True carrier re-insertion in SSB modes
- Detachable MW bar antenna
- Noise limiter & attenuator
- Versatile band scope with save trace facility

£459.95

See our website for full specification

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## Professional Scanning and Monitoring from AOR



A high performance all-mode communications receiver that covers the frequency range from 100kHz to 3GHz. As such it covers the complete radio spectrum, DC lead included.

### AR-8600 MkII Communications Receiver

- All mode: WFM, NFM, SFM, WAM, AM, NAM, USB, LSB, CW
- Frequency range: 100kHz - 3000MHz
- 100 - 530kHz (not guaranteed)
- Search banks: 40 \* Pass frequency: 2,000 (40 banks x 50)
- Airband 8.33kHz channel spacing
- Five optional slot card sockets
- Power: 10.8-16 DC (PSU optional)
- Tuning steps in multiples of 50Hz
- Scan/Search rate: Approx. 37ch/sec max.
- Two VFOs A / B \* Memories 1,000 (20 banks x 50 channels)
- RS232 PC interface fitted as standard

£649.95



### AR-DV1

#### Digital and Analogue wideband communications receiver

Multimode digital demodulation receiver featuring wideband reception, D-STAR, Yaesu Fusion, DMR and much more.

- 100kHz-1300MHz wide band reception
- Multi-mode digital demodulation
- All mode analogue reception.
- Memory Scan
- NR, notch, digi-data display.
- Built in SD card reader (audio recording, timer recording, CSV memory data upload/download, firmware updates) + 4Gb SD card included
- Clock, calendar (sleep timer, alarm, timer recording, reception logging on SD)
- 178W x 50H x 215D mm

£1199.95

### AR-8200D Wideband Scanner/Receiver

Higher spec than the AR-8200 with additional features:

- APCO25 decoding
- Voice recording
- MicroSD card slot
- 4GB MicroSD card included
- USB port
- CTCSS built-in
- Voice inversion built-in

£679.95 £659.95



### AR-DV10 Digital Handheld Receiver

The AR-DV10 is the most advanced digital handheld receiver covering 100kHz - 1.3GHz. The latests firmware upgrade now adds comprehensive trunk monitoring.

IPX5 water resistant

£939.95



## NEW! PROFESSIONAL COMMUNICATIONS RECEIVER

### AOR AR-5700D

- 9kHz - 3.7GHz
- Full Digital Decode
- PC Panoramic Display
- In Stock!



New!

- FM, FM-stereo, AM, synchronous AM, USB, LSB, CW, analog I/Q, FM video.
- D-STAR / GMSK / AMBE DV mode only
- YAESU / C4FM / AMBE+2 V/D narrow mode only
- ALINCO / GMSK / AMBE EJ47 (F1E) mode only
- D-CR / C4FM / AMBE+2
- NXDN / C4FM / AMBE+2 6.25kHz mode only
- P25 Phase 1 / C4FM / IMBE Conventional mode only
- dPMR / C4FM / AMBE+2 Tier 1 only
- DMR / C4FMx2 / AMBE+2 Tier 1 and Tier 2 only
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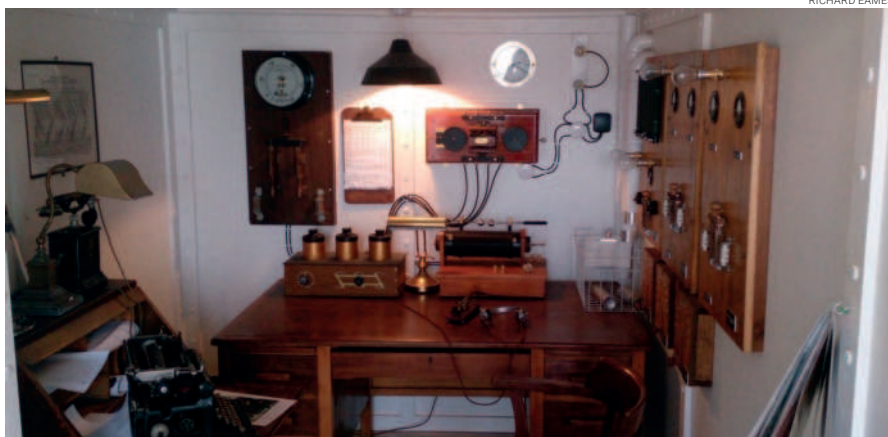


# Feedback

Have you got something to tell our readers? If so, then drop a line to [wiessala@hotmail.com](mailto:wiessala@hotmail.com)

RICHARD EAMES

Richard Eames contacted *RadioUser*, concerning our news item *Radio Round-up in RadioUser*, July 2020: 18, concerning the *Titanic*. The item surrounded a US judge's decision to permit the retrieval of the Marconi wireless equipment. Richard wrote, "[...] This seems regrettable, given that the ship is the grave of the victims of the disaster. It is also unnecessary. A replica of the wireless room has been recreated and is kept in the Marine Radio Museum at Fort Perch Rock on Wirral in Merseyside. The photographs are ones I took myself on a visit, so please feel free to use them if you like." I forwarded Richard's e-mail to Scott Caldwell, who replied on behalf of *RadioUser*: "Just an update from the US: The court has agreed to an extension for the expedition until Summer 2021. I agree with the comments raised in Richard's email. Marine Archaeology relates to the discovery of unknown facts and artefacts. What can we learn about the Marconi equipment? In 2001 and 2005, James Cameron et al imaged the Marconi rooms and I would suggest looking at the books *Ghosts of the Abyss* and *Exploring the Deep*. I know that the Marconi rooms, on the Olympic and Titanic now had a different layout. The set in James Cameron's film *Titanic* (1997) was based on



the Olympic's and is incorrect. Lastly, if we consider the wrecks of the Bismarck and Hood, would their Governments (legal owners) allow access to cut open wrecks. I very much doubt this. Although, the MOD did allow the recovery of the Hood's bell. This raises the question was is the difference? If, we had the opportunity to learn something new that would be more appealing. I have some salvaged items from the Titanic. But, I had to think long and hard about this. I still prefer the look but do not touch policy. The expeditions by James Cameron went

deep into the wreck and imaged many great artefacts in situ, mirrors, bed frames, water cabinets, and the lift controls, and the Marconi Field Regulators. In 1986, Robert Ballard team's gave the world the look inside Titanic when they imaged a brilliant crystal light fixture with a deep-sea plant growing in it - I remember the front page of the Manchester Evening News: *Flower in the Grave of Titanic.*"

[Thanks to both Richard and Scott, for raising this rather sensitive and important topic - Ed].

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E & O.E.





# Aviation Recovery & Early Aircraft Radio (Part II)

David Smith  
dj.daviator@btinternet.com

**David Smith assesses the current recovery plans for aviation in Europe, the closure of a Scottish airport, and call signs, and he continues with his series on the pioneering days of early aircraft communications.**

The first edition of Eurocontrol's *Network Recovery Plan* – the blueprint charting the path to recovery from the Covid-19 pandemic for European aviation – was published on 30 April 2020. This coincided with European traffic beginning a slow recovery from its lowest point of just 2,099 flights across the network on 12 April 2020.

An updated version of the plan is pub-

lished every Friday, covering a rolling four-week period and consolidating data from 350 airlines, 68 area control centres (ACCs), 55 airports and 43 states. It is reviewed every Monday by operational stakeholders, like air navigation service providers, airports, airlines, and military directors of operations, to tackle issues on a network basis, as inputs for the next edition.

The plan aims to play a major role in helping European aviation on the road to recovery by providing key aviation managers with the global view they need to plan effectively. It ensures that capacity is available at ACCs, in the airspace they oversee, and on the ground at airports, to meet the expected traffic demand from the airlines for each day of the next four weeks. By partnering for recovery from the start, the objective is

to ensure a safe and smooth revival phase for all involved, promoting progressive action as traffic returns.

<https://tinyurl.com/yyr4gqt9>

## Oil Support Airport Closure

Scatsta Airport in Shetland closed on 30 June 2020, after Bristow Helicopters and Eastern Airways lost a contract to fly offshore crew to oil facilities in the northern North Sea. The contract was awarded to Babcock and Loganair, who have decided to operate from Sumburgh in the south of the islands. Originally built for the RAF as a fighter station to defend the flying boat base at nearby Sullom Voe, Scatsta was restored and reopened to support oil operations from the Voe in 1978. Its Tower and Approach frequency was 123.6MHz, Radar

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was on 122.4MHz, and the Information Service on 122.0MHz.

### Averting Callsign Confusion

The Civil Aviation Authority (CAA), NATS and many airline operators continue to be concerned about the problems that result from the similarity of airline radio callsigns. These often give rise to both potential and actual flight safety incidents. The UK CAA Mandatory Occurrence Reporting Scheme (MORS) database contains many reports from Controllers and Flight Crew highlighting these problems. A move beginning in the year 2000, from numeric towards alphanumeric callsigns, did reduce confusion. A numeric callsign is one where the suffix consists of numbers only. An alphanumeric callsign is one where the suffix consists of a number (or numbers) followed by one or more letters.

Subsequently, in the documented cases of 'callsign-confusion', 84% involved numeric-only callsigns. 10% involved alphanumeric-only ones and 4% involved a combination of alphanumeric and numeric callsigns.

A recent study has found that many airline operators continue to utilise their IATA commercial flight numbers as a callsign suffix. However, because they tend to be allocated in batches of sequential and very similar numbers, confusion occurs. Several airlines have switched to alphanumeric systems.

However, if every operator adopts alphanumeric callsigns, the limited choices available within the maximum of four elements allowed in the callsign suffix means that callsign confusion is likely to result. Before changing to an effective all alphanumeric callsign system, which involves a significant amount of work, especially for a large airline, it is recommended that operators review their existing numeric callsign system to 'de-conflict' any similar numeric callsigns. Where there is no effective solution to those callsigns with the potential for numeric confusion, alphanumeric callsigns can be adopted. Current advice includes considering the measures listed in Table 1.

### Early Aircraft Radio (Part Two)

Regarding Part One of *Early Aircraft Radio* (*RadioUser*, July 2020: 16-19), our reader Timothy Dabbs, who is a volunteer in the Wireless Section at Brooklands Museum, wrote: "I have just read your article on early aircraft radio, which I found very interesting. However, there is no mention of Brooklands in Weybridge, Surrey where the first air-to-ground radio took place in September 1911.



The article about this is on the Brooklands Radio website."

<https://tinyurl.com/yxs6klu7>

Thank you, Timothy, I must confess that I was unaware of the Brooklands connection, since much of the information for the article came from RAF Air Historical Branch 1950s publications, namely *Signals* volumes covering aircraft radio and communications. One of them has a short piece on the origins of the subject but completely ignores the earlier Brooklands achievements. Perhaps because they were civilian and thus 'unworthy' of mention!

Briefly summarised, they began during September 1911, when trials of airborne wireless begun at the 'Brooklands Aviation Ground', using a Flanders monoplane with a Marconi timed spark transmitter operating from a 6V battery. In August and September respectively, of the previous year, first the Americans and then the British had successfully sent a Morse code message from an aeroplane; but, of course, the 'Holy Grail' was to achieve two-way communications.

On 9 May 1912, A W Mathieu of Marconi and pilot E. V. B. Fisher achieved the world's first successful two-way radio transmissions (using Morse code) while flying over Brooklands. Sadly, the same pilot achieved another first a few days later on the 13 May when the same aircraft was involved in a fatal accident at Brooklands. The subsequent investigation carried out by the Public Safety and Accident Investigation Committee was the first of its kind and became the basis of all subsequent aviation investigations.

Experimenting carried on at Brooklands until the outbreak of war when the Royal

- Start flight number element sequences with a higher number, e.g. six and above.
- Try to minimise the use of callsigns with four digits.
- Wherever possible, use no more than three digits.
- Avoid multiple uses of the same digit, e.g. 'ABC555'.
- Exhaust the numerical possibilities first, before using alphanumeric systems.
- Avoid flight numbers ending in a '0' (zero) zero or five ('5' might be confused, visually, with 'S' and zero, when combined with two digits (i.e. 150) could be confused with a heading or level.
- Avoid the use of similar/reversed digits/letters in alphanumeric callsigns, e.g. 'ABC 87MB' and 'ABC 78BM'.
- In alphanumeric callsigns, avoid phonetic letters that can be confused with operator designator prefixes, e.g. 'D' – Delta (the airline).

**Table 1: How to avoiding callsign confusion.**

Flying Corps took over the Marconi experimental establishment headed by R. D. Bangay. A few months later, in April 1915, there was a major increase in the size of the wireless training school at Brooklands led by Major C. E. Prince and Major H. C. T. Dowding (who would go on to become Air Chief Marshal Dowding of World War Two fame).

They were also joined by No 9 Squadron, now the oldest dedicated bomber squadron of the Royal Air Force, and, at the time, the only radio-training squadron.

This was just the start of Brooklands' connection with wireless. During 1916, Archibald M. Low (the inventor of TeleVista a forerunner of Television) came to Brooklands to work on radio-controlled un-

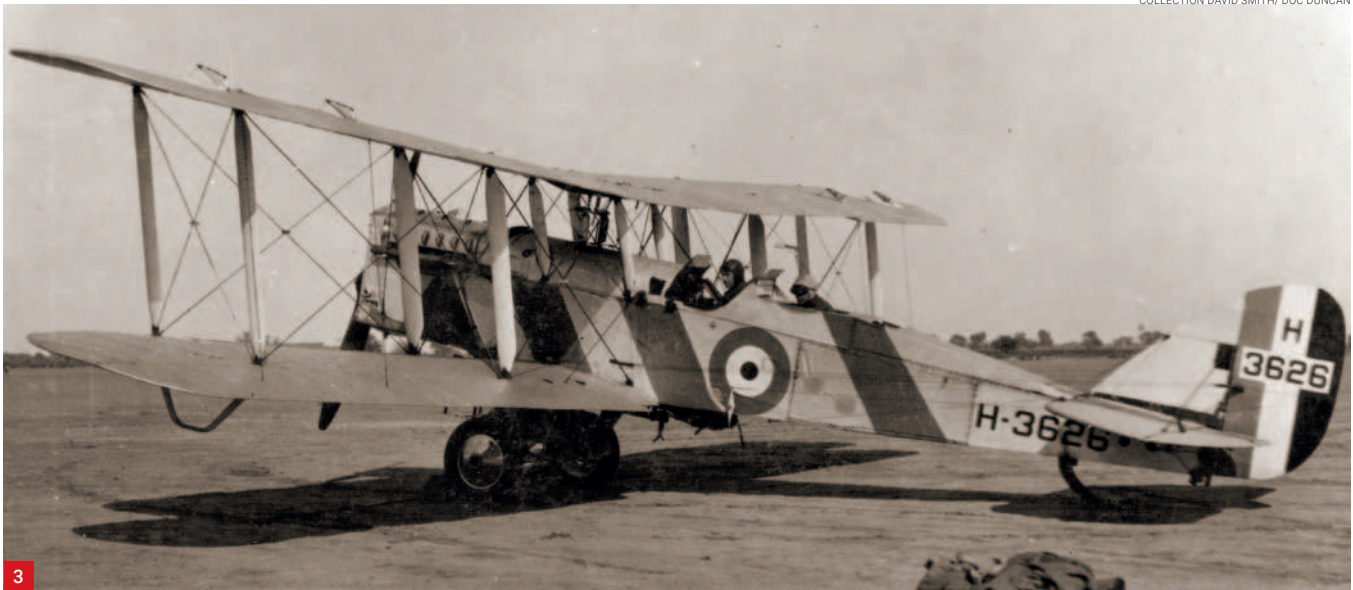


Fig. 1: A Pitts Special at Sleaf, Shropshire.  
 Fig. 2: A Sea Vixen at Bruntingthorpe, Leics.  
 Fig. 3: An Airco DH 9A – this type of aircraft was used to test various wireless installations in the 1920s. Fig. 4: A Boulton-Paul Overstrand K4553; 101 Squadron seen at an Empire Air Day at RAF Leuchars. A very outdated bomber but with plenty of room for equipment. Fig. 5: Hawker Audax K2017; 13 Squadron, a typical army co-operation type in the 1930s. Note the retracted hook behind the wheels to pick up messages from the ground if the wireless failed! Fig. 6: Avro Ansons of RAF Coastal Command on exercise with the Royal Navy as war approaches.

manned aircraft (drones) a subject which the Museum is still researching. The concept of communication between racing cars and the pits was also developed at Brooklands in the 1920s.

### Further Tests and Technical Developments

Returning to the narrative begun in Part I, early in 1924 the Air Staff of the RAF decided future policy about the installation of W/T, R/T and D/F (Direction Finding) equipment. As a result, every Airco DH 9A (Fig. 3) of one squadron, No 207, was fitted with W/T and R/T sets. However, only sufficient equipment was provided to enable the leader and his deputy to use two-way W/T and R/T, all other aircraft being provided with R/T reception only. Two W/T ground stations were set up to work with this squadron.

Progress in the next few years was disappointing, and there were many delays in the supply and fitting of equipment. Experience soon found that operation of all the individ-



ual sets required at the time was so complicated and cumbersome as to interfere with other duties of the aircraft crew. By 1927, the most urgent need was for the design of a general-purpose transmitter/receiver, which would fulfil all necessary functions.

Trials of varying success continued, culminating in the TRX.9 tested in 1932. At 5,000ft, R/T ranges were 30 to 40 miles air-to-ground and 10 to 12 miles air-to-air. This was the prototype of the TR.9 which, somewhat developed, was used by Fighter Command in the Battle of Britain. For bombers, there emerged a new general-purpose W/T set, the R.1082/T.1083. This and the TR.9 contained many faults and limitations but they represented the results of a long struggle for improved wireless equipment when the importance of aircraft radio was not universally understood.

The ever-increasing use of HF telegraphy and telephony by all nations necessitated close adherence to allotted frequencies and the development of transmitters of sufficient power and stability to overcome increasing interference. This interference was a great stimulus to the development of equipment designed to operate in the VHF bands. As early as 1927, the Air Ministry had become interested in a scheme proposed by Mr R. C. Galletti for generating a parallel of short wireless waves. However, adverse reports on its feasibility delayed matters until a revival of interest was sparked by encouraging flight trials in May 1930.

Further research followed at the Royal Aircraft Establishment at Farnborough, Hampshire, where a complete low-power transmitter and receiver was designed





5



6

and built. It operated in the 100 to 150MHz band, and in March 1931 the first of a long series of experiments began, to gain more knowledge of the properties and characteristics of such frequencies.

This formed the basis for the development of VHF wireless equipment.

### Degrees of Standardisation

By the end of 1932, flight tests produced some broad conclusions: Frequencies between 109 and 120MHz were suitable for many ground-to-air, air-to-ground and air-to-air purposes. The range was about equal to the optical path between transmitter and receiver, and vertical polarisation was preferable.

During 1933, service requirements and technical development had reached the stage where some degree of standardisa-

tion was possible. Initially, the sector commander or controller in the operations room did not attempt to speak to the pilot of an aircraft by radiotelephone. Messages to pilots were written on slips of paper and passed to R/T operators for transmission. The R/T operators were specially chosen for their clear enunciation and sat in sound-proofed enclosures.

In 1934, trials were carried out in which controllers spoke directly to pilots. When the trials proved successful, the practice was adopted universally. Eventually, it was discovered that there was a need to make interceptions at ranges greater than the 35-40 miles R/T range of the TR.9. This led to a requirement for a range of 100 miles, with aircraft flying at 5,000 feet. In the meantime, the range deficiency of the TR.9 was overcome by using mobile ground R/T relay

### RESOURCES

- A Short History of Air Traffic Control: <https://tinyurl.com/y3ykj8p4>
- Activities of the European Office up to 1954 <https://tinyurl.com/yb5czgh>
- Aviation: <https://tinyurl.com/y6rzaq3m>
- BAA Training: <https://tinyurl.com/y5ay6bey>
- History of ATC: <https://tinyurl.com/y6o38qkp>
- Levesley, J.: ATC History: <https://atchistory.wordpress.com>
- McKeeman, C. (2019) *A History of the Birdlip Aeronautical Communication Complex (1940-2017)*
- Moments & Milestones: <https://tinyurl.com/ybktvw5t>
- Ohallmhúráin, S (1986) *Aviation Communications Service 1936-1986*
- Post, R. KB8TAD: "Listening in on the WWI Western Front: the SCR-54A (BC14A) Receiver" (*The Spectrum Monitor*, July 2018).
- Reitz, K. (2020) 'Aviation Communications in 1920' (*The Spectrum Monitor*, March 2020: 32-35)
- Royal Air Force ARS (RAFARS): <https://www.rafars.org>
- Young, P. (1983): *Power of Speech - A History of ST&C, 1883-1983.*

stations, sited 30 or 40 miles forward of the sector ground station.

The mobile transmitter-receivers were known as 'R/T Tenders' and comprised a truck chassis mounting the radio equipment deployed some 30-40 miles from the sector airfield. The radio would be linked by high-quality telephone landline to the sector control room, permitting two-way communication between the air and ground. Because the infrastructure was already in place, most R/T Tenders were deployed close to the sector's Direction Finding (D/F) stations.

Another factor was a need for increased frequency stability for the TR.9 since frequency drift resulted from vibration and temperature changes during flight. In April 1937, crystal control was applied to the TR.9, which was then designated the TR.9C. Later, to facilitate transmissions for Direction Finding (DF) purposes while still allowing R/T contact to be maintained, a second frequency channel was provided on the TR.9.

Fig. 4 shows a *Boulton-Paul Overstrand* K4553, of 101 Sqn, and Fig. 5 is an image of a *Hawker Audax* K2017 of 13 Sqn. and Fig. 6 is of a *Coastal Command Ansons* exercise with the Royal Navy.

*To be continued...*

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# Radio Relaxation & Media Programmes

**Chrissy Brand**

chrissyLB@hotmail.co.uk

**O**n a drive home from Hove on a Saturday evening, I was struck by how three fabulous radio programmes were all on the air at around the same time.

Thank goodness we can simply listen to or stream such programmes again at our convenience.

Back in the day, it used to irritate me when I scanned the short wave bands at night, to discover English services clashing with each other, hour after hour. Perhaps I was being greedy by wanting to hear everything.

My memory has failed me in the details but it seemed that NRK Radio Norway was on at the same time as RDP Portugal, while Radiobras in Brazil, Canada Radio International and countless others were competing for my attention. Every thirty minutes, there was a new set of clashes.

Although many of those stations who I

**Chrissy Brand** tunes into a variety of music programmes, including jazz, new wave and new music on BBC local radio, catches a Covid-19 station in Cheshire and suggest some media-themed podcasts.

listened to no longer broadcast in English, a similar situation of clashes remains today; with tens of thousands of radio programmes and podcasts to select from, live or on-demand. There are worse dilemmas to have and, of course, with SDR, both these and my 1980s short wave problems would be solved, as I could simply record everything and listen at my leisure. Mind you, this then creates another issue, as there are never enough hours in a day to hear everything.

The best solution is to be able to choose from the quality of interesting programme content over the sheer quantity of output. I hope that this column guides you to some easier decision-making on that front.

## **Saturday Night's Alright For Listening**

BBC Radio Three's jazz music shows have been a long-established treat, combining analysis, history and interesting performances (Fig. 1). On the Saturday evening in question, I heard an episode of *J to Z*, a programme offering the best in jazz past, present and future. Kevin Le Genre presented highlights from the lockdown streaming festival, *Live From Our Living Rooms*. It included contemporary jazz offerings from bassist Linda May Han Oh, drummer Antonio Sanchez and vocalist Thana Alexa. There was also an enjoyable feature on the music that inspires and influences composer and trumpeter Ambrose Akinmusire.

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HARRY GROUT ON UNSPLASH

**Fig. 1: Light up your night with jazz and new music on the BBC. Fig. 2: Venezuelan music from Radio Rumbos - on short wave and online.**

The June 20th broadcast was very moving, with presenter Julian Joseph dedicating it to victims of racism and all those campaigning for racial equality around the world.

[www.bbc.co.uk/programmes/b09ymqm4](http://www.bbc.co.uk/programmes/b09ymqm4)

BBC local radio is not to be outdone by its national counterpart. I am delighted at the times it switches away from run-of-the-mill music and clichéd views of phone-in callers.

One of local radio's sublime offerings is *Stereo Underground*, heard on BBC Sussex and BBC Surrey (and possibly other BBC stations). According to its DJ, Richard Latto, the programme is the most downloaded podcast from the *BBC Sounds* app. New wave music, from the 1970s to the Noughties, is its speciality. Songs by Sham 69, Kirsty MacColl, The Heartthrobs, Green Day, and others, made my day, and also encouraged me to subscribe to the show.

Evidently, *Stereo Underground* is popular with commuters, which makes me smile, thinking of those loud and inspiring tunes being blasted out on the 0712 train from the Home Counties to London Victoria and Charing Cross!

You can listen live on a Saturday at 1700 to 1900 UTC (1800 to 2000 BST) for, "Music with attitude that defines a zest for life and an alternative spirit." Perhaps it is a case of being once a rebel, always a rebel.

[www.bbc.co.uk/programmes/p02v9nnp](http://www.bbc.co.uk/programmes/p02v9nnp)

Meanwhile, at 1900 UTC (2000 UTC) on BBC Oxford, check out the hour-long *BBC Music Introducing In Oxfordshire*, where Dave Gilyeat plays a range of new music. I enjoyed the sounds of Brave Rhino, Dada Paradox and Art Paolo.

Other stations on the network carry different versions of *BBC Music Introducing*. Have a look around *BBC Sounds*, and you will find *BBC Music Introducing in Leicestershire and Rutland*, where Dean Jackson showcases the best of under-the-radar local music on BBC Radio Leicester. Other BBC outlets broadcasting their own local talent include Radio Kent with Abbie McCarthy and Andrew Marston on BBC Hereford and Worcester.

Back on my journey, Radio Reverb (97.2MHz, DAB and online) aired an enthralling programme of free jazz music, which enthralled me until the signal faded when I was 20 minutes east of Brighton. This was *Ears Wide Open*, hosted by Paul Wilson from his garden, "caressing you with a wealth of discerning music in the jazz, post-punk, funk vein without genre limitations. Hey, you could

be surprised. All you need is an open mind and an interest in good, good music."

[www.radioverv.com](http://www.radioverv.com)

Incidentally, Radio Reverb is one of the most exciting and diverse stations in the country, if not globally. All genres of music are covered and there is a veritable Smörgåsbord of spoken-word content.

To illustrate my point, here is a selection from the dozens of programmes on Radio Reverb, surely proving that there is something for everyone: *The Albion Roar* (football), *Brighton Book Club*, *Welcome to Folkhampton*, *Let's Talk Property*, *Refugee Radio*, *Chilli Beat Science*, *Mental Health Matters*, *Growing Wild*, *Hammer and Tongue* (poetry) and *Lady Love*. The latter is a weekly radio show, "celebrating female and non-binary voices. *Lady Love* will excite, challenge and inspire you with subversive femininity and mighty people."

### It's Grime Up North

As soon as the lockdown restrictions allowed, I popped up north to visit family and friends. It was good to hear the sounds of Manchester's Unity Radio (*The Real Sound of the City*) once again, on 92.8MHz. *The NGY Show* (Next Generation Youths) is always interesting. This is a group of young people who travel from across Greater Manchester to attend radio-training workshops and deliver a live radio show.

A Unity Radio Sunday lunchtime programme plays black music from all around the world and, at other times, I enjoy listening for a dose of drum n bass and grime music. The station has a listen-again facility at the website, plus podcasts and a Unity Radio App.

During the lockdown, a free, physical CD "mixtape" containing 22 tracks, was produced. It brought together exclusive tracks from talented and emerging artists from across Greater Manchester, such as Abnormal Sleepz and Victoria Jane. There was also a bonus track called *Struggles* by Hasbo & D.G, exploring the subject of county lines, from a young person's perspective. The CD was part of the *Creative Care Packages* developed by Greater Manchester Combined Authority for young people.

[www.unityradio.fm](http://www.unityradio.fm)

Cheadle FM in Cheshire was one of the emergency Covid-19 stations that Ofcom gave a licence to early in lockdown (*RadioUser*, July 2020: 9 and August 2020: 44-47). Thanks to the efforts of community radio volunteers, Cheadle FM (87.9MHz) launched on May 23rd. I tuned in regularly during late June and was impressed with both the mix of music and the information that was disseminated in a friendly and reassuring



2

manner. The station achieved its aim of, "engaging people from all walks of life. Born out of the social crisis caused by Covid-19, Cheadle FM's goal is to bring people together, give everyone a platform and be a friendly voice for all those that need it."

However, it went off the air on June 30th, when the Cheadle FM Board decided, "not to seek an extension of our Covid license as that would have been too costly, both financially and in terms of wear and tear on our people. That said, we believe that Cheadle FM has filled an important need by 'Bringing Cheadle Together' and so we are looking at ways in which we can, with others, continue to meet that need in the future with a wider support base, greater content and increased audience. We will be sharing news about how this will look in due course."

### From Further Afield

Ecos del Torbes and Radio Rumbos (Fig. 2) from Caracas (670 and 4970kHz) offer a true taste of Venezuela. Both stations once boomed in from afar on the Tropical Bands and I happily recall first hearing the exciting, different sounding styles of music and presentation, in languages that were foreign to me.

Today, I listen to Ecos del Torbes online, although it broadcasts in Venezuela on 780kHz. The programme content is largely Venezuelan popular music, with much folk and ballads.

For me, the station paints vivid 'audio-pictures' of South America, which inspire travelling. All the programmes I hear, music-wise, are worth a listen. And even if you are not a fan of the folk music, the vintage-sounding jingles alone are worth tuning in for.

<http://ecosdeltorbes.net>

[www.radiorumbos.com.ve](http://www.radiorumbos.com.ve)

Lionel Clyne reported on two interesting radio stations. He heard Radio Ndarason at 1932 UTC on 12050kHz, broadcasting in Kanuri from the Woofferton (UK) transmitter site.

Lionel wrote, "Radio Ndarason was

Date	Time (UTC)	Station	Programme	Podcast	URL/ Stream/ Frequency
Intermittent	Unspecified	Swiss Info, Swiss Broadcasting Corporation	Inside Geneva with Imogen Foulkes	On Spotify, iTunes et al	www.swissinfo.ch/eng/insidegeneva
Daily	1400-1500	CRTV Cameroon	News and features	On Google podcast app et al	https://tinyurl.com/y4k8chul
Daily	1303-1330	Radio Tunis Chaîne Internationale	English: news, features, music	French, German, Spanish https://tinyurl.com/y6xktvn3	www.rtc.tn 963kHz
Friday	1800-2000	Radio Alty	LMG's Houseparty with Leah. Global DJs & club music	Alexa, Steema, Google & Apple podcasts	www.radioalty.co.uk
Thursday Fortnightly	Unspecified	NHK World Radio Japan	Meet the People	Only via NHK website	www3.nhk.or.jp/nhkworld/en/radio/people
Sunday	1800-2000	BBC Radio Scotland	Jazz Nights with Seonaid Aitken	BBC Sounds	www.bbc.co.uk/programmes/b08m8z10
Sunday	2000-2200	BBC Radio Scotland	Classics Unwrapped with Jamie MacDougall	BBC Sounds	www.bbc.co.uk/programmes/b007hq5

**Table 1. Top listening Recommendations for the month ahead in international radio.**

established in 2015 to broadcast in the regional languages of Kanuri, Kenembu and Maiduri, originally for a single, one-hour daily broadcast. However, the personnel at the station seem to be very ambitious and now broadcast three hours every morning and three hours every afternoon: I think the fact that they now broadcast from Woofferton, with an all-five SINPO, shows evidence that they are fulfilling that ambition. Their commitment is to help assuage some of the turbulence in the region, especially in the Lake Chad area. That being the case, they seem to be fulfilling a similar function to Radio Dabanga and Radio Tamazuj in the Sudan."

Radio Algérienne Holy Qur'an (Chaîne 1) was on the air at 1845 UTC on 13820kHz, broadcasting in English from Issoudun in France with a powerful signal. Lionel remarked that an English programme seemed unusual at that time and on that frequency. Lionel commented that these three Radio Algérienne stations, Chaîne 1, 2 and 3, were set up in 1986 when the Algerian broadcasting landscape radically changed.

There is a five-minute English programme scheduled at 1830 UTC on 13820 kHz. On July 2nd, Alan Roe of the British DX Club noted two short feature programmes in English, one on a historical personality and *Destination Algeria*.

Usually, a 30-minute Radio Algeria International programme in English (a news bulletin at 1330 UTC) is uploaded to the

Google podcast app daily. However, the July 2nd podcast was a short programme, the same one as observed on short wave by Alan. [www.radioalgerie.dz/rai](http://www.radioalgerie.dz/rai)

### Six of the Best Media Programmes on Radio

This month, I have selected six programmes that cover issues and developments in the world of media. They can all be downloaded or streamed so that you can listen at home, in the car or on your commute.

We start with *Mediawatch* from Radio New Zealand. This twice-weekly programme takes a critical look at the radio, television, press and electronic media scene in New Zealand. It is always useful to follow patterns and trends in other countries, to see how your own country can learn and improve and, hopefully, become more democratic.

<https://tinyurl.com/y6epjmdd>

In the UK, I always turn to the *Radio Today* podcast. This weekly programme covers a wide range of radio subjects. On June 24th, Dan McQuillen from Broadcast Bionics looked at radio tech in the pandemic. Other recent topics have included forgotten freelancers at the BBC and the closure of Liverpool station Radio City Talk. Once a month, there is a roundtable with influential radio industry guests.

<https://radiotoday.co.uk/podcast>

*The Media Podcast* is another UK

production. It comes out fortnightly and covers trivia (Harry and Meghan's battles with the tabloids) as well as more intellectual areas of discussion (diversity in television, Twitter fact-checking, journalists and political unrest).

[www.themediapodcast.com](http://www.themediapodcast.com)

*Talk Media* is hosted by Stuart Cosgrove and Professor Eamonn O'Neill. The programme gives, "a forensic analysis of how the media works, and who works the media. Packed full of candid commentary and informed opinion, *Talk Media* features a weekly guest commentator from the worlds of journalism, entertainment and politics."

<https://tinyurl.com/yybwqvm1>

Radio Survivor, in San Francisco, is a station and a podcaster that, "attempts to shed light on the ongoing importance of radio: from the airwaves (FM, AM, short wave, HD, satellite) to online ... As both fans and producers, we write about the problems and prospects of radio ... We embrace college radio stations in crisis. We defend radio pirates. And we care about the ongoing survival of our favorite radio stations."

[www.radiosurvivor.com](http://www.radiosurvivor.com)

For several years, Radio France International ran an excellent programme in English about the African media. It seems to have ceased in 2017 but there are dozens of episodes, dating back to 2010, which are worth revisiting.

I'm off to do that now.

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# The SatNogs Project and Geostationary Satellite QO-100

Tim Kirby

longworthtim@gmail.com

**Tim Kirby looks at a crowd-sourced satellite receiving network and hears from a reader who has been listening to a geostationary satellite using equipment he put together himself**

This month, we will look at a group of enthusiasts who have formed a satellite receiving network across the world. If the idea grabs you, it's something that you can do yourself, with relatively little effort (Fig. 1).

I must say, as I researched it more, to write this article, it very quickly went on my list of things to try here.

The project is called SatNogs, and it aims to provide a series of open-source (freely available) programs, blueprints for hardware and other technologies for a distributed network of low earth orbit satellite ground stations.

The idea dates back to 2014 when the project was initiated during the NASA *SpaceApps Challenge*, held at *Athens Hackerspace*. The project took part and won the first place of the *2014 Hackaday Prize*. This was for an open-source project, which would feature a connected device. The first prize would win a trip to space as soon as it was commercially available or the cash option (around \$200,000).

Over 700 projects signed up for the contest. By the way, if you've not come across the *Hackaday* website (then I highly recommend it – there are all sorts of interesting things to read.

<https://hackaday.io>

SatNOGS was the brainchild of the *Libre Space Foundation*, and it won first place and the grand prize. The group chose the cash prize to help start up the Foundation which, as you can tell from the website, has several exciting projects.

<https://libre.space>

## An Open-Source Approach

Because the projects are open-source, it means that anyone can contribute to software or hardware designs and that all the designs are freely available. You can read more about the principles of Open



Source at this URL:

<https://opensource.com>

There is also a summary, which states, "Open source projects, products, or initiatives embrace and celebrate principles of open exchange, collaborative participation, rapid prototyping, transparency, meritocracy, and community-oriented development."

If you are involved in IT projects in any function these days, you will certainly be very well aware of the Open-Source choices which are now available.

The aims of the SatNOGS project are summarised in Table 1.

The ground stations are intelligent and are capable of tracking satellites without any manual intervention. Some have a GPS module connected to them, so they know where they are; they also have information about satellite passes available to them; therefore, they also know where the satellites are, in terms of both azimuth and elevation. Furthermore, they have an azimuth/elevation rotator connected, so that the antennas can be made to track the satellite as it passes across the sky. I enjoyed reading that the design for one of the rotators used by the project was such that much of it could be 'printed' using a 3D-printer.

Not all stations have steerable aerials and rotators. Some of them use turnstile or other omnidirectional aerials such as 'egg-

**Fig. 1: You don't need all this to receive satellites for yourself. Fig. 2: A SatNOGS observation – you can see much of the data that has been collected. Fig. 3: Looking up data from a particular satellite is easy in SatNOGS. Here's the data for Quetzal-1. Fig. 4: An effective ground station may very well look like this...**

beaters'. This makes setup and operation of the station more straightforward – you can make up a turnstile aerial in a matter of an hour or less if you have the appropriate bits. Indeed, the *SatNOGS wiki* advises that if you are getting started, it's worth going with the 'simple-antenna-approach', rather than worrying about getting tracking going.

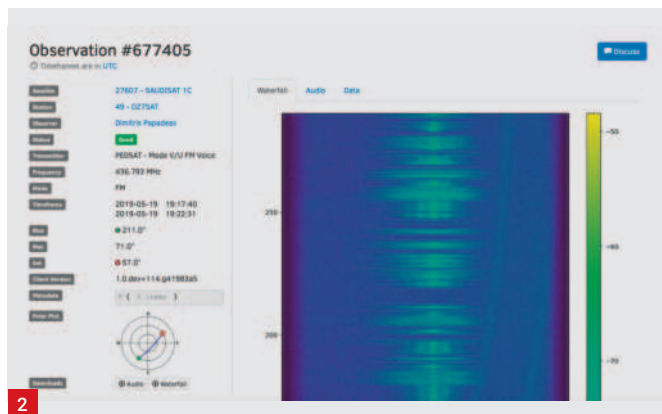
The 'basic' station design uses a Raspberry Pi and an RTL-SDR dongle, both of which are low-cost devices. To make things even easier, there's an image that you can download onto an SD card and use on your Raspberry Pi with all the software installed. There's an excellent page which shows, step-by-step, how to set up your Raspberry Pi for *SatNOGS* work:

[https://wiki.satnogs.org/Raspberry\\_Pi](https://wiki.satnogs.org/Raspberry_Pi)

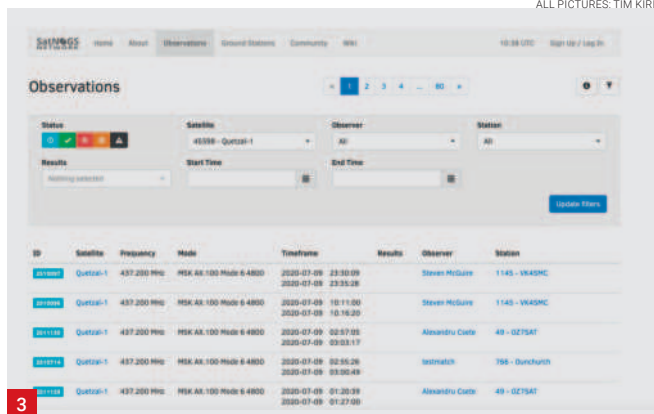
## Easy for Newcomers

What I liked about the process was that it was clear, it had been made as simple as possible for newcomers. However, there is also plenty of room for experi-

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2



3

- Bulk manufacturing and deployment of affordable Satellite ground stations.
- Modular design for integration with existing and future technologies.
- A platform for a variety of instrumentation around satellite ground station operations.
- A firm platform for a ground station collaborative network (one to one, one to many, many to many).
- A community-based approach to ground station development.
- A solution for massive automation of operator-less ground stations based on open standards.

**Table 1: The Aims of the SatNOGS Project**

mentation as you gain confidence and knowledge (Fig. 2).

The documentation is encouraging, and the basic omnidirectional aerial that is suggested that will be able to receive satellites is very straightforward – a dual-band 144/432MHz mobile magnetic-mount aerial, placed on a baking sheet or biscuit tin lid. Realistically, they point out that if you want to do some of the more advanced decoding, such as 9600bd transmissions from 1W (or less) Cubesats, then a better aerial will be required. However, this comes at a later stage when you are ‘hooked’.

The data received by your station is parcelled up and sent back to a central repository via the Internet. From here, it can be made available to the ‘customer’ who may range from individuals to organisations. Of course, the great thing is that with a network of receiving stations around the world, a virtually continuous stream of data can be received from a satellite if required, rather than as in the ‘old days’ when a ground station would be poised to receive telemetry as a satellite passed over and then would not hear anything further, until the next pass of the satellite, perhaps 90 minutes or so later, depending on the orbital parameters concerned.

On Twitter, I asked how people used the SatNOGS network. This ranged from a Dutch radio amateur who said that he had used the system to see how he sounded on an amateur radio satellite, using his hand-held transceiver and aerial. He looked up the pass in the database, found the audio and played it back. Magic! You might like to try this for yourself. The pass in question can be found here:

<https://tinyurl.com/yyoyuscg>

### Impressive Detail

I have included a screenshot of the data shown, which provides an impressive amount of detail about the observations. You can also see the option to download the audio and play it, which, if you’ve never heard a pass of the amateur satellite, SO-50, you might find interesting anyway.

Another reply to my tweet was from the team in Guatemala who launched the Quetzal-1 CubeSat, Guatemala’s first satellite. The SatNOGS network enabled the team to determine that the satellite was functioning, very shortly after it had been deployed from the International Space Station (ISS), rather than having to wait, as described earlier, for the satellite to come into range of the ground station in Guatemala. The team also told me that they had been particularly grateful for the network because it had allowed them to collect considerably more data than they would have otherwise been able to do if they were the sole collection point. More data, in this case, means more information about how your satellite is performing.

I had a quick spin through the observations in the SatNOGS database for the Quetzal-1 satellite (Fig. 3).

Sure enough, I could see observations from North America, Australia, and Europe. At this point, I discovered it was quite interesting to click on the ‘station’ details for the different observations because there you

can see the variety of systems in use, ranging from fully-tracked Yagi aerials to a simple dual-band vertical on a ground plane.

I was encouraged to see that data from a simple station was very usable and interesting.

You can see the geographical spread of the ground stations in the network at this URL:

<https://network.satnogs.org>

### Success Stories

I asked Nikoletta Triantafyllopoulou of the *Libre Space Foundation* if she could give me a couple of SatNOGS success stories! She wrote, ‘The first one is about ACRUX-1, an Australian university satellite that was launched about a year ago. Everything was working fine for the first couple of days. The orbital parameters were released early on, we were ready to track the satellite – but after the first couple of days, the satellite went dead. The team behind ACRUX-1 thought that that was it. But every once in a while, we kept an eye on it.

“But, almost 5 months later, in December 2019, things became quite interesting. A radio amateur from Uruguay picked up a signal of an ‘unknown’ satellite, posted about it on Twitter and that is when one member of our network recognised the satellite, notified the network and we started tracking ACRUX-1. This time, it became a priority for our network, and we started collecting data about it!! It was ‘resurrected’ only for a couple of hours but it was exciting to track it. One thing to note is that while it was ‘resurrected’, it transmitted on a different frequency than the one in the first place.”

Nikoletta continued, “The second case is about a Falcon Heavy launch, which happened almost a year ago. It was to carry multiple Amateur Radio satellites, including LightSail-B and two satellites E-TBEx-a and E-TBEx-b. The story of the latter is quite fascinating because of one of the two satel-



## 732 - guidoz

**Owner** kc1ist

**QTH Locator** DM79ls

**Coordinates** 39.769°, -105.020°

**Altitude** 1625 m

**Min Horizon** 10°

**Target Utilization** 100 %

**Antennas**

- Vertical (UHF)
- Ground Plane (UHF)
- Ground Plane (VHF)

**Success Rate**

**Observations** 13581 [View all](#)


**Creation Date** 1 year, 1 month ago


**Client version** 0.9

**Testing** Last seen 0 minutes ago

**Uptime** 57 days, 22:53:53 [Log](#)

Nagoya UT-308UV on mylar space blanket ground plane atop cushiony outdoor furniture -> rtl-sdr v3 -> rpi 3b+





lites; not only was it transmitting on another frequency than the intended one, this was also the same frequency as the other satellite! So, the situation was a bit complex, considering that many satellites were transmitting on this or similar frequencies. On top of that, the two TBExs satellites only transmitted periodically, which made their identification a challenging endeavour. At that time, we worked closely with the team behind the satellites, and they provided useful details which along with the information we had about their satellites led to successful tracking. This is the thread in the community forum with all the details on how things developed and observations were added as the situation became clearer.

<https://tinyurl.com/y39755pq>

"Now, as far as the main use case is concerned: SatNOGS is a global network of ground stations that can help teams communicate with their satellite. They can reach out to us, provide us with the necessary details and information and we can take care of the process of organising and tracking their satellite. The sooner a team reaches out to us, the better, as we can take our time in planning the whole process. Our guide maps out the steps that need to be taken.

<https://tinyurl.com/y4th58kt>

"Our experience is that many teams seem not to pay enough attention to the ground-segment of their mission, and often they are left with no ground station to track their satellite. Lastly, we can never stress enough the fact that what makes SatNOGS efficient and what fuels its success is the collaboration and the sense of community within the network. If it were not for the

enthusiasts and community members to actively participate and contribute with their ground stations, observations, enthusiasm and expertise, SatNOGS would be what it is today."

I hope you have found this introduction to SatNOGS interesting. If you decide to have a go at setting up your own station, please let me know how you get on (Fig. 4).

My thanks to Nikoletta at the Libre Space Foundation for all her help in putting this piece together.

### Receiving the Geostationary Satellite QO-100

It was great to hear from Steve Holloway who wrote as follows: "I wanted to share my recent experience of putting together a low-cost receive system for the Es' hail 2 (QO-100) geostationary satellite. I expected the task to be quite complex after online research yielded plenty of information about modifying LNBs with a TCXO or feeding a GPSDO frequency reference to avoid local oscillator (LO) drift.

"With an inexpensive (£10) Octagon PLL-based LNB mounted on a 55cm Sky 'mini-dish', I was able to receive the satellite CW beacon at the calculated IF of 739.5MHz with my venerable AR5000 in USB mode. A cheap Bias-Tee obtained from eBay provides 12V to the LNB. I initially used a compass to set the approximate dish azimuth (there is a useful dish pointing calculator at <https://eshail.batc.org.uk/point>) and I made small adjustments to azimuth and elevation to maximise the beacon signal.

"With this very simple system I could mon-

itor SSB QSOs on the satellite quite well, but the small drifts in the LNB LO over time meant that I had to slowly re-tune the receiver to keep the received speech intelligible. I then found out that the SDR Console program can lock onto the BPSK signal transmitted from QO-100, to compensate for drift and frequency offset of the LNB LO. The configuration steps are outlined here:

<https://www.sdr-radio.com/EsHail-2>

"I used an SDRPlay RSP1a as the receiving device for SDR Console and with beacon locking active, the received signals are 'rock-solid', as you can see from the waterfall display in the attached screen-capture. It is a very interesting satellite to monitor. I have received stations from Europe, Africa and Russia operating 'traditional' rigs with transverters or SDR-based equipment. I even picked up transmissions from a station operating portable.

"My next steps will be upgrading to a larger diameter dish to attempt to decode the DATV signals on the wideband transponder."

The QO-100 satellite is amateur radio's first geostationary satellite. It uses the 2.3GHz band (13cm) for uplink, and the downlink is on 10GHz (3cm). If you would like to have a listen to it for yourself, you can use an online receiver, based at the Goonhilly site in Cornwall:

<https://eshail.batc.org.uk/nb>

I hope that this will capture your interest and that you might be tempted to build a simple system as Steve has done. You too may start looking in skips to see if there are any old Sky dishes to be found!

I will be back next month with an introduction to CB Radio.

Enter our competitions at [www.radioenthusiast.co.uk/competitions](http://www.radioenthusiast.co.uk/competitions)

# European Private Shortwave Stations

Stand: August 1st 2020

Only legal stations are included. Most stations use 100 – 1500 Watts of power.

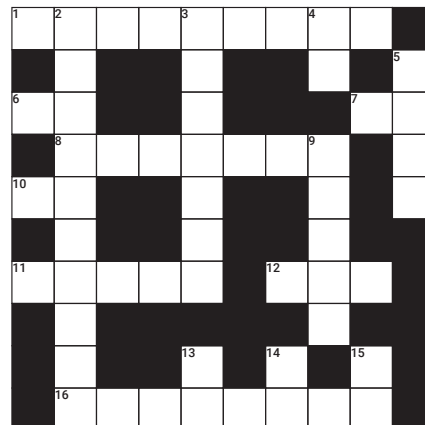
D = Germany, DNK = Denmark, FIN = Finland, NL = Netherlands, NOR = Norway, Irr. = irregular, F.pl.: future plan, min. = minutes, Mo = Monday, Tu = Tuesday, We = Wednesday, Th = Thursday, Fr = Friday, Sa = Saturday, Su = Sunday

kHz	Country	Name	Transmitter Site	Schedule (UTC)
3920	NL	Radio Piepzender	Zwolle	Mainly weekends
3955	D	Radio Channel 292	Rorhbach Waal	24/7
3975	D	AM Shortwave Radio	Winsen	Mo 15-23, Tu-Fr 16-23, Sa-Su 07-23
3985	D	Shortwaveservice	Kall-Krekel	Daily 15-2310
3995	D	HCJB	Weenermoor	24/7
5805	DNK	Radio208	Hvidovre	24/7
5825	DNK	Radio OZ-Viola	Hillerød	We 20-22, Sa-Su 11-13
5840	DNK	World Music Radio	Bramming	24/7
5895	NOR	Radio Northern Star	Bergen	1300-2210
5920	D	HCJB	Weenermoor	Daily 06-16
5940	NL	Radio Onda, Belgium	Borculo	Irr. From Oct 25 2020: -> 6200 kHz
5980	FIN	Scandinavian Weekend Radio	Virrat	1st Saturday of the month
6005	D	Shortwaveservice	Kall-Krekel	Daily 07-19
6070	D	Radio Channel 292	Rohrbach Waal	Mo-Fr 06-22, Sa-Su 05-03
6085	D	Shortwaveservice	Kall-Krekel	Daily 07-17 (Radio MiAmigo)
6115	D	Radio SE-TA 2	Hartenstein	F.pl. - due September 2020
6150	D	Europa 24	Datteln	Daily 06-16
6160	D	AM Shortwave Radio	Winsen	Mo-Fr 11-19 21-22, Sa-Su 08-19 21-22
6170	FIN	Scandinavian Weekend Radio	Virrat	1st Saturday of the month
6200	NL	Radio Onda, Belgium	Borculo	F.pl. - due Oct 25 2020 (ex 5940 kHz)
7310	D	Shortwaveservice	Kall-Krekel	
7365	D	HCJB	Weenermoor	Daily 08-13
9670	D	Radio Channel 292	Rohrbach Waal	24/7
11690	FIN	Scandinavian Weekend Radio	Virrat	1st Saturday of the month
11720	FIN	Scandinavian Weekend Radio	Virrat	1st Saturday of the month
15560	D	Shortwaveservice	Kall-Krekel	F.pl.
15805	DNK	World Music Radio	Randers	Sa-Su 07-20
n/a	NL	Mike Radio	Heerde	F.pl. - due September 2020

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 list is not copyrighted and may be published everywhere. Next list will be published on September 1st 2020. Deutscher Wetterdienst (5905 and 6180 kHz broadcasting at 0600, 1200, 1600 and 2000 UTC for 30 min. each) has previously been included

# Crossword

Answers on page 36



### ACROSS

- The old name for a capacitor
- Abbreviation for the type of electron movement supplied by a battery
- Morse abbreviation for "Thank You"
- The country which has the amateur radio callsign prefix 'TF'
- Amateur radio callsign prefix for New Zealand
- TV pioneer who, in collaboration with amateur radio, sent TV pictures across the Atlantic in 1928
- Another name associated with the 'Yagi' aerial
- The electronic component which had a circuit symbol that was a zig-zag.

### DOWN

- A Clapp-Gouriet is this type of circuit
- The country with the amateur radio callsign prefix 'M'
- Morse abbreviation for 'and'
- The second part of a two-name 1920s microwave oscillator
- A two-electrode valve
- The amateur radio callsign prefix for Ireland
- Abbreviation for the filament voltage in a battery valve radio
- Morse abbreviation for 'near' and 'number'

This crossword was set by Justin Lindars of Lindars Radios at: [www.amateurradiosales.co.uk](http://www.amateurradiosales.co.uk)  
If you are a trader and would like to contribute similar content to RadioUser, please email the editor.

# In next month's RadioUser

- Review of the Moonraker MRW125 Antenna (Plus a competition to give away three of them)
- How to Read Propagation Forecasts
- The History of Non-Directional Beacons
- Introduction to CB Radio

Plus your favourite regular features & columns

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ICOM

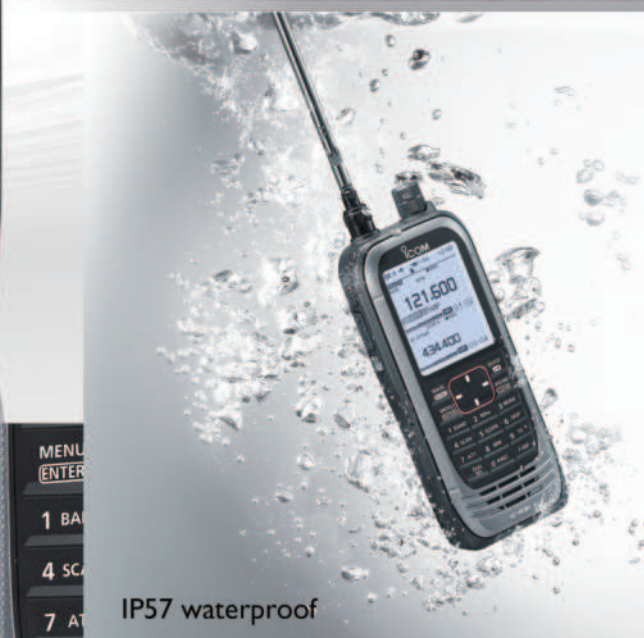
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**Anne Reed 2EI GK Y**

hamreed@blueyonder.co.uk

I first became interested in radio at the very early age of about ten when I used to visit my Grandfather who had a 1947 Cossor Model 470. This had a walnut-veneered plywood cabinet and cost £21-11-6d plus purchase tax!

I would watch him with great interest tuning along on the short, medium and long wave bands. My father had a Bush DAC90 in a brown Bakelite case. My own first purchase was an Ultra Coronation Twin Model R786 made in 1953, which was a very good radio but alas, it got broken in 1961 when moving to Cheltenham.

On a visit to the RSGB 1988 Vintage Show at the NEC, I spotted one for sale, but it cost nearly £100, so I had to withdraw my interest. The Tandy shops were always a magnet, and over the years I purchased various base and handheld scanners. My favourite CB base transceiver was the York 869, and this helped me on my way for transmitting practice. I made a very good friend, Roger Provins, who also became a radio amateur (GORGJ) and helped me with my learning.

My main CB antenna was a Delta Loop, which looked like a sailing ship and was just a bit too noticeable.

The heavy-duty brackets support my 6m-antenna to this day.

In March 1997, I decided to get cracking towards an Amateur Radio Licence and plucked up the courage to sign on for the very last Amateur Radio course held at Gloscat in The Park, Cheltenham, from September to May. I found this rather a long slog, but I did attend every week.

The tutor liked all board work and would take up to 30 minutes explaining certain circuits. About nine of us attended this course, and some at the back of me regularly fell asleep!

I prayed for some practical work, as there was an antenna on the roof, but there was only one demo the entire term. I did have one go at the *City and Guilds Radio Amateur Examination* but found it too difficult.

After a short gap, I decided action was needed so I studied the RSGB Novice paperwork and noticed it was more 'hands-on'. I decided to take the plunge, as it were, and I wrote in to the Gloucester Amateur Radio Society (G4AYM + G2HX).

<http://www.g4aym.org.uk/default.htm>



ANNE REED

## A Woman's Lot is Amateur Radio

**Anne Reed** reminisces on her amateur radio education, wonders where all the women-hobbyists are, revisits radios she has loved and tries to avoid trapping her gardener husband with too many wires in her garden.

Brian G4CIB's letter was most welcoming, and everyone, including Vernon GOHTO, gave me some marvellous help. I took the very last Gloscat Novice Examination in a room all on my own and was successful.

Since then, I have continued to enjoy my amateur Radio Licence to the full. I have been an RSGB member since 1985. I am now an active Committee member of the

Gloucester Amateur Radio and Electronics Society, having held the posts of Assistant Treasurer, Treasurer, and Secretary.

At present, I am RSGB Examination Secretary for the club. I also enjoy operating.

I have always been very concerned that, sadly, women seem to be left out of the amateur radio hobby.

Moreover, when I peruse the list of new

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**Fig. 1: Anne on QRZ at Crickley Hill Club.****Fig. 2: The Club's 2019 Construction Contest.****Fig. 3: A visit to Gloucestershire Airport.****Fig. 4: The 2019 BIWOTA Special Event Station.**

members in my recent issue of *RadCom*, most of those listed were male. This makes me feel quite sad - where are all the ladies?

My thoughts on this are that a lot of men may already have some engineering experience or a near alternative, which appears to make things so much easier, even when studying for the amateur radio exam.

Maths was not always one of my strong points. In terms of other necessary knowledge, I must admit to finding things difficult when going through the various processes.

However, I have been lucky, in that my father was an engineer and draughtsman,

Also, my work in the motor trade, from 1961 onwards here in Cheltenham, certainly gave me some much-needed additional help.

I do think that the three-tier exam system has been a big success. I note that things have been slightly updated more recently. As the Examination Secretary for our Gloucester Amateur Radio and Electronics Society Club, I enjoy meeting other members weekly, as well as operating out-of-doors, be it on a canal-side or the local hills.

I find that putting out a call say on 2m, one never knows exactly who will return your call; several years ago, when taking part in an interview on our Gloucester BBC programme, the interviewer said amateur radio was like putting out a fishing rod to see who would come back.

I have always tended to be a Yaesu person; currently, I operate the FT7800.

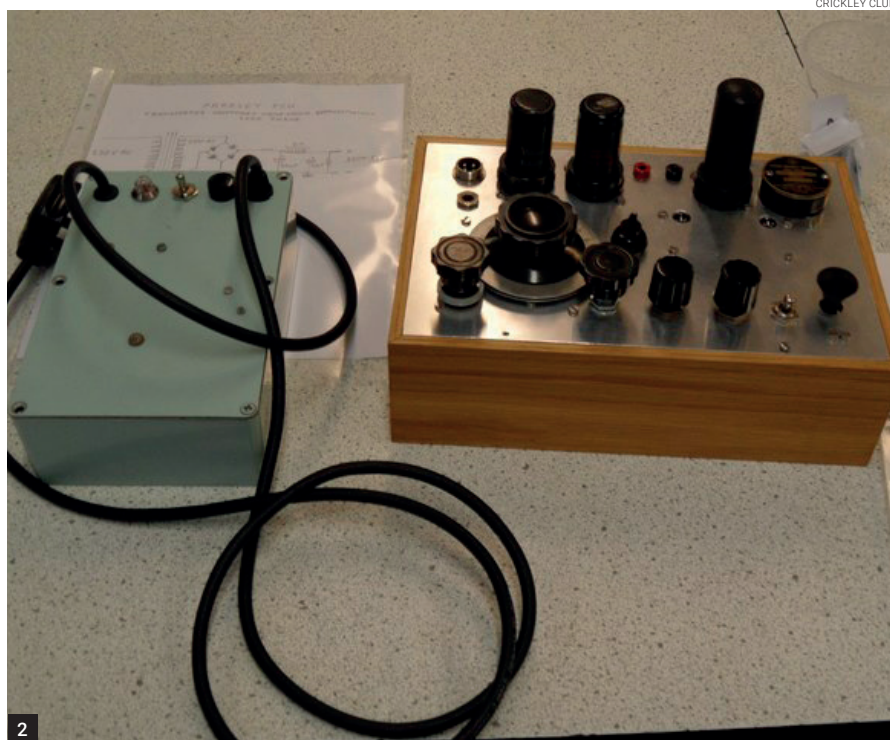
I also use a Watson W30 antenna, which works extremely well on 2m and 70cm.

The aerial is situated over 16 feet up, at the back of our bungalow.

I also operate the FT857, FT897, and FT450D models, and the odd handheld.

My husband is what you could describe as dedicated to his gardening hobby as I am to mine. He is a judge for country shows, but let me tell you he is not at all keen on any wires crisscrossing the garden for HF.

Therefore, I have to make use of an end-fed running along the fence. I think I might change to a dedicated Vertical very soon; that way, the other half will be happy to regain some wooden poles in the garden.



2

CRICKLEY CLUB



3

CRICKLEY CLUB

Even with nearly 59 years of marriage, this October one has to tread carefully!

*[This is an updated and edited version of a text first published at the URL, below.*

*Where, indeed, are all the ladies in the hobby, amateur radio or DXing? What makes you take up this hobby? Does it depend on your training? Get in touch with me and tell our readers about it – Ed.]*

<http://www.g4aym.org.uk>

<https://www.qrz.com/db/2E1GKY>



4

CRICKLEY CLUB

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2083 WATTS

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### Uniden



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400 WATTS

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100 WATTS



#### Scanner Antennas

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## ALINCO



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### Base

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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

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# Modelling a G5RV Aerial and Dealing With Swarf

Keith Rawlings  
Keith.g4miu@gmail.com

**Keith Rawlings continues his practical explorations of the EZNEC aerial modelling software suite for a G5RV aerial, and he comes to the aid of an acquaintance with an unusual aerial problem.**

Welcome to this month's column. I had originally intended to continue on the aerial modelling theme this month and to describe some more of the features of the AN-SOF software suite. Unfortunately, my PC, which the software runs on, became unstable. Therefore, rather than risk missing this month's deadline I decided to hold over AN-SOF for the next time, while I find the problem, and to return to EZNEC.

## Working EZNEC

In the July issue (*RadioUser*, July 2020: 24-26) I described how I had modelled a G5RV type aerial in an Inverted Vee configuration, using EZNEC software.

A G5RV antenna is a dipole with a symmetric resonant feeder line, which serves as impedance matcher for a 50Ω coax cable to the transceiver.

<https://tinyurl.com/y3jm58wn>

My aerial was used in this way because it was supported by a single, vehicle-mounted, mast. Now, if we think about it, when modelling a dipole in a conventional manner (i.e. with a straight top) all we have to do is ensure the dimensions in the Z-axis are the same.

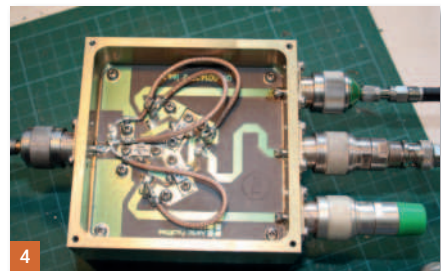
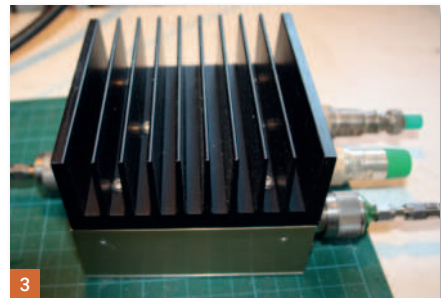
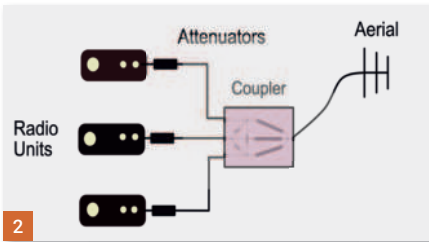
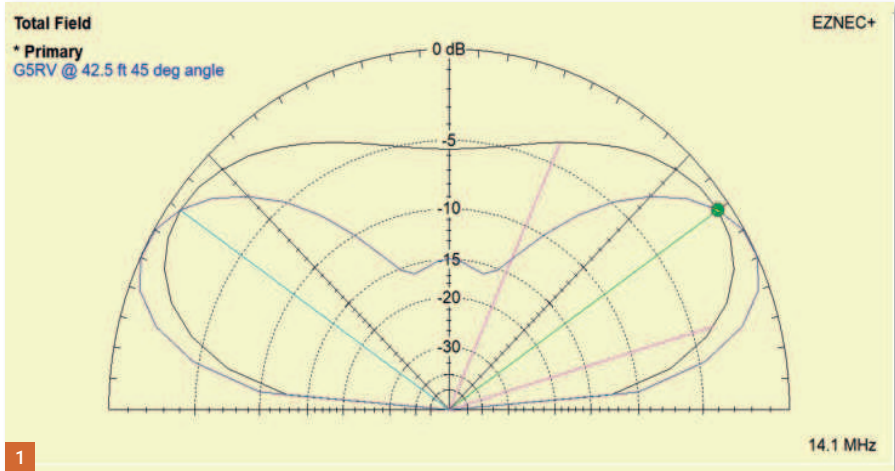
When modelling an Inverted Vee (or any aerial with a slope) it may be that we want to design it to a specific angle, and this usually involves a bit of basic trigonometry. EZNEC can do these calculations and modify the model for you. Let us take a straight dipole, say to the dimensions of a G5RV, that is 51+51 feet, and put Z at 32ft. We use two wires:

X=0 Y=0 Z=32: X=0 Y=51 Z=32

X=0 Y=0 Z=32: X=0 Y=-51 Z=32

Note the -51 in the Y-axis on the second line!

Now let us say we want to angle the wires downwards at 45 degrees. To do this, left-click on the Y-axis value of '51', and you



will be presented with some options. Select 'Elevation Rotate End'. A dialogue box will appear asking for a value. For a downward angle of 45 degrees, we enter -45 and press 'OK'.

You will notice two things: First, only one of the two wires has angled downwards: This is the reason we used two separate wires. Had we used just one wire the whole element would have angled at 45 degrees, and this would not be what was wanted.

The second thing to note is that we now get a warning that the end of the wire is in the ground.

Therefore, we have a problem!

We need to either reduce the angle or increase the height (or both) of the dipole.

Not a problem; go to 'Edit' and 'Undo Rotate', and our wire will go back to its original position. (You can also use 'Ctrl-Z').

Using 'Undo', if needed, we can repeatedly play about with the height and/or angle of our model to find a dimension that suits us, and then, once we are happy, we can run a simulation to see if the design is doing what we want it to do.

Keeping the Z-axis at the same height, I tried an angle of 30 degrees.

Fig. 1: Combined elevation plots of G5RV.

Fig. 2: Diagram of the coupler/radio layout.

Fig. 3: The combiner on the bench under test.

Fig. 4: The innards of the combiner.

Fig. 5: Close-up of the offending connector.

Fig. 6: VNA trace of the combiner after the 'repair', demonstrating excellent results.



PICTURES: KEITH RAWLINGS

EZNEC calculates that the ends would be 6.5 ft off of the ground and from a safety aspect this would seem suitable. If 45 degrees is a 'must', then an apex height of 42.5 ft would place the ends close to 6.5 ft.

Looking at Fig. 1, you will see different elevation angles of the G5RV at 14.1 MHz.

The blue trace demonstrates the dipole at 42.5 feet, and an angle of 45 degrees, while the black trace is the same aerial at a height of 32ft and an angle of 30 degrees. The lower radiation angle of the 42.5ft (blue) aerial would be a better choice for longer-distance working.

I have chosen to demonstrate this wire modification feature using just a single wire at a time. It is also possible to use the "Group Modify" feature to select the desired wires and undertake the changes together.

### An Unusual Fault

I recently had a call from a friend regarding a problem they had with one of the radio links at his place of work. Part of their system, which is on a digital trunked network, consists of three radios linking to a nearby base station. Each radio is linked to a single, vertically-polarised, Yagi via a UHF Combiner.

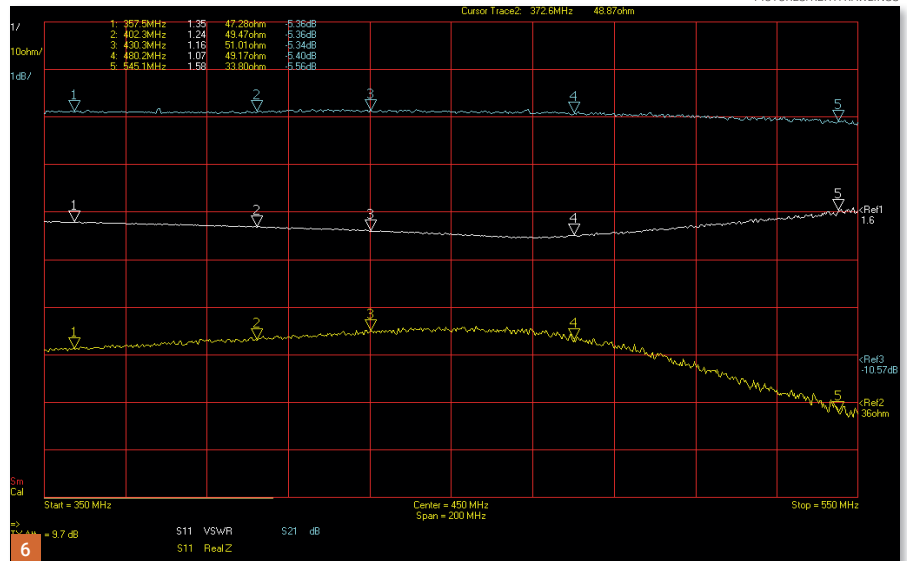
They were experiencing problems with this link going down, due to poor signal levels and had traced the issue to the combiner which appeared to be faulty. A quick DC continuity check revealed a DC path between each port. As the system may be changed shortly, they were reluctant to source a replacement unit so I was asked if I could look at it.

### Background and Method

The combiner was quite old, and it had been working perfectly for a considerable number of years. The setup consists of three desktop radios connected to the unit (using an unspecified output power) after first being routed through 10W 20dB power attenuators which, when added to the port isolation of the combiner, gave adequate system isolation (over 80dB).

This resulted in no de-sensing of the receivers when any of the transmitters were active. Typically, they were looking at around -50 to -60dBm RX level from the base station to end up with an RX level on each radio of about -80dBm. The combiner feeds a multi-element Yagi aerial that points to the base station which is about a mile away (Fig. 2).

The quoted signal levels were such that the added loss of the attenuators and combiner were of no consequence, the link nor-



mally being stable and reliable. Unlike us enthusiasts, where we are usually looking for every last dB of signal, a 'commercial' link just has to work.

We had to get a wriggle on because – with the unit removed – only one radio was now able to access the link from this site. When the combiner arrived, I found out that it was an Aerial Facilities LTD model. The label stated that it covered 450-470MHz and was dated 6/6/2002 (Fig. 3).

This was the only information I had to hand until my friend e-mailed over a copy of the data sheet. The latter specified that it had an insertion loss of less than 5.2dB, 17.7dB of return loss on each port and an isolation of better than 20dB. Outwardly the unit measures 100mm square by 80mm high, with over half of that height taken up by a substantial heatsink. Connections are made through four Type-N sockets.

I have worked on several aerial facilities combiner/ circulator products in the past; to be honest, there is not much to go wrong, although I have, very occasionally, seen failures due to mismatches or, more often, lightning damage of varying degrees. Removing the cover fitted on the base of the unit, I gave it a visual inspection.

I expected to find some signs of damage due to lightning, as I doubted that the likely power levels the unit was seeing could have caused any harm. However, everything inside looked pristine and damage-free (Fig. 4).

I could see straight away that it was a Wilkinson splitter, which coupled three ports to a single port using three 1/4 wave ( $\lambda/4$ ) lines and three resistors in Delta configuration; the resistors provide matching and isolation and are rigidly fixed to the heatsink to

dissipate heat.

Attempting to check continuity through each port with a multimeter will never work on this design as all ports are electrically linked at DC. To add to this, each arm of the split also has an air-cored inductor to ground, thereby effectively extending the DC path to ground as well.

This also makes it impossible to check the resistors without removing them from the circuit as each one is effectively shorted at DC.

### Some Further Steps

My next step was to put the unit on my SDRKits Network Analyser and measure each port in turn, to get an idea of what I was up against.

<https://www.sdr-kits.net>

I had to use substitute 50Ω, as I seem to have misplaced my N-Type kit. I used this to terminate the unused ports and connected the TX and RX lines from the VNWA to the unit.

On the common port (Port 1) I performed an S11 sweep to look at VSWR and Impedance and an S21 Sweep to determine through loss in dB to one of the coupled ports. The S11 sweeps revealed an extremely poor match on the 'common port' of around 3Ω, and a bad S21 through loss. I would have expected to see very nearly 50Ω impedance on the common port and certainly not 15dB or more of through-loss.

Changing the VNWA connections and looking at ports 2-4 demonstrated that these ports looked roughly ok with around 37Ω impedance, which varied when I removed the load off of the unconnected port. However, when removing the load off of the common port this made no difference to the

# Radio Round-up

other three ports; so, the problem looked to be around there somewhere – but where? The solder joint of the connector to the PCB looked OK; nonetheless, I tried re-soldering it, first removing the VNWA leads. After reattaching the leads and running another sweep the input impedance rose to around 15Ω.

This confirmed I was in the right area. The PCB was a good fit to the case but still had adequate clearance around it. I doubted that it was shorting out anywhere, but I carefully loosened the screws fixing the resistors to the heatsink, and then the screws to the PCB. As I did so, I saw the VNWA reading jump and then settle again.

I wondered if there was a problem with the N connector on the common port – perhaps the pin was loose?

I disconnected the VNWA and looked down the N socket and saw what looked like gold plating 'swarf' sitting on the PTFE insulator at the bottom (Fig. 5 - 'swarf' consists of fine chips or filings of stone, metal, or other material produced by a machining operation). Could this be the problem?

I gave a good healthy blow down the socket, which seemed to clear it; after a quick clean-up with a soft brush, I reattached the leads and ran another sweep. Now, the VNWA demonstrated a perfect match on the input as can be seen in Fig. 6. Although the combiner is rated from 450-470MHz, I ran sweeps from 357 to 545MHz and found that it had a surprisingly wide operating bandwidth, returning a flat response right up to 480MHz. The input Impedance was now fine, as was the input-VSWR, and through loss was under 5.5dB. Port isolation measured around 30dB at 460MHz. It appeared, therefore, that everything was back as it should be.

I have seen this 'swarf' problem before. The last time was when a friend purchased a brand new Uniden UBC3500XLT that had an intermittent receive problem. Before returning it, we tried it on another aerial – only to find it worked perfectly. This too had problems with traces of metal but on the aerial itself. The Uniden was new out of the box, so the question is, why did the combiner, after being in service for many a year all of a sudden have this problem?

Although I used the VNWA in 2-port mode to measure through the combiner, the fault could have been found with a simple 1-port measurement with an analyser covering the required frequency range, for example, an MFJ, or any of the cheap analysers now widely available.

Stay safe and I will see you all next month!

**AUDIOUK RELEASES MORE COVID-19 PRODUCTION GUIDELINES:** Trade body AudioUK has released a new set of publicly-available guidelines for producers to safely work on productions during the COVID-19 pandemic. It has been prepared in consultation with the Department for Digital, Culture Media and Sport (DCMS) with input from audio professionals, content producers and broadcasters, the music industry, industry bodies, unions and the devolved administrations in Wales, Scotland and Northern Ireland. AudioUK's one-hundred-plus member companies previously had access to a 'beta' version of the guidelines, prepared using the latest government advice. AudioUK is a member of the DCMS working group on film, TV and content production, which the DCMS has used to provide support and expert advice to representatives of content production from across film, TV, video games, music and audio. Kellie While, Chair of AudioUK and Head of 7digital Creative, said: "Audio production has responded well so far to the crisis, with our members adapting swiftly and many innovative radio programmes and podcasts being produced. With a wider range of working activity now permissible, we were receiving many enquiries from members on how to widen their activity safely and we're pleased we were able to respond with some initial guidelines. "Now we can provide guidance right across the industry. We hope these guidelines will give production companies and those who commission the confidence to take part in a wider range of production activity, so our sector can continue to grow."

(Source: AudioUK)  
<https://tinyurl.com/y2lz7zew>

**AUSTRALIA TECSUN RADIOS BLOG:** In 1843 the phenomenon known as the Solar cycle was discovered by Samuel Schwabe a German astronomer who observed transitions of the Sun from periods of high activity to low activity every 11 years, over a period of nearly 20 years. Put in simple terms, the Sun is composed of a huge ball of electrically charged hot gas. As this gas moves, it generates a powerful magnetic field. This magnetic field transitions through an 11-year cycle (known as the Solar Cycle) during which the magnetic poles of the Sun are transposed, i.e. the North and South Poles change places. This cycle affects activity on the surface of the Sun, such as sunspots and solar flares. The energy released by these events charges particles in the ionosphere, affecting radio propagation. More solar flares and sunspots occur at the peak of the cycle than at the bottom of the cycle. Typical values are 80-100 sunspots at the cycle peak and 15 or so at the cycle minimum. When a strong flare occurs, the increased x-ray and extreme ultraviolet

radiation produce ionisation in the lower, D (absorption) layer of the ionosphere, disrupting HF radio broadcasts by absorbing rather than reflecting signals. We are currently at the end of Solar Cycle 24 (calculated as mid-2020), and from this point, we can expect an increase in solar activity and changed radio propagation as the maximum useable frequency (MUF) for shortwave communications increases with an increase in solar activity. At the peak of the Solar Cycle, the higher frequencies of the shortwave spectrum are very good. Low power stations can be heard over remarkably long distances. At the bottom of the cycle, the current position, those higher frequency signals will not usually support normal propagation via the ionosphere. So propagation at lower frequencies will be better whilst higher frequencies will suffer. (Source: NASA)

**IONOSPHERE AND SPACE WEATHER:**

The web portal of the Ionosphere and Space Weather (ISW) section within the Geophysical Department (CPG) of the Royal Meteorological Institute (RMI) of Belgium provides information on our current research and development activities as well as access to (some of) the services related to ionosphere/space weather conditions and effects. The main areas of research are ionospheric/space plasma structure and dynamics, with emphasis on ionospheric/geomagnetic disturbances, irregularities, and their effects on Comm/Nav systems' performance; design, development, and programming of robust algorithms for nowcast and short-/long-term forecast of geo-space plasma parameters by utilising ground (ionospheric incidence sounding, geomagnetic, cosmic rays) and space (GNSS, LEO satellite) based measurements, and the Development and programming of theoretical and empirical models for numerical simulation and investigation of Geospace plasma system conditions and associated phenomena

<http://ionosphere.meteo.be>



Solution to crossword on page 28



# DRM & DAB Updates, Times Radio, and a new DRM Radio

Kevin Ryan

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**Kevin Ryan reviews the start of broadcasting from Times Radio, reports on a controversial new DRM station in the USA and comments on a busy end-of-year period for the UK Regulator.**

I listened to the opening morning of Times Radio. If you do like news, then tune in for a new experience. The biggest difference to other talk stations is that the presenters have lots of time for every topic; perhaps this pace has been chosen to be akin to reading a newspaper. At times, there seemed to be more presenter chat and less news, but then the show is four hours long.

The other shows are just three hours long. Apart from *The Mariella Frostrup Show*, just after lunch, I have not sampled them. I am now slowly drifting back to talkRADIO and LBC News.

On Day One of the broadcast, some smart speakers retrieved 'Times Radio Malawi' instead, and the owner of that station was interviewed the following morning on the *Breakfast Show*. By then the confusion was starting to sort itself out. The slogans of the two stations are 'Know Your Times' (UK) and 'It's About Time'.

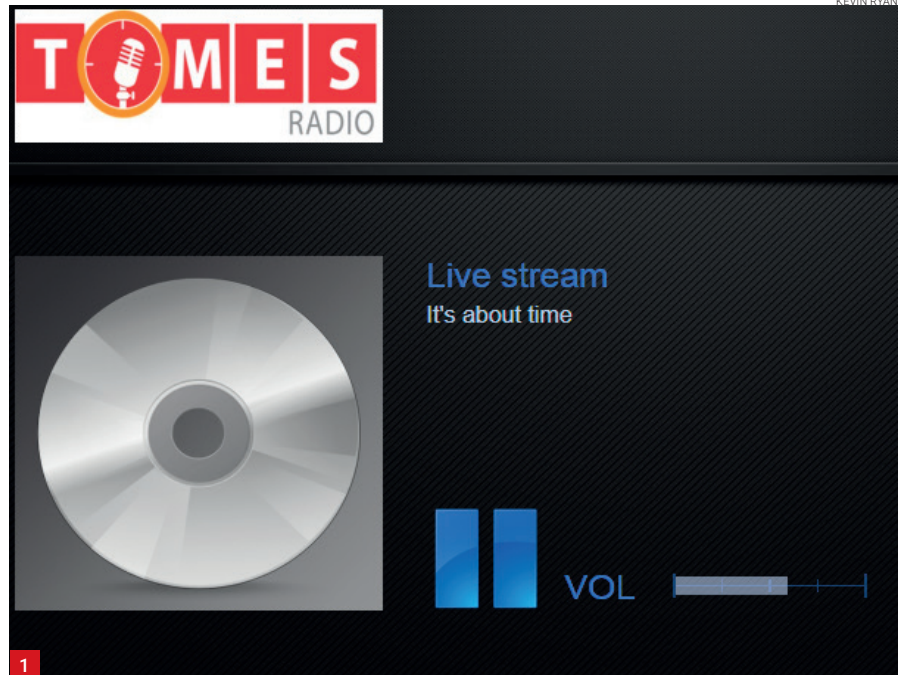
There is a radio player (Fig. 1) on the Times Radio Malawi website if you fancy having a listen; however, just to warn you, my anti-virus software detected a few potential bits of malware on this website.

<https://times.mw>

<https://www.times.radio>

## DAB Updates

It is worth scanning the whole DAB spectrum sporadically to pick up any new stations. My most recent scan picked up 167 stations from 13 multiplexes between channels 9A and 12D, including two small-scale DAB trials from Woking and London. I use a loft antenna. Now that the trees are in leaf, the increased signal loss keeps these two multiplexes close to the noise floor. The scan picked up the Kent multiplex with good strength, and I can only conclude that I am getting that signal here in Reading from the Wrotham transmitter. Using a



portable radio, a scan picks up the West Wiltshire multiplex also on channel 11C, but the signal is too weak to decode any audio.

## Ofcom News

Ofcom ran a consultation over last winter to get views from radio stations, transmitter operators and the public, on extending the licences of existing national analogue broadcasters, like Absolute Radio, talkSPORT and Classic FM, whose licences expire in 2022. Ofcom decided to make provision for all licences to be extended by ten years. A little over 40% of UK radio listening is still to FM and AM, and analogue radio will remain an important medium for listeners over the next few years. However, current trends suggest that analogue could account for just 10% or less of listening within a few years.

Ofcom states that the transition to digital is sufficiently advanced so that there is no longer a need to keep the pressure on broadcasters by way of a shorter renewal period. Ofcom also thinks that the transition to digital radio listening indicates a 'natural endpoint' for analogue broadcasting by the end of the decade.

This is a big clue as to the results of



the forthcoming *Digital Radio and Audio Review* which should come out in March next year. This review is expected to tell us how we are going to listen to the radio and other audio content in the future to inform government policy on a planned 'digital switchover'.

My guess that the decision will be left to the commercial broadcasters to decide the date, and I expect they will shut down AM stations well before then. What do you think?

Enter our competitions at [www.radioenthusiast.co.uk/competitions](http://www.radioenthusiast.co.uk/competitions)

**Fig. 1: A brief moment of unexpected publicity for this local service in Malawi; this station aired on some smart speakers, instead of its new namesake in the UK.**

**Fig. 2: A recently purchased radio should display any slideshows transmitted by DAB stations in the UK, like Heart London.**

**Fig. 3: Frontier Silicon continues to improve the graphics on its DAB receivers but DAB broadcasters in the UK ignore the slideshow feature.**

**Fig. 4: Some DRM enthusiasts oppose this new DRM station, on the grounds that it is not a 'public broadcaster'.**

## New DAB Multiplexes

Ofcom has granted requests from the licensees for each of the three new local radio multiplex services to postpone the backstop launch date of their services by a year, to October 2021. The three areas are the Channel Islands, Morecambe Bay, and North and West Cumbria.

## Station Changes

Apart from the appearance of Times Radio on DAB, there has also been a number of other changes: The talkRADIO station is leaving the Aberdeen multiplex, and listeners will now have to rely on the DAB+ signal on the SDL National Multiplex. It has been replaced by Times Radio.

Magic Musicals joins the Tayside and Stoke on Trent multiplexes. The Surrey Multiplex is losing Eagle 80s and Encore Radio. Suffolk First is ending its service on the Suffolk Multiplex. Colourful Radio is closing on the London 3 multiplex. Bradford & Huddersfield, Stoke on Trent and Swansea are all gaining Absolute Classic Rock, Country Hits, Hits Radio, Magic Chilled, and Magic Soul. Pulse 80s, Signal 80s and Wave 80s are closing on the same three multiplexes.

## Small-Scale DAB

The advertising of small-scale DAB by Ofcom is expected to go ahead as planned this month, possibly with an extended timetable because of the ongoing Coronavirus (COVID-19) pandemic. Nation Broadcasting, the operator of the Glasgow small-scale DAB multiplex, plans to offer a free place for community radio stations on any future small-scale multiplexes it might own.

The company plans to apply for some licences but has not indicated which they are. I think it will be for Glasgow, Edinburgh and Inverclyde in this first round. It is also offering a service to provide

multiplex management and technical services to those wanting to operate their own multiplex.

## DAB Slideshow

Apart from Capital and Heart in London (Fig. 2), many UK stations do not use the Slideshow feature in DAB. These two stations transmit pictures of the artists singing the songs. German stations use the slideshow option a lot more, and now, with the commissioning of a new DAB+ broadcasting facility, *Norddeutscher Rundfunk (NDR)* will tailor its DAB+ Slideshow service, which already contains a lot of additional information, to individual regions in Northern Germany.

Typically, this will be regional weather information at a glance, alternating with pictures of the presenters, music title and CD cover advertisements, as well as the headlines of the current NDR news.

More DAB radios can display pictures on colour screens, and Frontier Silicon has a new range of chips that support high-quality colour displays, multiple image formats (Fig. 3), analogue and digital clock displays, a more configurable night mode, and something called *ActiveScan™*.

*ActiveScan* is meant to improve user experience by ensuring that the radio station pre-sets, and station lists are always up to date. *ActiveScan* continuously monitors airwaves and updates the station list.

To be honest, I cannot see what is special about this new feature.

<https://tinyurl.com/y3dw224o>

## New DRM Station in the US

The Parable Broadcasting Company LLC applied to the FCC to build a short wave station at Batavia, Illinois. There is nothing very unusual about this because plans for short wave stations come and go in the USA.

What is unusual is that the station plans to only use DRM with two 10kW transmitters (main/standby) feeding a TCI 527-6 log periodic antenna. The application states that: *"The purpose of the construction and operation of this proposed international short wave Broadcast station is specifically to serve the areas of Europe that may be authorized by the Commission. The planned broadcast content includes religious and educational programming, as well as data content provided by third parties. The applicant is positioning the proposed station to take advantage of the recent push by the National*



*Association of Shortwave Broadcasters to develop and provide content for the growing DRM Market."*

The technical requirements and equipment for generating the DRM signal are standard, consisting of the RFmondial *DRM Content Server* and the RFmondial *DRM Modulator*. Together, these generate a full audio- and multimedia- DRM signal. The proposal further states that the audio signal is transmitted to the *Datacasting Modulator* (not mentioned before).

This produces a drive signal to the RF stage, consisting of an orthogonal frequency-division multiplexing (OFDM) signal. The latter carries both the audio and the datacasting components with a total bandwidth of 10kHz. I am unable to determine if the OFDM output is going to be like that produced by, for instance, WINB, where the 10kHz bandwidth is split between a standard DRM signal and a baseband signal nobody can decode; neither is it possible, at present, to tell what it is being used for.

On the other hand, the OFDM output might be like the one at KTWR, which includes multimedia information, along with the audio. Time will tell because this project might never come to anything: Three years ago, there was a similar





**Fig. 5: KTWR transmitted 13 files via DRM to create this website; good reception was required for the whole of the 30-minute broadcast, for me to be able to capture them.**

**Fig. 6: The Avion Communications Systems Inc. Avion AV-DR-1401 DRM radio.**

proposal from Turms Tech LLC to create a DRM-only station in Bergen New Jersey, using a Yagi aerial. Their intended purpose was to broadcast financial, economic news and data for unnamed clients.

### The Plot Thickens

You would think that DRM enthusiasts could support this project. However, some, like Christopher Rambaugh, Kim Andrew Elliott and Benn Knob, are objecting to the FCC. They insist that the station should not go ahead (Fig. 4). They are claiming that the data services may not constitute 'broadcasting', and that the station is really a point-to-point *data service* for a financial trading outfit called 'Latency Arbitrage'.

This practice is not illegal and is related to high-frequency (not the radio type) stocks and shares trading carried out by computers.

As I understand it, an arbitrage is to do with a simultaneous purchase and sale of a stock asset, executed by a trading algorithm that makes a profit based on a difference in price. The company performing the latency arbitrage gets market information before the rest of the world adjusts their orders due to a speed- (or 'latency'-) advantage.

To qualify as 'broadcasting', for reception by the general public, all data messages from this station must be in a form readily decoded by ordinary DRM receivers and rendered as publicly accessible content without encryption or obscuration of their purpose or meaning.

<http://drmnainfo.blogspot.com>  
<https://tinyurl.com/y8ckgoam>



I think I must be missing something but would a point-to-point link, say from Chicago to London, transmit data faster than over the internet on an undersea cable? Where would the receiving station be, because this needs to be a professional installation? Or is this just a proposal from a company that does not really understand radio, and especially DRM?

### China xHE-AAC

One morning in late June (23rd/24th) I spotted a powerful DRM signal on 15625kHz at 0630 UTC, while I was using a remote KiwiSDR in Vietnam. It turned out to be CNR 1 from China testing the xHE-AAC audio encoding system and using a different programme from that carried on the other DRM transmitters at that time. Initially, I thought that there was a problem with the audio but after a while, I could detect very faint instrumental music that gradually increased in strength. The transmitter went off at 0700 UTC.

The next day, it was there again, until around 0700 UTC, and I found it again on 17660kHz, still broadcasting at 1130 UTC. On these days, the usual 17830kHz service from Qiqihar was off-air.

It returned on 25th June. The xHE-AAC tests appeared again, for just one day, on 27th June.

I recorded the transmission to continue with my testing of the *DReaM* 2.2.1

software, which should be able to decode from a file. Sadly, *DReaM* crashed as soon as it tried to open a file – not a good start!

### KTWR Transmissions

KTWR in Guam transmits in DRM every weekend in three languages including English. Recently, they swapped from a slideshow of items to include a website in their transmission alongside the audio. The *DReaM* suite decodes this form of multimedia, and I managed to receive the 30-minute broadcast in full to get to the website (Fig. 5), which *DReaM* displays in its multimedia player.

### Avion DRM Receiver

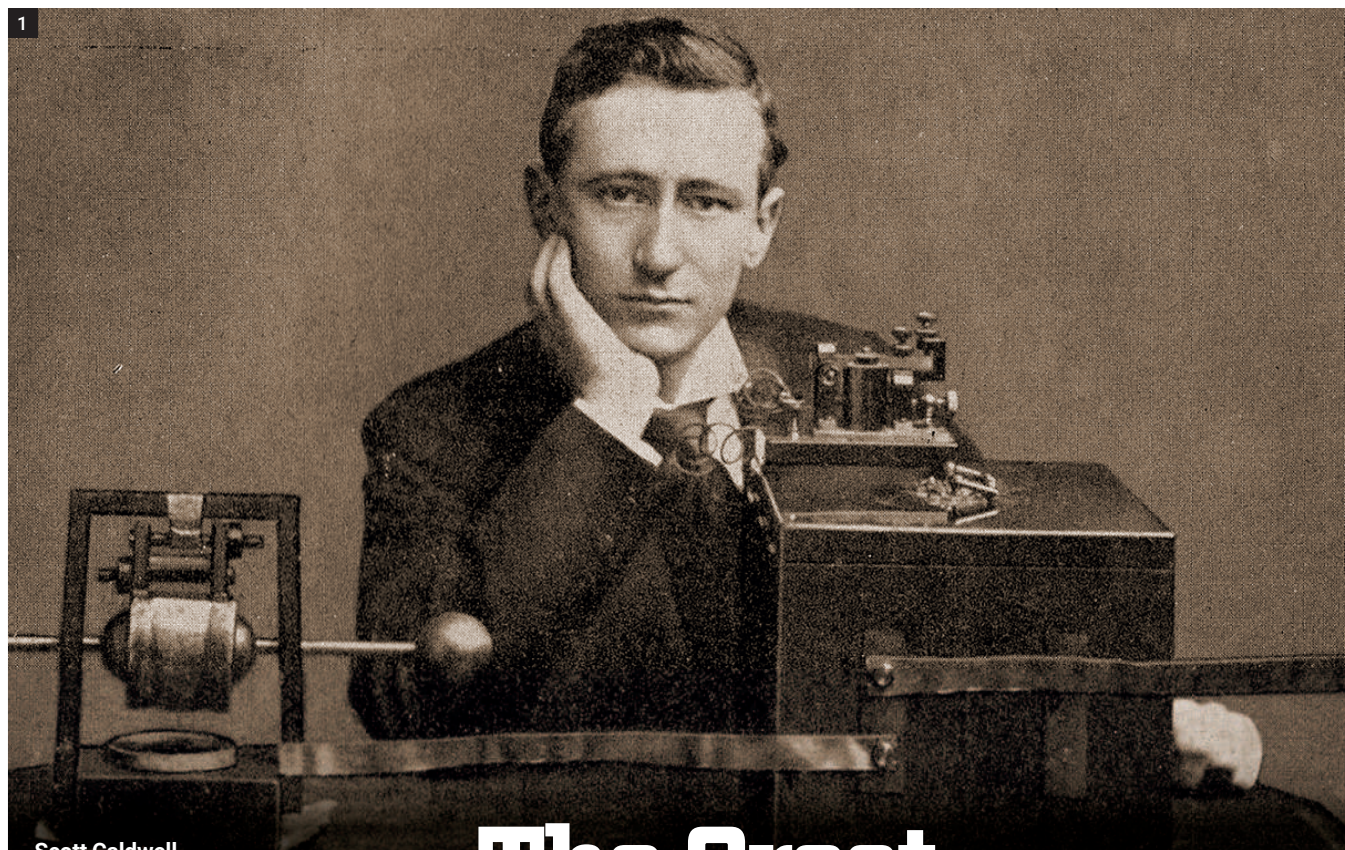
The Avion AV-DR-1401 (Fig. 6) is back on sale on Amazon India's website at a new price of ₹9,225 (ca. £94). Once again, sales are restricted to India. Communications Systems Inc. of India upgraded the model using a new PCB design with enhanced sensitivity, and improved FM signal reception, mainly by completing re-designing the antenna circuits. The manufacturer has also upgraded the software for the Emergency Warning Functionality (EWF) so that it can be used when the receiver is in standby as well.

The receiver's detailed specifications can be found on the Avion Communications Systems Inc. website:

<https://tinyurl.com/y8m8efk9>

Enter our competitions at [www.radioenthusiast.co.uk/competitions](http://www.radioenthusiast.co.uk/competitions)





Scott Caldwell

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# The Great Marconi Scandal of Summer 1912

**B**y the Summer of 1912, the Marconi Wireless & Telegraphy Company was at the pinnacle of its prestige and fame. On April 15th, 1912 it had once again proved its worth, by saving 705 souls from the wreck of the *RMS Titanic*, which had foundered after a collision with an iceberg. The company's share price had skyrocketed to the figure of £10 for an ordinary share. In 1913, for the first time in the brief history of the company, a share dividend was issued to the general shareholders.

The Liberal Government of the time, led by Herbert Henry Asquith (1852 – 1928) was at the height of its political standing, securing another General Election victory over the Conservative Party. This was a period of social and technological change; politics was now slowly opening up as a career choice for the new professional middle class.

In this context, many politicians were concerned about how they would maintain their social position and standard of living if they ever lost political favour with the electorate or their influential party leaders. This

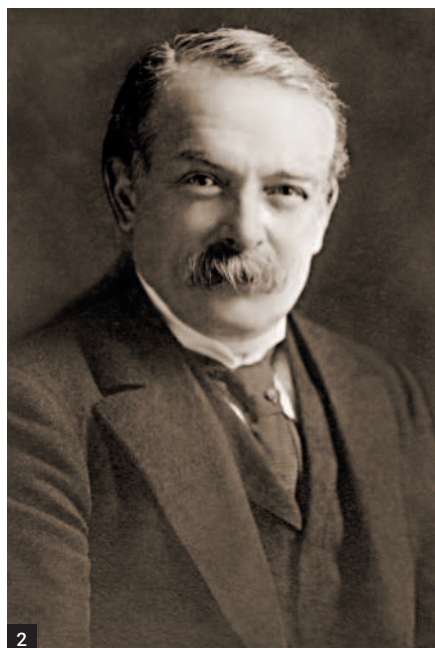
Reflecting an earlier incarnation of today's debates about the 5G network, **Scott Caldwell** investigates how radio communications, politics and society intertwined in Edwardian Britain.

potential scenario applied to David Lloyd George (1863 – 1945) (Fig. 1) who had revolutionised British politics with the laying of the foundations of the Welfare State. He had few independent capital resources and previously received an income from his legal partnership, with his brother William. As his political stature increased, he subsequently earned an additional income from public speaking and journalism, in line with the other political personalities of the era, like Winston Churchill (1874 – 1965, Fig. 2).

## The Marconi Wireless Telegraphy Company

Against this backdrop, Godfrey Charles Isaacs (1866 – 1925) was of Jewish ancestry and had risen rapidly in the Marconi Wireless Telegraphy Company since his appointment in 1911. He was also a board member of the American division of Guglielmo Marconi's (1874 – 1937) empire, and he was subsequently authorised to sell approximately 50,000 shares to British investors, before their sale on the open market.





His first port of call was to his politically influential brother, the Solicitor-General Rufus Daniel Isaacs (1860 – 1935); maybe he could recommend any prominent politicians who would be interested in purchasing Marconi shares? The interest amongst senior Liberals was considerable, and business was conducted swiftly.

### The Business-Politics Nexus

Lloyd George initially purchased a total of 1,000 shares, at £2 per unit. The Liberal Chief Whip, Alexander Alec Murray (1870 – 1920) also followed suit and agreed. On April 18th, 1912, Alec Murray purchased another 2,000 shares on behalf of the Liberal Party. This was a very astute business move, as shares in Marconi's business empire now began to skyrocket, due to their prominent role in the rescue of the *Titanic* survivors.

Godfrey Isaac was the youngest member of Joseph Isaacs's family; aged just 40, he had risen rapidly to the position of Managing Director. He had no formal qualifications relating to the wireless industry, yet he had a unique gift as an extravagant promoter. He had attended Hanover and Brussels Universities, was fluent in several languages and had extensive business contacts within the main European finance houses.

These were all gifts Marconi required in transforming his company into the global leader of wireless telegraphy, whilst pursuing his passion for experimenting in the science of long-distance communication. In many respects, Godfrey



Isaacs would become the salesman of the British division of the Marconi empire.

### Networking the Empire

To network the vast British Empire, the Liberal Government offered a tender to the world's leading wireless telegraphy companies. It was initially perceived that 18 stations would be networked in Egypt, India, Malaya, and Australia. In charge of the tendering process was the Postmaster-General, Herbert Samuel (1870 – 1963, Fig. 3), a close working colleague of Lloyd George. The Marconi Wireless Telegraphy Company had one distinct advantage over its competitors – a direct link to senior Liberal members in the form of Rufus Isaacs who had recently represented the Board of Trade during the inquiry into the *Titanic* disaster.

### The Origins of the Scandal

Lloyd George wished to financially plan for the future and looked to invest his limited savings in the stock and shares market. He had been warned by his close associate, George Cadbury to be careful and not declare his investments publicly, as the Conservative-controlled press still favoured traditional *laissez-faire* politics. Lloyd George had already earned £100,000 from his shares in the Surrey Commercial Docks Company and urged his wife to purchase more additional share capital.

The concerns of Lloyd George regarding his political future do appear to have some merit since the Liberal Party had slowly begun to lose its majority in the House



Fig. 1: Guglielmo Marconi; Fig. 2: David Lloyd George, Liberal Chancellor of the Exchequer. Fig. 3: Winston Churchill.

Fig. 4: Herbert Samuel, Postmaster General. Fig. 5: Marconi on an old 2000-Lira banknote.

of Commons and was now dependent on the support of the Irish Nationalist Party. Politics was slowly changing from an autocratic self-serving institution into one of more openness to the plight of the underprivileged.

A driving force behind this change in society was the rapid growth of technology and communications; there was money in machines. Almost anything seemed possible in this climate, and often it was. Society was becoming more prosperous in the golden days before the horrors of the First World War (1914 – 1918).

On April 19th, 1912, the remaining shares were put on general sale to the public, at the price of £3, per share. By the end of the business day, they had increased in price to a respectable £4, which was considered not bad after only one day's trading.

### The Battle to Operate the British Empire Wireless Network

The tender to construct and operate a British Empire wireless network was highly competitive and was between to great rivals: the Marconi Wireless Telegraphy Company and Telefunken. Both possessed the technological capability to manage and fulfil the requirements of the contract. Subsequently, the Postmaster-General Herbert Samuel (Fig. 3) consulted with

PICTURES: CREATIVE COMMONS

his fellow cabinet colleagues to ascertain their preference.

The response from Winston Churchill was typical of his nationalistic nature and mirrored his desire to support a British-registered company. He emphasised that the tender should be awarded to a solely British concern. To further ascertain the merits of each tender, the Liberal Government appointed the Parker Commission, which visited wireless installations in Germany, Denmark, and the powerful Marconi station at Clifden (Ireland).

Their final report was published on April 30th, 1912. Not surprisingly, it concluded that the Marconi Wireless Telegraphy Company, was the only realistic tender for the contract, given their pioneering experimental research in long-distance communication. Inside information suggested that Herbert Samuel had almost concluded negotiations with Marconi (Fig. 4), in terms of the establishment of an Empire Wireless Network.

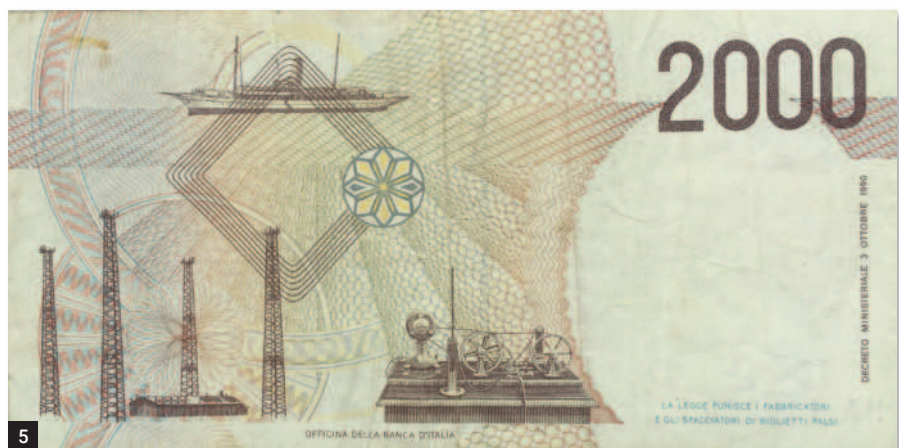
The opportunity to make some 'quick and easy money' was too great for the Liberals, and Rufus Isaacs sold his entire shares for the remarkable sum of £20,000. Lloyd George and Murray decided to follow suit and promptly sold half of their share capital. Rather foolishly, Lloyd George decided it was a great opportunity and purchased an additional 1500 shares in the company.

## The Edwardian Moral Code

In Edwardian society, the moral code was still extremely high, in keeping with the values of the Victorian era. The general public had faith in the politicians to govern their country. However, it was also a great time of social reform; union unrest was rapidly increasing as the working class demanded more welfare support from the state. The magazine *Eyewitness* was a guardian of the moral code and its aim was "to make the English public know and care about the perils of political corruption".

The city editor of *Eyewitness* had been reporting on the rapid growth in Marconi share prices since early January 1912 and provided regular updates: "Marconi wireless shares are experiencing a period of unparalleled strength". Therefore, additional negative comments continued to be published, with the *Eyewitness* keen to question the morality of both the Liberal Government and Marconi's senior management.

To emphasize their point, the *Eyewitness* began to address the Liberals as "The



Marconi Party", inferring that the two organisations were inter-related and not mutually exclusive in their operation. In an attempt to save face, Churchill was dispatched to visit Lord Northcliffe, who owned *The Times of London* newspaper. His purpose was relatively simple – to seek out sympathetic coverage from the influential newspaper.

The outcome of his visit was considered marginal at best. *The Times* reported that, although the Liberal ministers had lacked judgement in purchasing shares in Marconi, they did not warrant or justify the monstrous offences that they have been accused of committing. Lloyd George had personally written to Lord Northcliffe to thank him for the newspaper's continued support. As events unfolded in this public war of words between the Liberals and the radical press, he would soon regret offering his support, and he soon changed his opinion.

Other British tabloid publications also investigated the allegations of financial misconduct, and an article in the *Outlook* magazine was perceived as the most politically-damaging piece. It dramatically claimed that, "The Marconi Company has

from its birth been a child of darkness. Its finances have been of a most chequered and erratic sort". Another political attack by *Outlook* was considered as purely Anti-Semitic: it noted that the Isaac brothers and Samuel were all of Jewish ancestry.

In the early 20th Century, Anti-Semitic feeling was rife throughout Europe; Tsarist Russia had been repeatedly subjected to several bloody pogroms. On August 31st, 1912, *Outlook* published an article that questioned the character of the Marconi shareholders: "Are they the right sort of people to be entrusted with an all British scheme of wireless telegraphy?" The editor had obviously forgotten that Marconi was of Italian and Irish parentage and throughout his life he retained strong ties with his birth country.

## Summons and Investigation

On March 25th, 1913 Rufus Isaacs was summoned before the Parliamentary Committee, in connection with allegations of financial misconduct. During cross-examination, he meekly admitted to purchasing shares in the American Marconi Company. Isaacs addressed the House of Commons in resolute defence



of his actions:

*"I assure the House that no such intention was ever-present in our minds. All that we meant was that this was not the opportunity; that the proper opportunity was at the Select Committee. I also think that, in all probability, looking back upon it, our minds were a little too full of the indignity of the charges of corruption which were then being circulated".*

This act of admission opened the proverbial flood gates, and the alleged scandal was allowed to intensify, partly due to the clumsy manner in which it was handled by Asquith. To investigate allegations of insider-trading by Liberal Party members, Asquith established a cross-parliamentary commission, consisting of six Conservatives, six Liberals, two Irish Nationalists, and one Labour member; it was headed by Albert Spicer.

Rufus Isaacs and Samuel both selected the formidable Sir Edward Carson KC (the Irish Unionist Leader) to represent them during the subsequent parliamentary investigation.

For over 6 weeks the commission collected witness statements and evidence. It caused the Liberal Government considerable anxiety and embarrassment, damaging its reputation amongst the electorate. The scandal also made international news. For example, the French newspaper, *Le Matin* published a story that claims that Samuel, Isaacs, and Lloyd George had all purchased shares in Marconi. The newspaper backed down in its claim, due to a lack of evidence and was forced to publish a full apology. However, no legal action was issued against the newspaper on the advice of Churchill; maybe he wished to preserve good diplomatic relations with the French, under the spirit of the recent *Entente Cordiale*.

### Political Repercussions

The month of April 1913 was a difficult time for the Liberal Government: Stanley Buxton (President of the Board of Trade) was under intense pressure to explain the lax legislation relating to the lack of lifeboat capacity on British Merchant ships. While Asquith met with King George V, he admitted that key ministers had offered their resignation *en masse*.

Asquith finally conceded to the Sovereign that he considered their actions unwise and lamentable. However, he refused to accept their resignations, fearing a vote of no confidence in the Liberal Government. This period was a watershed

for Marconi who began to exert his influence and prestige on the political stage, a move that has tarnished his reputation amongst historians.

To prevent further damages escalating in the press or the House of Commons, Asquith advised on a misguided policy of keeping silent. This allowed both the press and his political foes to intensify their attacks. Many contemporary observers interpreted the silence from the Liberal Government as an admission of guilt.

Even Churchill was dragged into the political dogfight when the editor of the *Financial News* published an article claiming that he had also purchased shares in the American Marconi Company. He simply stormed into the commission's meeting and announced in a typical forthright tone that *"he never at any time, in any circumstances, had any investment or any interest of any kind, however vaguely it may be described, in Marconi telegraphic shares or any other shares of that description in this or any other country of the inhabited globe – never"*. It is little wonder that anybody else could get a word in edgeways with Churchill in full flow, with the passionate defence of his political character and reputation. He concluded his speech with the words, *"May I assume that your examination of me is finished?"* He then simply stood up and left the room.

The next witness before the commission was Marconi himself, who attended on May 7th, 1913. He had a particular taxing verbal duel with the commission, and he would not back down in this belief that his company had done nothing wrong. The question raised by historians relates to the actions of the Postmaster-General, Herbert Samuel who – through his alleged ignorance or ineptitude – had allowed the Liberal Government to commit itself to the expensive purchase of an obsolescent wireless system.

### Conclusion

Finally, negotiations between the Post Office and the Marconi Wireless Telegraphy Company were concluded on 30th July 1913. The result was an incredibly unique contract between three parties: Marconi, his company, and the Postmaster-General, Herbert Samuel. The last year had deeply affected all parties, and there was a lack of expectation over the project of a British Empire Wireless Network.

It was mainly internal disagreements, which dominated the Select Committee. It regarded the purchase of American

### Further Reading

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<http://earlyradiohistory.us/1920alt.htm>
- Andersen, L. I. (1980): *Priority in Invention of Radio: Tesla vs. Marconi* (AWA Monograph No. 4, March 1980)
- BBC: *The Atlantic Leap and Beyond*:  
<https://tinyurl.com/y3r76etq>
- British Vintage Wireless Society:  
<http://www.bvws.org.uk>
- Fondazione Guglielmo Marconi:  
<http://www.fgm.it/en/home.html>
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- Hughes, T.P. (1983) *Networks of Power*  
<https://tinyurl.com/ycpdtrt>
- Malanowski, G. (2011) *The Race for Wireless – How Radio was Invented (or Discovered)*
- Marconi Calling (Archive):  
<http://www.marconicalling.com/front.htm>
- Marconi Centre Poldhu:  
<http://marconi-centre-poldhu.org.uk>
- Marconi Museum (Fondazione GM) Villa Griffone, Italy:  
<http://www.fgm.it/en/home.html>

Marconi shares by Liberal ministers as lacking prudence, given their privileged position in British society. The report was viewed by many critics as a 'whitewash', as all parties were cleared of any wrongdoing, although their political reputation had been gravely damaged by the public nature of the whole affair. It was reported that Lloyd George had suffered ill health and had lost weight due to the probing nature of the investigation.

On June 18th, 1913, the House of Commons assembled to debate the Marconi Affair, and it was divided along party lines. The Conservative opposition pushed for new ethical codes of members and emphasized the complete want of frankness of the Liberals when they faced questions over the purchase of shares in the American Marconi Company.

In many respects, the Marconi Scandal of 1912, reflected the John Profumo Scandal of 1963, in nearly toppling the government. However, for the time being, the Liberal Government managed to hang onto power. The crisis of Irish Home Rule and the deterioration of European relations would soon materialise as a set of more significant problems. They defeated the opposition by 348 votes to 268, and once again they were dependent on the support of the Irish Nationalist Party.



1

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# Radio and the Environment (Part II)

**I**m writing this on a hot summer's day while listening to the radio. The BBC World Service and other international broadcasters are reporting findings from the EU Earth observation programme, *Copernicus*. It is noted that the persistently high summer temperatures in Arctic Siberia are creating wildfires, which are releasing record amounts of Carbon dioxide into the atmosphere.

In turn, the heat in this region will disgorge the captured carbon in the permafrost. A worrying scenario.

The broadcasting of news stories and features like this is now commonplace and is important in order to raise public awareness. However, I feel that environmentally-conscious correspondents, podcasters and broadcasters need to do much more. Perhaps this could be by joining or spearheading campaigns locally, nationally and internationally to help force governments around the world to act.

**Chrissy Brand** concludes her essay, looking at how radio stations, radio amateurs and podcasters are responding to ongoing climate change and other environmental disasters.

However, until more broadcasters join up with environmental organisations and become proactive to implement change, we will continue to speed ever faster into the Armageddon of the climate crisis.

## Far From Amateurs

What is the amateur radio community's response to climate change and other emergencies? During the Covid-19 lockdown, both the BBC and RSGB observed how a large number of people were returning to the hobby. Clubs and individual operators set up nets to

communicate with each other. Most inspiring of these, and encouraging for the future, was eleven-year-old Anne-Marie Rowland in Cornwall, who ran twice-weekly meetings to help keep people in contact.

Supporting your own community is laudable and to be encouraged but what about in the wider world? There will clearly be a much-needed role for emergency communications for as long climate change continues to go unchecked by governments and polluters, causing floods, fires and

Why not visit our new online bookshop at [www.radioenthusiast.co.uk/store](http://www.radioenthusiast.co.uk/store)



**Fig. 1: Radio amateurs helped in the Australian bushfire crisis. Fig. 2: Radio broadcasters and the environment - a natural partnership?**

famine on a biblical scale.

During the unprecedented bushfires that raged in Australia at the start of 2020, radio hams again proved their worth. Licensed amateur radio operators and members of WICEN New South Wales, a specialist support squad of the Volunteer Rescue Association, provided emergency communications in situations when the public communications infrastructure failed.

<https://nsw.wicen.org.au>

The ABC reported how Neil Fallshaw and 30 WICEN members provided a temporary radio system in the Bega, Cobargo, Narooma, and Bermagui areas after some of the local radio infrastructure was damaged or had lost power and mobile phones went down due to the damage (Fig. 1).

Neil reflected, *"We put a radio repeater system on [a] mountain to cover a portion of the south coast ... They needed people who would be able to operate the radios in a communications environment which can get pretty hectic."*

First Response Radio, CDAC Network and Displacement.iom.int (an online platform designed to enhance access to a displacement tracking matrix) are three noteworthy organisations.

They monitor and aid populations in the never-ending changes in migration patterns and emergencies that have been caused by global industry's detrimental effect on the climate.

Radio is the most affordable and available communications technology and is life-saving in times of crisis. One example of this took place in 2019 for displaced people in Mozambique after Cyclone Idai struck.

The International Organisation for Migration found that in one camp near Guara Guara, radio was transformative: *"A community-centred radio service was broadcasting nearby and there were radio sets in the hands of community members. The camp managers had set up radio listener groups using wind-up radios given by a First Response Radio team. FRR had also equipped and trained volunteers in the nearby town of Buzi to set up a temporary FM station using a studio suitcase. CDAC's Communication, Community Engagement and Accountability Coordinator and a Community Engagement Working Group*



*(CEWG) made sure that the station received vital aid and health messages in local languages from the humanitarian hub in Beira. Voices from across the local communities – leaders, teachers, young people – also came on air to send messages of encouragement and make community announcements."*

<https://displacement.iom.int>

<https://tinyurl.com/y392nkl2>

### Green-Inspired Radio

If broadcasters are obliged to report facts and educate people – and I believe that they should be – then dealing with the climate emergency is an area that mainstream radio needs to improve on. If only the climate crisis had been given the same attention for the past 40 years as the Covid pandemic has for the past six months, then many of the green issues could have been resolved a long time ago.

Some broadcasters do cover environmental issues and campaigns quite well (Fig. 2), in a bid to raise awareness. In turn, this helps pile public pressure on world leaders, as the fate of the planet is in their hands. There are some fine examples of such programmes on mainstream radio. Here are just a few of these I have heard recently.

Leena Vuotovesi is an environmental

leader in Europe's greenest town, Li in Finland. The town stopped burning fossil fuels and will have reduced carbon emissions by 80% at some point this year. BBC World Service broadcast a programme about Li in *The Documentary*, last December.

Leena presented a BBC World Service documentary in May, called *Recycling in Chile, Recycling in Spain*, examining the reasons why Chile is so much better than Spain, which fails to reach EU recycling targets. La Pintana is an impoverished town that recycles more than anywhere else in Chile. Under Claudia Pizarra, environmental champion and mayor, locals turn vegetable waste into compost, cooking oil into biodiesel and cigarette ends in to fertiliser.

[www.bbc.co.uk/programmes/w3ct0t30](http://www.bbc.co.uk/programmes/w3ct0t30)  
[www.youtube.com/watch?v=VK3nK9j9ULE](https://www.youtube.com/watch?v=VK3nK9j9ULE)

Deutsche Welle's *Living Planet* programme is also one to offer solutions and inspiration, alongside coverage of problems. On May 28th, it aired a rather beautiful programme about the sounds of healthy coral reefs. Tim Gordon, a marine biologist at the University of Exeter, talked about his research into restoring corals on Australia's Great Barrier Reef, by playing the sound of healthy reefs underwater.

**Fig. 3: The radio programmes we hear can reflect our outlook. Fig. 4: Deutsche Welle has no time to sit on the fence. Fig. 5: Native American women on the march.**

*Eco Africa- the Environment Magazine* is another example of DW brilliance in this field, in this case, a weekly TV programme. In just one thirty-minute edition (on the 2nd of July 2020), *Eco Africa* went to *Senkelle Swayne's Hartebeest Sanctuary* in Ethiopia, made art from recycling old mobile phones and spoke with Modou Fall, an anti-plastic campaigner in Senegal.

[www.dw.com](http://www.dw.com)

Radio New Zealand's *Mediawatch* (June 28th) spoke with Eloise Gibson, the climate change editor at New Zealand journal *Stuff*. In March, *Stuff* launched climate change initiative *The Forever Project*. Eloise pointed out how post-Covid recovery must have climate and sustainability at its heart. Radio New Zealand also airs *Our Changing World*, which looks at science, nature and green issues. Perhaps programmes like these prove that we are what we listen to? (Fig. 3).

[www.rnz.co.nz](http://www.rnz.co.nz)

### On Air Innovation

The green message doesn't have to be delivered in a heavy-handed or patronising manner. Sharing an appreciation for nature is just one step in the right direction. Mark Lapidus is a multi-platform media, content and marketing executive and *RadioWorld* contributor. He came up with an interesting angle when writing about Minnesota rock station KQDS's *The Great Outdoors* blog.

<https://tinyurl.com/y4r7kowu>

Mark suggested that radio stations appoint one of the on-air talent or a freelancer to be an "outdoors person", who could, in time, become an influencer. Giving a clever name or title to the role would help spread the message across social media platforms and on the air. Emphasising the appeal of communicating with nature and guiding the audience to explore and appreciate and care for the environment could also generate revenue for the radio station.

He gave an illustration of how this might work on a commercial radio station, "On-air pre-recorded piece: 'Hey, it's Smokey O, the Outdoors Guy. During this amazing spell of weather, have you considered hiking in the nearby George Washington National Forest? Parts of the forest are less than two hours from DC. One trail I particularly recommend is the Woodstock Tower Trail,



a moderate 45-minute gradual climb. When you get to the top, you can climb the ranger tower where you can see for miles over the Shenandoah Valley. Entrance to the park is free. Get more details about how to plan your day at (station's website), Facebook page or see pics at #SmokeyO.'

"Tag: 'Smokey O, the Outdoors Guy, is brought to you by Smoot's Outfitters, where all your climbing gear is now 20% off.' On Instagram, you'd post pics of the hike. Your host, Smokey O, could do a weekly five-minute podcast about his [or her] forays. Some of these clips could be recorded while Smokey O is actually hiking, a great way to inspire listeners to get up and go."

Another innovative Deutsche Welle programme is presented by Neil King and Gabriel Borrud. *On The Green Fence* returned for a second season, produced from a safe and disinfected radio studio in Bonn (Fig. 4). The first episode, on the 4th of June 2020, was called *Transforming Our World*, while another was titled *The Holocene Strikes back*.

It is an informative, innovative and inspiring programme that conducts, "in-depth interviews with leading experts and visionaries about how we can turn the coronavirus crisis into something good for our planet. Their approach: Don't let ideological baggage or face masks get in the way of an honest and open chat."

### Planet Radio

Radio France International has a loyal following and many listeners' clubs in Asia and Africa. It encourages environmen-



tal discussion and activism through RFI *Planète Radio*. This sector of RFI also helps develop community radio and runs an annual ePOP short video competition, in conjunction with the French Development Research Institute. Young people produce videos that show how lives have been negatively affected by climate and other environmental changes.

The 2020 winners included former *RadioUser* contributor Adita Prithika Subrahmanyam, for her piece on cultivation between factories. Adita won a series of masterclasses in Paris with RFI and fellow ePOPers, a €1,000 grant to design and run a local ePOP Camp workshop in her community, and five ePOP video shooting kits.

[Heartfelt congratulations, Adita, from the team at *RadioUser* – Ed.]

Prithwiraj Purkayastha, president of the RFI Listeners' Club of Jorhat in Assam, India, won fourth place in the Club



DULCEY LIMA ON UNSPLASH



RFI category for his video “*Solution for Greener Cities*”.

The *Grand Prize* winner was Hadama Diakit  from Bamako, Mali, for his video “*The Economy of Waste*”, while the *Young Female Producer* award went to Olivia Christine Jeanne, from Alakamisy, Madagascar for “*The Value of Trees*”.

You can watch the winning videos online.

This is a hopeful message to round off this look into how the radio industry can benefit environmental issues.

[www.rfiplaneteradio.org/en](http://www.rfiplaneteradio.org/en)  
<https://youtu.be/T06hoxHJjIQ>  
<https://tinyurl.com/y5mt8qrr>

### Green For Danger

For environmental activists, from broadcasters and podcasters to activists defending the land, there are tough times ahead. The past has not been too pretty, either. Many people who stand up for the environment are assassinated by right-wing governments and their big-business brethren. One of the far too many examples being Chico Mendes, the Amazonian environmentalist, and rubber tapper union leader who was murdered by a rancher in 1988.

Chico was remembered in BBC Radio 4’s 18-programme series *Green Originals*, aired earlier this year and available online. Kenyan environmentalist Wangari Maathai,

*Die Gr nen* founder Petra Kelly and Great Barrier Reef campaigner Judith Wright were also featured.

[www.bbc.co.uk/programmes/m000dgbf](http://www.bbc.co.uk/programmes/m000dgbf)

In July, Levon Sevunts of Radio Canada International highlighted the dangers for those of us who are active in trying to save the planet. A study in *Global Environmental Change* (Volume 63, July 2020) of “2,743 cases of environmental conflicts worldwide, found that, despite the fact that these activists primarily use nonviolent forms of protest, they become victims of violence in 18 per cent of these conflicts and murder in 13 per cent of all cases. In 20 per cent of environmental conflicts, activists face criminalization, including fines, legal prosecution and prison terms, the study found. Assassination, violence and criminalization of activists become even more endemic when Indigenous Peoples are involved.”

<https://tinyurl.com/y48yy8j7>

Many rational-minded broadcasters and individuals, environmental, political organisations and pressure groups will continue to speak out and fight back (Fig. 5). There is no other option: Getting the word out on the air, building up popular movements, joining actions and protests, on social media, in person and on the airwaves, is paramount for Earth’s very survival.

### Selected Resources

Backhaus, Bridget (2019) *Community Radio as Amplification of Rural Knowledge-Sharing*:

<https://tinyurl.com/y22smfsf>

BBC Radio 4: *Costing the Earth*:

<https://www.bbc.co.uk/programmes/b006r4wn>

BBC Radio 4: *Environmental Index*:

<https://tinyurl.com/y48fuaf>

Deutsche Welle: *Living Planet*:

<https://tinyurl.com/y4nof9u77>

Friends of the Earth: *How to Save the Planet*:

<https://tinyurl.com/y5kpnq3a>

*Green Originals* (BBC/ Open

University, 15 Episodes):

<https://tinyurl.com/y6sh46mt>

Greenpeace: *3 Podcasts for Climate Activists*:

<https://tinyurl.com/y4fcsr4x>

In Our Time: *Climate Change* (BBC Radio 4):

<https://www.bbc.co.uk/programmes/p0054617>

IUCN: *Role of Community Radio in Natural Resource Conservation*:

<https://tinyurl.com/y568czvz>

Serafini, P. (2019) *Community Radio as a Space of Care: An Ecofeminist Perspective on Media Production in Environmental Conflicts* *International Journal of Communication* 13(2019), 5444–5462:

<https://tinyurl.com/y6yeqm83>

Society of Environmental Journalists (USA) Podcasts:

<https://tinyurl.com/y4x68mlj>

talkRADIO: *Environment*:

<https://talkradio.co.uk/environment>

Tuneln (Environment):

<https://tunein.com/radio/Environment-g282>



# Cruise Ship News, Weather, and a NAVTEX Primer

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**In his regular column this month, Robert Connolly reminds us of the difficulties faced by cruise ship operators and staff during the Coronavirus Crisis, and he explains how you can receive NAVTEX messages.**

For those of us who would normally monitor the marine VHF communications of cruise ship arrivals and departures at the various UK ports, this has been a very bleak year.

Due to the Coronavirus pandemic, nearly all the world's cruise ships have been laid up since the spring.

In the 'early days' of the pandemic, the various news media carried extensive cov-

erage of passengers quarantined on various cruise ships, and of the subsequent efforts to repatriate them. However, many crew members remained on board when the cruise ships anchored up.

Given the subsequent closure of air routes and the borders of many countries around the world, these crew members became trapped on board, especially when their contracts had ended.

The staff affected were not just the engineering and front-of-house staff, but also those who were contracted, for example, as entertainers.

## Repatriation Voyages

As a result, the various cruise companies had to devise a system to facilitate the repatriation of crew members whose con-

tract time on board had expired. The system they devised was to have various ships of their line rendezvous at sea. Personnel requiring repatriation were transferred by tender to other ships, which then carried out 'repatriation-voyages' to various groups of countries.

As I write this column, in mid-July 2020, the cruise industry has not restarted, and cruise ships are still laid up at various ports and anchorages around the UK and the world, rotating between port and anchorage for bunkering and resupply of food etc..

Cruise ships were not the only vessels affected by the pandemic; several ferries were also affected, due to the lockdown and restrictions on non-essential travel that resulted in few passengers travelling. While most ferries around the British Isles kept

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GEORG WIESSALA

Fig. 1: A GMDSS NAVTEX receiver (L) and marine GPS receiver (R). Fig. 2: The Mörer Infobox WIB2D stand-alone NAVTEX Receiver. Fig. 3: Using Yet Another NAVTEX Decoder (YAND) to decode the messages. Fig. 4: The new NASA Marine BT-3 NAVTEX Receiver for use with your smartphone and the Blue NAVTEX app.



operating, it was mainly for the carriage of freight. Some of the dedicated freight roll-on / roll-off ferries insisted that all trailers were unaccompanied. Under normal circumstances, these ferries could carry up to twelve lorry drivers.

During the pandemic, there was also a noticeable reduction in cargo shipping. Vessels that had arrived in the British Isles early in the pandemic went to anchorages after discharging their cargo, to await further instruction.

### NAVTEXT: An Overview

This month I will be explaining the format of NAVTEX messages. The official NAVTEX frequencies are 490kHz (national using local language), 518kHz (international English language) and 4209.5kHz (national in local language).

On various marine HF frequencies, you will also find transmissions that look like NAVTEX signals. Officially, these are referred to as HF Maritime Safety Information (MSI) broadcasts. However, in essence, the same format as in NAVTEX is used here.

A NAVTEX station has a predefined area for which it is responsible, in terms of sending information. NAVTEX transmissions are also called narrow-band direct printing (NBDP) with the transmissions built on SITOR-B (a forward error correcting (FEC). Messages are transmitted using binary frequency-shift keying (BFSK) at 100 bit/s, and with a 170Hz frequency shift.

The characters are encoded using the 7-bit CCIR 476 character set, and basic error detection is enabled by employing FEC. Navtex transmitting stations normally have an operational range of between 200 to 400 nautical miles.

Below is an example of a received NAVTEX signal:  
 ZCZC UA18  
 112320 UTC JAN 20  
 MONDOLFO RADIO  
 COASTAL WARNING NR. 726/19 OCT  
 31 (18 RILANCIO)  
 ADRIATIC SEA - PESARO -  
 RIG KEY MANHATTAN WILL BE STATIONING  
 ON PLATFORM BRENDA PERF. IN  
 PSN:- 44 06.59N - 013 02.40E  
 UNTILL 23 GEN 2020.

ALL TRANSITING SHIPS AND BOATS PAY  
 MAXIMUM ATTENTION AND REMAIN  
 OUTSIDE THE SAFETY ZONE OF THE  
 PLATFORM WITH RADIUS OF 500 MT.  
 CENTERED ON THE PLATFORM.  
 NNNN

In this example, the transmission begins with a 'phasing-signal' of at least 10 seconds in length, followed by the four characters "ZCZC" which identify the end of phasing.

This is followed by a single space, then four characters B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub> and B<sub>4</sub> in the example above UA18.

B<sub>1</sub>, in our example U, is the identification letter of the transmitting station.

B<sub>2</sub>, in our example A, indicates the message type being transmitted, in this case indicating a navigational warning.

The allocated letters for message types are detailed in Table 1.

In our example, the characters B<sub>3</sub> and B<sub>4</sub>, 18 define the serial number of the message within that particular message type. Then comes a 'carriage-return' and a line-feed, followed by the date and time of the transmission. In our case, this is 112320 with the date of '11', and the time at '2320 UTC'.

The text of the message then follows, and 'NNNN' indicates the end of the message.

This is followed by another return key and two line-feeds. If this is just one of a series of messages to be transmitted by the station, there will be a five-second phasing signal followed by 'ZCZC' and the next message. If it is the final message in the transmission, there will be an end of emission idle signal 'α' for at least two seconds.

- A. Navigational warnings
- B. Meteorological warnings
- C. Ice reports
- D. Search & rescue information, and pirate warnings
- E. Meteorological forecasts
- F. Pilot and VTS service messages
- G. AIS messages (formerly Decca messages)
- H. LORAN C messages
- I. Not used (formerly OMEGA messages)
- J. SATNAV messages (i.e. GPS or GLONASS)
- K. Other electronic Navaid messages
- L. Navigational warnings (additional to 'A' [not to be rejected by receiver])
- M - U. Not currently used
- T. Test transmissions (the UK only, not official)
- V. Notice to fishermen (the U.S. only, currently not used)
- W. Environmental (the U.S. only, currently not used)
- X. Special services – allocation by IMO NAVTEX Panel
- Y. Special services – allocation by IMO NAVTEX Panel
- Z. No message on hand.

Table 1: The Various NAVTEX Message Types.

### NAVAREAS and Transmissions

The world is divided up into different NAVAREAS. The most common areas received in the UK are as follows:

- NAVAREA 1 (Northern Europe, including the Baltic and Iceland).
- NAVAREA 2 (Atlantic Coasts of France, Portugal, North Africa, Azores, and Madeira).
- NAVAREA 3 (Mediterranean, Black Sea and the Caspian Sea)

Signals from NAVAREA 19 (Arctic Region of Norway) may also sometimes be received.

Occasionally, with suitable propagation conditions during winter nights, some signal may be received from NAVAREA 4 (North America).

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Identification	Transmission start times (UTC)
A	0000 0400 0800 1200 1600 2000
B	0010 0410 0810 1210 1610 2010
C	0020 0420 0820 1220 1620 2020
D	0030 0430 0830 1230 1630 2030
E	0040 0440 0840 1240 1640 2040
F	0050 0450 0850 1250 1650 2050
G	0100 0500 0900 1300 1700 2100
H	0110 0510 0910 1310 1710 2110
I	0120 0520 0920 1320 1720 2120
J	0130 0530 0930 1330 1730 2130
K	0140 0540 0940 1340 1740 2140
L	0150 0550 0950 1350 1750 2150
M	0200 0600 1000 1400 1800 2200
N	0210 0610 1010 1410 1810 2210
O	0220 0620 1020 1420 1820 2220
P	0230 0630 1030 1430 1830 2230
Q	0240 0640 1040 1440 1840 2240
R	0250 0650 1050 1450 1850 2250
S	0300 0700 1100 1500 1900 2300
T	0310 0710 1110 1510 1910 2310
U	0320 0720 1120 1520 1920 2320
V	0330 0730 1130 1530 1930 2330
W	0340 0740 1140 1540 1940 2340
X	0350 0750 1150 1550 1950 2350

**Table 2: Key NAVTEX Transmission Time Slots.**

Each NAVAREA has a co-ordinating country. These are the UK (for NAVAREA 1) France (NAVAREA 2) and Spain (NAVAREA 3).

<https://tinyurl.com/y6xwzku6>

Stations with a NAVAREA are allocated an identity letter (B<sub>i</sub>). This is based on their time slot for transmission. Each station is allocated a fixed 10-minute transmission slot, repeated every four hours.

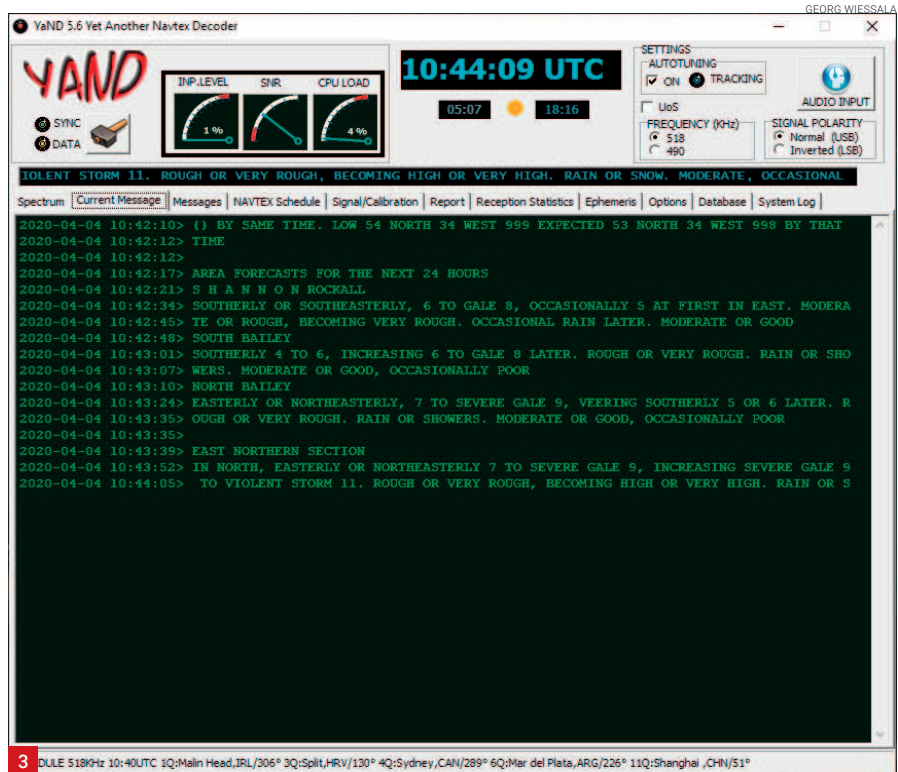
The allocated letters run, beginning with 'A' at 0000 hours UTC, to 'X'.

Table 2 contains the full details of the relevant time slots. Although each station has a defined 10-minute transmission slot, it can transmit certain types of messages (for example, gale warnings or Search and Rescue (SAR) messages) *outside* this allocated period.

### NAVTEX DXing and Operations

Many DXers try to receive as many stations as possible, from as many NAVAREAS as possible.

However, ships will normally have their NAVTEX receiver set for just the NAVAREA the vessel is operating in. The NAVTEX receivers on ships can also filter out certain types of messages, for example, C-Ice report messages. The reception of messages transmitted using subject indicator characters 'A', 'B', 'D' and 'L' (navigational and meteorological warnings, SAR information, acts of piracy warnings, tsunamis and other nat-



ural phenomena) is *mandatory* and cannot be deselected on the NAVTEX receiver. This has been designed to ensure that ships using NAVTEX always receive the most essential information.

The phasing signal is automatically transmitted by the NAVTEX transmitter at the beginning of each message and is critical to the effective operation of the system. It is this signal, which enables a NAVTEX receiver to lock-on to a particular station's transmission, providing the frequency is not already in use.

If another station within transmitting range – and with a time slot before the one of the station selected – overruns its time slot (regardless of the B1 transmitter identification character in use), its transmission will 'blank' the phasing signal of the subsequent transmitter. It will then seem to the receiver as if the second station is off the air' and its broadcast will not be received, possibly denying the user significant safety information.

This is the main reason behind the importance of each station adhering to its allocated time slots. Similarly, if the phasing signal for a particular station is too short, some receivers will be unable to lock-on to the transmission.

From an operational point of view, and to avoid erroneous reception and interference of transmissions from two stations having the same transmitter identification char-

acter, it is necessary to ensure that such stations have a large geographical separation. The allocation of transmitter identification characters by alphabetical sequence to adjacent sites can also cause problems; hence, consecutive transmitter identification characters are not normally allocated to adjacent stations.

Experience has shown that this removes the risk of a station over-running its time slot 'masking' the phasing signal of an adjacent station, which is about to begin its transmission. However, for us as hobbyists receiving stations from a different NAVAREA to the one we are located in, is all part of the enjoyment.

For most of us in the UK, this is within NAVAREA 1. The reception of stations from NAVAREA 3 would mainly occur as darkness sweeps across Europe, and will depend on propagation conditions.

### Message Overlap and Storage

Unlike ships that require NAVTEX information for the NAVAREA that they are operating in, DXers do not mind if a station received from a different NAVAREA 'blocks' a station with the same time slot allocation from our own. NAVTEX receivers on ships can select the NAVAREA they want to receive signals from.

Therefore, a signal from another NAVAREA is normally not a problem for them. When a message is received for the



first time by a NAVTEX receiver, the message identity is recorded and stored in the memory for 72 hours. This ensures that subsequent transmissions of the same message are not re-printed or repeated in the display unless they are re-received over 72 hours later.

Certain operating procedures have also been found necessary: messages in each category should be broadcast in reverse order of receipt by the NAVTEX coordinator, with the latest being broadcast first; cancellation messages should be broadcast once only. The cancelled message should not be transmitted on the broadcast in which its cancellation message appears.

### Priority Levels

One of a total of three levels of message priority levels is used to determine the timing of the first broadcast of a new warning in the NAVTEX service. In descending order of urgency, they are as follows:

- (1) *Vital* for immediate broadcast, subject to avoiding interference to ongoing transmissions
- (2) *Important* for broadcast at the next available period when the frequency is unused; and
- (3) *Routine* for broadcasting at the next scheduled transmission.

Both vital and important messages should be repeated at each scheduled transmission time slot if the situation is still valid.

Examples of a vital NAVTEX message would cover an initial shore-to-ship distress-related message, or 'acts of piracy' warnings, tsunamis and other natural phenomena warnings. This will normally be broadcast using NAVTEX number B3B4 = 00. If the frequency is in use, NAVTEX managers should contact the station which, according to the schedule, will be transmitting during the following time slot, and ask it to postpone the start of their transmission by one minute, to allow space for the vital message. When the vital message has been transmitted, the scheduled station is free to start its routine transmissions.

Messages assessed as *important* are to be broadcast during the *next available* period when the NAVTEX frequency is unused. This is to be identified by monitoring the frequency. Examples of this include meteorological warnings.

### Frequencies and Details

National NAVTEX service transmissions on 490 or 4209.5kHz may repeat the messages broadcast over the International



NAVTEX service but in a national language, or the messages may be tailored to meet particular national requirements, for example by providing different or additional information to that broadcast on the International service.

The national NAVTEX service is targeted at recreational vessels, fishing fleets or other small commercial craft. These are vessels, which do not fall under SOLAS (*Safety Of Life At Sea*) regulations, and whose operation would benefit more from the national information broadcast compared to the international broadcast.

<https://tinyurl.com/qy3psge>

More detailed information regarding NAVTEX can be found in the International Maritime Organisation (IMO) navtex manual. It may be downloaded from this URL:

<https://tinyurl.com/yaa7vnhe>

On HF, NAVTEX transmissions can be found as follows:

Boston (USA) on 6314kHz (0140), 8416.5 kHz (0140 & 1630), 12579 kHz (0140 & 1630), and 16806.5kHz (1630); Isfjord (Svalbard, Norway) on 4210 kHz (0645, 1115, 1845, 2315), 6425kHz (0645, 1115, 1845, 2315) and 8416.5 kHz (0630, 1100, 1830, 2300); Iqaluit Canada 8416.5 kHz (0330, 1530).

Information on other HF MSI sta-

tions may be found at William Hepburn's excellent website

[www.dxinfocentre.com](http://www.dxinfocentre.com)

For the wider context, you may wish to check out the comprehensive World Meteorological Organisation (WMO) document of 7th May 2019, as regards NAVTEX:

<https://tinyurl.com/y9ywc5ny>

Finally, Figs. 1 and 2 show (on the left) an onboard GMDSS NAVTEX receiver and (on the right) a marine GPS receiver. Figs. 3 to 5 illustrate different ways to receive NAVTEX, with either a stand-alone unit (Mörer WIB2D), an HF radio with software on your PC (Yand, see below), or a NASA Marine BT-3 NAVTEX device you can use on your smartphone, in conjunction with the *Blue NAVTEX* app.

<https://tinyurl.com/y6pzf6uc>

There are various software NAVTEX decoders, such as *Frisnit*, *JVComm32*, *Mscan Meteo Pro*, *SeaTTY*, *Yand* ('*Yet Another NAVTEX Receiver*') and *Zorns-Lemma 11.4.2*.

[http://www.jvcomm.de/index\\_e.html](http://www.jvcomm.de/index_e.html)

<http://mscan.com>

<http://www.dxsoft.com>

<http://www.dxzone.com>

<http://www.wettermonitor.de>

Until next time, *Fair Winds*.

Georg Wiessala

wiessala@hotmail.com

**T**he idea of utilizing a radio, in particular an HF radio, for teaching purposes is, of course, not new. When I researched this article, I found that many publications on this topic go back to the 1930s, and even further.

You can see that, in the time of European Fascism, and after World War Two, neutral and unbiased information would have been a rare and much sought-after commodity. Is it so much different in our age of fake news? The radio has never been quite forgotten as an instrument of pedagogy. More often than not, case studies have been few and far between, but they can be found, nevertheless. In many cases, teaching by radio has meshed in with other agendas, such as political influencing, economics and development aid, religious proselytizing, language-learning and many more.

Nowadays, of course, 'distance-learning' using technology, often means the world-wide-web. This, however, has serious drawbacks; it does not nearly reach where it needs to be; plus, it can be manipulated and even switched off at will if national powers so desire.

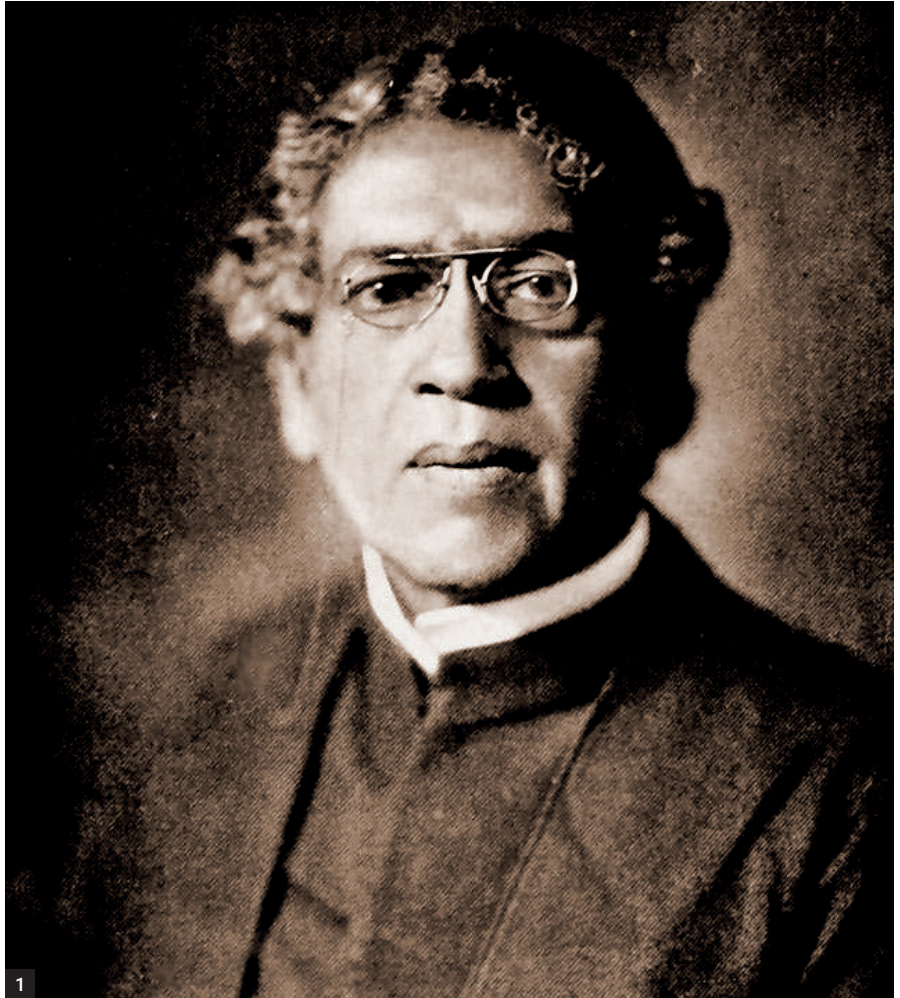
Radio in education, therefore, should assume a pivotal place on any syllabus. Much of it is less prone to propaganda and hate than is the online world – although it seems we can never be entirely free of bias.

And, of course, *the radio is 'cookie-free'*. Nobody can easily see, and trace, what you hear and learn, how often you do this and with whom you share your interest.

### Prominent Uses of Radio

Pedagogic initiatives can make headlines when they employ the good old wireless for education. What I am saying here for receivers equally applies to transceivers too, it goes without saying. Even a brief trawl of the recent academic and popular literature yields numerous resources relating to, for example, radio-schooling across the vast distances of the Australian Continent, in Canada, Africa or India.

The activities and regularly scheduled school contacts of ARISS (*Amateur Radio on the International Space Station*) continue to fascinate teenagers across the UK and elsewhere, drawing many of them into a future science education – and the radio hobby. More generally, what one might



# Radio: Your Home Schooling Resource

The editor draws on his former occupation and suggests a variety of ways in which students of all ages – in lockdown or not – can be taught about our world and beyond, through the use of a radio.

term 'radio science' is a large and growing field, and it does not just comprise education and one-air pedagogy. The general consensus is that this branch of knowledge owes its existence to Jagadish Chandra Bose (1858-1937, Fig. 1). Bose, if you have not heard the name, made progress in his research of remote wireless signalling and was the first to use semiconductor junctions to detect radio signals.

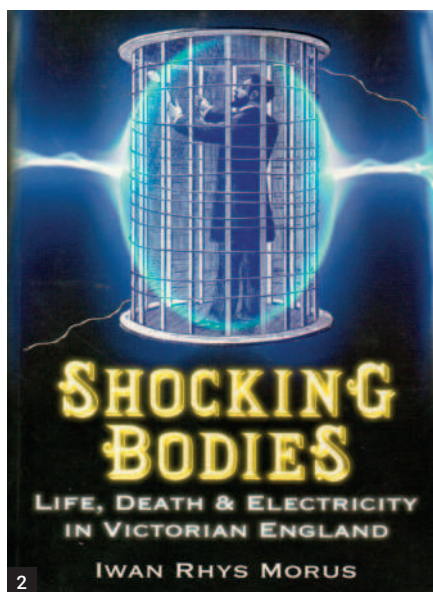
### Curriculum Waves

My prime concern this time is not 'radio-history', in the strict sense of the term – Scott Caldwell and colleagues are looking after that particular area very well indeed, in the pages of *RadioUser*.

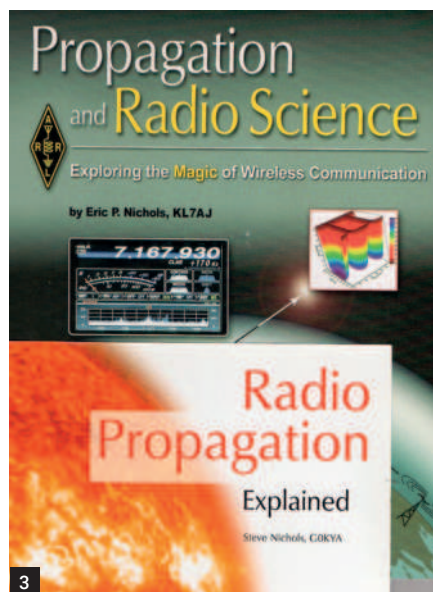
Here, I am interested in the place of radio, especially HF radio, on the curriculum, in the sense of what it is that we may learn *from* and *with* our radios. I am further

Why not visit our new online bookshop at [www.radioenthusiast.co.uk/store](http://www.radioenthusiast.co.uk/store)





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Fig. 1: Radio Pioneer Jagadish Chandra Bose (1858-1937). Fig. 2: Iwan Rhys Morus sharing and demystifying electrical knowledge. Fig. 3: One of the main areas of learning about radio today. Fig. 4: Radio with an educational focus: The NASA INSPIRE Project. Fig. 5: Radio-Art or 'Radio-Kitsch'? Fig. 6: Vintage Radio: Between Art and Science.

inspired to write this – a necessarily very brief overview – because of three things: first, my own experience in using my trusted short wave radio to teach, at school and university; second, the current global lockdown situation, which has led to such an increase in online learning (and radio-buying); and third, the persistent questions of non-radio-hobbyist friends, to the tune of, “yes, but is there any serious stuff to be had from that hobby of yours?”

The short answer to the third point is “yes, definitely”, of course, and, for the purposes of this article, I shall limit myself to four main branches of knowledge, which you can easily explore with radio. This division is, naturally, not complete and quite arbitrary, in that it reflects my own background, in both teaching and radio:

- News and Current Affairs
- Natural Sciences
- Politics, Economics and International Relations
- Literature, Art and Design

### A Broad Pedagogic Bandwidth

When I took my ‘heavy-metal’ AOR AR7300 HF receiver into the classroom with me for the degree courses I taught on European Studies and International Relations, it caused considerable consternation amongst the students at first.



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As I recall, not many had thought about HF radio before. “Radio”, said one 20-year old self-assuredly, “surely is obsolete”, and I explained patiently which modern technologies are, in fact, unthinkable without radio.

### Moving swiftly on...

By contrast, some of my students – to my surprise – were also licensed, active, radio amateurs, especially those on their year abroad.

It is maybe useful to stress that this is now more than eight years ago; even at this distance, there were undoubtedly more short wave radios and stations than there are now. Or at least *different* ones.

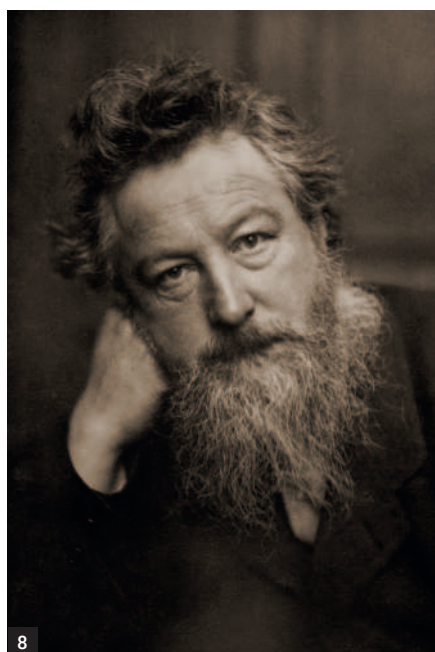
Therefore, it was relatively easy to set tasks, such as comparing news reporting

and propaganda coming from a range of international broadcasters, deconstructing the language used in radio, or linking radio to theory, or political and social matters, such as development aid or views about the European Union or United Nations. Not to speak of the language skills involved when broadcasts were not in English, and when DSP and the emerging noise-suppression technology really came into its own. The emerging field of computer-assisted (language) learning was a good complement to the radio, now and then.

There were many other ways in which radio could be used in Humanities teaching, both in ‘live’ and recorded formats. To be sure had I had the facilities afforded by the latest generation of Software-Defined Receivers (SDR) back



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Fig. 7: 21st-Century Italian radio design.  
 Fig. 8: William Morris (1834-1899).  
 Fig. 9: Using radio to learn about Space Weather.  
 Fig. 10: Required reading for Aurora-enthusiasts and radio fans. Fig. 11: Radio-Science and fiction: *The War of the Currents*, dramatized.

then – for example overnight-recording and selective playback of whole chunks of frequencies – the mind boggles at what we could have done in our groups.

However, my AOR, and an assortment of robust Grundig Satellites (500, 650 ‘Europa’ and 700), did very well indeed. I hope that the generations of students whom I made listen to them did pick up something about things like international power-play, human rights and clandestine stations, reliable and ‘fake’ news, political agendas and manipulations, minority voices, and ‘shop windows’ into countries.

### Bridges of Knowledge

My area of expertise at that time is largely in the Social Sciences, and I used the radio as a teaching tool against that particular background. I am happy to think that my ex-students, both in the UK and further afield, enjoyed this method, at

least as a supplement to more ‘traditional’ lectures and seminars.

I hope many of them remember the ‘Mad Professor’ with his Magic Sound Box.

But what can happen when we draw our circles wider, to look at other branches of knowledge?

You could think of a history class on ‘radio-pioneers’, both male and female, as a kind of ‘learning bridge’, which you can walk across to broaden your teaching scope.

Pioneers, like John Henry, Nicola Tesla or Heinrich Hertz were all of their time, and their experiments and discoveries often reflected the wider cultural, technical, ‘spiritual’ and social questions of the day.

Editors like Laura Otis (2002) have shown (in her case for the 19<sup>th</sup> Century) how ‘radio’, ‘waves’ and ‘electricity’, for instance, have been strongly reflected (and refracted) in the best literature of the time.

Otis’s research also demonstrates how the scientific writings of people like James Clerk Maxwell or Samuel F. B. Morse both added to, and contrasted with, those of authors Mark Twain, Rudyard Kipling or Mary Shelley.

More recently, radio analysts like Ivan Rhys-Morus, have firmly embedded the discoveries of Nikola Tesla and others in the discourses of the period, concerning the body, life and, well, the afterlife too (Fig. 2).

### Radios and Science

Not wanting to get carried away by all those fascinating debates of the past, I’d like to bring us back to the present,

however, and to the issue of what areas of education and knowledge radio can be used to illuminate.

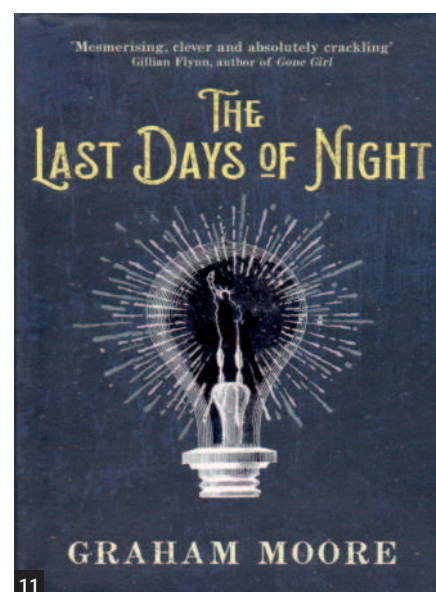
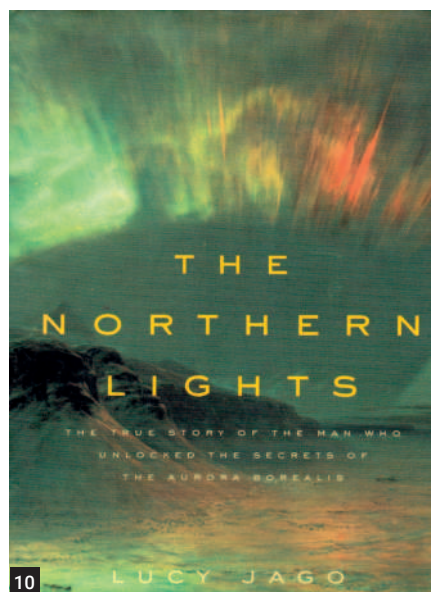
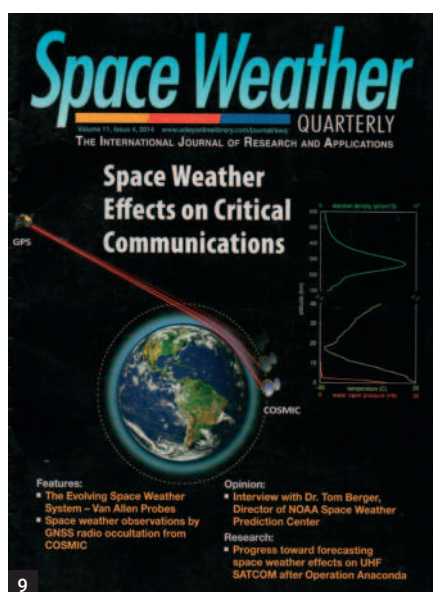
Therefore, let us (immodestly) follow Maxwell and Einstein and construct a ‘thought-experiment’: it would be fascinating to investigate what happens when we treat our HF receivers, transceivers, and associated gear, as ‘scientific instruments’, reflections of public opinion and objects of ‘design’ and ‘desire’.

In fact, it may be better to ask, “*what can you not learn from a radio?*” The scope for education, demonstration and experimentation using an HF radio is virtually limitless. Tell your students about *propagation*, for example, and you will have opened the floodgates: the number of things to know here is exponentially larger than the few publications available in this area to the non-academic radio enthusiast, although there are some excellent primers, both in print and online, from the ARRL, the RSGB, Springer Publishers and others (e.g. Fig.3).

Moreover, studies of ionospheric physics, propagation and the Earth’s ionosphere and magnetosphere offer a rich field of activities. You can involve radios and aerials in your classes in order to make your students understand ‘light’, ‘particles’, ‘waves’ (electrical and magnetic) ‘charges’, and much more besides.

Furthermore, your learners can employ radios to appreciate ‘ground’ and ‘sky’ wave, to learn about ‘lines of sight’, ‘forces’ and ‘fields’, to comprehend refraction and dispersion, attenuation and absorption, and to understand so much more. Quite a bit of this has been covered in *TSM* and *RadioUser* before, in columns and longer articles on propagation, aerials and radio technology. Against this background, it is perhaps fair to say that we are now not just





using the old AOR AR7300 any more, at least not in the main; we are also availing ourselves of the possibilities afforded by computers, soundcards, online- and SDR technology, such as receivers offered by *SDRPlay*, *AirSpy*, and so on.

<https://airspy.com>

<https://www.sdrplay.com>

In fact, SDRs (Baron, 2017) have begun to open up the scope of subjects considerably; they link computer science, radio and electronics – and they appeal massively to the younger generation (and many ‘oldies’ too).

Aerials too, are a large and inexhaustible topic – as large as the doorstopper-of-a-book I am now using as a teaching reference myself, *Rothammel's Antenna Book*.

<https://tinyurl.com/y5wx8weu>

So, tell your learners – and let them gather experience about – such phenomena as polarisation, techniques such as aerial modelling, and good practice in aerial installation and maintenance.

### Other Disciplines

The idea of radios as scientific instruments has, of course, spawned many independent fields of research. Metrology and measurement are two such areas, the science of time-measurement, and investigating time signal stations is a great way into this fascinating field.

Signals interpretation and analysis are other obvious candidates for the construction of lesson plans; you could introduce people to this area by a variety of pathways, like number stations (maybe linked to the historical background of the

Two World Wars or the Cold War) or utility monitoring, both of which have featured in *RadioUser* and *TSM*. Or you may be fascinated by radio astronomy or signals from space – not just the ISS.

I admit that, where I have made occasional presentations to local clubs, I have tended to ride my own hobby-horse and attempted to stimulate interest in weather-watching by radio or VLF studies; both of these areas are very rich in what you might term ‘general-learning-potential’, and they can be illuminated with relatively simple, and portable, means. The US NASA Inspire project is a great example of this (Fig. 4).

You may wish to focus on other areas, for which your HF radio or transceiver is essential. You could instruct people, for instance, about instrumentation and calibration, direction-finding and decoding.

The sky is the limit. With the enclosed diagram and my case studies at the end, I am aiming to propose a number of subjects and scenarios, which, in my view, are lending themselves particularly well to the use of radios as teaching tools. I feel certain that you can think of many more that I am not listing here – as always, contact me with your ideas and suggestions.

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### Radios and Art

Last but by no means least, radios are also artworks and objects of desire for many of us. In terms of *radios as works of art* – both visual and auditory – just look at *Babel*, by Cildo Meireles. Visit it, if you can – this is a cacophony in art, a true

Tower of Babel. It does make you think about things like information-overload, for instance. I also like the vintage aspect of the, increasingly modern, radios used in this art installation.

For certain, you can fill an entire art class with this.

<https://tinyurl.com/y5wb88fy>

The *Longplayer Project* is another, mind-blowing, art initiative, although you do need an internet radio for that. A radio station that plays for 1,000 years – but *who exactly* is playing it? Humans or an algorithm? Are the machines taking over at last? Radio meets art meets philosophy.

You know you will want to write a lesson plan for this right now.

<https://longplayer.org>

Lastly, consider *Border Tuner*, Mexican-Canadian artist Rafael Lozano-Hemmer's 2019 art installation. I'd venture to say that this kind of radio-art would resonate very much in the USA of today.

<https://tinyurl.com/y6jpxxq4>

In the world of sound-art, composers, such as Alvin Lucier (b. 1931) have been using ‘natural radio’ in their experimental compositions – just listen to a sample of Lucier's work *Spherics*: a sound installation and recordings of ionospheric disturbances, for large-loop antennas, tape recorder and playback system.

You can also try *VLF Aeriology* by the Australian ‘cross-media artist’ Joyce Hinterding (b. 1958).

<https://tinyurl.com/y6elzj6s>

<https://tinyurl.com/yyzptreu>

And last but not least, are Stephen P McGreevy's recordings of whistlers, sferics, chorus and tweets etc. (*The Music*

**Books**

Barron, A. (2017) *SDR: Software Defined Radio* (RSGB)  
 Nichols, E.P. (2015) *Propagation and Radio Science* (ARRL)  
 Nichols, S. (2016) *Radio Propagation Explained* (RSGB)  
 Otis, L. (2002) *Literature and Science in the Nineteenth Century* (OUP)  
 Poole, I. (2004) *Radio Propagation. Principles and Practice* (RSGB)  
 Rhys Morus, I. (2011) *Shocking Bodies [...]* (The History Press)  
 Richards, M. (2020) *Raspberry pi Explained for Radio Amateurs* (RSGB)  
 Russo, L. (2018) *Radio Wars. Broadcasting in the Cold War* (Routledge)  
 Wulff, A. (2019) *Beginning Radio Communications* (a-press).

**Websites:**

INSPIRE Project (NASA):  
 International Union of Radio Science (Union Radio-Scientifique Internationale, URSI):  
<https://www.ursi.org/homepage.php>  
 Institute of Electrical and Electronics Engineers (IEEE):  
<https://www.ieee.org>

**Journals:**

*Journal of Radio and Audio Media*:  
<https://www.tandfonline.com/loi/hjrs20>  
*Radio Science* (AGU):  
<https://tinyurl.com/y626xha7>

**Teaching Scenarios for Radio**

Delve into Physics and utilise your radio to demonstrate space-weather (Fig. 9) and EM wave propagation; investigate the properties of our atmosphere and ionosphere. You may wish to include the life and work of someone like Kristian Birkeland and his Aurora-Expeditions. Make Lucy Jago's book *The Northern Lights* required reading (Fig. 10). Find out about the style of Birkeland's and his contemporaries' scientific writings to analyse the language and context of the time.

Allow your students to listen for a week to the short wave programmes of international broadcasters, from different continents, especially News / Current Affairs schedules; what are the similarities and differences in the reporting of events like the Coronavirus pandemic by, for example, Radio Romania International, Radio China International, All India Radio, The Voice of America and the BBC (or any other combination). What are the reasons for the divergencies? What is 'real' and what is 'fake' news? How to distinguish? Use web-SDRs or internet radio if you like, to

of the Magnetosphere) not really works of natural 'sound-art'?

<http://www.auroralchorus.com>

There is so much more to explore in Radio Art (Fig. 5), but this is as much time as I have for it in this article – I am not even beginning to go into the appearance of radios in film and TV.

Go, listen, view and enjoy!

**Aesthetics and Collectibles**

When it comes to radios as *art objects in themselves* – whether you are looking at a beautiful wooden cabinet vintage radio, a Bakelite beauty, an Eastern European trannie from the 1970 or the latest in cutting-edge Italian design (Figs. 6 and 7) – there is no doubt that you are looking at amazing *objets d'art* here, collectables of the highest order, cherished and maintained by many, and often with immaculate attention to detail.

It is, therefore, also possible to appreciate the artistic value of radios, independently from their functional value. In this context, let us remember British textile designer, poet, novelist, translator, and socialist activist William Morris (1834-1899, Fig. 8), who was associated with the *British Arts and Crafts Movement*.

It was he, who, memorably, coined the phrase, "*Have nothing in your house that you do not know to be useful, or believe to be beautiful.*" This could be my radio-philosophy too, I admit; whilst function and specs are important to me and many other radio amateurs and enthusiasts.

collect more material.

Look at *The Spectrum Monitor's* coverage in 2020 about History: *100 Years of Radio* (e.g. Schneider, John W9FGH: 'Radio Broadcasting's First Years: What was it like?' *TSM*, July 2020: 7), or Ken Reitz's recent article on radio magazines (*RadioUser*, July 2020: 34): From here, you can branch out to investigate the technical development of radio, the lives of the first pioneers, and the social, economic and cultural context, such as the War of the Currents, dramatized in *The Last Days of Night* (Fig. 11).

This is an obvious one, already widely-practised, during and outside of radio shows: build your own, 'home-brew' gadgets and learn to code. US author Alex Wulff has recently written a great introduction to the makers' community, using micro-computers like the Raspberry Pi and Arduino (Wulff, A. (2019) *Beginning Radio Communications* (a-press)). In Europe, *RadioUser* authors Mike Richards and Nils Schiffhauer have gone down similar avenues, combining radio and computers. There is also a significant community interested in building solar monitors with Very Low Frequency

Nevertheless, form and style too can be seductive and give as much joy.

<https://tinyurl.com/ssw8w3b>

Add to that another dimension: The product design, 'feel' and 'look' of radios has, at times, closely mirrored the concerns and moods of the time in which they were made; first, radios were, essentially, furniture, in the early space age, they looked like little *Sputniks*. Today they have joined so many other objects in that they have been 'virtualised', looking like uninspiring little black boxes – the 'downside' of SDR receivers.

I think there is room for both in my shack; while I do appreciate the advanced functionality of SDRs, I cannot do without the physical object, knobs-on and all, that is the radio.

**Conclusion: Case Studies**

Let's finish with a few practical case-studies you can work with, I hope (Table 1).

These are some very basic scenarios you might wish to take as starting points for your radio-related classroom lesson, interactive presentation or home-schooling session with the kids.

These suggestions cut across the artificial subject boundaries suggested by my four categories, above, and they overlap, addressing as many different areas of the curriculum as possible.

Who knows, maybe you could even be inspired to use some of this to draw more youngsters into your club, radio charity or association.

(VLF) technology, combining radio with radio astronomy and geophysics

<https://photobyte.org>; <https://dk8ok.org>

Look at Product Design: Show your students a range of radios from different eras and countries and let them guess the decades and geographical origins of manufacture. Ask how contemporary radio design reflects the 'tastes' of each decade and why. Why have some radios been made to look like other objects (rockets, buildings, space ships, globes etc., Fig. 5)?

Select a range of exhibitions and installations involving radios as the means of producing and showcasing the Arts and Culture. Why were radios chosen for the projects? What kind of topics do the projects highlight? From here, look at what people thought was worth preserving, and why; investigate the hundreds of radio museums across the world; pick a few and place them into their historical, cultural and political context.

<http://bdxc.org.uk/museums.html>  
<https://tinyurl.com/yxmpwet>



# The 5XX Station, Paul Nipkow, Britbox News, and DXing

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Keith Hamer and Garry Smith begin a series about early television pioneers, revisit the 1926 Geneva Plan, examine BritBox, appraise the genius of Alan Turing, and offer their regular DX-TV and FM news.

## Early Radio: The Geneva Plan Revisited

In July (*RadioUser*, July 2020: 27-28), we mentioned that, after many delays for technical reasons, the *Geneva Plan* was eventually introduced on November 14th, 1926. This was an attempt to reduce interference amongst the ever-increasing number of European stations sharing the same frequencies. Before the Geneva Plan, the BBC's original master plan to avoid interference was to open a high-power transmitter on long-wave.

Station 5XX, with 15kW aerial power, was duly constructed by the Marconi company in Chelmsford, Essex. 5XX Chelmsford was brought into service on Monday, July 21st, 1924, operating on 1600 metres. Initially, the programming was only experimental, but it later became known as the 5XX High-Power Station Programme, later to be renamed the High-Power Programme. Alas, the station in Chelmsford closed. However, the station rose again like a phoenix when the BBC constructed their own 5XX transmitter at Daventry in Northamptonshire.

The new, and first, long-wave station, known as 5XX Daventry, was brought into service on Monday, July 27th, 1925. It broadcast on 1,600m with an aerial power of 25kW (Fig. 1).

## Early Television Pioneers: Paul Nipkow

We have often mentioned that the electro-mechanical television apparatus by John Logie Baird (1888-1946) was largely based on the ubiquitous Nipkow Disc scanning system. Apart from Baird, there were many other television pioneers around the World working on scanning systems.



These included Alan Campbell-Swinton, Vladimir Zworykin, Alan Blumlein, Herbert E. Ives, Charles Francis Jenkins, Kenjiro Takayanagi, Alexander Bain, Dénes Mihály, Manfred von Ardenne, Boris Rosing, and Karl Braun.

We will be featuring a selection of these inventors in future columns. This time, however, the photo-cell spotlight is turned onto the Russian-German pioneer, Paul Julius Gottlieb Nipkow (1860-1940, Fig. 2).

He was born on August 22nd, 1860, in Lauenburg (now Lębork, located in Poland), Pomerania. At the time of Paul Nipkow, Pomerania (*Vorpommern* in the German language, now located in Brandenburg) was in north-eastern Germany and stretched from the Recknitz river to the Oder-Neisse estuary.

Today, most of Pomerania forms part of Poland, but its westernmost area is in eastern Germany and gives its name to the German state of Mecklenburg-West Pomerania (Mecklenburg-Vorpommern), famous for its White Cliffs – immortalised on the island of Rügen, in the art of Caspar David Friedrich (1774-1840).

<https://www.off-to-mv.com/en>

Nipkow attended school in Neustadt, West Prussia. 'Prussia' no longer exists; West Prussia (*Westpreußen*) is now part of Poland, and East Prussia (*Ostpreußen*) be-



Fig. 1: The BBC's first long-wave station, known as 5XX Daventry, was brought into service on Monday, July 27th, 1925. Fig. 2: The Russian-German television pioneer, Paul Julius Gottlieb Nipkow. Fig. 3: The original March 2019 pre-launch BritBox logo. Fig. 4: The latest £50 note, posthumously honouring the UK's coding genius, Alan Turing.

longs to Russia. Whilst at school, Nipkow studied telephony and the transmission of moving pictures. After graduation, he moved to Berlin and studied science, in particular, physiological optics with Hermann von Helmholtz (1821-1894) and electro-physics with Adolf Slaby (1849-1930).

## BBC MW Transmitter Closures

In May (*RadioUser*, May 2020: 22-23), we mentioned that a number of BBC medium wave transmitters were scheduled to be closed this year. Consequently, in a press statement, Kieran Clifton (Director, BBC Distribution & Business Development) attempted to explain the reasons behind the plan.

He said: "The majority of radio listening in the UK, including to the BBC, is now digital, and digital listening is continuing to grow. This change was planned as long ago as 2011, but we have taken a measured approach to implementing it, to ensure that as many of you as possible have already

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moved on to other ways of receiving the services before we make this change. We know that the changes will impact some of you, and that's why we're speaking about the plans again now. We want to make sure that people listening to these transmissions will be able to use other methods to hear the same programmes.

The BBC is committed to a digital future for radio, and in the past few years we have funded local DAB expansion, made all local radio stations available on digital terrestrial TV (such as Freeview), and we have transformed our on-line and mobile offering with BBC Sounds. Together with FM (which has recently been expanded for Radio Wales), these ways of receiving our stations now make up the great majority of listening, and as a result, continuing to transmit these services on medium-wave would no longer represent good value for money."

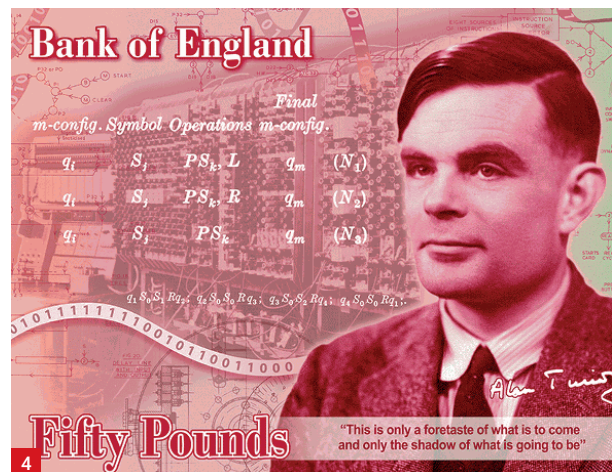
In addition to some services closing, the following stations will have reduced MW coverage:

BBC Radio Scotland: Areas in and around both Aberdeen and Kirkcudbright; BBC Radio Wales: Tywyn, Forden and Llandrindod Wells transmitter areas; BBC Radio Cumbria: Areas in and around Whitehaven; BBC Radio Norfolk: Areas in and around Norwich.

Two years ago, the BBC closed 13 medium-wave transmitters resulting in the withdrawal of AM transmissions by the following BBC Local Radio stations: Sussex, Surrey, Humberside, Wiltshire, Nottingham, Kent, and Lincolnshire. Moreover, reduced medium wave coverage for BBC Devon, BBC Lancashire and BBC Essex was also introduced.

### Banned BritBox Programmes

The BritBox television streaming service was originally announced with pre-launch



publicity back in March 2019 (Fig. 3). Some vintage programmes have already been banned for transmission by BritBox on racial grounds. These include, perhaps not too surprisingly, *Love Thy Neighbour* and *Till Death Us Do Part*.

Perhaps what is surprising, *Fawlty Towers* and *Only Fools And Horses* were originally on the hit-list. However, the BritBox consortium (BBC, ITV, Channel 4 and Channel 5) have since realised that these very popular series will attract many new subscribers. Therefore, they have relented, although a 'warning-announcement' is expected to be aired just before transmission!

### Techno Topics: More On HEVC

Going back to the July issue of this magazine once again (*RadioUser*, July 2020: 27-28), we introduced one of the very latest television innovations – High-Efficiency Video Coding (HEVC).

Between 2013 and 2015, BBC Research & Development led a project, in collaboration with Parabola Research and Queen Mary University of London, called THIRA to resolve some technical challenges. THIRA was co-funded by the Technology Strategy Board and investigated the difficulties associated with storage and delivery of ultra-high-definition content in UHDTV services. Strangely, no-one at the BBC seems to know what the acronym 'THIRA' means.

The project led to the design of several techniques to speed up the HEVC coding process, with minimal impact on compression efficiency. In 2015, the BBC demonstrated the results at the IBC (International Broadcasting Convention), held in Amsterdam. The finalised coding system was called the *Turing Codec*, named after the 20th Century English mathematician, logician, philosopher, theoretical biologist, cryptanalyst and father of the modern-day

computer, Alan Turing (1912-1954).

A 'codec' (coder-decoder), converts a signal into a compressed digital format for transmission and then back into an uncompressed form for access. Codecs accomplish the conversion by sampling the signal several thousand times per second.

Despite Alan Turing's overwhelming number of accomplishments, particularly in helping bring World War II to an end, he was never recognised during his lifetime in his home country, the UK, simply because he was gay.

Because of adverse pressure from his peers, he ended his life by cyanide poisoning. He was posthumously awarded an OBE. In 2019, Alan Turing was officially acknowledged by the British establishment by appearing on the new polymer £50 banknote (Fig. 4). We asked the editor of *RadioUser* if he could send us a sample to illustrate the column. We are still waiting, Georg!

*[It is an enigma of some proportions, Keith and Garry, how the money could have got lost in the post! – Ed.]*

### 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 at the E-mail addresses at the top of this column.

### DX Corner

The 2020 Sporadic-E season is proving to be an outstanding and encouraging event. Many Band I analogue transmitters have already been received with some new services being noticed.

For details of DX reception and news items covering May and June 2020, please check out the *Radio Enthusiast* website: [www.radioenthusiast.co.uk](http://www.radioenthusiast.co.uk)



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**O**ver recent months, during, arguably, the most difficult times we have had to endure in our lifetime, some unexpected publicity has been garnered by people linking the Coronavirus pandemic to the rollout of 5G.

Near where I live in the West Midlands, for example, we have seen cellular base stations attacked and burned down; 5G engineers have even suffered physical attacks perpetrated by those who believe that low power millimetre wavelengths harm human health.

I saw an interesting piece on this subject recently by Jon Mundy, a writer for T3 Magazine and Channel 5's *The Gadget Show* amongst others. I feel that this is worth expanding on.

<https://5g.co.uk/guides/how-safe-is-5g>

# 5G: Is It Safe?

**Chris Rolinson** looks more closely at the safety of 5G, takes a glance at another new Network Radio and checks out a useful website upgrade

## Is 5G safe?

We know that 5G will provide a massive boost to the mobile industry and thus, by extension, to the Network Radio hobby (Fig. 1). It promises increased data speeds and greater capacity for networks to handle more traffic. But most excitingly perhaps, a much lower latency, which could make quite a difference to NR related apps like Zello.

For most of us, it will be like having constant mobile access to an extremely fast and responsive Wi-Fi connection,

frequently with better speeds than many of us get over home broadband.

But, as Jon poses, "*Is 5G safe? And is there a link between the rollout of 5G and the current coronavirus pandemic that's sweeping the world?*" These are important questions, although they are two separate ones and should not be confused (Fig. 2).

## 5G and Covid-19

At this time, there is simply no plausible link discovered between 5G and the



**Fig. 1: Is 5G the future? Fig. 2: Are masts like this safe for humans? Fig. 3: Does using a mobile device 'fry' your brain? Fig. 4: The Electromagnetic (EM) Spectrum, showing ionising waves. Fig. 5: Hytera's new PCD550. Fig. 7: The new Network Radios Monitoring Webpage.**

spread of coronavirus.

In the UK Government Coronavirus daily briefings, officials had to go as far as making a direct rebuttal about this issue. They also put it in writing on 6<sup>th</sup> May, "There is no evidence of a link between 5G and coronavirus. These theories have been rejected by scientific experts in the World Health Organisation and Full Fact, a UK-based independent fact-checking charity."

The World Health Organisation (WHO) has also weighed in: "5G mobile networks DO NOT spread COVID-19". They continue, stating something that seems to me blindingly obvious, "Viruses cannot travel on radio waves/mobile networks", before pointing out that COVID-19 has been spreading in many countries that do not even have 5G mobile networks installed at all, Iran is just one example.

<https://www.who.int>

### Persistent Safety Fears

There are fears simply because there is a lot of misunderstanding about radio frequency energy in general.

As radio enthusiasts, we already know a little about the electromagnetic spectrum and how RF works, probably more than the average citizen. We might even be aware of the difference between ionising and non-ionising radiation. X-Rays for example, which are harmful to human health if we are overexposed to them, fall into the ionising category. Hobbyists understand that Radio & TV, satellite signals, along with mobile networks, all transmit RF energy in different parts of the spectrum. The main reason 5G brings a new concern to the table is that, although it is very low powered, some 5G frequencies (not all, it should be noted) are in the millimetre wavebands. Such frequencies have not been used by mobile networks before and some are asking if frequencies of 24GHz and higher, especially in the density needed to provide cellular coverage, might yet prove to be a risk to health.

### Views From Science

Concerns over mobile network safety generally are not new. Back in the 1990s, I well remember TV reports about Essington - a village in Staffordshire, where several

people fell ill following the erection and commission of a new 3G mast in the area.

But how does one prove that events like mast erection and illness are linked? Could it just as easily be a coincidence? Does the fact that there something new has appeared outside one's home play on people's minds? Does psychology play a part?

These are difficult things to separate – they need properly designed and monitored studies.

### The Cancer Issue

Brain cancer has been one area where microwave signals have long had the finger of suspicion pointed at them – due to holding cellular devices close to the head - and yet there is not much evidence for such signals being a causal factor.

Researchers in Australia, using 30 years of data concurrent with mobile operators in that country, could not find any correlation between mobile usage and brain cancer (Fig. 3).

In the UK, the NHS responded to that report by suggesting that "when it comes to risk factors for cancer, such as smoking, poor diet, drinking too much alcohol and lack of exercise, mobile phone ownership is probably not a significant risk to your health".

Moreover, Cancer Research UK has found no correlation between mobile phone usage and cancer. Mobile ownership in the UK increased by around 500% between the 1990s and 2016, yet the incidence of brain tumour rate during that same time increased by around 34%. The increase in cancer was attributed to both improved reporting and detection of cancer in general over that time.

<https://tinyurl.com/ycvjszjy>

### More About Waves

All Radio Frequency fields are forms of non-ionising waves; this includes the millimetre wavebands (Fig. 4).

A definition of non-ionising radiation has been given by the International Commission for Non-Ionizing Radiation Protection (ICNIRP). According to this, non-ionizing radiation is "electromagnetic radiation that does not carry enough photon energy to ionize atoms or molecules".

Simply put, they don't have any inherent power to alter the structure of a human cell.

Ionising waves, on the other hand, like the aforementioned X-rays, do indeed have the ability to alter human cell structure – which is why your dentist and doctor don't



like giving you too many doses of them!

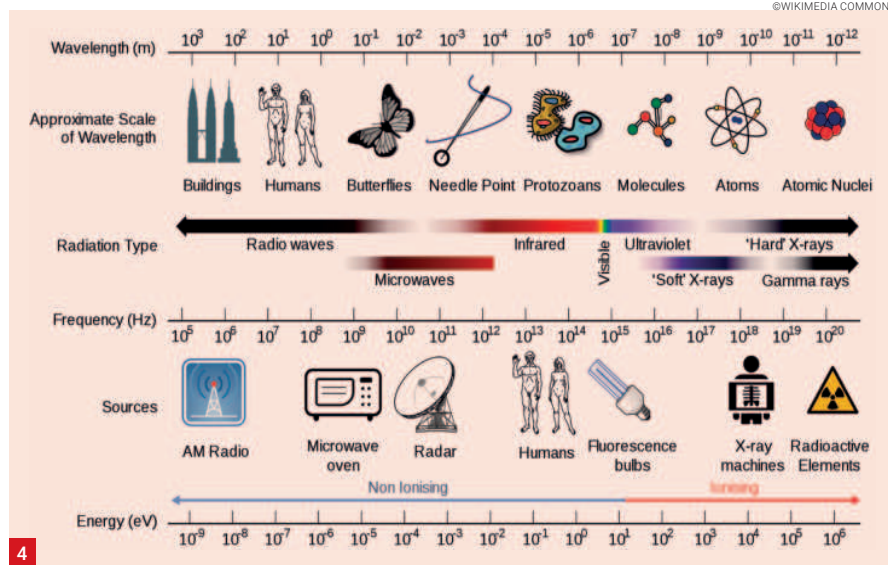
Ultraviolet (UV) rays we get from the Sun sit right on the edge between non-ionising and ionising radiation, above about 300THz.

This explains why we should be concerned about sunburn (and tanning booths!).

These waves are well over 10 times higher than the highest 5G frequencies, and are we exposed to them most of the time, especially if the weather is sunny!

### Official Positions

In response to an online petition to launch



an independent inquiry into the health risks of 5G, the Department of Health and Social Care (DHSC) issued a statement, which said, *“Exposure to radio waves has been carefully researched and reviewed. The overall weight of evidence does not suggest devices producing exposures within current guidelines pose a risk to public health.”*

Furthermore, in October 2019, Public Health England issued a report stating, *“It is possible that there may be a small increase in overall exposure to radio waves when 5G is added to an existing network or in a new area. However, the overall exposure is expected to remain low relative to guidelines and, as such, there should be no consequences for public health.”*

<https://tinyurl.com/y7bm5gdm>

Last but not least, Ofcom has conducted its own spectrum tests to establish health risks with 5G. It found that *“In all cases, the measured EMF levels from 5G-enabled mobile phone base stations are at small fractions of the levels identified in the ICNIRP Guidelines”*.

<https://tinyurl.com/ycwr7fw3>

## Other Points of View

While claims of direct links with the Coronavirus can seem a little outlandish, there has however been considerable traction, among some scientists and medics, for the theory that 5G frequencies might nonetheless impact human health in general.

Take a look at this article for starters:

<https://tinyurl.com/yylotazu>

There has even been an appeal made to the EU by some doctors and scientists asking for a moratorium on the 5G rollout,

while more research is done:

<http://www.5gappeal.eu>

And there are even some hefty scientific papers, which question the link between 5G and health issues, such as this very technical one on ‘Human Exposure to RF Fields in 5G Downlink’ from Georgia USA if you fancy some bedtime reading!

<https://arxiv.org/pdf/1711.03683.pdf>

But as with so many things, it seems that the science changes, depending which scientists you decide to listen to (and maybe, if I may be cynical, who is paying them?)

Furthermore, science is, by its nature, a subject where you propose a theory, test it and then revise that theory in the light of the evidence. So our knowledge is in a state of constant flux – it’s just how science works.

The cynic might suggest that governments will always do what is best for the companies that stand to make a lot of money from 5G – others would argue that 5G will benefit us all and we should get on with rolling it out.

Whatever you believe, it is surely wise to look where the money is flowing in a debate like this.

There are large vested interests at stake everywhere, and there is always a possibility that big money can speak louder than the truth. Unravelling these threads is a difficult task for anyone and it is well worth spending time doing your own research.

My personal take, for what it is worth? *Always take special care in the close presence of RF, whatever the frequency!* Few people, in my experience, die of being too careful...

5

## More New Radios

Hot on the heels of the last two month’s reviews, it’s great to see more see Network Radio devices in the pipeline or coming into the stores for sale.

Hytera’s new PDC550 (Fig. 5) has finally hit the shops:

<https://tinyurl.com/ycsvgtpj>

This is Hytera’s take on a DMR/Network Radio hybrid. The device is rugged and ideal for use in harsh environments - it touts IP68 protection and complies with MIL-STD 810G. Hytera is especially proud of their anti-slip coating, making the PDC550 easy to grip in the hand.

Weighing just 375 grams (including battery, antenna and belt clip), the PDC550 would be considered relatively light in its class. Even so, it manages to sport a 5-inch HD Corning Gorilla® Glass multi-touch screen, which Hytera says will stay legible even in strong light. The touchscreen can be easily operated with gloves and even in difficult weather conditions – sounds great for the adventurers amongst us.

Like all Hytera radios, we can expect excellent sound quality, both on transmit and receive.

The device offers dual microphones, meaning Hytera’s noise-cancellation technology can be employed.

There is also a speech recognition





function, meaning the radio can excel, even in the noisiest of environments. The PDC550 runs Android 8.1; Hytera claims it will offer a high level of compatibility: it is equipped with an Open Application Interface (API), which will enable customer-specific applications to be developed; very useful for business, but maybe there's an opportunity here for an enterprising Android radio hobbyist developer too?

I am guessing it will easily run Zello – of course, we will have to wait and see for sure, but since the recently reviewed PNC380 from the same company had no problem, I would guess it will work fine!

Don't expect this device to come cheap though – at the time of writing it is showing around the £700 mark!

### Monitoring Network Radios

'Hairy Paul' MM7WAB contacted me recently to tell me about an update to the *Network Radios Monitoring* Webpage. Have a look at it here:

<https://tinyurl.com/y24rsgy2>

It has recently undergone a facelift but allows anyone worldwide, with or without Zello or a Network Radio, to listen in to the goings-on in the Network Radio suite of channels (Fig. 6).

All 8 channels, from 00-06 and the EV ('Events') channel are present, and Paul has even provided direct clickable links to each individual channel's page on the Zello site. That should make it really easy to find your way to the suite if you have not been there before.

Rounding things off, Paul has also put direct links to their Facebook group and their lesser-known Telegram Chat support group.

That's all for this month – feel free to get in touch via the above email address and let me know the news from your corner of the networked world. It is always great to hear from you.

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# Win a Hytera PNC380 Network Radio

Thanks to our friend Andrew Clark, of G6 Global, we have a fabulous Hytera PNC380 Network Radio, worth £250 to give away as a prize. The radio is already in widespread use, both in the UK and on the Continent, has very high specifications and benefits from an excellent build quality. It was reviewed in last month's issue and can be extensively customised, for hobby or professional use.

To be in with a chance to win this amazing network radio, just enter this competition just answer the question below on our website at:

[www.radioenthusiast.co.uk/competitions](http://www.radioenthusiast.co.uk/competitions)



What is the capacity of the battery in the Hytera PNC380?  
a. 1,000 mAh b. 2,000 mAh c. 3,000 mAh d. 4,000 mAh

Entry is only via our website. Entries close at midnight on 28th September 2020. To enter you must answer the question correctly and answers received after the end date will not be accepted. The winner will be notified by email. Warners Group Publications Plc standard competition terms apply, to view visit [warners.gr/compterm](http://warners.gr/compterm). For information on how your personal data is processed, secured and your rights, our Privacy Policy can be viewed here - [warners.gr/privacy](http://warners.gr/privacy) or available in hard copy upon request. The winner will also be announced in the November 2020 issue of RadioUser.

Enter our competitions at [www.radioenthusiast.co.uk/competitions](http://www.radioenthusiast.co.uk/competitions)



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Wideband SDR Receiver. 150kHz-1.9GHz incl SAW Filters.

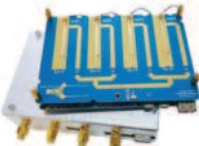


ML&S: £149.95

### KerberosSDR

A Coherent RTL-SDR with 4x Channels.

For direction finding, passive radar, beam forming, or just as four RTL-SDRs!



ML&S: £179.95

### HackRF One

HackRF One from Great Scott Gadgets is a Software Defined Radio peripheral capable of transmission or reception of radio signals from 1MHz to 6GHz.



ML&S: £219.95

## DIGITAL & ANALOGUE

### UNIDEN UBCD3600XLT

New digital TruckTracker V Professional Scanner Receiver, covers 25-1300MHz wideband frequencies.

The TruckTracker V operation allows this scanner to scan APCO 25 Phase 1 and Phase 2, DMR, Motorola, EDACS, LTR Tracked Systems as well as conventional analog and P25 digital channels.



ML&S: £449.95

### ICOM IC-R6E

The 100 Ch/Sec Wideband Signal "Search Machine"

Communications handheld receiver. While retaining basic features of its popular predecessor the IC-R6, the IC-R6E contains many improvements including 100 channel per second scanning speed, 1,300 memory channels, 15 hours of continuous receive capability, optional drop-in charger stand and voice control squelch.



ML&S: £199.95

### WHISTLER TRX-1 DIGITAL SCANNER



The Whistler TRX-1 Handheld Scanner is a multi-system adaptive digital trunking scanner with Motorola P25 Phase I, X2-TDMA, Phase II and DMR making it capable of monitoring unencrypted channels/systems.

ML&S: £419.95

### AR-DV10

The ULTIMATE all mode all band scanner.

100kHz-1300MHz Analogue & Digital Modes.



ML&S: £939.95

### ICOM IC-R30 SCANNER

The Icom IC-R30 has extremely wide coverage and supports all of the usual analogue modes (FM, AM, SSB, CW) as well as a few digital modes including NXDN, P25, DPMR and DSTAR. A worthy upgrade over the older IC-R20.



ML&S: £569.95

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## ANTENNAS

### BONITO RANGE AT ML&S

#### ANTENNA JET AAS300



A USB powered antenna splitter designed to work between 9kHz and 300MHz. Now you can use your one antenna with up to 3 receivers simultaneously. Finally, you can listen to marine band traffic, The Archers on Radio 4 and the air band at the same time (provided your antenna will cover it all!)

ML&S ONLY: £234.95

#### ANTENNA JET ASM300



A USB controlled antenna switch and mixer. It can be used as a simple switch, or can be used to switch in more than one antenna, to aid receiving to an optimum performance.

ML&S ONLY: £189.95

#### BONI-WHIP (PSU needed)

The active antenna that is raved about. Covering 20kHz to 300MHz and ideal for times when you can't erect a wire antenna. For home, for travelling and for DX camps. And despite the whip being only 4 inches long, it actually works!



ML&S ONLY: £109.95

#### GigActiv GA3005



A portable active antenna capable of covering 9kHz to 3GHz. Perfect if you are away on holiday and want to have a listen to the bands. You'll need to provide it with 5V via a USB cable (included) and some coax but it is just ready to go.

ML&S ONLY: £386.95

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