



All the New Gear
The latest from Stampfl,
Icom, SDRplay & Vine

Noise Problems?
A beginner's guide to DSP
and noise cancelling tech

RadioUser

September 2021 £4.99

www.radioenthusiast.co.uk



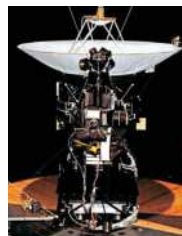
NEW FOR MARINE

We review the all new Icom IC-M94DE portable transceiver with inbuilt AIS receiver



HISTORY

The Angry-9 Radio
Looking back at a reliable military field & vehicle radio



SPACE

Voyager Messages
How we continue to hear remote spacecraft signals



WARNERS
Display until 30th September 2021

PRICE PLEDGE – we aim to be competitive – seen it cheaper then let us know



NEW

Tecsun PL-990x Top Of the range Portable radio

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

£259.95



Tecsun S-2000

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

- 1000 station memories
- Signal Attenuator
- Dual timer alarm
- Wide/narrow filters
- 1000 station memories
- Dual alarm clock function
- MP3: Aux input
- Rotary Antenna: MW/LW

£299.95



Tecsun S8800 GM SSB Shortwave Radio

- FM, SW, MW, LW • SSB with LSB/USB
- 650 station memories
- Deluxe Gun Metal Tuning knob
- Remote control, Alarm & sleep/timer
- DX/Local antenna gain control
- Built-in battery charging feature
- Supplied with batteries & remote control

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BEARCAT



UBC-125XLT 500 Channel AM/FM scanner

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

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

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Popular 'Airshow' scanner

- 25-512MHz (with gaps)
- Modes: AM/FM
- 300 channels
- Close Call

£99.95



EZI-33XLT

Compact handheld - easy to use!

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

£64.95



UBC-370CLT

500 channel AM/FM scanner

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

£119.95

HEADPHONES



Yaesu STA77

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

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- Variable gain
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• Gain: 11dBi

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

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Active Receive Antenna
Covers: 1.8-30MHz

£44.95



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High quality stainless steel, chromed brass & anodised aluminium construction
• 300 MHz-3GHz

£69.95



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Indoor Discone antenna
25-1300MHz complete with cable and BNC plug

£49.95



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AN48X NEW!
Covers: SW, MW, LW
Active wire loop..... £39.95



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Low Noise - hear weak signals in the LW, MW and SW Bands
• Receives 10kHz-500MHz
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- 60MHz - 260MHz
- Use over internet
- 60 x 45 x 10 mm

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- 24MHz-1,800MHz
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- 24 - 1,800MHz

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- SY4.....3 el (26-28)MHz 13.15 dBi..... £119.95
- SY50-3.....3 el 50MHz 8.5 dBi..... £99.95
- SY50-5.....5 el 50MHz 10.5dBi..... £129.95
- SY68-3.....3 el 70MHz 7.0 dBi..... £79.95
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- WY400-6n.....6 el 432MHz (wide band) 11.0dBi..... £79.95
- WY400-10n10 el 432MHz (wide band) 14.0dBi..... £119.00

ICOM



Icom AH-8000

Professional Discone Antenna Suitable for both Transmit and Receive
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- PSW-30H..... Switch mode 30A (max) 9-15V DC..... £69.95
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PL259 connector (Part: 7350)..... £8.95
N type connector (Part: 7395)..... £9.95

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Ecoflex 10 Plus
per metre..... £3.79 price per 102m drum..... £359

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Aircell 7
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Aircell 5
per metre..... £2.75 price per 102m drum..... £259

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Professional Communications Receiver

- 10 kHz – 3.0GHz Super Wideband
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AR-DV10 Digital Handheld Scanning Receiver

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- TETRA, P25 (Phase 1+2), DMR, Mototrbo, dPMR
- Latest Firmware!

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£939.95

ICOM



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- 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

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BCT-15X

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BEARCAT



SDS-100E Advanced Digital & Analogue Scanner

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

Activated Version (DMR, NXDN already activated) £649.95

BEARCAT



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!

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BEARCAT



UBCCD-3600XLT Digital Scanner with 'Close Call' and Analogue AM/FM

- Receives: 25-1300MHz
- SD card slot

£425

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

£479.95

ALBRECHT



Albrecht AE255M Wideband Base Scanner

- Covers 25-960MHz (w/gaps)
- Step sizes: 5/6, 25/8, 33/10/12, 5/20kHz
- Turbo search (180 steps/sec)
- 300 memories, Clock Display, Skip feature, c/w Mains adaptor, Car adaptor, Antenna, Mounting bracket

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ALBRECHT



Albrecht AE125H 500 Channel AM/FM Scanner

- 5-960MHz (w/gaps)
- Civil/Military Air bands
- Close Call feature
- Hyper search -300/sec
- CTCSS & DCS
- Supplied c/w: Mini USB lead, 2 x AA 2,300 mAh NiMH Batteries

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- Spectrum Sweeper

Whistler TRX-1 £419.95



Whistler TRX-2 £479.95

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- Displays: Capacity, Voltage, time & rate

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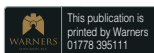
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We regret that replies to technical queries cannot be given over the telephone. Any technical queries by e-mail are very unlikely to receive immediate attention either. So, if you require help with problems relating to topics covered by RU, then please write to the Editorial Offices, we will do our best to help.

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It is hard, indeed, to beat the value of a monthly subscription to this magazine. Not only will you never miss an issue, but you will also find it landing on your doormat before anyone else.

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20 Airband News

David Smith enjoys a remarkable new website on the subject of vintage airband radios, investigates a fascinating airband blog and discovers the frequency framework at RAF Waddington.

22 Airshows 2021

David Smith presents our popular guide to the remaining airshows, displays, fly-bys, and related historical events.

Cover Story

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28 A Beginner's Guide to Noise Cancellation

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30 Rallies and Events

We are approaching the tail end of the main Rallies Season; check out our comprehensive guide to both physical and virtual Hamfests, lectures and local meetings. Always check before you set out!

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Richard Nosworthy recently paid a visit to Radio Cardiff, a ground-breaking community radio station in South Wales. Here is his report on this local station's past, present and future.



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Keith Rawlings surveys the latest in aerial modelling software and undertakes further fine-tuning with his loop-on-ground aerial setup.

Radio Meteorology & Journeys into Space

Georg Wiessala
wiessala@hotmail.com

Hello and welcome to the September issue of *RadioUser*. There is no doubt that the days are drawing in a little now. What is good news for the medium wave DXer or short wave connoisseur, is greeted with slight dismay by many who like to combine radio with the great outdoors, SOAT enthusiasts or geo-caching fans.

Our first 'autumnal' issue – as you have come to expect by now – once again aims to offer a range of diverse and up-to-date features, news and columns; I hope you find something here for you.

The weather is set to be rough for the foreseeable future; and the climate, as many of us are aware by now, is changing. We will have a little more of an emphasis on what one might call 'radio-meteorology' over the next few issues, starting with Robert Connolly's *Maritime Matters* this month, and looking into how to use your radios and aerials to obtain accurate information on both weather and climate, as the year progresses.

Robert has also been kind enough to review the new Icom IC-M94DE handheld maritime transceiver for us (see cover page). Read on to learn what he found out.

In other reviews, Kevin Ryan takes us on a tour of new DAB radios that many of you might not have heard about. Keith Rawlings rounds off the reviews section with a look at contemporary aerial modelling software.

Our key features include a portrait of a multi-faceted local community radio station in Cardiff.

Such profiles of broadcasters will also feature more prominently in the future since many of you have asked us for this.



On the technical side, there is a handy introduction to the art of noise cancellation and digital signal processing, by Graham Somerville, while Scott Caldwell catches up with one of the least-known radio pioneers, Oliver Heaviside.

Our historical strand this month is completed by a feature on, *inter alia*, Alexandra Palace, by Keith Hamer and Garry Smith, and a section by Tony Smith, on a very special wartime radio, known as the 'Angry-9'. Moving from Sea to Space, do not miss Tim Kirby's section on radio signals from the *Voyager* probes.

In our regular columns this month, you can learn more about gender-specific radio, new broadcast awards, a great vintage airband scanners website, and on how radio listening and seasonal reading can be mutually fruitful and enjoyable.

Plus, there are plenty of pointers to news and products, resources, airshows, private European short wave stations, rallies, and new radio-related publications.

Enjoy the magazine, stay safe, and do not forget to let me know what you would like to see covered here.

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

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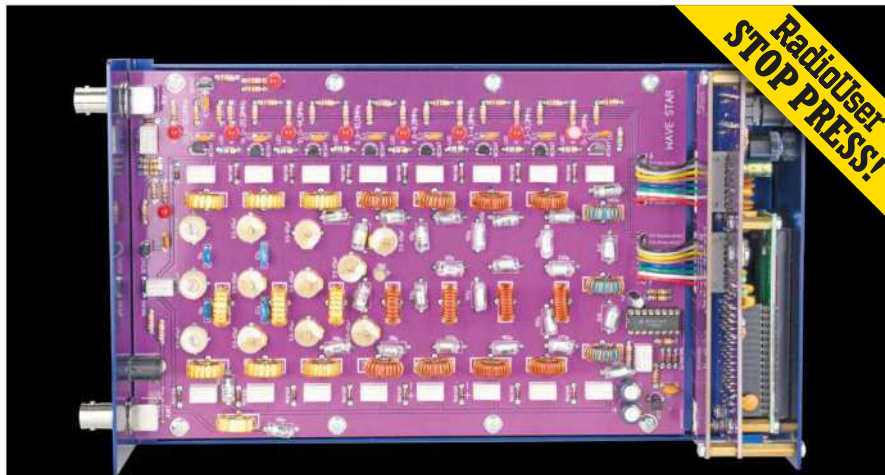
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What's New

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



Swiss Precision from Stampfl

Stampfl Ham Electronics was founded by Heinz Stampfl HB9KOC in 2005. Heinz makes kits, Morse keys and various smaller components for amateur radio enthusiasts. The new Stampfl WAVE STAR kit allows you to build a preselector for frequencies up to 30MHz.

The device has many uses for home-build projects, SDRs and general receivers. The hardware was developed by Heinz Stampfl, (HB9KOC) the software by Ernst Kirschbaum (DL2EBV) and Rolf Hasler (HB9QN). There is a low pass filter for the area up to 41MHz and

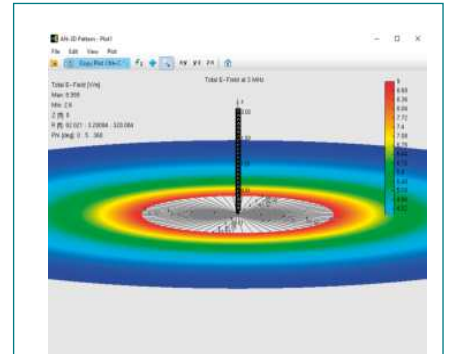
other, switchable, filters. Filters are selected electronically, via the front panel buttons. The preselector has a bypass function and is suitable for reception purposes only. The kit sells for CHF 510 (Euro 490).

Heinz Stampfl has also developed a new kit called RF-Scout and the Q30 und S-VFO modular kits, and he is working on a short wave SDR radio.

<https://www.heinzstampfl.ch>

<https://tinyurl.com/kyndcm66>

<https://tinyurl.com/4928nefd>



AN-SOF Update

AN-SOF is pleased to announce the release of the new *AN-SOF Professional 6.10*, software package, which includes some new features; for example, the radial wire ground screen is shown in an AN-3D pattern; the finite substrate is also shown in an AN-3D pattern; 'TAB' (\t) has been added as a field separator for importing NEC files, besides the already existing separators: commas and spaces; and an 'Average Gain Test (AGT)' feature has been added to 'Power Budget' as a complementary parameter to the percentage error of an antenna model.

A-1 Resource: Wireless Telegraphy

Here is an amazing collection of out-of-print rare books scanned to digital PDF format and put on disk. It is *über-packed* with information and knowledge about how to learn this craft from the pioneers of yesteryear. This is a truly fascinating look at the history and development of the technology of Wireless Telegraphy. Included are manuals and guides on the construction of the equipment, vacuum tubes, thermionic tubes, how to make a wireless set, and so on, for either the beginner or advanced enthusiast. This library has to be an essential element in the toolbox and radio shack. The tens of thousands of pages contain essential knowledge and insights, diagrams, images and explanations that provide a truly encyclopaedic library of knowledge that is unsurpassed. This unique collection is the most complete one, available for just £3.90 on eBay (Source: Bob Houlston).

www.tinyurl.com/wirelessold

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



New from LAM Communications

Lee, of LAM Communications, has been in touch to let us know about several new products available from stock at the moment. They are the Vine Antennas RST-SPK-L Super-Size extension speaker, and the Vine Antennas RST-HAM Pole 12m heavy-duty fibreglass vertical aerial. Check out the links below for further details.

<https://tinyurl.com/6eaxb4se>

<https://tinyurl.com/2v99j9zd>

<https://tinyurl.com/3mw2san>

sales@hamradio-shop.co.uk

Lindars Radios

Justin Lindars, of Lindars Radios in Yeovil, has recently been adding plenty of new stock items to his popular website. Go see for yourselves, at the URL below:

01935 474 265

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



SDRplay: SDRuno Scheduler Beta Version to be Released

SDRplay is releasing a public beta version of its much-anticipated *SDRuno Scheduler* function (*Radio User*, July 2021: 11). At a recent webinar hosted by the Dover Amateur Radio Club, several AM DXers joined in and were extremely enthusiastic about its potential for helping identify those 'mystery-stations'. This is achieved by setting the recorder to select short 'top-of-the-hour' segments. Most broadcasters announce their station ID at the top of the hour. The picture shows how easy it is to set up such a repeating request, which can either be for an IQ recording of the whole AM band in one go or – as in this example – the capture of a simple, 2-minute, audio sample of a specific frequency, on the hour every hour, for 48 hours.

Also available in *SDRuno V1.41* is a new *ADSB Plugin*, which simplifies the way you can use an SDRplay RSP for decoding real-time transponder signals from aircraft in your vicinity. You simply ensure you have a suitable antenna for 1.090GHz and launch *SDRuno* and the new *ADSB Plugin*. This new Plugin works with freely available Virtual Radar Server software, which collects the data from the *SDRuno* plugin and produces a clickable map that shows

all the aircraft found in real-time. Anyone who has an *RSPduo* (the dual tuner SDR) can simultaneously listen to the corresponding ATC voice channel to monitor the pilot interaction with air traffic control.

Mike, KD2KOG from *SDRplay* has produced a comprehensive app note covering this and the many ways this new plugin can be used to customise displays via its internal ADSB web server.

SDRplay is also working closely with several antenna manufacturers to jointly recommend antennas for SDRplay SDRs and vice versa.

There are now some videos demonstrating how active magnetic loop antennas can be used for HF and below.

For these and videos on all the topics mentioned here, go to the *SDRplay YouTube* channel (URL at the end).

The RSP family of SDR receivers range in price from around £100 to £240, and they are available directly from SDRplay Ltd., or Martin Lynch & Sons, Moonraker, Nevada, Radioworld, SDR-Kits, and Waters & Stanton.

A full traders list for our international readers can be found at the second URL, below

<https://www.youtube.com/c/sdrplayrsp>

<https://www.sdrplay.com/distributors>

jon.hudson@sdrplay.com

ICOM: Hybrid LTE/Licenced Professional Two-Way Radio

The IP730D series from Icom is a new Hybrid radio that can provide nationwide coverage over LTE networks as well as conventional VHF/UHF professional radio mode (IDAS digital/Analogue radio modes) to work locally. The versatility of having two technologies (LTE & IDAS Digital PMR) merged into one, provides a range of options and applications for industries ranging from event and facility management to large utility infrastructure projects. When you first look at the IP730D series you will notice it has two PTT buttons; the main PTT button and the sub-PTT button. You can use one for LTE communication and the other for an IDAS/Analogue channel. The sub PTT button offers smooth switching between talking on LTE and IDAS/Analogue channels. With this level of ease, you get the best of both worlds in one unit. The LTE Mode provides secure private push-to-talk nationwide communication over an LTE (4G) and 3G network. This provides coverage into building basements or high-rise floors where conventional radio systems may not reach. The IP730D series provides full-duplex operation in LTE mode. This allows users to talk and receive at the same time, much like a telephone conversation. Professional Two-Way Radio Mode: Conventional VHF/UHF two-way radio mode provides a stable, local alternative allowing you to operate in a local environment such as a stadium or theme park to remote, mountainous areas where a mobile signal may not be available. It would also be suitable for other areas where cellular signals are inaccessible like tunnels or in large scale events when there is a possibility the cellular network becomes congested by an incident or an overwhelming amount of use. Professional Two-Way radio mode provides an essential backup communication system. Bridge Mode is another exciting feature of this new hybrid radio. It provides a literal bridge between the two technologies. The IP730D series can transmit/receive to an LTE radio from an IDAS digital radio and vice versa by either Main PTT or Sub PTT or both at the same time. The main features of the IP730D series are on the ICOM website:

<https://icomuk.co.uk>

<https://tinyurl.com/2h32p3w>

Tel: 01227 741741

sales@icomuk.co.uk



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

Radio News



OFCOM AGREES FOR RADIO CAROLINE TO TURN UP POWER: A power increase has been agreed for Radio Caroline to extend its coverage area from Suffolk and Essex to include Kent as East Sussex. The station is broadcasting under a community radio licence and was originally granted 1kW of power on 648 AM in 2018. The actual power increase amount has not been announced. Ofcom says a power increase was agreed to combat man-made noise and interference in the existing coverage area and to extend coverage to adjoining areas. While the subsequent increase in the licensed area was considered to be significant, the decision-maker deemed there to be exceptional circumstances in connection with approving this request, saying the service has experienced high levels of background noise and interference, particularly in urban areas. The licensee also serves a 'community of interest' as opposed to a defined geographic community meaning the service is positioned to be accessible to the community of interest in the proposed extended areas. Ofcom adds: *"There is an affinity between the existing and extended coverage area as the sea path from the existing transmitter at Orford means that the service is already receivable in parts of the extended coverage area, although existing reception is currently poor. Furthermore, the studio location means that the station attracts and engages volunteers from both the existing and extended coverage areas. The power increase will therefore improve signal in the extended coverage area, where some of the station's volunteers live and work"*.

(SOURCE: Community Radio Today)

<https://tinyurl.com/hu898uf4>

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

NEW ZEALAND FREQUENCY ALLOCATION

UPDATE: The NZ Radio Spectrum Management (RSM) body has recently published a new issue (No. 11) of the *Table of Radio Spectrum Usage in New Zealand (PIB 21)*. The publication incorporates several updates from *ITU Radio Regulation 2020*, including some modifications from the recent planning activities in relation to the 1700-2300 MHz and 3.5GHz band.

(SOURCES: ICQ Amateur / Ham Radio Podcast)

<https://tinyurl.com/rrt9jftj>

<https://tinyurl.com/cj3779s8>

Network Radio: Inrico Models, plus RF Finder B1

The **Inrico T522A** is billed as the most popular LTE rugged screenless network radio. This Android-based radio has 4G/LTE coverage. Take a look at the specifications at this URL:

(Source: Network Radios)

<https://network-radios.com>

<https://tinyurl.com/tshvhp6>

Inrico T310 - 4G/Wi-Fi Handheld Network Radio

In line with the tradition of the T300 series, the **Inrico T310** has abundant standard features such as an HD speaker, one-key SOS, a torchlight, dual SIM-card slots, a TF card slot, and IP54. It packs all of them into a highly ergonomic and compact body. It sports a modular design, is easy to configure and was designed with users in mind, offering such optional features as a rear camera, NFC touchscreen and more. Check out the full technical specifications here:

<https://tinyurl.com/3eh68cxw>

Inrico S300 4-G Wi-Fi

This network radio is fully compatible with the International Radio Network (IRN) and with the new Echolink for Android.

<https://tinyurl.com/bpmc96s4>

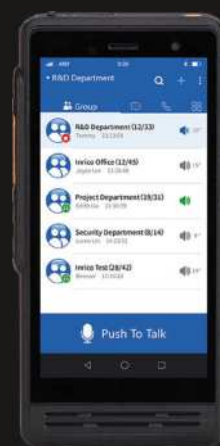
Rfinder B1 Dual Band DMR 4G/LTE

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info@Network-radios.com

<https://tinyurl.com/35thp7bx>



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News Extra

CLASSIC F.M. LIVE RETURNS TO LONDON'S ROYAL ALBERT HALL: Classic FM will be back at London's Royal Albert Hall on Wednesday 22nd September for the first time in two years. The concert will be hosted by Classic FM's morning presenter Alexander Armstrong, and Margherita Taylor, presenter of the weeknight Smooth Classics. For more than two decades, Classic FM has been staging classical music concerts at London's Royal Albert Hall, which is celebrating its 150th Anniversary this year. September's concert will be recorded for broadcast on Classic FM on Thursday 23rd September at 8 pm. Philip Noyce, Classic FM's managing editor, said: "Over the past 20 years, we have brought some of the world's greatest musicians to the iconic Royal Albert Hall – the home of Classic FM Live – as well as showcasing new and emerging classical music stars for our audience to enjoy. It feels great to be going back to the Hall, for the first time in two years, with a stunning line-up including Nigel Kennedy and Chineke! Orchestra. Whether or not those attending have been to a classical music concert before, they will have the warmest of welcomes because our spectacular concert promises to be a very special classical music celebration." (SOURCES: Classic FM | Radio Today) <https://tinyurl.com/y5f99332> <https://tinyurl.com/e7s9ses6>

Publications & Resources

RADIOWORLD
Your guide to radio technology

The FCC looks to whack some tech rules
Seven radio technical regulations are getting a look for revision or deletion.

Talk hard! How the FCC's new rules will affect you.

Workers' rights: How the FCC's new rules will affect you.

Ink-stained wrist: A look at the history of the wrist.

WebDAD: native-level access to your automation system from anywhere.

ENCO
ENCO.com/VirtualGems

EBOOKS: Tools for Strategic Technology Decision-Making

Radio World's growing library of ebooks can assist you in maximizing your investment in an array of platforms and tools: licensed transmission, online streaming, mobile apps, multicasting, translators, podcasts, RDS, metadata and much more.

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CQ-DATV (NO. 98, AUGUST 2021)
<https://tinyurl.com/4v2dtdvx>

CQ MAGAZINE (USA):
(Free) June/ July 2021 issues
<https://cq-amateur-radio.com>

DOMESTIC BROADCASTING SURVEY 2021
<http://www.dswci.org>

EOS MAGAZINE SPECIAL:
Detecting Exoplanets
<https://tinyurl.com/5h2kvmr6>

ONAIR COACH NEWSLETTER
<https://onaircoach.net>

RADIOWORLD (07 & 08)
<https://tinyurl.com/6ajadjjs>

The Journal of The Radio Amateur Old Timers' Association
OTNews

Maintaining the Traditions and Spirit of Amateur Radio Autumn 2021 (Sep) OTN139

My collection of Morse keys
Page 16

Mount Everest, 1933
Radio at The Roof of the World
Page 34

One Hundred Years of Short Waves 'Across the pond'
Page 19

Honour the past, enjoy the present, ensure the future

RADIOWORLD
Your guide to radio technology

How to pick an on-air processor
Here are 10 tips to help you with that important decision.

Crystal Service: Which has a culture of great community work.

WebDAD: native-level access to your automation system from anywhere.

ENCO
ENCO.com/VirtualGems

RADIOWORLD - TRENDS IN DIGITAL RADIO
<https://tinyurl.com/3vut49j7>

RADIO KURIER 08/2021 (IN GERMAN)
<https://www.radio-kurier.de>

RAOTA: OTN 139 (AUTUMN 2021)
<http://www.raota.org>

REVIEW:
Malहित DSP2 (SWLing Post)
<https://tinyurl.com/yvn23wyz>

THE SPECTRUM MONITOR
<https://www.thespectrummonitor.com>

ICQ AMATEUR / HAM RADIO PODCAST:
'Thoughts from the Radio Shack 1'
<https://tinyurl.com/44hdb7cc>

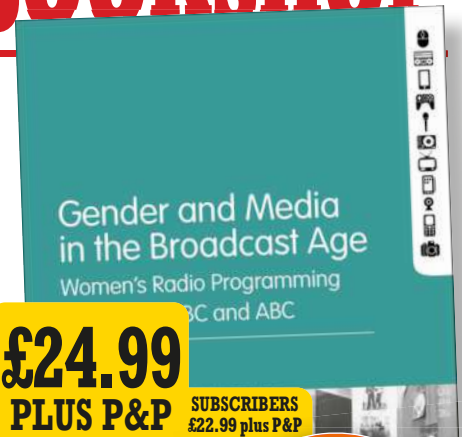
See our great book and magazine offers at www.radioenthusiast.co.uk/store

Visit our Book Store at www.radioenthusiast.co.uk

RADIO ENTHUSIAST BOOKSHOP

Gender and Media in the Broadcast Age

Women's participation in media continues to be a key challenge to notions of the public sphere and the book concludes that profound changes initiated in the broadcast era are unfinished in the age of digital media. Lloyd therefore provides rich and valuable evidence of the dynamic relationship between media texts, producers and audiences that is relevant to contemporary gender debates.



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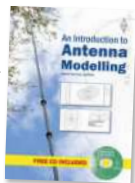
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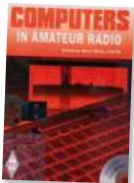


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DAVID BRUYNDONCKX ON UNSPLASH



Chrissy Brand

chrissyLB@hotmail.co.uk

Finding trustworthy and informative news sources is a key to understanding and improving the world, even more so in an age where the ability to spread misinformation and to misrepresent whole swathes of the population is rife. The tools that can be used to counteract this include international radio. It has always been an important player, and those stations that still broadcast in a range of languages are to be applauded.

A daily dose of news and features from Radio Romania International, Radio New Zealand, Radio France International and Deutsche Welle, and others, can be life-affirming. Simply knowing that intelligent and comparatively balanced reporting of global and local news stories is occurring gives hope that there is a quest for justice in the world.

Freedom Awards and Intelligent European Radio

Chrissy Brand seeks out a wealth of quality news and audio from Continental Europe and congratulates some path-breaking radio award-winners

European Active Audio

To illustrate the power of international media working in harmony, one of my preferred 'go-to' media channels in recent months is called EURACTIV.

Based in Brussels (Fig. 1), it produces a

daily e-newsletter, *The Capitals*, which contains more information than your average newspaper. Consisting of breaking stories and features from European capitals, Athens to Zagreb via Paris and Pristina, I digest as much of this as possible.

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with its national recovery plan, Slovenia assuming the European Council presidency and Berlin upsetting Brussels by opting out of the uniform application of the *Digital Vaccination Travel Certificate*.

The current *Euranet* slogan is promising, and it remains a beacon of hope for many: *"Understanding Europe better. The leading radio network for EU news."*

<https://euranetplus-inside.eu>

<https://tinyurl.com/m5vsw89v>

<https://tinyurl.com/4wdxysd>

<https://tinyurl.com/9aybj58v>

<https://tinyurl.com/2unuycmb>

The *Euranet Plus* annual summit took place in June. The topic addressed was making the *European Green Deal* work for all. The English-language session lasted half an hour. It was moderated by Beatriz Rios of *Euranet Plus*, with guests from five European broadcasters: Dobromir Videv of BNR, Bulgaria; Claudia Knoppke from AMS, Germany; Balázs Náray of MTVA / MR, Hungary; Magdalena Skajewska of Polskie Radio; and Lidija Petković from RTV SLO in Slovenia.

Of those broadcasting organisations, all bar Hungary have an English service, but their website can be translated from Hungarian. All of these broadcasting websites are worth engaging with. I have given links to each organisations' English audio or section below:

<https://bnr.bg/en>

www.polskieradio.pl/395

www.rtv slo.si/radio/oddaja/48

<https://mtva.hu>

German company AMS (Audio Media Service) was new to me. This media company plays a vital role in local radio. *"The local radio stations in Ostwestfalen-Lippe and the district of Warendorf receive a full service from us. We take care of all aspects of studio, transmission and transmission technology. We take over the marketing of advertising times, the conception and production of radio elements, as well as marketing and administration. In addition, we also look after the online offers."* The AMS website is full of well-written features, as well as marketing material. They recently published a white paper that looked at what online audio is, *"From kitchen radio to smart speaker: online audio – the future of radio advertising."* I am running parts of it through a translator engine, as my German is not what it should be.

[This can easily be remedied, Chrissy – Ed.]

www.ams-net.de



Freedom of Speech Award: The Winners

In 2015, Deutsche Welle launched a *Freedom of Speech* award. This award honours, *"a media person or initiative that has shown outstanding promotion of freedom rights."* This seems an appropriate initiative for the German state broadcaster as, after all, *"The promoting of democratic values, human rights and the dialogue between different cultures has been at the core of DW for more than six decades."*

Last year, the award went to 17 journalists from 14 countries. This represented all broadcast and print journalists globally who have been arrested, threatened or simply disappeared due to their reporting on the Covid-19 pandemic.

This summer, the 2021 recipient was announced. She is a Nigerian journalist, Tobore Ovuorie, who came to prominence eight years ago when exposing a human trafficking ring.

Upon receipt of the DW award, Tobore urged all journalists to expose injustices: *"On no account should we let our voice be silenced. We must refuse to conform to dictatorship. That way, we will bring light into darkness and our various societies, communities, and countries will become saner, safer and better spaces for us all and generations to come."*

Full details are in the DW article below; there is now also a report on Deutsche Welle TV's *YouTube* channel.

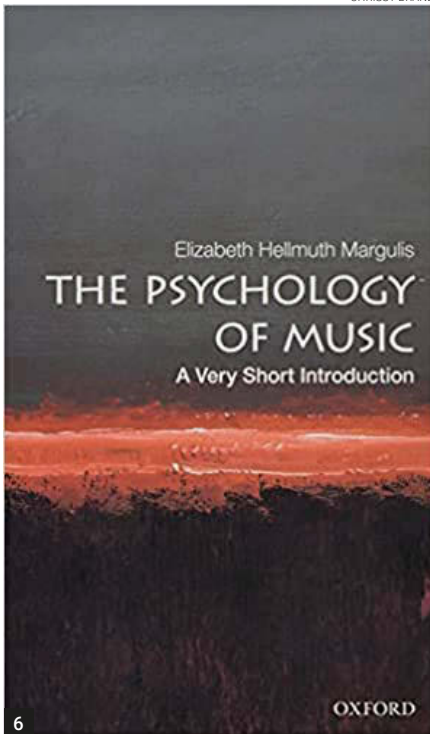
<https://tinyurl.com/yxxwakrt>

On a more light-hearted note, an awards ceremony took place in the UK in May, when the *Radio Academy ARIAS* (*Audio and Radio Industry Awards*) winners were announced.

I am often surprised at how few of the nominees I have heard of, which I take to mean the ARIAS do a good job in promoting some of the lesser-heard voices in the profession.

Whenever lists of nominees and winners are published, it provides a good opportunity to have a listen to their work. This is what I have now done with the following: The best new presenter was Poppy Begum from the BBC Asian Network. As well as her radio show on that station, she is an investigative journalist who has worked on some hard-hitting documentaries, including *Channel 4's 24 Hours in Police Custody*, and BBC Three's *Sex & Lies and Drugs Map*.

A gold award for the best new programme went to BBC Radio One's *The Yungblud* podcast. Yungblud is a songwriter and musician who talks to friends and fans about their lives. Topics covered in the dozens of shows so far have included OCD, religion, poetry and freedom-fighting.



Amongst the many awards handed out, one for creative innovation went to TBI Media, for its role in the pop-up radio station Absolute 40s. This was a temporary radio station that broadcast for just one day, 8th May 2020, to mark the 75th anniversary of VE Day.

<https://tinyurl.com/ss8rera2>

Any radio broadcaster reaching its 80th anniversary is a winner in my book, and NHK World Japan celebrated this milestone in July 2021. Its weekly listener interaction programme, *Friends Around the World*, creates a positive atmosphere with upbeat music in between queries and praise from listeners (Fig 3).

If you missed Episode 64 on short wave on 4th July, (0430 UTC weekdays and 0500 UTC weekends on 7355 or 7245kHz), catch it online instead.

One of the presenters visited the Yamata transmitter station, whilst the other presenter admitted she had not heard of it before. That seemed rather surprising for a professional broadcaster in Japan. A discussion about the continuing merits of short wave broadcasts was also mentioned.

www3.nhk.or.jp/nhkworld

<https://tinyurl.com/jfbt37zs>

Music on the Brain

Talking of 'upbeat' music, this leads me nicely to an article examining the psychological effect of music on the brain.

A former colleague of mine, Professor Jane Ginsborg, recently gave an interview to an organisation called *Insure 4 Music*. It underlined how music's powerful and enduring impact on emotions, memories, and mental health cannot be understated.

This kind of background reading is something that every music radio station director, programme maker and advertiser should surely be made aware of.

<https://tinyurl.com/jc2x3hy4>

Most of us are affected deeply by music, and whatever our preferred genre or styles of music, it plays with our emotions and dopamine doses (the chemical that makes us feel good). All music achieving this is equally valid.

Conversely, I have encountered a few people who remain unmoved by the power of music, with music radio being merely a background entertainment for them, and not the food of life that it is for many radio and music lovers.

The *Mono Loco Mixtape* radio programme (Fig. 4) is not too many steps away from these thoughts. This is a diverse and eclectic show broadcast live on Soho Radio (Sundays from 1600 to 1900 UTC). The presenters succinctly state that there are, "only two types of music, good and bad, and we only play the good stuff."

A mix I heard was an intoxicating blend of Brazilian laid-back tracks. However, with no unnecessary chatter by the DJ, it is a DJ set or playlist rather than a radio programme in the conventional sense.

This is just one example of how radio has evolved, and there is room for all. Perhaps it is partially an antidote to the banter of many radio presenters and DJs of the past (and present), along with it being a simple 'transfer' of the club scenes' DJ sets into a streaming format.

Radio DJs and club DJs are different beasts: the former plays tracks and 'fillers' in between, while the latter concentrates on curating and remixing music. The similarity in both types of DJ is their mission: to create the right atmosphere for their audience, thus creating a dopamine hit.

<https://tinyurl.com/jfrh97kv>

Refugee Radio Australia

Following on from my feature on refugee radio stations (*RadioUser*, April 2021: 53-55), Melbourne community radio station 3CR should be added to the list of resources.

Episode 99 of its weekly *Refugee Radio* covered Belarussian activists seeking refuge in neighbouring Poland and the

Tamil Murugappan family who are seeking a regular life in Australia. There was also an interview with Aran from the Tamil Refugee Council from *Asia Pacific Currents*. Finally, a song called *Waiting for the Light* by Nine Rose and Fran was played for the refugees on hunger strike for over two weeks.

They had been held in the MITA Detention centre in Melbourne. The 3CR programme blurb sums up the harrowing situation, "Can you imagine what it would be like to have to flee terror in your own country, spend days or weeks in a leaky boat on dangerous, rolling seas ready to swallow you at any moment, and then arrive in a new country, where you are terrorised even more?"

www.3cr.org.au/refugeeradioshow

www.roadtorefuge.com/shifting-the-story

Manchester International Festival

It was uplifting to attend some of the events at the 2021 Manchester International Festival in July. Music, art, cinema, photography, installations and talks graced forty sites around the city centre. As you would hope, radio also influenced the festival: There were several acts under the *BBC Music Introducing in Manchester* banner. Soft Lad (Sophie Galpin) performed (Fig. 5), as did Caoilfhionn Rose.

BBC Introducing is one of the BBC's best initiatives, promoting local new music through its local radio network. Tune to your local BBC radio station, for instance, BBC Gloucestershire on Saturday nights from 1900 to 2100 UTC) for *BBC Music Introducing in the West*.

Or dig in deep and listen to each local radio station's version of the programme on the *BBC Sounds* app.

www.bbc.co.uk/introducing

www.bbc.co.uk/programmes/p0035lnc

Another radio station that promotes young and new talent is called Amazing Radio. This organisation launched in 2007 and, "is a UK-based media business 100% focused on helping new and emerging musicians - with discoveries including Alt J, Chvrches, Haim and many more. Featuring *Amazing Radio*, *CMJ* and *OurStage* we've been described as 'a revolution', 'nobly-democratic', and 'a force for good', by both the US and UK press."

<https://amazingradio.com>

[Fig. 6 shows the cover of a short introduction to how music can affect our brains – Ed.]

David Harris

mydogisfinn@gmail.com

David Harris evaluates a new book that throws a spotlight on gender-specific broadcasting, and he assesses a biography of a long-standing, successful, and multi-lingual, BBC investigative journalist.

Gender and Media

The first book under review this month is a new study of the rise and fall of radio programmes aimed at women in the early years of broadcasting. Its author, Dr Justine Lloyd (pictured) is a lecturer in Sociology at Macquarie University, Sydney, Australia. She has made a study of gender-specific programming in Australia, Canada and the UK.

The book begins by referencing the broadcast *To the Women of the Empire*, made by Queen Elizabeth (the wife of King George VI) in November 1939. This was made by the *BBC Empire Service* and subsequently rebroadcast across Australia by local stations. It was seen as signifying a changing role for women in the wartime economy with radio becoming a new social force due to its immediacy and intimacy.

Gender-specific broadcasting originated at the very dawn of radio with WHA, which broadcast from the University of Wisconsin transmitting a programme specifically for women. WHA has broadcast continually from Madison, WA on 970kHz and today transmits educational programmes and relays of the *BBC World Service*.

In 1923, KGW Portland, Oregon was the first commercial station to have women's programmes. Today, KPOJ (the successor of KGW) is a Fox-owned sports station.

It was not until 1929, that ABC aired its first woman's programme in Australia.

And Canadian women had to wait until 1935 for their first show.

The BBC broadcast the first *Women's Hour* in September 1923, although this was actually a 30-minute programme followed by children's stories. Interestingly, the *Wikipedia* entry for *Women's Hour* gives the starting date as October 1946 and does not refer to the pre-war programmes.

I can recommend the reliable online archive that is the *BBC Genome Project*:

<https://genome.ch.bbc.co.uk/issues>

This invaluable resource was widely used by Dr Lloyd in her research. Not only do the back copies of the *Radio Times* contain details of all radio programmes from 1923 onwards; there are also many fascinating articles about the development of radio technology. Anyone wanting to write a history of UK broadcasting



Proto-Feminists, National Women and Square Pegs

could get a book's worth of material from this website alone.

Dr Lloyd makes the point that in all countries with gender-specific programming the early shows were mainly talks or discussions on worthy subjects. The first case study is that of ABC, Australia from 1935 to the 1950s. Early programmes were quite political in content, which led to pioneering broadcaster Irene Greenwood having to step down for political reasons. Dr Lloyd has uncovered a report in the ABC archives, which stated that women want light music, warm personalities, chatty hints and funny stories rather than education, news and serious music.

One of the themes in the book is the conflict between the well-educated middle-class female presenters, who saw radio as a way of educating women and raising their consciousness, and the male station controllers who wanted to 'dumb things down' and enforce their own patriarchal views.

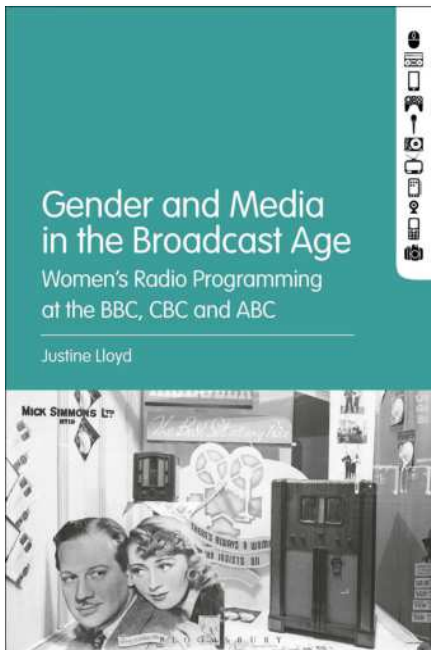
Dr Lloyd sees many of the early female radio pioneers as 'proto-feminists'.

In Canada, radio programmes for women only really began as part of the war effort, and she talks about the idea of the 'national

woman' created by CBC. The author focuses on *BBC Woman's Hour* from 1946 – 1955. She sees the change that came about as part of a move from the 'cultural uplift', envisaged by Lord Reith, to a more 'intimate' experience, where the broadcaster spoke directly to the audience rather than lectured to them. *Woman's Hour* was very popular in the post-war period, attracting some 3.5 million listeners and generating over 1,000 letters a week. From 1946 to 1973, *Woman's Hour* was on *BBC Light Programme* ('Radio 2' after 1967). It was not until 1973 that it moved to Radio 4. In 1990, the show moved from its original 1430 slot to 1030, and then to 1000, where it remains as one of Radio 4's flagship programmes. Feedback from listeners indicated that women wanted items about health, childcare and other serious subjects. Above all, they did not want to be patronised.

In the mid-1950s, the programme covered the (previously forbidden) subject of homosexuality (which had been illegal in the UK until 1967).

By the time of the 1990s, when Jenni Murray was the lead-presenter, *Women's Hour* was seen as an overtly feminist programme. Dr



*Gender and Media in the Broadcast Age
Women's Radio Programming
at the BBC, CBC and ABC.*
Lloyd, Justine (2021), 194 pp.
Bloomsbury Academic. Pbk. £25.
ISBN 9781501318771
www.bloomsbury.com

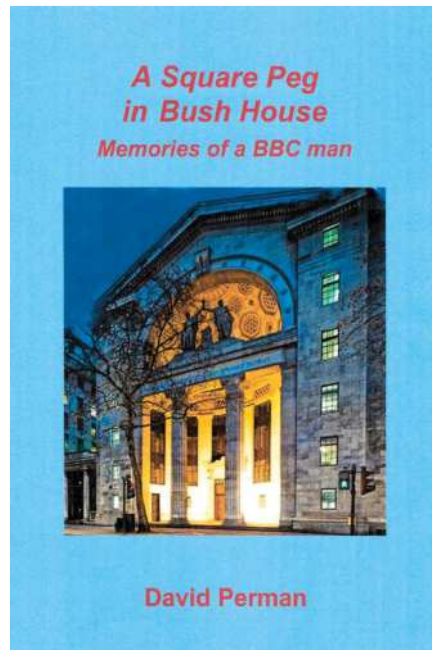
**BUY
FROM US!**
See page 13

Lloyd also cites the now-forgotten example of *Viva! Radio*, which was launched in 1995 as a women's radio station in London on 963kHz by PR guru Lynne Franks. The station was a flop and was sold in 1996 and renamed *Liberty Radio*. The licence for 963kHz is now held by the Asian station, Sunrise Radio.

Gender and Media deserves a space in any university library. This title is a very interesting and innovative study of women's broadcasting across three continents, and it makes a strong case that early broadcasters were at the forefront of feminism.

A Square Peg in Bush House

Square Peg is a memoir by David Perman (b. 1936), who worked for the *BBC World Service* at Bush House, London, from 1969 until his retirement in 1990. David had previously worked as a journalist for the *Oxford Mail* and *The Observer*. Bush House is located on Aldwych, in central London and was opened in 1925 as a Trade Centre. It was conceived by American industrialist Irving T. Bush (1869-1948). Since 2015, it has been part of the campus of King's College, London. Some *RadioUser* readers might remember going to Bush House to visit the BBC World Service Shop, which, if I remember this correctly, sold a limited range of world band radios, along with BBC ephemera



*A Square Peg in Bush House
Memories of a BBC Man*
Perman, David (2020)
Rockingham Press. 2020.
226 pp. Pbk. £14.99.
ISBN 9781904851806
www.rockinghampress.co.uk

and the BBC WS magazine, *London Calling*.

Bush House was the home of the BBC WS from 1941 until 2012. The BBC was relatively slow to become an international broadcaster, starting its English language short wave broadcasts in 1932 (as the *Empire Service*). In 1938, the Corporation began foreign language services with broadcasts in Arabic. By the end of the Second World War (1939-1945), it was broadcasting in 45 languages.

David joined the BBC WS as a talks writer, at a time when the Northern Ireland troubles were dominating the headlines. Before joining the BBC, he had already established himself as an author by writing books about Cublington (the proposed site of a new London airport) and religion in Britain. Moreover, he produces such prominent BBC programmes as *The World Today*, *Twenty Four Hours*, and *Outlook*. Amongst the people he interviewed for the BBC were Aldo Moro, the former Italian Prime Minister who was assassinated in 1978. David also covered the re-opening of the Suez Canal and the 1975 referendum on Britain's membership in the European Union (EU).

In 1976, David was appointed Arabic Programme Organiser for the BBC WS. He now is in charge of 9 hours of programming a day and 52 staff. In addition to having to learn Arabic, David was sent on a tour of Arab capi-

tal cities in October 1977. He spent a month in Cairo, Beirut, Damascus, Baghdad, Amman, and Jerusalem. The Politics of the Middle East are very complex and seemingly intractable.

However, a similarly convoluted situation seemed to arise at Bush House, where David found himself a victim of the animosity displayed by some staff. This eventually led him to be removed from the Arabic Service and given the job of Organiser of the Greek Service. Fortunately for David, the Greek staff were more welcoming and not polarized into factions. Prior to his appointment, David executed quite a broadcasting coup by interviewing Ayatollah Ruhollah Khomeini (1902-1989), when he was exiled in Paris, just preceding the Iranian Revolution (of 1978). Khomeini went from being an obscure cleric to becoming Supreme Leader of Iran, a post he held until his death in 1989.

One point that stands out in David's memoir is just how well resourced the BBC World Service was in those days. The WS did not just recycle material from the domestic BBC schedule but commissioned its staff to develop original programmes. He conducted a series of interviews with leading economists such as J.K. Galbraith, Milton Friedman, and with prominent politicians like Nigel Lawson, Shirley Williams, and Margaret Thatcher.

In 1980, he moved to Nafplio (Ναύπλιο) Greece for 10 weeks to learn Greek - no mean feat. He subsequently took up the challenge of putting together a 13-part series, *America, Europe and the World*. This programme involved David travelling the world to interview major figures, such as Lord Carrington, Roy Jenkins, George Ball (US politician), Günther van Well (Head of the German Foreign Ministry), Zbigniew Brzezinski (US National Security Adviser), Cyrus Vance (US Secretary of State), Jean Kirkpatrick (US ambassador to the UN) Robert Mugabe (Zimbabwean Prime Minister), and several other global figures.

Quite a lot of the book is taken up with David's fascinating sketches of these prominent leaders.

In 1990, after serving for over 20 years with the BBC WS, David took early retirement and became curator of the Ware Museum in his home town of Ware, Herts. He also sets up the *Rockingham Press*, which has published around 100 poetry titles, including some translated works by Turkish and Persian poets. Rockingham also publishes works on local history and biography.

David has certainly had a very full and varied career, which he brings to life in this well-written and illustrated book. It provides a valuable insight into the BBC WS during the 1970s and 1980s.

David Smith

dj.daviator@btinternet.com

In a significant step forward for the drone industry, beyond-visual-line-of-sight (BVLOS) command & control solution developer sees.ai has become the first company in the UK to secure authorisation from the CAA to trial a concept for routine BVLOS operations. The permissions come as part of a test project to prove the concept, ahead of potentially opening it up to the wider market.

The authorisation enables sees.ai to fly BVLOS at three nominated sites without needing to pre-authorise each flight. Removing this limitation triggers the next phase of growth for the drone industry by proving the potential of BVLOS drones.

The authorisation also permits BVLOS flights to occur under 150ft. This initially requires an observer to remain in a visual line-of-sight with the aircraft and be able to communicate with the remote pilot if necessary.

Testing the concept in industrial environments, and for inspection, monitoring and maintenance purposes will enable sees.ai to prove the safety of its system before extending it to increasingly more challenging tasks.

New technologies, such as automatic detect-and-avoid systems, will result in data gathering from these test flights from which risk and hazard assessments can be used to cover operations beyond the three trial sites.

The future aim is for drones to fly autonomously – both high up, alongside manned aviation, and lower down, inside industrial sites, suburbs and cities. For the foreseeable future, unless they have specific permissions as in this case, all other drone operators must keep their aircraft within line of sight and follow the Drone Code.

<https://tinyurl.com/28wvb9yk>

The Old and the New in Airband Radios

In the January 2021 issue (*RadioUser*, January 2021: 30-31), I featured an interesting vintage airband radio website:

<https://www.airband-radio.co.uk>

This site is dedicated to airband radios which came on to the market in the 1950s and 1960s. As the Webmaster comments, "This is very much a work in progress, and I welcome any information you can provide for the website for others to enjoy".

For those of you who can remember the *Shorrocks*, *Gauers*, *Park Airs*, and a host of others, this is an ever-growing mine of infor-



A Treasure Trove of Vintage Airband Radios

David Smith explains more drone developments, provides an update on a vintage radio website and recommends a blog that covers all things airband. He also offers a comms profile of RAF Waddington.

mation on the pre-scanner era.

Moving slightly nearer to the present, I quote from the site: "Although not from the 1960s, I wanted to include Swinburne Electronics as they were the creation of Ron Swinburne, who owned The Aviation Hobby Shop at Birmingham Airport. As a child, I visited this shop many times with my father! The DR600 was the very first radio to be sold by Ron and his family. DR standing for Digital Radio (Or David & Ron!)."

"This was way ahead of its time as it included a digital display, room for six crystals and a dial so you could tune across the VHF airband. These were being sold for around £150. The first batch had a blue case, but shortly after the company that produced these folded and another supplier was needed. These later models had a black case."

"The DR600 was followed by a CR600. 'CR' stood for 'Crystal Radio'. This was similar to the DR600 but without the digital display. These were being sold for around £100. The last model that Swinburne produced was a DR100 which was a cheaper model but kept the digital display similar to that used in the DR600."

Overall, Ron believes Swinburne sold

around 1,500 radios, although many more would have been supplied if some large commercial orders had come to fruition.

Unfortunately, this was not to be so, they were sold primarily to aviation enthusiasts.

My thanks to Ron for taking the time to meet me and providing all the information above'.

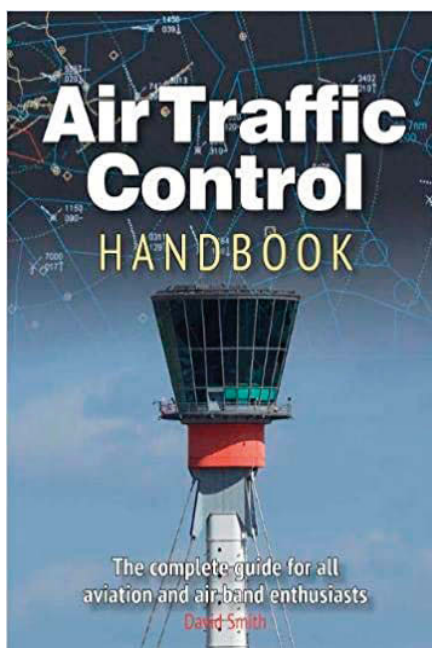
The site includes a few related links, including to the *Mersey Radar* blog.

<http://www.merseyradar.co.uk>

This is an informative aviation blog focusing on contrail-spotting, photography and radio/airband articles. I am guessing that the 'blogger' based his title on the long-defunct *Mersey Radar*, which provided a service to high-level aircraft from an ops room at RAF Hack Green in Cheshire. I remember hearing on airband in the 1960s a USAF C-135 (a cargo version of the Boeing 707) being told to change frequency to *Mersey Radar*. It was at the height of the 'Beatles-craze' and the pilot, querying the station name, suddenly made the connection and hollered "Yeah, yeah, yeah!".

But I digress.

Back to the blog, and here is a typical ex-



ample of a piece covering the history of the much-missed Yupiteru hand-held scanners. "Arriving on the market in the very early 1990s, it set the bar so high, in technical terms, that the competition was blown clean out of the water. So much so, the competition did not even try to compete such was the level of excellence achieved by engineers at Yupiteru. Everybody has heard of the more popular MVT-7100, but it was the much earlier MVT-7000 that changed the scanning hobby forever.

"In the market of the day, AOR/Fairmate had the HP100/200e, which had a terrible user interface (an AOR trait in their handheld units, which continued for decades).

"Icom sold the more expensive R1 receiver (I nicknamed it the chocolate-éclair of scanners - lovely to look at but very little good inside).

"It looked nice enough but was truly awful, as it received everything else except the intended frequency.

"Sony promoted the Air 7, nicely made, very, very, expensive and very limited in coverage. By the time 1993 came along, Yupiteru had a line of receivers to suit every budget and need. Every last one of them was excellent and they sold in droves worldwide".

To finish off this month's column, my aircraft pictures show a Dutch Air Force F-104 Starfighter at a Coventry Airshow in 1976 (the summer of scorched grass!) and a Stinson Reliant at Halfpenny Green.

[For further information, you may wish to consult the new edition of David Smith's forthcoming ATC Handbook – Ed.].



RAF ATC Profiles 5: Waddington

ICAO Code: EGXW RAF IATA Code: WTN

Frequencies	(MHz)
Waddington App/Radar	345.075; 362.300*
Waddington Zone	232.700; 119.500
Waddington Director	280.175; 123.300*
Waddington Talkdown	344.200; 376.200
Waddington Tower	241.325; 121.300; 257.800*; 122.100*
Waddington Ground	342.125
*NATO Common Frequency (available on request only)	
Vulcan Ops	369.400

Lower Airspace Radar Service (LARS) is available from 0800-1800, Mondays to Thursdays and Fridays (subject to station-based operational requirements). Outside LARS operating hours, pilots requiring transit of either the Waddington MATZ or Danger Area EG R313 are to call Waddington Zone on 232.700MHz or 119.500MHz. No reply will indicate that the Waddington MATZ and EG R313 can be crossed avoiding the ATZs at Waddington and Scampton (N.B.: MATZ = Military Aerodrome Traffic Zone).

ATIS	
Waddington Information	291.675
Nav aids	ILS/DME CAT I Runway 20 TACAN WAD 117.100MHz
Runways	02 (2839 x 58m) 20 (2839 x 58m)

NOTES (A-Z)

Air Ambulance

Lincs/Notts Air Ambulance operations are given high priority on movements.

Helicopter Operations

Departures and arrivals, except routeing, are via the East or West aerodrome boundary at 500ft. RAF Waddington has a dedicated Helicopter Landing Area that awaits surface restoration. It is unserviceable until further notice. Helicopter crews will be passed parking instructions by ATC.

Holding

When aerobatics are taking place within EG R313, routine instrument approaches to Runway 20 are not permitted. Aircraft should be prepared to hold for up to 30 minutes or should execute visual or radar-to-visual recoveries.

Military Aerodrome Traffic Zone (MATZ)

A circle 5nm radius up to 2,000ft above aerodrome level with final approach stub aligned on Runway 20.

Noise Abatement Procedures

All station flying, except essential operational tasks, is to cease at 2359hrs (local). However, visual circuits, 'touch-and-gos' or low approaches are not permitted after 2300hrs (local); approaches (visual, straight-in or instrument) are to culminate in a full-stop landing. Only straight-in approaches will be allowed for movements outside normal operating times. Low-level circuits when on Runway 02 should also be kept to an absolute minimum, commensurate with the training or operational task. After 2100 (local), low-level circuits should not be conducted on Runway 02 unless there is an urgent operational requirement.

Operational Hours

0800-2359 (Mon-Thu); 0800-1800 (Fri). Note that RAF Waddington currently operates a flexible flying window; times may differ from the above at short notice. Contact Ops for more details.

Warnings

Strong Westerly winds can produce unexpected turbulence in the final stages of approach to Runway 20. A busy public road crosses the Runway 20 undershoot; pilots are to be aware of the possibility of high-sided vehicles not complying with traffic lights, or traffic light failure. There is a 6ft high perimeter fence in the Runway 20 undershoot. Inbound Air Systems contact Approach at least 20nm before MATZ boundary. Instrument Approach Procedures (IAP) for Waddington are established outside controlled airspace. Due to increased bird activity during the migration season (October to March) aircraft commanders are not to routinely plan to depart or arrive within +/- 30 minutes of sunrise and sunset unless it is operationally essential and they are authorised to do so. Practice diversions and diversion commitments may not be accepted when the bird-state is assessed as 'high'.

Summer Air Shows

DAVID SMITH



David Smith
dj.daviator@btinternet.com

August 19th (Thursday)
DUXFORD FLYING DAY: Duxford, Cambs CB22 4QR. A themed show 'Young Aviators'.
www.iwm.org/airshows

August 21st to 23rd (Saturday to Monday)
WHITBY REGATTA: Whitby, North Yorkshire. There are generally air displays on two of the days
www.whitbyregatta.co.uk

August 25th to 28th (Wednesday to Saturday)
PORT OF DARTMOUTH ROYAL REGATTA: Dartmouth, Devon TQ6 9PS. Usually includes some air displays.
www.dartmouthregatta.co.uk

August 26th and 27th (Thursday and Friday)
CLACTON AIR SHOW: West Green-sward, Clacton seafront, Clacton-on-Sea, Essex CO15 1NW. Limited flying this year, with flypasts by the Red Arrows and Battle of Britain Memorial Flight.
www.clactonairshow.com

August 27th (Friday)
SIDMOUTH AIR DISPLAY: Sidmouth, Devon EX2 4DR. Includes Red Arrows.
www.visitdevon.co.uk

August 28th (Saturday)
WINGS AND WHEELS: Henstridge Airfield, Henstridge Marsh, Somerset BA8 0TA. Vintage and classic aircraft fly in to this airfield.
www.wingsandwheelshenstridge.com

August 29th (Sunday)
LITTLE GRANSDEN AIR AND CAR SHOW: At Fullers Hill Farm, Little Gransden, Cambs SG19 3BP. Over three and a half of flying is planned. along with classic cars and much else on the ground.
07730 091132
www.littlegransdenairshow.co.uk

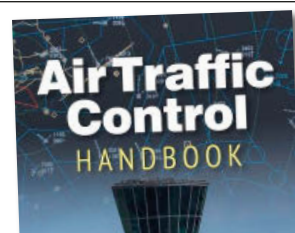
September 2nd to 5th (Thursday to Sunday)
BOURNEMOUTH AIR FESTIVAL: Bournemouth, Dorset BH1 3AF. Major civil and military involvement, including the Red Arrows.
www.bournemouthair.co.uk

The above photograph takes us back in time to June 2019 for the 'Daks Over Duxford' event with an impressive display of Dakotas in various military and civilian markings lined up. The first in line is an original Normandy veteran which dropped paratroopers on Sainte-Mère-Église, in the early hours of 6th June 1944. Strictly speaking, it is a C-47 Skytrain, Dakota being the name used in RAF service. Four Harvards run their engines in the foreground with a Dragon Rapide behind them taking time off from pleasure trips.

Air Traffic Control Handbook

by David J Smith

OUT ON 29th OCTOBER 2021



First published in 1986 as *Air Band Radio Handbook*, David J Smith's *Air Traffic Control Handbook* is now into its 11th edition. From its original publication, the book was acknowledged as the essential reference for ground-based airband listeners, as well as student and private pilots and those with an interest in Air Traffic Control (ATC). This new edition has been fully updated with changes in procedure, radio frequencies and call signs, and is illustrated in colour, making the book an incredible source of information for all those interested in the subject and all those contemplating a career in ATC. Retired Air Traffic controller David J Smith's accessible and comprehensive text explains the intricacies of air traffic control and its jargon, enabling the reader to locate and interpret what is going on in the airways overhead. This fully revised new edition is a book that no one with an interest in the subject can afford not to have on his or her shelves.

<http://www.crecy.co.uk/air-traffic-control-handbook-11th-edition>

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Infants Under 2 Free,

VIP Tickets Adults £60.00, Children 5 - 15 years £30.00,
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Due to Covid regulations, ALL tickets MUST be purchased in advance

www.thevictoryshow.co.uk/index.php/contact-details/application-forms

FOXLANDS FARM, COSBY, LEICESTERSHIRE LE9 1SG



For more information go to
www.thevictoryshow.co.uk



RADIO FRANCE INTER



1

Chrissy Brand
chrissyLB@hotmail.co.uk

The travel restrictions this summer have curtailed many European holidays – and put a stop to the associated listening to AM and FM in far-flung regions – for thousands of us. Instead, I have happily made do, so far, with a couple of camping trips. One of these saw me appreciate radio from both the Isle of Wight and the Isle of Man on the same day.

I started the June day in question at a clifftop campsite near Bridport in Dorset, listening to community station Vectis Radio on 104.6MHz from Newport on the Isle of Wight. Vectis veers from the mainstream at times, especially on Saturdays, with specialist blues, reggae and dance music programmes. The daily 1800 to 2000 UTC slot is also put to some invigorating and creative use. The programmes are presented by some enthusiastic and knowledgeable presenters and include *All That Jazz* on Monday, *The New Music Show* on Tuesday and Sunday, *The Folk Show* on Wednesday, *Electric Eclectic* on Thursday, *The Dark Side of the Moon* on Friday, and *The Mashup* on Saturday.

www.vectisradio.com

Meanwhile, Isle of Wight Radio on 102.0 and 107.0MHz is a fairly run-of-the-mill sounding commercial radio station. However, it does champion local and live music, and there is an amusing feature in the *Paul, Hayley and Jamie Show*, called *Monday's Misheard Lyrics*.

www.iwradio.co.uk

<https://tinyurl.com/886f9zwy>

MW Meandering, Island Sounds, and Radio Reading

Chrissy Brand celebrates some of the cool sounds of summer on international radio before she heads to the beach for some radio reading. This, in turn, inspires some further listening.

The best BBC local radio programme I heard during my camping trip was *The Localist*, which featured Ollie Peart looking at the people, places and stories that put Dorset on the map.

<https://tinyurl.com/ttp6fkkh>

Medium Wave Wanderings

On my journey homewards, I enjoyed the late-night programmes on Manx Radio, “*The Nation’s Station*”, which may be true, although it is a small nation. The 1368kHz frequency can be heard in many parts of the UK, although my car radio reception is, unsurprisingly, best when I find myself in between Staffordshire and Cumbria.

From 2100 to 2300 UTC each weekday, you can hear George Ferguson’s *The Late Show*. Lively listener interactions interspersed with music, offering both light-hearted and serious points of discussion.

The big issue whilst I was tuned in was a campaign to save a row of historic elm trees. Many Manx Radio listeners were furious, and an online petition to save the elms was plugged on air. The petition had reached out far and wide by the time I added my signature.

After the 2300 UTC news, the station switched to *Night Flight*, which is an automated playlist format. It churned out a surprisingly varied and listenable range of pop and rock music from the 1960s to the current day. This helped me drive through a heavy rainstorm and safely reach my destination.

Manx Radio gives the Isle of Man a voice that extends well beyond the island, as well as being an asset to those that still tune around the medium wave band.

www.manxradio.com

We must make the most of what remains

See our great book and magazine offers at www.radioenthusiast.co.uk/store

Fig. 1: Radio France Inter plays many great programmes for summer picnics.

Fig. 2: *Late Nights on Air* and *Bad Time in Buenos Aires* are recommended reading.

Fig. 3: Radio in fact and fiction in the Canadian wilderness. Fig. 4: Tango, the 'People's Dance', on Argentinean radio.

on medium wave. With the closure of many of the remaining BBC local radio medium wave outlets in May and June 2021, the band is significantly altered. I would miss BBC Radio Derby on 1116kHz, especially Natalie Graham's *Late Night Show* which is broadcast over BBC WM (West Midlands). However, that frequency is safe, for now.

I have also been making the most of Český Rohlas Dvojka from Brno on 954kHz, with Czech chat and music, along with the ubiquitous dose of American rock and pop music.

Tours of the Radio Caroline ship in the River Blackwater have recommenced this summer, after being halted last year due to Covid-19. I will report from my planned visit in a future issue.

On 648kHz, one of my preferred Radio Caroline shows is hosted by André van Os, on Saturday afternoons and Tuesday nights. He was formerly head of the internet department of Radio Netherlands Worldwide and also worked on the Voice of Peace's internet station.

Graham Smith noted a video documentary on Al Jazeera English about these two pioneering pirate stations: Radio Caroline and The Voice of Peace. *Rebel Radio Ships* examined how the stations challenged the status quo.

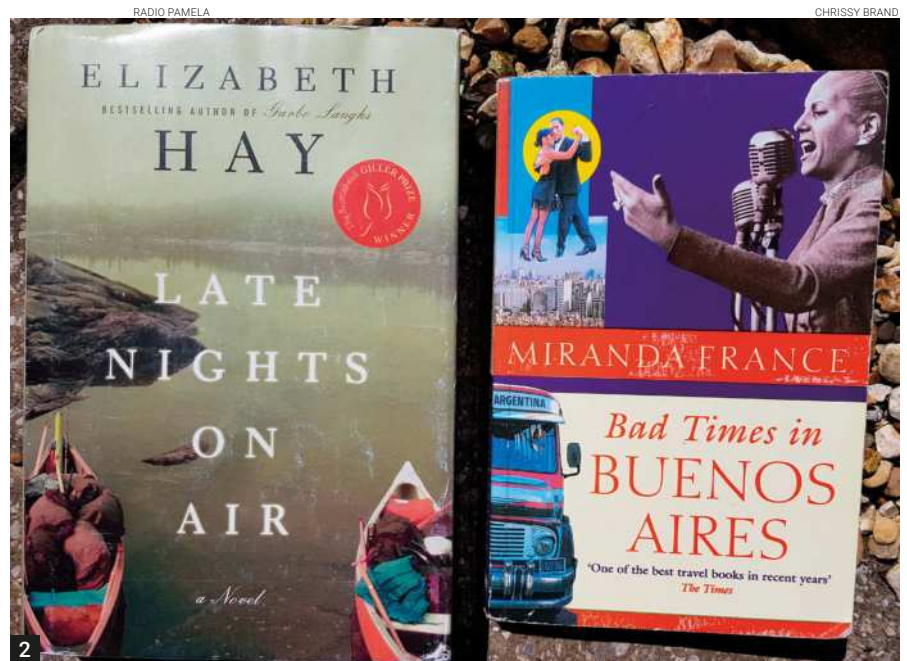
<https://tinyurl.com/foxs9u7p6>

Bretagne 5 is the remaining station from France on medium wave, on 1593kHz. However, FM offers more options. The summer programming on Radio France Inter (Fig. 1) can also be a joy to hear, whether you are listening by pulling in an FM signal in the UK or resorting to streaming online. The station offers information, humour and cultural programmes and covers a wide range of music, such as chanson, soul and electro.

www.franceinter.fr/musique

Radio Resources

Dan Roberts in California has been producing *The Shortwave Report* programme for 25 years. This 30-minute show is released every Thursday evening PST or early in the morning, UTC. It is relayed on several radio stations but is also available at Dan's website and on most podcast apps.



The Shortwave Report consists of a review of international news and opinion, in English, recorded from a short wave radio and the internet. This includes times, frequencies, and websites for listening at home. Regular stations featured include Radio Exterior de España, Deutsche Welle, Radio Havana Cuba, Sputnik Radio and NHK Japan.

The five most recent editions are also archived on the website.

www.outfarpress.com

Graham Smith wondered what the station broadcasting music on 927kHz is. He wrote, "It seems to be on a bearing of ESE from my

location in Bury St Edmunds. However, there is no announcer and not even the occasional record in (say) Italian or Romanian, which would enable me to hazard a guess at the station's location. An Italian station called Radio Albatross was once reported on this frequency."

This station could be WMR (World Music Radio) which began broadcasting on 927kHz from Hvidovre, Copenhagen, in April. Stig Hartvig Nielsen stated that its power will be increased to 500W. "The transmitter provides excellent reception in the larger Copenhagen area and parts

Date	Time (UTC)	Station	Programme	Podcast	URL/ Stream/ Frequency
Daily	0950 to 0200	Radio Tarma, Peru	Andean and folk music	www.radiotarma.com/programacion	4775kHz and www.radiotarma.com
Monday	2000 to 2100	Vectis	The Storyteller with Paul Wilson	www.vectisradio.com/presenters/paul-a-t-wilson	104.5 MHz and www.vectisradio.com
Wednesday Friday	1130 to 1330 0800 to 1000	Canalside Radio, Cheshire	Magic Months with Matt Isaac	https://canalsideradio.net/listen	https://canalsideradio.net and 102.8MHz
Third Sunday Repeated: Wednesday Thursday Friday	1600 to 1700 0600 to 0700 1000 to 1100 1300 to 1400	Radio Reverb, Brighton	Food and Drink Show with Karen Morton	www.radioreverb.com/shows/food-and-drink-show	www.radioreverb.com/listen-again and 97.2 MHz
Sunday to Wednesday	1900 to 2100	Nile FM, Egypt	How Crazy Are We? with Hisham Moussa	https://nilefm.com/show/60/how-crazy-are-we-	https://nilefm.com

Table 1. Chrissy's Top listening tips for the month ahead in international radio.

of Zealand and south-west Sweden during daytime. Unfortunately, a very powerful, Italian pirate station (supposedly from the south-west of Milan) began using 927kHz a short while after WMR was launched on 927, making reception of WMR impossible in most parts of Europe, and even causing severe interference to WMR on 927kHz in Denmark during evenings and night time."

Table 1 shows my other listening recommendations for the next month.

Radio Stations in Literature

For a theme of programmes and podcasts this month, I have been influenced by books with a radio theme that I have read on the beach (Fig. 2). *Late Nights on Air* by Elizabeth Hay (McClelland & Stewart Ltd., 2007) was a novel I first started reading a few years ago. Having now completed it, I rate it as both a radio themed-novel and a drama. The author worked for CBC Radio in Yellowknife, Winnipeg and Toronto.

Late Nights on Air begins in the summer of 1975 at radio station CFYK, Yellowknife, in Canada's Northwest Territories. Several newcomers join the station, escaping stressful events that have befallen them elsewhere. The reader soon gets to know the key characters in the small community.

These include former big-shot television presenter, Harry Boyd; quirky European Dido Paris; station gatekeeper Eleanor Dew; and a shy, new presenter Gwen Symond, to name but four. Their lives are all intertwined by radio, plus the threat of a gas pipeline coming to the area. There is also a movement to set up a CBC Northern service for the indigenous population. Personal and professional lives are woven around the main thread of the radio station, and the book takes on a travelogue of epic proportions including a canoe trip into the wilderness.

It really is an engaging read, with plenty of remarkable facts and figures, alongside much speculation of how a small-town radio

station survived and operated at the heart of the community back in the days when analogue radio was king.

Real-life radio from that part of Canada is reflected today by the CBC North Service, with video, audio and news features online. *The Trailbreaker* is a fine example. It is a morning show where Loren McGinnis connects you, "with the great northerners who are breaking trail in the Northwest Territories" (Fig. 3).

www.cbc.ca/news/canada/north
<https://tinyurl.com/6s9vreuw>
<https://tinyurl.com/y7s49yam>
<https://tinyurl.com/4rehbfsh>

I first mentioned the *Radio Detective* series of novellas, written by M.H. Vesseur, a few years back. I have recently read two more of them. The self-published stories are available in print or as a download, and it was the latter format that I bought this time, choosing to enjoy them on my e-Book reader.

Tax Me if You Can is the third book in the series. Protagonist Carl Pappas presents a WCBN radio show about business, called *The Boardroom*, which earns him the moniker of *The Bizz Jockey*. The real-life WCBN is a Michigan student station that started in the 1970s. Pappas and producer Hitomi Sakamoto plan to reveal secrets about tax-dodging practices around the globe. The pair visit a fictional tropical country and soon run into trouble with the business community and the military junta. The books are fast-paced and entertaining, combining real-world issues and the believable trials and tribulations of working at a local radio station.

Vesseur's latest novel is called *The Hitomi Files*. Written before the pandemic, it sees Hitomi Sakamoto, "drawn into a final battle between ruthless scientists, a greedy corporation, desperate environmental activists, a cold-hearted assassin and a manmade virus that longs to escape."

www.mhvesseur.com



Bad Times in Buenos Aires was the debut publication by Miranda France (Weidenfeld & Nicholson, 1998). She went on to become a journalist, based in London, but this travel book captures the unease and intricacies of Argentinean society in the 1990s. A book review in *The Observer* remarked that the book is, "part twentysomething travelogue, part Orwellian entrée into the underbelly of a sprawling apocalyptic city." Argentine radio is mentioned a few times: Miranda noted that the country's 24-hour tango station, FM Tango, was started at the instigation of General Juan Domingo Perón, who passed a decree to safeguard the amount of national music played on radio stations. However, a different station called Radio de Tango can currently be heard from Buenos Aires (Fig. 4).

<https://radiodetango.com.ar>

On one of her frequent themes of the popularity of psychoanalysis amongst the population, Miranda mentioned that a popular radio programme, made by the patients of a psychiatric hospital, had a

slogan of, "In a society where everyone is unbalanced, only the mad are really sane." For a slice of Argentine life in 2021, tune to RAE (Radio Exterior al Argentina). RAE Argentina al Mundo ("To the World") broadcasts in English on short wave via WRMI and can be heard online. During the pandemic, which has affected Argentina particularly badly, station staff have been working from home. The BDXC *publication Broadcasts in English* (A21 Season) noted that this has reduced output to one weekly programme per language, plus daily posts online. The relays via WRMI are on 9395kHz from 0100 to 0130 UTC to The Americas, from Tuesday to Saturday inclusive, plus Thursday, targeted to Europe and The Americas, from 0200 to 0230 UTC on 5800 and 7780kHz. The 2021 *World Radio and TV Handbook* states that QSL cards are issued for reception reports that are emailed to

qslrae@gmail.com

RAE also produces a weekly DX programme, called *DX Supplement*.

www.radionacional.com.ar/welcome

www.radionacional.com.ar/?s=DX

Early this century, Joyce Kreig wrote a trio of crime novels that featured Sacramento Talk Radio personality Shauna J. Bogart: *Murder off Mike*, *Slip Cue* and *Riding Gain*. Sadly, due to Joyce's disillusionment with the corporate takeover of much of the FM radio scene, she feels unable to develop the series further. However, she has not ruled out the possibility of setting another Shona novel in the radio scene of the 1970s or 1980s. Joyce is currently working on a crime novel set in the early days of Silicon Valley. She used to work at KFBK in the Californian capital city of Sacramento, a station that is still on the airwaves. She would probably work at Talk 650 KTSE today.

<https://kfbk.iheart.com>

<https://tinyurl.com/4sz4jahn>

Capital Public Radio is a Sacramento station that Joyce would approve of as its mission statement is, "to provide a trusted and indispensable source of information, music, and entertainment while strengthening the civic and cultural life of the communities we serve." *Cap Radio Reads* is one of its many high-quality programmes. In addition, Lit Hub Radio is another fount of intelligent talk, in the form of a book review podcast. There is also an interesting Wikipedia page listing dozens of fictional radio stations that have been created over the years

<https://tinyurl.com/b6xkrctt>

<https://lithub.com/lithub-radio>

<https://tinyurl.com/2rh7r9fw>

European Private Shortwave Stations

August 1st 2021

Only legal stations are included. Most stations use low power, but a few use several kW. Note that UTC is used here – not CET/CEST! D = Germany, DNK = Denmark, FIN = Finland, NL = Netherlands, NOR = Norway F.pl.: future plan, Int'l = International, Irr. = irregular, 24/7 = twenty-four hours a day, seven days a week Mo = Monday, Tu = Tuesday, We = Wednesday, Th = Thursday, Fr = Friday, Sa = Saturday, Su = Sunday.

kHz	Country	Name	Transmittersite	Schedule(UTC)
3920	NL	RadioPiepzender	Zwolle	Irr.
3955	D	RadioChannel292	RohrbachWaal	24/7
3975	D	ShortwaveRadio	Winsen	Daily1500-2200
3985	D	Shortwaseservice	Kall-Krekel	Daily1400-2200
3995	D	HCJB	Weenermoor	24/7
5895	NOR	RadioNorthernStar	Bergen	Daily0329-2210
5920	D	HCJB	Weenermoor	Daily0600-1600
5930	DNK	WorldMusicRadio	Bramming	24/7
5970	DNK	Radio208	Hvidovre	24/7
5980	DNK	RadioOZ-Viola	Hillerød	We2100-2200,Sa-Su1100-1300
5980	FIN	ScandinavianWeekendRadio	Virrat	1stSaofthemonth(not inSeptember)
6005	D	Shortwaseservice	Kall-Krekel	Daily0800-1600
6005	NL	RadioDeltaInternational	Elburg	Sa2000-2100&2200-0100
6020	NL	RadioDeltaInternational	Elburg	Su0600-1800
6055	DNK	RadioOZ-Viola	Hillerød	Alternative to5980
6070	D	RadioChannel292	RohrbachWaal	24/7
6085	D	Shortwaseservice	Kall-Krekel	Daily0700-1700(RadioMiAmigolnt'l)
6115	D	Radio SE-TA2	Hartenstein	
6140	NL	Radio Onda,Belgium	Borculo, NL	Weekends.F.pl.:Daily0630-1900
6150	D	Europa24	Datteln	Daily0800-1600
6160	D	ShortwaveRadio	Winsen	Daily10-16&18-22 +Su08-10
6170	NL	RadioEurope	Alphen a/dRijn	Testphase.F.pl.:Daily16-21
6170	FIN	ScandinavianWeekendRadio	Virrat	1stSaofthemonth(not inSeptember)
6185	NL	RadioPiepzender	Zwolle	Irr.
7220	NL	Rockpower	Nijmegen	Irr.(within0800-2400)
7365	D	HCJB	Weenermoor	0800-1300
9530	NL	Radio Onda,Belgium	Borculo, NL	F.pl.:FromAugust
9670	D	RadioChannel292	RohrbachWaal	24/7
11690	FIN	ScandinavianWeekendRadio	Virrat	1stSaofthemonth(not inSeptember)
11720	FIN	ScandinavianWeekendRadio	Virrat	1stSaofthemonth(not inSeptember)
15790	DNK	WorldMusicRadio	Randers	Sa-Su0700-2000+irr.atothertimes
25800	DNK	WorldMusicRadio	Mårslet,Aarhus	24/7

This list is compiled by Stig Hartvig Nielsen each first day of the month – and is based on details supplied by the various radio stations, the stations websites, monitoring observations, HFCC registrations, and some presumptions. The list is not copyrighted and may be published everywhere. Subscription by email is free of charge; write to shn@wmr.dk.

Follow us on Facebook @radioenthusiasts and Twitter @REnthusiasts

Graham Somerville
graham@bhi-ltd.com

Understanding technology can be difficult at times, especially when complex mathematics and equations are involved. In this short article, I have tried to explain the different types of noise cancellation and Digital Signal Processing (DSP) used to make signals clearer for the user, without using too much technical jargon.

Digital Signal Processing

DSP, as the name would suggest, means the processing of signals by digital means. A digital signal consists of a stream of numbers in binary form. The processing of the signal is achieved by performing numerical calculations. DSP can mean 'Digital Signal Processing', or 'Digital Signal Processor', a specialised type of microprocessor chip, as used in our bhi DSP noise cancelling products (Fig. 1).

The development of digital signal processing dates from the 1960s because of the introduction of large mainframe computers used for big number-crunching applications. However, DSP techniques were not widely used at this time because suitable computing equipment was only available in universities and scientific research institutions.

The introduction of microprocessors in the late 1970s & early 1980s made it possible for DSP techniques to be used in a much wider range of applications. Manufacturers such as Texas Instruments, Analogue Devices and Motorola developed Digital Signal Processor chips.

In signal processing, the function of a filter is to remove unwanted parts of the signal, such as random noise, or to extract useful parts of the signal, such as the components lying within a certain frequency range. There are two main kinds of filters, analogue and digital, and they are quite different in their physical makeup and operation.

Analogue and Digital Filters

Analogue filters are made up of discrete components such as resistors, capacitors and op-amps. These filter circuits are widely used in applications like noise reduction, video signal enhancement, graphic equalisers, in hi-fi systems. Here, at all stages, the signal being filtered is an *electrical voltage or current*, which is the direct analogue of the physical quantity (e.g. a sound or video signal).

Digital filters use a digital processor to perform numerical calculations on sampled values of the signal. The processor then carries

A Beginners' Guide to Noise Cancellation

Graham Somerville, of bhi Ltd., delineates the fundamentals of DSP and noise cancellation technologies, looking at analogue and digital filtering and various types of noise reduction and cancellation technology.



out numerical calculations on the resulting binary numbers, which now represent sampled values of the filtered signal, and then outputs these through a digital to analogue converter (DAC) to convert the signal back to analogue.

Therefore, in a digital filter, the signal is represented by a *sequence of numbers*, rather than a voltage or current. They are easy to design and program and can be changed without affecting the circuitry, whereas analogue filters can only be changed by redesigning the filter circuit. Analogue filter circuits are also subject to drift and are dependent on temperature, whereas their digital equivalents do not suffer from these problems.

Digital filters can handle low-frequency signals accurately and are being applied to high-frequency signals in the RF domain, which in the past was the exclusive preserve of analogue technology. They are much more versatile in their ability to process signals in a variety of ways.

This includes the ability of some types of

digital filters to adapt to changes in the characteristics of the signal, as in noise cancellation for speech signals.

The architecture of a DSP chip is designed to carry out numerical operations incredibly fast, processing hundreds of millions of samples every second, to provide real-time performance. Electronic equipment manufacturers have invested heavily in DSP technology because of applications in mass-market products. DSP chips now account for a substantial proportion of the world market for electronic devices.

Noise Reduction

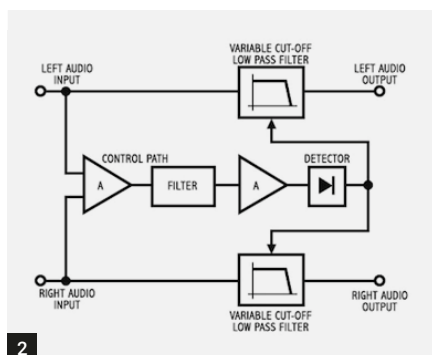
Noise reduction is the process of *removing noise from a signal*. Over the years, there have been several ways of doing this, to improve signals. One of the most popular and well known is *Dolby* noise reduction systems. First developed around 1966, *Dolby B* was a sliding band system for the consumer market, which helped make high fidelity practical on cassette tapes. It is still common on stereo tape players and recorders to the present day. It works by compressing the dynamic range of the sound during recording and expanding it during playback to reduce the effect of noise & hiss.

Dynamic Noise Reduction (DNR) is an audio noise reduction system that was introduced by National Semiconductor in 1981 to reduce noise levels on long-distance telephony (LM1894 chip).

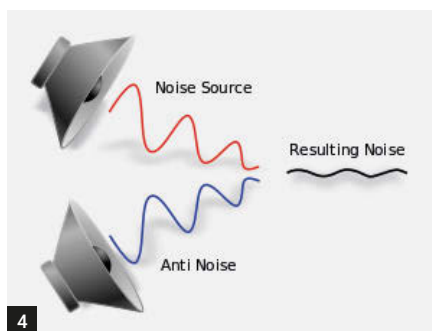
It is a playback-only system and does not need the source material to first be encoded. It was a development of the unpatented single-chip Philips Dynamic Noise Limiter (DNL) system, introduced in 1971 and it reduced noise by as much as 10dB (Fig. 2).

Real-Time Noise Cancellation

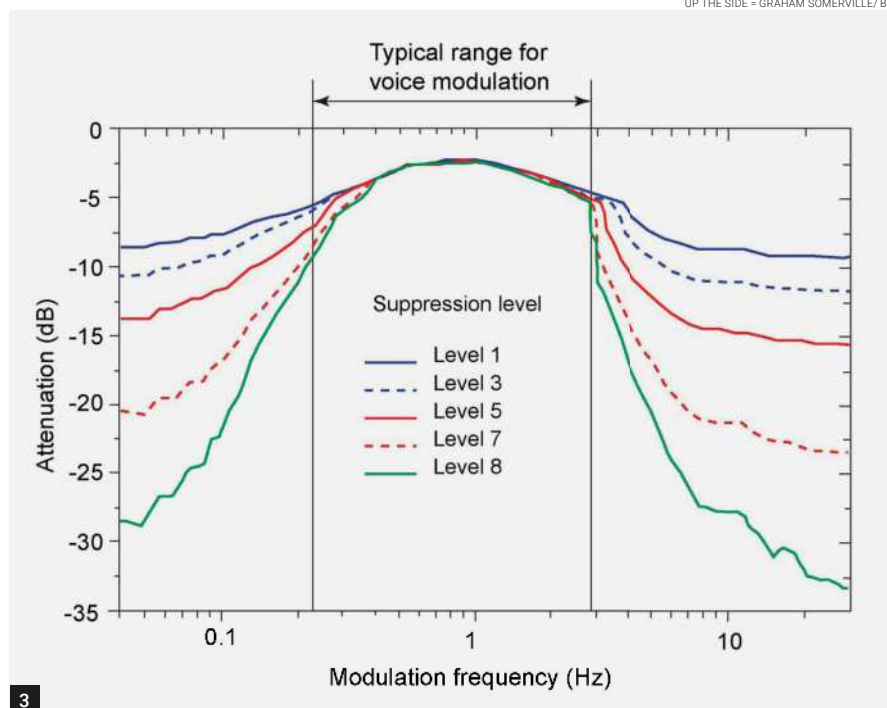
Another type of noise-cancelling uses time-frequency analysis techniques to study a signal in both the time and frequency domains *simultaneously*. Noise can be removed using



2



4



3

spectral editing tools, which work in this time-frequency domain, allowing local modifications without affecting nearby signal energy.

The method bhi uses is based on this type of approach. The technology operates in the frequency domain and looks for signals with speech characteristics. Signals with modulated speech characteristics pass through. Other sounds with higher or lower modulation frequencies than speech are removed, depending on the filter level selected (8 to 40dB).

There is almost no distortion of the speech signal, even for extremely low signal-to-noise ratios of 0 dB and below, and the technology is self-adapting to changing noise environments, so no 'training' of the noise filter is required. With bhi DSP noise cancellation, the passband of the noise cancellation is subdivided into sub-bands.

The system then evaluates each sub-band to see if it has speech or noise characteristics. If the signal has noise characteristics, the noise portion is removed from this sub-band. If the signal-to-noise ratio is extremely low, and/or a high level of noise suppression is selected, the system may yield artefacts in the form of slightly 'robotic' speech. Operators can adjust the level of noise suppression to suit their own needs. The technology does not change the characteristics of the noise, that is residual noise still sounds natural, and a technique called 'spectral diffusion' is used to reduce the effect of the phenomenon of 'musical tones' for most filter settings.

The graph in Fig. 3 shows the effect of applying different filter levels to a noisy speech

signal and the resultant effect on what passes through to the listener after filtering.

Active Noise Cancellation

Another type of noise reduction system is Active Noise Reduction or Active Noise Cancellation (ANR/ANC). This type of noise cancellation is mainly used in noise-cancelling headphones to reduce unwanted ambient sounds.

It uses a technology that is different from the other systems. This involves using one or more microphones placed near the ear in the headphones. The circuitry inside the headphones then uses the microphone signal to generate an 'anti-noise' signal (Fig. 4).

The ambient noise, as heard within the enclosed volume of the headphone, is then cancelled out. This works well for continuous sounds, such as the sound in an aeroplane cabin, but is rather ineffective against speech or other rapidly changing audio signals. ANC/ANR also cancels the lower-frequency portions of the noise and depends on more traditional methods such as soundproofing to prevent higher-frequency noise from reaching the ear. This approach is preferred because it reduces the demand for complicated electronic circuitry that would be required for noise cancellation at higher frequencies, where active cancellation is less effective

Summary

DSP technology and noise cancellation are used in a wide variety of applications to perform specific functions, and the performance

Fig. 1: The author at the 2019 Newark Hamfest.

Fig. 2: Diagram of the Dynamic Noise Reduction (DNR) method. Fig. 3: The effect of applying different filter levels to a noisy speech signal.

Fig. 4: Generating and 'anti-noise' signal in noise-cancelling headphones.

and effectiveness of these specific functions depend on who has written the instructions, and on how proficient they were at doing it.

The results you can get between different equipment manufacturers can therefore vary quite considerably.

[For readers interested in the wider history of the development of electronics and some of the technologies mentioned here, Derek Cheung's book, Conquering the Electron, offers some further background reading.]

Graham Somerville is MD of bhi Ltd, who design and manufacture a range of DSP noise cancelling products and accessories for the radio communications market. Formed in 2002, bhi will be celebrating 20 years of trading in 2022. Graham did a four-year apprenticeship in Electronics in 1976-1980 at Crawley College of Technology, where he went on to gain both a Full Technological Certificate and an HNC in Electronics.

He acquired wide experience of different manufacturing environments, including dot matrix printer repairs, laser rangefinders, night vision equipment, robotic blood sampling machines, and hotel electronics, before spending 11 years working for a large electronic component distributor as a sales engineer - Ed.]

Rallies & Events

Due to the Coronavirus situation, the Rallies calendar remains dynamic at the moment, and there will be more cancellations and postponements. All information published here reflects the situation up to and including 26th July 2021. Readers are advised to check carefully with the organisers of any rally or event, before setting out for a visit. The Radio Enthusiast website will have updates, please check here regularly: www.radioenthusiast.co.uk To get your rally or event onto this list, please, e-mail full details as early as possible, to: wiessala@hotmail.com

15 August

DARTMOOR RADIO RALLY: The rally will take place in the Yelverton War Memorial Hall, Meavy Lane, Yelverton, Devon, PL20 6AL. CR|FP|BB|TS. Doors open at 10 am. Admission is £2.50.

Roger: Tel: 07854 088 882
2e0rph@gmail.com
<https://dartmoorradioclub.uk>

21-22 August

BATC CONVENTION FOR AMATEUR TV 2021 (CAT21): Midland Air Museum, Rowley Road, Coventry CV3 4FR. AGC is Sunday afternoon. (Lectures will be streamed online). Test facilities available for 5.6GHz/Portsdown/Minitouner/Ryde/power amplifiers/preamps).

<https://batc.org.uk>
<http://www.midlandairmuseum.co.uk>

22 August

GRAND FIELD DAY OUT: Willesborough Windmill, Ashford, just off junction 10 of M20. Gates open from 10 am to 4 pm. Free event. Various bands in operation, portable working at its best. All interested parties wishing to set up a station, please contact the e-mail below. Set-up is from 9 am, and clear-away from 4-5 pm. All food/drink on site to be purchased from the Trust's Cafe/BBQ.

g0gcq@yahoo.co.uk

29 August

TORBAY ANNUAL COMMUNICATIONS FAIR: Newton Abbot Racecourse, Devon TQ12 3AF. 10 am (9 am D). Admission: £2. (BB|CR|FP|RSGB)

Tel: 01803 864 528/01803 557 941
rally@tars.org.uk

30 August

HUNTINGDONSHIRE ARS (HARS) ANNUAL BANK HOLIDAY MONDAY RALLY: The show is at the Ernulf Academy, St Neots PE19 2SH. Open 7 am (traders), 9 am (public). Stalls are available. The organisers are planning to hold the Rally, but only in line with Government advice and the permission of the Academy. (FP|BB|CR|RSGB)

Malcolm MOOLG: Tel: 01480 214 282
www.hunts-hams.co.uk
events@hunts-hams.co.uk

4 September

G-QRP CONVENTION ONLINE EVENT
Steve Hartley G0FUW

5 September

THE TELFORD HAMFEST: Harper Adams University Campus TF10 8NB.
Tel: 01952 255 416
Tel: 07824 737716
www.telfordhamfest.org.uk

12 September

CAISTER LIFEBOAT RALLY: Caister Lifeboat Station, Tan Lane, Caister-on-Sea, Norfolk NR30 5DJ. 9.30 am (8 am for sellers); easy parking; access via car park in Beach Road. Raffle. The museum will be open. (CR|TI|22)

Zane M1BFI Tel: 0771 121 4790

12 September

EXETER RADIO AND ELECTRONICS RALLY: America Hall, De la Rue Way, Pinhoe, Exeter EX4 8PW.
Pete G3ZVI Tel: 07714 198 374
g3zvi@yahoo.co.uk

19 September

CAMBRIDGE REPEATER GROUP RALLY: Foxton Village Hall, Harman Road, Foxton, Cambridge CB22 6RN. Open 9.30 am (7.30 traders) Admission £3. (BB|CR|RSGB)

Lawrence M0LCM Tel: 07994 197 2724
rally2021@cambridgerepeaters.net
www.cambridgerepeaters.net

26 September

BRITISH VINTAGE WIRELESS SOCIETY (BVWS): RetrotechUK 2021 will take place at the Warwickshire Event Centre. RetrotechUK is the new name and image for the National Vintage Communications Fair.

<https://www.retrotechuk.com>

26 September

WESTON SUPER MARE RADIO SOCIETY 6TH RADIO & ELECTRONICS RALLY: The Campus Community Centre, Worle, Weston-super-Mare BS24 7DX. Opens 10 am (visitors [D: 9.30]) and 7 am (traders).
Dave G4CXQ Tel: 07871 034 206.
g4cxq@btinternet.com



October

RSGB CONVENTION: (Online, TBA).
<https://tinyurl.com/2xtre867>

16 October

ESSEX CW BOOT CAMP: 3rd Witham Scout & Guide HQ, at the rear of Spring Lodge Community Centre, Powers Hall End, Witham, Essex CM8 2HE. Open 8.30 am (registration). 9 am (public). Finishes at 4.30 pm. Admission is £10, with free soup/drinks/cakes. (CR|FP)

Andy G0IBN
Tel: 0745 342 6087.
g0ibn1@yahoo.com

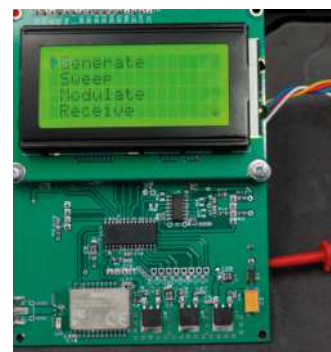
17 October

HORNSEA AMATEUR RADIO RALLY: Driffield Show Ground, Driffield YO25 3AE. Open 10 am. Admission: £2 (under 14s free). Raffle. (BB|CR|CBS|FP)

Les 2E0LBJ Tel: 01377 252 393
lbpinkney1@hotmail.com

17 October

HACK GREEN RADIO SURPLUS HANGAR SALE: Hack Green Secret Nuclear Bunker, Nantwich, Cheshire CW5 8AL. Government Covid Regulations permitting. Fully Covid-compliant. Any last-minute cancellation will appear on our Facebook Page:
Facebook: HGsecretbunker
<http://www.hackgreen.co.uk>



7 November

HOLSWORTHY RADIO RALLY: Holsworthy Leisure Centre, Well Park, Westwood Road, Holsworthy, Devon, EX22 6DH. Open 10 am. Traders. (BB|CR|D)

Howard M0MYB

BB Bring & Buy CBS Card Boot Sale CR Catering/Refreshments D Disabled visitors FP Free Parking L Lectures RSGB (RSGB) Book Stall SIG Special-Interest Groups TI Talk-In (Channel) TS Trade Stalls

See our great book and magazine offers at www.radioenthusiast.co.uk/store

Radio News

ANTIQUES ROAD SHOW AND SPY RADIOS:

The *Antiques Roadshow* recently saw a World War Two spy radio, which was disguised as a toolbox, fetch a huge valuation, when it travelled to Kenilworth Castle. Mark Smith marvelled at the ingenuity of a spy radio, which was used in World War Two in a recent episode. The item, from the outside, was made to look like a toolbox but when opened, displayed a detailed radio, which could be 'powered by any source'. So how much was it worth? Mark put a £10,000 to £15,000 price tag on it.

(SOURCE: *Radio Signals ARS & Express* online, via Bob Houlston G4PVB)

www.tinyurl.com/spyradioexpress



G-QRP CONVENTION 2021: In April 2021, the G-QRP Club ran a survey to gauge support for a physical Convention this year. The results showed that the vast majority were not yet ready to meet in person and would prefer another virtual Convention. The Committee thought long and hard about hosting a small gathering for those who would like to meet up but decided to

leave it until 2022. So, the *G-QRP Club Convention 2021* will be a virtual event over the weekend of the 5th and 6th of September. The Committee is now working on matching up the wish lists of topics and suggested speakers, to bring you another great QRP (remote) gathering. The plan

is to join up with the *Telford Hamfest* once again next year and have a physical Convention that can also be enjoyed remotely by those unable to attend in person.

(SOURCE: Steve, G0FUW)

<http://www.gqrp.com/convention.htm>

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DESKTOP MKII

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Burgess Hill RH15 9RR, UK
Tel: 01444 870333

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E & O.E.





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www.moonrakeronline.com

Moonraker (UK) Ltd, Cranfield Road, Woburn Sands, Bucks MK17 8UR

WHISTLER

TRX-1 Leather case

Keep your treasured TRX-1 safe with this high quality leather case

£29.95

MRW-TRX3 Antenna Pack

Three compatible antennas in this great pack

£39.95

TRX SD cards

A genuine replacement for the Whistler TRX-1 SD card

£19.99



WHISTLER

TRX-1E Digital Handheld Scanner

We have worked with Whistler to customise a UK band plan for the scanners! This ensures the radios cover UK bands in the correct steps and the correct mode. The TRX-1 will receive both amateur and commercial DMR transmissions as apart from the frequency they are fundamentally the same mode. The radio is supplied with software and users can select mode when writing memories or select auto and it will work out the mode itself! This multi-system adaptive digital trunking scanner supports Motorola P25 Phase I, X2-TDMA, Phase II and DMR.

Buy the TRX-1E for just

£419.95



419 WATTS

WHISTLER

WS1065 Desktop Radio Scanner



The Whistler WS1065 employs cutting edge technology to bring a high level of performance and innovative features. This model clearly raises the bar in the area of advanced trunking scanners.

Buy the WS1065 for just

£299.95

299 WATTS

WHISTLER

WS1025 Desktop Radio Scanner

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This multi-system adaptive digital trunking scanner supports Motorola P25 Phase I, X2-TDMA, Phase II and DMR making it capable of monitoring the following unencrypted channels/systems:

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- MotoTRBO™ Capacity Plus
- MotoTRBO™ Connect Plus
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Buy the TRX-2E for just

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Key Specifications

- Frequency: 25-54MHz, 108-136.99MHz, 137-174MHz, 216-379.97MHz, 380-512MHz, 764-781MHz, 791-796MHz, 806-960MHz (excluding cellular), 1240-1300MHz
- Simple Zip Code programming
- Easy updating via Internet
- APCO P25 Digital Phase I & II
- Removable, remote magnetic head
- Scanning at up to 70 channels/second
- CTCSS and DCS subaudible decoder
- IF Discriminator Out • Store Favourites Scan List
- User upgradable CPU firmware
- Spectrum Sweeper • Clock / Calendar
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WHISTLER

WS1010 Handheld Scanner

This 200-channel scanner lets you listen to FM radio bands and can be categorized into 10 separate memory banks. Also, it offers the convenience of one-touch searches of marine, air and ham.

Key Features/Specifications: 200 Channel memory - plenty of memory to store all your favorite frequencies in 10 separate storage banks. Backlit Liquid Crystal Display - easy to read and program data even in low light situations.. Data Cloning - allows transfer of the programmed data to another WS1010 scanner.

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89 WATTS

WHISTLER

WS1040 Handheld Scanner

The WS1040 scans most common trunked radio system signalling formats, including Motorola, EDACS, LTR and P25 trunked radio networks. Talk group and individual call monitoring is supported.

When monitoring P25 digital systems, the exclusive Automatic Adaptive Digital Tracking instantly adapts the digital decoder to the digital modulation format of the transmitted signal, then analyses the signal over 50 times each second and adapts to any subtle changes caused by multipath or fading. No cumbersome manual adjustments are required.

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299 WATTS

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579 WATTS

Uniden

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The Uniden SDS200 mobile scanner has the same features as the handheld version SDS100, plus some extra enhancements. Uniden's SDS200 incorporates the latest True I/Q receiver technology, which provides the best digital decode performance in the industry.

Buy the SDS200 for just
£749.95

749 WATTS

Uniden

Bearcat UBCE-3600XLT Digital Handheld Scanner

This is a new digital Truck Tracker V Professional Scanner Receiver, covers 25 - 1300MHz wideband frequencies. The Truck Tracker V operation allows this scanner to scan APCO 25 Phase 1 and Phase 2, DMR, Motorola, EDACS, LTR Tracked Systems, NXDN as well as conventional analogue and P25 digital channels. With features such as close call RF capture, 4GB memory, location based scanning, range control, multi-site trunking, audio recording and multi-colour LED alert, this is must have equipment for all the professional users out there!

Buy the UBCE-3600XLT for just
£479.95



479 WATTS

Uniden

UBC-125XLT Handheld Scanner

A best selling Handheld scanner with great performance at a budget price! Uniden UBC 125XLT is a quality handheld scanner in a stylish compact design that is made from robust materials. Uniden UBC 125XLT is designed for indoor and outdoor activities in the professional world. The programmed channels are grouped into 10 Banks with 50 channels in each. In this way Uniden UBC125XLT is very easy to use once the interesting frequencies are programmed. Uniden UBC 125XLT has Close Call and 10 preset frequency bands.

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129 WATTS

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UBC-370CLT Desktop Scanner



A quality desk top scanner. It is designed for home use, with a big speaker for excellent sound. Included: 12VDC power supply, Telescopic antenna, 500 Channels in 10 banks FM & broadcast (Store & search upto 30 Preset FM broadcast channels)

Buy the UBC-370CLT for just
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119 WATTS

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UBC-75XLT Handheld Scanner

The UBC-75XLT's Main features include 300 memory programmable channels, close call RF capture with Do-Not-Disturb, automatic close call detection and tune into nearby transmission, 10 pre-programmed service searches, 10 custom search ranges, channel priority with Do-Not-Disturb, temporary lockout, PC programming, battery save and low battery alert, scan/search delay/resume options, quick and turbo search facility, triple conversation circuit, key confirmation tones, three power options and many more.

Buy the UBC-75XLT for just
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99 WATTS

Uniden

UBC-355CLT Desktop Scanner



Uniden UBC 355CLT is a quality base and mobile scanner in an elegant cabinet. It is designed for home and mobile use, with a large speaker for excellent sound. The fixed channels are placed in eight banks, where seven are pre-programmed for known frequencies.

Buy the UBC-355CLT for just
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89 WATTS

Uniden

EZI-33XLT PLUS Handheld Scanner

Uniden EZI 33XLT Plus is a handheld scanner in a compact design. New! Includes Rechargeable NiMH Batteries and USB Charging Cable. The small size of the Uniden EZI 33XLT Plus makes it easy for the user to take it out in the field by attaching it to the belt or carrying it in a pocket. The scanner is made from robust materials. The fixed channels are placed in nine banks, one for each frequency band. Thus allowing for a very easy access to all the interesting, pre-programmed frequencies.

Buy the EZI-33XLT PLUS for just
£74.95

74 WATTS



Uniden

Bearcat BCT-15X Mobile Scanner



With Uniden exclusive features like Advanced Dynamic Memory System, Close Call RF Capture Technology and GPS compatibility. The Close Call Technology instantly locks onto nearby radio transmissions even if you haven't programmed them into the scanner and then conveniently scans those Close Call Hits so you can stay up to date even after leaving the Close Call range.

Buy the BCT-15X for just
£249.95

249 WATTS

FIGS. 1 AND 5: RICHARD NOSWORTHY; FIGS. 2, 3 AND 4: RADIO CARDIFF



Richard Nosworthy
helo@richardnosworthy.cymru

In an office block, a stone's throw from the River Taff, Donna Zammit welcomes me to the headquarters of Radio Cardiff. Donna is both a presenter and the Head of the station, and when I visit on a weekday afternoon, a pre-recorded programme is playing from the quiet studio, based in a low-rise office building near a storage facility and a soft-play centre.

The atmosphere on the day I visited (in July 2021) perhaps does not reflect the huge amount of energy and creativity you hear on air – but that is understandable given that we are only just emerging from a pandemic. The community station - which offers diverse and local radio for the Welsh capital - is still in the process of returning to normal after the lockdowns.

"I haven't made anybody come back", Donna tells me later when we sit down to talk; "Their shows are there for them, obviously. People who are comfortable coming back are back. So, we've got about 4-5 live shows a day now and the rest are pre-recorded."

Radio Cardiff broadcasts from an industrial and commercial area of the city undergoing redevelopment. To the north lie

Radio Cardiff: Diverse Community Radio for the Welsh Capital

Richard Nosworthy offers a profile of Radio Cardiff, an innovative community radio station in South Wales. The station has undergone much change and is developing a number of exciting plans for the future.

the shops and offices of the Welsh capital's city centre, but the station's roots lie in the suburbs to the south and west: Butetown, Grangetown and Riverside – diverse, multicultural areas reflected in the variety of music and programmes broadcast on the station.

Background and History

Radio Cardiff is very different to the other stations found on the dial in this area, with a wide variety of different musical styles and speech output, delivered by volunteers. The station's website (see below) states

that its goal is, "to serve the multicultural communities in which we live and work ... offering our listeners a diversity of music styles, local & national news and community interest programmes, every day", offering 'an alternative to mainstream BBC and commercial radio stations.'

A quick listen will soon reveal that the station lives up to its promise!

The website adds that each week, over 26,000 Cardiffians tune in – although Donna informs me that without official RAJAR figures, it is difficult to be sure, and a council survey 9-10 years ago put the

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figure at 48,000 listeners.

<https://radiocardiff.org>

Whatever the number of listeners tuning in, the station has certainly built a loyal following, with listeners regularly texting presenters and joining the DJs on their Facebook pages. While much of that listener base is from its 'core' area, where the FM signal is strong, Donna tells me that people do respond from further afield.

This ranges from the outskirts of the city where the FM signal is patchier, to listeners to the live stream around the world. For example, she tells me the house DJs in the evenings have a strong following in the US.

Radio Cardiff is a listener-supported, volunteer-run station. It has more than 100 volunteers from across the communities that make the city their home.

"You've got presenters that have been with us from day one", says Donna, before

reeling off a list of names of some of the people that have been on air since the beginning, playing a mixture of jazz, reggae, blues, soul, house, and everything in between. Donna also tells me her daughter, Rachel, has been with the station "since she could walk", and that she now presents a drivetime show.

As well as the passionate volunteers who bring their love of various musical genres to the station, Radio Cardiff offers opportunities to young people to gain broadcasting skills. It was this idea of providing experiences and training that were the foundation of the station when it was set up in October 2007, following an earlier incarnation as a temporary station called *Beats FM*.

Donna explains that people generally just drop in, call, or send an e-mail if they want a show, and she asks them to send in

Fig. 1: Donna Zammit in the new Studio of Radio Cardiff. Fig. 2: DJ Neffi. Fig. 3: Donna Zammit and Jeremy Rees. Fig. 4: Latifa and Rhys Phillips. Fig. 5: Donna Zammit with the Radio Cardiff logo.

material. In the afternoon I visit the studios, she has been answering more requests to get involved, and recruiting presenters is not a problem.

The team has supported each other during the lockdown and Donna says they have "very loyal volunteers, the best volunteers I've ever worked with, honestly - they're lovely!"

A Diverse and Multicultural Broadcaster

As I write this article, I am streaming the station's *Drivetime Show*, playing a dance version of *(Sittin' On) The Dock Of The Bay*. A look at the online schedule shows that

next up is a phone-in for Cardiff City fans, followed by a trance and house show, and then a jazz programme.

"It's for everyone", says Donna. "The only show that we haven't got now that we used to have was the Rock Show. We've got a Welsh Show. So you know, it's everything. It started as a MOBO station, but it's still very diverse in the listenership...you'd be surprised how many people stop you in the street and say, 'oh I caught such-and-such-a-show yesterday, and it was really interesting'".

As well as the many types of music featured, listeners enjoy the range of speech content. Alongside the news, weather, and traffic, this includes more unusual features such as film reviews, science and mental health discussions. The ethnic diversity of the station's volunteers reflects the community it serves, and the station is very much connected to local people and events - for example, using its Facebook page, to promote a local market, rugby team and fundraisers.

<https://tinyurl.com/hsrd9fcw>

Adapting to Recent Challenges

The station, like so many others, has had to cope with some challenging times recently. When the pandemic hit last year, the station's community role became even more important, sharing information on food banks and deliveries and providing free advertising slots to those serving the community.

"That was a huge success, we had loads of feedback on that. I think we really kept them going through lockdown", says Donna. "We've had non-stop prerecords, 19 hours a day maybe ... I think we provided an excellent service for our listeners."

The other big development has been a new studio. For a while, Radio Cardiff was based in two shipping containers next to the current building, as it waited for a more permanent home to become available. Donna tells me that when they got the go-ahead, it was good timing: "Through the lockdown, two rooms became available, so we obviously bit their hands off. What a perfect time to move as well, because we weren't interrupting anyone's shows, so that's what we did."

She and two others from the team got stuck in, moving the equipment and doing some painting and decorating. This gave them a great project to work on during Covid restrictions. As well as the main studio, they named the edit suite the *Makani Suite* after Raheem Makani, a well-known



former DJ who died last year.

The pandemic has not been the only recent challenge for the station. A couple of years ago, Radio Cardiff overcame financial difficulties by becoming part of *Safer Wales* – a charity whose mission is to 'support, protect and empower groups of people who are often invisible in society'.

While this has put Radio Cardiff on a secure footing and provided support for young people getting started in radio, Donna tells me that the station remains as it was.

Plans to Expand Coverage

Cardiff is a city of 350,000 people, with many more commuting or visiting from the nearby valleys and further afield. This constitutes a large potential audience, but much of the Welsh capital is currently beyond the range of a strong Radio Cardiff signal on FM, at least in the home.

However, this is about to change.

The current FM setup relies on a short microwave link from the studio to a transmitter on a block of flats in Butetown. It provides good coverage of the southern and central parts of the city, with more patchy reception beyond that. "Sometimes you can pick it up as far as Merthyr [Tydfil]...I think it depends where the wind's blowing! It's usually just around the city centre", says Donna.

This reflects my own experience – I live a few miles from the transmitter, and while the reception is good outdoors or in the car, indoors the signal often fades and my internet radio, phone or PC are better options.

While online listening is of course an option, the station is taking steps to improve coverage across the city and the wider region. It has already been given one extension on FM, and it is now waiting for another one.

The station has also been awarded a DAB license.

These changes are due to take full effect next year, with an additional FM transmitter in the north of the city due to go live at the same time as DAB broadcasting in south Wales. Donna is expecting these changes to have a massive impact: "I think it is going to triple our listenership, maybe quadruple it."

Despite this planned growth, she says the station will still be a station for Cardiff, with its first commitment to serve the community.

The Future

As well as better coverage, the other hope for the station is to get back how it operated before Covid. The pandemic has meant a halt to the usual broadcasts from various outdoor events, and Donna has missed working outdoors and meeting people. "I think if it wasn't for lockdown, I think it would have been fabulous - all the opportunities. Because we had festivals planned, outdoor things."

The hope is that the station will now get those opportunities back, as it looks to reach even more listeners in the future. With so much commitment from the team, it seems well placed to grow.

As Donna puts it, "Radio's a bug, isn't it? The bug never leaves you!"

Keith Hamer

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Garry Smith

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When engineers designed high-power broadcasting systems in the early 1920s, it was essential to use water-cooled triodes. Wireless engineers were aware that this type of triode was not as robust as the glass type and, consequently, liable to the so-called 'Rocky Point' effect. This term described the sudden internal 'flash-over' of the valve. Many theories existed to explain this effect. Some engineers asserted that there was a sudden expelling of occluded gas, producing a momentary 'softening' of the triode and a consequent 'flash-over' between anode and filament. This 'flash-over' was possibly facilitated by any issues which may have existed in the construction of the triode, for instance, in the filament support.

When the power supply was limited – or, perhaps more accurately, where the regulation of the power supply was not sufficient – this momentary 'flash-over' was extinguished by the failure of the supply to maintain a voltage across the triode, which was taking far more than its normal share of the load. The use of an alternating current in the power supply was often effective in quenching the sudden arcing-over of the triode. In the 'choke-control-system', the presence of an inductive choke in series with the supply to the triode could also tend to lower the strain imposed upon the defective valve.

The use of the 'amplification-of-modulated-high-frequency' system resulted in a greater strain upon the power triodes because there was no protecting choke. It was thought that the best way to reduce the 'Rocky Point' effect was to design triodes, which were able to handle far more power. For instance, with the 'amplification of modulated high-frequency' system, the efficiency of the power-magnifier was about 33 per cent. For 50kW in the aerial, 150kW had to be supplied to the anodes of the power magnifier.

The best triodes in the 1920s could handle between 12kW and an absolute maximum of 15kW. This involved 10 triodes in parallel, with one triode handling only one-tenth of the total power to the bank of valves. Upon exhibiting 'flash-over', theoretically, a minimum of ten times the normal power was applied to one valve. If,

The Rocky Point Effect, and the BBC at 85

Keith Hamer and Garry Smith explore the 'Rocky Point' Effect, preview BBC TV's 85th Anniversary in 2022, delve into the history of Alexandra Palace and guide you to their online DX-TV & FM News column.

however, two triodes each handling 75W were taking the load, the maximum power that could be applied to a faulty triode would be only twice the normal. Whatever the theory, the 'Rocky Point' effect was one of the great difficulties that had to be addressed by the wireless designer, not only for broadcasting transmitters but for any transmitter using triodes.

Searching For Barbara Heaviside

The item in our July column about Oliver Heaviside (*RadioUser*, July 2021: 41-43) – the first person to discover the effects on radio-wave propagation due to the atmosphere's ionised E-layer – prompted former *RadioUser* Sky High columnist, Godfrey Manning, to write with a request for information:

Barbara Heaviside was a relative of Oliver's and also a school friend in Leeds with Godfrey's late mother. After leaving school, they both became good pen-friends. Godfrey wonders if any *RadioUser* reader can tell him what the relationship was between Barbara and Oliver? Godfrey thinks that Barbara was very young when Oliver died in February 1925 or may even have been born shortly after his death. After a fair amount of research, the authors have, unfortunately, drawn a blank.

[see also Scott Caldwell's History column in this month's issue – Ed.]

Vintage Wireless Equipment

This month's saunter through vintage copies of forlorn newspapers and magazines has unearthed the *Electone Automatic Programme Selector* (Fig. 1). A small sketch of the device, including the all-important plugs, is shown in the advertisement (the text has been left in its original format to reflect the spelling and punctuation conventions of the time). This is the full description of the equipment featured in a *Fredk. J. Gordon* advertisement dated 1927:



"The *Electone Automatic Programme Selector*. Round the clock - any hour is yours - Pick everything good out of the *Wireless Programme* - note the times and then with the aid of 'ELECTONE THE AUTOMATIC PROGRAMME SELECTOR'; your watching and waiting can cease. Simply connect up with Receiving Set and L.T. Battery, put in the plugs opposite times required, and the items you have chosen will automatically come through at appointed hours. It switches off between selections without any move on your part.

"Truly the wonder machine of radio, it makes your set almost human in service, saves wastage of H.T. and L.T. supply and prolongs the life of Batteries and Valves. Remember you secure your full day's selection from the programme at one setting only by using the plugs provided. It is not only a Programme Selector but is at all times an attractive and reliable timepiece. ALL BRITISH INVENTION AND MANUFACTURE. FOOLPROOF AND GUARANTEED. Price 27/6. In polished Mahogany or Oak Case. Write for a Free Copy of 'Father Time Toes the Line', an Interesting Illustrated Folder. Obtainable from all Dealers or direct from the Licensees & Sole Manufacturers. Fredk. J. GORDON & CO. LTD. 92 CHARLOTTE STREET, LONDON, W.1."

This sounds like a truly wonderful piece of technology from 1927. However, without an app, graphic equaliser, an impossible-to-use remote control, and sneaky software

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ALL PICTURES: THE KEITH HAMER+GARRY SMITH ARCHIVE COLLECTION.

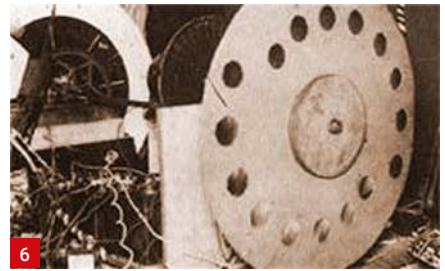


Fig. 1: An advertisement from 1927 for the *Electone Automatic Programme Selector*. Fig. 2: Extensive construction work inside Alexandra Palace ('Ally-Pally') in 1935. Fig. 3: The cupola roof was removed in preparation for the erection of the 220-foot steel mast. Fig. 4: The original transmitting aerials at Alexandra Palace in 1936. Fig. 5: The transmitting mast under construction at Alexandra Palace. Fig. 6: One of the original Nipkow discs used by John Logie Baird. Fig. 7: Baird's *Intermediate Film Process* equipment which filmed studio scenes and transmitted them with a 65-second delay while the film was still wet.



upgrades to make the device useless within a few months, the authors don't think that it would catch on these days, with or without a polished mahogany or oak case!

BBC Television: 85th Anniversary (Part I)

Next year (2022), will mark the BBC's Centenary, and 2021 represents BBC Television's 85th Anniversary. You can share your very own BBC memories here:

<https://tinyurl.com/48vrp5ds>

The World's first, regular, public, high-definition television service began on November 2nd, 1936. The adjectives *first*, *regular*, *public*, and *high-definition* have very significant meanings. Our features on the German inventor, Paul Gottlieb Nipkow (1860-1940; *RadioUser*, September 2020:57-58; November 2020: 25-27; January 2021: 60-61; 30-31) have highlighted the fact that – as the prospect of war in the 1930s grew closer – the propaganda-value of the German 'Third Reich' (which claimed that television was their invention) was soon realised: The *Reichsministerium für Volksaufklärung und Propaganda* opened a television station called *Fernsehsender 'Paul Nipkow'* in 1935.

<https://tinyurl.com/etf85v98>

Although the station was officially classed as being *public*, very few of the Berlin inhabitants could receive the broadcasts at home at the time. Programmes were not shown regularly and with only 180-line resolution, they were certainly not *high-definition*. Even John Logie Baird managed to improve his electro-mechanical system to 240 lines scanning by November 1936.

The BBC's *London Television Station* was established at the Alexandra Palace, affectionately known as '*Ally Pally*'. This was the first purpose-built television transmitting station to be constructed by the BBC. The site was selected as it seemed to offer the best compromise between several requirements, notable amongst which was the necessity for the station to be situated as high as possible above sea level, and yet be near the centre of London. The impressive Palace still exists today, although there are reports of severe financial difficulties. It stands some 300 feet above sea level, between Wood Green and Muswell Hill. It is a very large building, a feature which was an additional recommendation back in the Thirties. The new station was experimental, making it difficult to estimate how much

space would ultimately be required.

The Postmaster-General's Committee met for the first time in May 1934 and was made up of an impressive array of dignitaries including William Mitchell-Thomson (1st Baron Selsdon – Chairman), John Cadman (Vice-Chairman), Vice-Admiral Charles Carpendale, Colonel A. S. Angwin, F. W. Phillips (G.P.O.), O. F. Brown (Department of Scientific and Industrial Research), Noel Ashbridge, and J. Varley Roberts (G.P.O.). They considered the development of television and recommended that the BBC should equip the station with two very different methods of broadcasting television programmes. The systems were to be provided by the *Marconi-EMI Television Company Limited*, and the *Baird Television Company Limited*.

The two divergent systems were tried under strictly comparable conditions, each being used alternately for periods of one week. The BBC leased from the Alexandra Palace Trustees an area of some 30,000 sq. ft. (2,787 sq. m.) in the southeast corner of the Palace in which the main part of the station was housed. A further area of some 25,000 sq. ft. (2,322 sq. m) in the northeast corner included a large theatre which was available for rehearsals and as a general extension. Both areas included a tower. Extensive construction work began in 1935 in preparation for the planned BBC London Television Station (Fig. 2).

From the very outset, BBC bosses, including the Director-General, John Reith, were less than enthusiastic about television. Although Baird, together with the BBC, had conducted many experiments during the late 1920s, the one, and only, mention we could find in technical journals during our research was a brief note in 1929. It stated:

"Television - A system, as yet in the experimental stage only, whereby a fixed or moving object is made visible at a distance by electrical means".

First Aerial System

Although the Baird and Marconi-EMI systems were entirely separate in all other respects, it was agreed at an early stage that they should use a common aerial and feeder system which was designed and erected by the Marconi-EMI Television Company, Limited. One of the earliest steps in the installation of this system was to erect on the southeast tower a mast to support these aerials.

The cupola roof was first removed (Fig. 3). This left the original brick structure of the Palace 80ft high (approximately 24 me-

tres), upon which was erected a mast 220 feet in height (67m). The mast was a steel structure with a square section at the base, gradually tapering for the first 120 feet (36.5m) of height. At this point, the tapering finished, and the section became octagonal. The topmost aerials were located about 600 feet (183m) above sea level. The latter section supported two systems of aerials placed one above the other and of similar design. The upper aerials were for vision and the lower ones for audio signals. Both systems consisted of triangular dipoles in push-pull together with a system of reflectors to enhance the outward radiation which prevented currents from being induced into the steel mast.

The aerials were then connected to the transmitters below by concentric copper tube feeders in which were incorporated certain electrical transformations designed to ensure that the aerial radiated the maximum of picture detail with a minimum of distortion (Fig. 4). The Palace tower was reconstructed to provide an entrance hall on the ground floor with five floors of offices above (Fig. 5). The area in which the studios and transmitters were located was along the south front of the Palace adjoining the entrance hall. The area was, to a certain extent, naturally adapted to its purpose as it consisted of two floors: On the ground floor, there was enough space for three large halls suitable for housing the transmitting apparatus. On the upper floor, there were several rooms; these could be easily adapted to form studios, control rooms, dressing rooms and scenery stores. In May 1934, the TV Advisory Committee stipulated that a minimum of 25 frames per second should be employed at the London TV Station.

A further prerequisite was that the transmission system had to employ a minimum of 240 lines per picture. Before the official start of television in 1936, there were two forms of picture scanning systems available: mechanical and electronic (see next section).

The Mechanical Scanning System

Many methods were employed during the very early days of experimental television in the dissection of the picture before transmission. As we have discussed in previous columns, one of the earliest techniques made use of the Nipkow disc, invented many years ago and named after Nipkow.

This amazing device consisted of a circular metal disc, pivoted at its centre, and drilled with a series of holes on a spiral path

(Fig. 6). Upon rotating the disc, these holes scanned an area. Numerous variations of this arrangement were also used, such as mirror-drums, and discs carrying a spiral of lenses in place of the small holes. While these devices were more efficient in the transmission of light, they dropped out of use as they could not be constructed with sufficient accuracy to be suitable for high-definition television.

By the mid-Thirties, only the original Nipkow disc survived, and this device, running at high speed in an evacuated casing, was used by the *Baird Television Company Limited*, for transmission by all their processes. In the spotlight method – which applied to close-up and three-quarter length pictures of one or two persons only – a projected spot of light traversed, or scanned, the subject in a series of lines and frames in the usual manner. Light reflected from the subject fell upon photo-electric cells, the resultant current variations from which constituted the vision signal. Standard motion-picture films were scanned similarly by passing the flying spot of light through the film and then to a photocell.

Baird invented the *Intermediate Film Process* which applied to more extensive scenes being televised from a studio. This involved the recording (on 17.5mm film) of a photographic image of the scene, utilising an ordinary motion-picture camera. Straight after exposure, the film was rapidly passed, in turn, first through a developing tank, then washed, fixed, and scanned through a Nipkow disc while it was still wet (Fig. 7).

The process took 65 seconds resulting in a transmission delay. The negative film, while wet, was then scanned by a disc that rotated at 6,000 rpm. The illumination for this process was provided by a 30-Amp arc lamp. Due to the film still being wet, there were often strange unintended visual effects during the transmitted scenes.

DX-TV & FM News

The latest DX news, plus details of changes to broadcast television and radio services, are always available online via the *Radio Enthusiast* website:

www.radioenthusiast.co.uk

Stay Tuned!

Please send archive photographs, information, news or suggestions for future topics via the e-mail addresses shown at the top of this column. Unfortunately, we cannot undertake to answer e-mails relating to technical issues or give advice on suitable equipment.

Scott Caldwell

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It is often said that Oliver Heaviside (1850-1925; *RadioUser*, July 2021: 11; Figs. 1 and 2) was a very complex man, with a rather 'rough' personality. He seems to have come across as opinionated and impatient with those he considered less intelligent than himself. Cambridge physicist G.F.C. Searle was a close scientific friend (a rarity in itself) and he described him as "a first-rate oddity".

So, how can we best approach this radio and atmospheric sciences pioneer?

To begin with, and in the most general terms, Heaviside was an English physicist who, it has to be said, has been largely forgotten by many. However, his place in history is secure, and it is now time to tell his remarkable story. The outstanding fact about his life is that he accurately predicted the existence and composition of the ionosphere. This is the electrically conductive layer in the upper atmosphere, which reflects radio waves.

Beyond this, Heaviside was a true pioneer – and a maverick – in a new branch of science (Applied Mathematics). Like any revolutionary discipline, he was professionally attacked for his views on the experimental nature of mathematics as a tool. Heaviside also played an important role in the development of James Clerk Maxwell's (1831-1879) electromagnetic theory. This culminated in the development, amongst other things, of coaxial cable, and it is still a fundamental aspect of the radio hobby.

The Makings of a Genius

It is not well known that the Heaviside family lived on the fringes of poverty in the notoriously crime-ridden, lower-class area of Camden Town, a classic representation of 'Dickensian' London.

Heaviside's home was just around the corner from where the legendary Charles Dickens had lived during the most miserable part of his childhood. The only consistencies of the local areas were poverty, crime, disease, and death.

His father, Thomas, was a skilled wood engraver whose skills were being systematically eradicated by advances in manufacturing technology that underpinned the industrial revolution. His mother, Rachel Elizabeth (*née* West), was a former governess who now managed a small school that catered



PUBLIC DOMAIN

A Maverick and Radio Pioneer (Pt I)

In the first part of a two-part article, **Scott Caldwell** examines the life and work of Oliver Heaviside (1850-1925), beginning with early life and portraits of those who exerted the greatest influence on him.

for the neighbourhood children. After receiving a small inheritance, the family moved to a more affluent area of Camden Town, reducing the bad influences of petty criminality that Heaviside had been routinely subjected to.

He later described his childhood in a letter to Irish physicist George Francis FitzGerald: "I was born and lived 13 years in a very mean street in London, with the beer shop and bakers and grocers and coffee shop right opposite, and the ragged school and the sweeps just round the corner.

Though born and bred up in it, I never took to it and was very miserable there, all the more so because I was so exceedingly deaf that I couldn't go and make friends with the other boys and play about and enjoy myself. And I got to hate the ways of tradespeople, having to fetch the things, and seeing all their tricks. The sight of the boozing in the pub made me a teetotaler for life. And it was equally bad indoors. Father was a naturally passionate man, soured by disappointment, always whacking us, so it seemed. Mother similarly soured, by the worry of keeping a school".

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Fig. 1: Oliver W Heaviside (1850 – 1925).
 Fig. 2: Our coverage of the pioneer in July 2021.
 Fig. 3: Arthur E. Kennelly (1861-1939).
 Fig. 4: James Clerk Maxwell (1831-1879).

Charles Wheatstone's Influence

Heaviside's social communication skills were adversely affected by scarlet fever which impaired his hearing. This greatly affected his life, making his childhood unhappy; socially, it restricted his relationships with other children. Heaviside was of slight build, and he stood out due to his bright red hair. Despite his lack of social skills, his school reports were rather good, and in 1865 he was graded fifth place out of 500 students.

However, he initially had little interest in academic subjects, and he left school at 16 years of age.

Many historians have argued that he had become disillusioned with the regime in the school. Others have advocated that the reason for Heaviside leaving formal education was solely related to the fact that there was a lack of finances to support him anymore, even though he was just beginning to mature academically.

However, leaving school did not mean that Heaviside abandoned learning altogether. Under the guidance and tutorship of his famous uncle, Sir Charles Wheatstone (1802-1875), an inventor of the early telegraph and a well-known musical instrument manufacturer, Heaviside studied languages (German and Danish), music, and learned the fundamentals of telegraphy. Under the patronage of his famous uncle, Heaviside obtained employment as a telegraph operator in Denmark.

It was whilst working in Denmark that Heaviside discovered that, apparently, signals from England to Denmark could be transmitted faster than those sent from Denmark to England. Heaviside was regarded as a valued employee at the *Anglo-Danish Cable Company*.

However, he required special management as many considered him to be 'prickly', and he frequently refused to do tasks that he thought were beneath him.

A consistent worry for Heaviside was his physical health and mental wellbeing. He was plagued by a condition he called 'hot and cold disease', which developed into nervous disturbances that he feared might be an early indication of epilepsy. A death sentence in Victorian England.

Cable telegraphy was the growth

industry in the late 1860s. It was slowly beginning to mature into a reliable communications network, represented by the successful spanning of the Atlantic Ocean in 1866. The vast majority of telegraphy cables were built, laid, owned and operated by British firms who seemed to own a monopoly of this emerging industry. After all, they were tasked with networking the vast British Empire – an empire where the sun never set.

Directions and Publications

Concerns about his deteriorating health forced Heaviside to re-evaluate his future career direction; in May 1874, he resigned from the Anglo-Danish Cable Company. He became determined to focus on his one true passion – scientific research. He would never again hold a full-time paid position, but insisted on working full time, devoted to electrical research problems that held back the development of global wireless communications. His brother Arthur provided much needed financial support, and he also occasionally collaborated on research projects related to engineering.

However, Heaviside worked essentially in isolation at his parent's spare room, his mind fully engaged in the task at hand. He was a regular contributor to the trade paper *The Electrician*, a publication with an ambition to constantly improve its academic scope and standing. He received the sum of £40 per year for his efforts. Between, 1883 and 1887, he published approximately two to three articles per month.

These formed the bulk of his scientific output, now known as *Electromagnetic Theory and Electrical Papers*.

The Kennelly – Heaviside Layer

One of the most important contributions Heaviside formulated, in the context of modern telecommunications, was his prediction in 1902, of an ionized reflective layer in the atmosphere. This was found to reflect radio signals back towards the Earth. The Irish-American electrical engineer Arthur E. Kennelly (1861-1939; Fig. 3) was working independently on research that proposed the existence of a 'reflective' layer in the Ionosphere. He published his work in March 1902, and Heaviside followed suit in December 1902.

Subsequently, this atmospheric layer became universally known as the *Kennelly-Heaviside Layer*.

It is now known as the *E-Layer*.



This ground-breaking research helped to solve the mystery of how Guglielmo Marconi (1874-1937) had managed to transmit wireless signals over the horizon, from Poldhu in Cornwall to St John's, Newfoundland (Moldwin, 2008: 11-12, 75). Subsequently, Edward Appleton (1892-1965) proved the existence of such a layer in 1927, for which he was awarded the Nobel Prize in 1947 (Judge, 2020: 40).

The Polymath: James Clerk Maxwell

Applying his unique mathematical skills, Heaviside utilised the theories of James Clerk Maxwell (1831-1879; Fig. 4) theories to telegraphy lines, particularly to ones that transmitted over long distances. His research primarily focused on underwater cables. It was here that both the speed and scope of the signals were impaired by the effects of the inductance of the cables. This research managed to solve one of the problems that plagued early versions of telegraphy systems. This concept was further applied to telephone systems that were unable to transmit voice signals over long distances, as low and high frequencies travelled at varying speeds. They ultimately became a garbled noise that was virtually impossible to coherently understand.

Table 1 contains a summary of Oliver Heaviside's life and work.

A collection of Heaviside's notebooks, papers, correspondence, notes, and annotated pamphlets on telegraphy are securely held at the Institution of Engineering and Technology (IET) Archive Centre.

In Part two of this article, I will be looking at some more details of Oliver Heaviside's achievements and at his multi-faceted personality, which could be both help and hindrance to his life's work.

[Check out Keith Hamer's and Garry Smith's brief coverage of Oliver Heaviside in the July 2021 issue of RadioUser (RadioUser, July 2021: 41-43) – Ed.].

- Coaxial Cable
- Heaviside-Kennelly Layer (E-layer) Ionosphere
- Heaviside Cover-Up Method
- Heaviside Step Function
- Reactance
- Vector Analysis

Table 1: Oliver Heaviside: Key Research Areas and Scientific Contributions (A-Z).

- 1885-87: 'Electromagnetic Induction and its Propagation', *The Electrician*. 1887. Electrical Papers
- 1888/89: 'Electromagnetic Waves the Propagation of Potential, and the Electromagnetic Effort of a Moving Charge', *The Electrician*
- 1889: 'On the Electromagnetic Effects due to the Motion of Electrification through a Dielectric'. *The Electrician*.
- 1892: 'On the Forces, Stresses, and Fluxes of Energy in the Electromagnetic Field', *Royal Society*, 183, pp 423-480.
- 1892: 'On Operators in Physical Mathematics', Part 1, *Royal Society*, 1(52), pp 504-529.
- 1892: Electrical Papers, Volume 1, *MacMillan Company*, London & New York.
- 1893: 'On Operators in Physical Mathematics', Part 2, *Royal Society*, Vol 54, pp 105-143.
- 1893: 'A Gravitational and Electromagnetic Analogy', *The Electrician*.
- 1893: 'Electromagnetic Theory', Volume 1, *The Electrician Printing and Publishing Company*, London.
- 1894: 'Electrical Papers', Volume 2, *The Electrician Printing and Publishing Company*, London.
- 1899: 'Electromagnetic Theory', Volume 2, *The Electrician Printing and Publishing Company*, London.
- 1912: 'Electromagnetic Theory', Volume 2, *The Electrician Printing and Publishing Company*, London.

Table 2: Significant Publications by Oliver Heaviside, in chronological order.

- Heaviside, O. (1892) 'Electrical Papers', *MacMillan & Co Ltd*, London, England, Vols I and II
- Mahon, B. (2009) 'Oliver Heaviside: Maverick Mastermind of Electricity' (London: IET)
- Mahon, B. (2017) *The Forgotten Genius of Oliver Heaviside: A Maverick of Electrical Science* (London: Prometheus Books)
- (2009) *Oliver Heaviside - Maverick Mastermind of Electricity (History of Technology Series)* (IEEE)
- Moldwin, M. (2008) *An Introduction to Space Weather* (Cambridge: CUP)
- Nahin, P.J. (2002) *Oliver Heaviside [...]* (London: The Johns Hopkins University Press London)
- Searle, G.F.C. (1950) 'The Heaviside Centenary Volume' (London: IEE).

Table 3: Further Reading on Heaviside.

Radio News

LOCAL BBC RADIO PROGRAMME SHARE:

Local BBC Radio in England is to share more programmes between stations to help with staffing problems due to self-isolation issues. Chris Burns, Head of Audio and Digital for the corporation, told staff this week across the country that some output across the day and at weekends will be networked with nearby stations.

For example, in Yorkshire, BBC Radio Sheffield, BBC Radio York and BBC Radio Humberside will take the evening show from BBC Radio Leeds with Sanchez Payne, Monday to Thursday starting next week. All four stations will then take the Friday evening show from BBC Radio Lincolnshire. Chris Burns said: "In order to preserve our resilience and ensure that no one is forced to cancel planned leave – from next week, Local Radio will be sharing some output across the day and at weekends. We have discussed this with the NUJ and BECTU, who are supportive of this approach and we have also stressed to them, that this is an interim measure to get us through the summer and we will return to our current schedules on 6th September."

In March 2020, standardised schedules with four-hour shows and no double-headers were introduced across the network. This move was introduced as a 'temporary' measure' but there are no signs of the previous structure being reinstated at stations.

Dozens of long-serving presenters have also left the network over the last 15 months due to the lack of work or changes in the target audience.

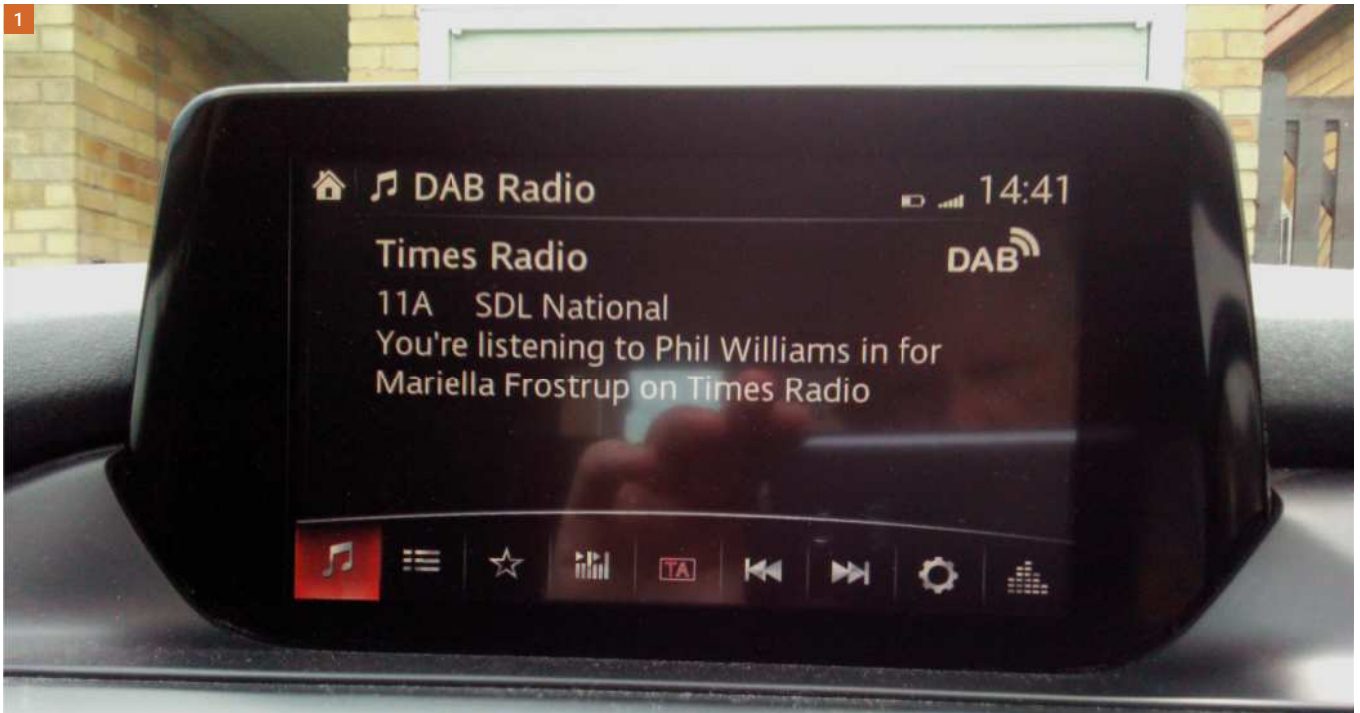
(SOURCE: Radio Today | National Press | Industry Press, August 2021)

<https://tinyurl.com/484f7ahe>
<https://tinyurl.com/fnmtty6j>

HAM RADIO AND MENTAL HEALTH:

It comes with all the benefits of social media but without any of the downsides, and one of Australia's oldest ham radio enthusiasts says it is also the perfect hobby for retirees looking to stay mentally sharp. West Australia-based Norman Gomm VK 6 GOM took to ham radio over 40 years ago and now - aged 82 - has no intention of signing off just yet. As one of VK's estimated 10,500 licensed ham radio operators, VK6GOM is also President of the Bunbury Radio Club. (SOURCE: ICQ Amateur/ Ham Radio Podcast | Colin Butler | ABC)

<https://tinyurl.com/k7rhs68>
<https://tinyurl.com/y72kmts2>



In-Car DAB Standards and Portable DAB Receivers

Kevin Ryan

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The DAB presentations to the Kuala Lumpur-based Asia-Pacific Broadcast Union (ABU) in July 2021 contained a very interesting

session on DAB in-car receivers. As I have mentioned before, the WorldDAB organisation has been spending a lot of time on this sector bringing together interested parties to create a new radio/media dashboard in cars and other vehicles.

The most interesting part was the results from a study of the features found on this type of receiver. I am not sure how many models were tested. The results apply to car radios rather than domestic units but there is some crossover.

<https://www.abu.org.my>
<https://www.worlddab.org>

Receiver Profiles

The WorldDAB umbrella organisation regularly reviews and updates its

Kevin Ryan tests the portable Azatom Aspire G1 and DAB PC-1A DAB radios and investigates the latest trends in the rapidly evolving area of in-car DAB radio technology and transmission standards.

receiver profiles, providing the minimum specification for a basic DAB+ receiver, and of what it calls a 'rich-media' one. The profiles cover both in-vehicle and domestic devices.

However, in practice, the two types of radios are now on different development paths, mainly due to the large display screens installed in new cars.

WorldDAB assumes that new cars will nearly all have an internet connection, possibly via 5G, and car radios will be hybrid models, mixing and matching data from both radio and online.

There are hybrid domestic receivers now branded as *SmartRadio*, but most of them are just DAB+/FM capable.

<https://tinyurl.com/4aeak764>
<https://tinyurl.com/nzvnjemj>

In-Car Radio Features

The review identified the eight features listed in Table 1 as common to almost all in-car receivers. I went through the DAB radio in my Mazda 6 (bought in 2016) and ticked the features (✓) implemented on that device (Fig. 1). The radio supports hard-linking (see glossary) but it is an optional setting; the device doesn't handle/display images or station logos.

However many in-car receivers do things a bit differently and that may be to do with the age of the device and a trend to 'unclutter' the screen (Table 2).

Radios with the latest modules from Frontier Silicon, such as the *John Lewis Octave* can display images sent as part of the audio data (X-PAD) and via a separate (packet-mode) sub-channel.

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Fig. 1: My Mazda car radio includes AM, FM and DAB+. DAB stations are listed by ensemble, without the option to list them alphabetically.
Fig. 2: The Azatom Aspire G1 radio is good value for money and solidly built.
Fig. 3: The DAB PC-1A: Its standby analogue clock is well designed. It offers a chargeable battery and makes for a handy travel radio.

DAB Receiver Trends

To gauge how DAB radios are developing for the domestic market I purchased a couple of devices from suppliers on eBay. These mini-reviews skip over Bluetooth and FM reception to concentrate on DAB/DAB+ features and the number of buttons and sockets on the device.

The Azatom Aspire G1

This supplier was unknown to me up to a few months ago. It offers a range of receivers on its website. I ordered the device from the company's eBay store (at £35) because their website shop was not linked to any payment gateway. I picked the Aspire G1 to compare it with the Pure Elan DAB+.

This is a different style of radio, not least in terms of buttons on the front panel. Azatom defines this radio as being in the 'retro-style' category (Fig. 2). The buttons are *TUN-*, *TUN+*, *MENU*, *Power/Mode*, *Preset*, *1* or *2*, *3* or *4* and *5* or *6*. The radio has 30 presets for DAB, with six available on preset buttons in three sets of two.

There is a multifunction (Select/Snooze/Skip Forward) control knob on the side for *SELECT* or volume adjustment. It took me a bit of time to master this knob because I tended to scroll away from my choice as I pushed to select it. The unit has a head-phone socket, an aux-in socket to play audio from an external source, and a DC-in connector. The radio is either mains-powered via a micro-USB connection or by inserting 4 x AA batteries. The standby screen is an analogue clock with Roman numerals, which is rather different. The device has a three-year extended warranty provided you register it via your Azatom account.

The colour display based on a dot matrix is 60mm on diagonal. It can display mode, time and battery level at the top; the name of the radio station is next, then a block with an icon showing the mode and station information. At the bottom, there are various 'status' icons showing, for example, if an alarm is set, the preset number of the station, and a five-segment representation of the signal strength, next to the aerial symbol.

The signal strength and the aerial symbol are shown on the main display, which also



offers an option (in the info-carousel) that shows the error rate (in per cent) and a horizontal bar graph.

The System Menu

The system menu is accessed by long-pressing the *MENU* button. A short press of the same button opens the information carousel. The top level of the menu contains options for *Full Scan*, *Manual Tune*, *Prune* and *System*; the *System* Sub-Menu is where you will find the functions for *Sleep*, *Alarm (x2)*, *Time*, *Backlight*, *Language (English, German, French and Italian)*, *Factory Reset*, and *SW (Software) Version*.

The *Time* sub-menu expands to *Manual Setup*, *Auto Update (Any source, DAB, FM, none)*, *Time Format (12/24h)*, and *Date Format (UK/US)*. The *Backlight* feature adjusts light levels for the display. Last but not least, the *Factory Reset* option allows users to restore operations by carrying out a system reset.

The Azatom Aspire G1 in Operation

As always with a new radio, finding your way around the controls and menus takes a little time to learn, especially when it comes to short- and long-press options for a button. The telescopic aerial extends to 37cm (the Pure Elan DAB+ extends to 53cm) but it does not impact the sensitivity too much.

In a comparative test, both radios picked up 42 DAB services; however, the Elan

- DAB stations are shown all together in a single list, alphabetically sorted
- Have on-screen and physical buttons to navigate between stations (✓)
- Show (at least a truncated version of) text (DL) (✓)
- Support extended text mode (DL+)
- Can show visual images (DAB) slideshow delivered using audio channel (X-PAD)
- Support announcements (✓)
- Support alarms
- Has hard-linking enabled by default.

Table 1: Essential DAB In-Car Features (WorldDAB).

- Listing DAB and FM stations separately (✓)
- Showing station logos from various sources
- Showing all the text sent via DL (✓)
- Having two or more tuners (unknown)
- Showing ensemble names (✓)
- Showing stations listed by ensemble (✓)
- Showing DAB channel numbers and frequency information (✓)
- Nighttime mode to dim visuals (✓)
- Current and Next programme information
- Soft linking to stations of a similar genre (✓)
- Support part-time services like BBC Radio 4 Parliament
- Receiving DAB slideshow via Packet Mode Channel (e.g. Capital London, Heart London).

Table 2: Desirable In-Car DAB Radio Features.



3

picked up another 10 in a couple of reruns. For a small portable with a single 3" speaker, the audio is pleasant to listen to. Unlike some other receivers, there is no equalizer to shape the audio to speech or music. Having six presets available on buttons is a plus for me.

The information carousel (short-press of the *menu* key; long-press accesses the menu proper) cycles through the available information in this order: *Signal quality* – *programme type (PTY)* – *Ensemble Name* – *Ensemble channel & frequency* – *audio coding in use* – *Today's Date* – *DLS text*.

The DAB PC-1A Radio

This is a radio I have chosen from an eBay seller at £27. Unsurprisingly, this radio is made in China. This is a small portable radio almost the same size as a personal radio, and the few controls are all of the push-button type. The specification is quite high, and the device is only slightly let down by its sensitivity, which just falls short of a portable with a longer aerial. The radio supports a slideshow (image display), but it will only display images included in the audio data stream. The radio re-booted itself on both Capital London and Heart London. Both of those have a separate image channel, and I think the radio's sensitivity was a factor in this context.

The DAB PC-1A in Use

With a reduced button count of just four (*up*, *ok*, *down*, *mode*) many functions, such as station presets, are now in the 14-item main menu. The menu and sub-menus are very similar to that of Azatom, but this radio has

an equalizer and the option to switch between an analogue or digital clock when on standby (Fig. 3). The *up* and *down* buttons both access the station list; once the list is open, they can be used to move through stations.

On the side of the radio are the *up* and *down* volume controls. When short-pressed, these provide access to the information carousel and the system menu, respectively. The radio has a micro USB power input. This also charges the internal battery and a headphone socket. The latter works best on a three-pole plug. I tried an i-phone type headset, but this did not establish a reliable connection. The menu functionality of the radio is very similar to that of *Majority* radios, and the device has a passing resemblance to the *Majority Eddington* model.

The telescopic aerial is 42 cm long when fully extended but it is not as sensitive as the Azatom Aspire. When I powered the radio up the first time, it was pre-loaded with DAB stations from Australia!

The best aspect of this radio is its size/. The telescopic aerial gives it an edge over personal DAB radios, many of which employ the wire in the headphones as the aerial.

Receive Sensitivity

My estimates of a radio's sensitivity are not very scientific. I use a digital radio from Pure as a 'benchmark' because it has been tested and awarded a *Digital Radio Tick Mark* (see below). Most modern DAB receivers show basic technical information, typically signal error as a number, and signal strength, usually as a horizontal bar. My tests on digital radios and those carried by profes-

Service Following Service following is maintaining the same audio or data content that the user has selected to cope with the reception conditions that occur when travelling by car.

Hard Linking The radio switches to an alternative broadcast of the tuned service.

Soft Linking The radio switches to a similar broadcast to the tuned service (i.e. Capital Radio London to Capital Radio UK).

Capacity Unit A Capacity Unit (CU) is the smallest segment in a data frame and contains 64 bits. A data frame contains 864 CUs that is the multiplex limit.

Dynamic Label (DL) A text message with information, such as track playing, now/next, news headlines, weather, sports results, and so on. Broadcasters usually send DL messages frequently and with different content, one after the other. Each message replaces the one sent before.

Dynamic Label Plus (DL+) Extension of the DL feature; allows storing and filtering of DL messages in the receiver, which can then be selected by the listener. Users do not need to read, or even be aware of, the complete stream of DL messages.

F-PAD Fixed Programme Associated Data is information that is related to the audio such as Dynamic Label messages.

X-PAD eXtended Programme Associated Data provides data capacity for new uses and applications associated with the audio, such as adverts, artists' pictures, and weather maps.

TPEG Stands for Transport Protocol Expert Group, which defines how traffic and travel information is decoded by a DAB radio.

Table 3: Glossary of Terms and Acronyms Used.

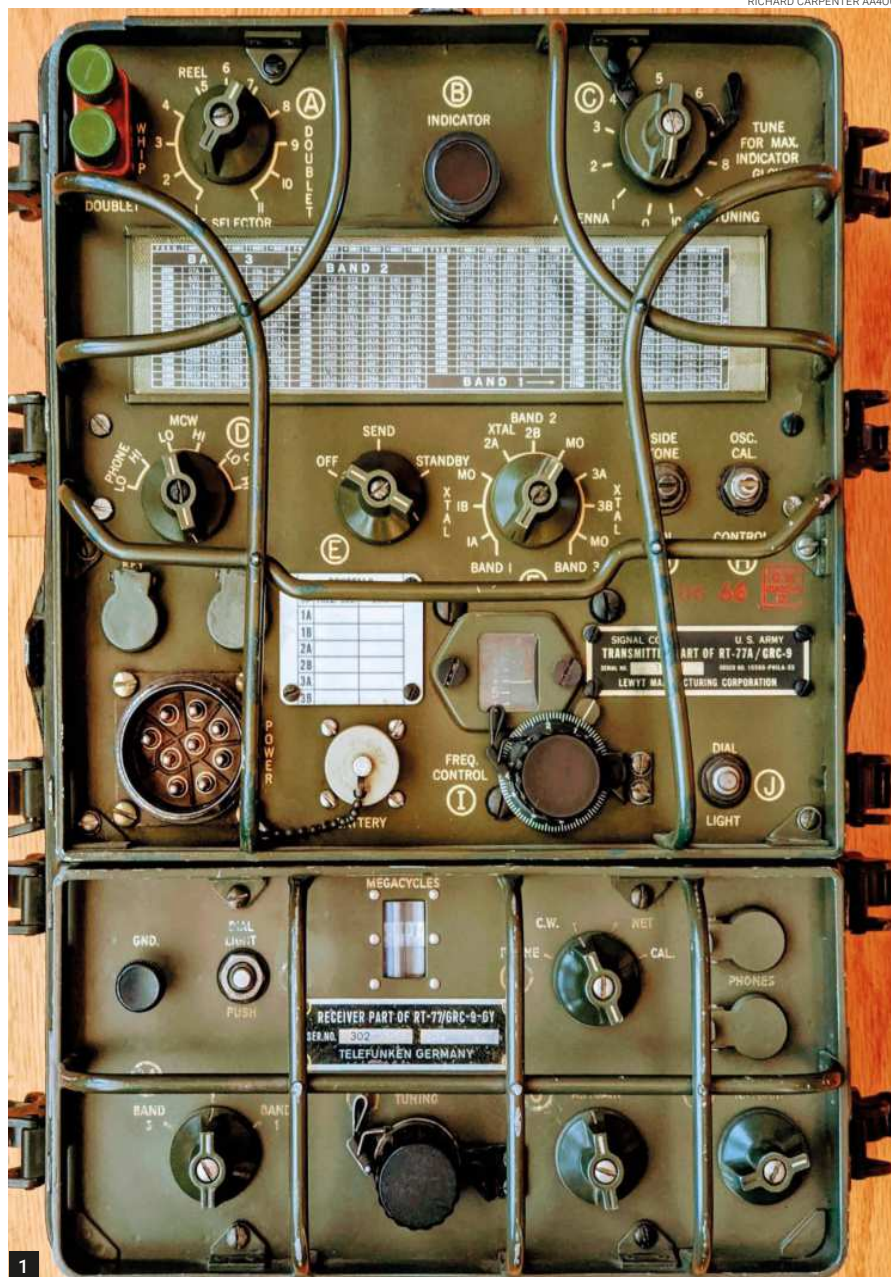
sional testers show that the way the signal strength bar progresses is rather arbitrary. For any given receiver there is no consistent relationship between each segment and the strength of the received signal. I found the Pure Elan E3 and the Elan DAB+ to be fairly consistent. Both have 17-segment signal strength bars, with a solid line between levels five and six. I think the lower portion of the scale changes at 4dB/segment and then changes again to 2dB/segment.

Many DAB+ receivers sold in the UK have a *Digital Radio Tick Mark*. This informs the buyer that the digital radio in the box has been tested and approved as being able to receive all FM, DAB/DAB+ stations available at a particular UK address.

<https://getdigitalradio.com/digital-radio-tick-mark>

Table 3 contains a glossary of terms used in this column. See you next time.

RICHARD CARPENTER AA400



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The AN/GRC-9 ('Angry-9'; Figs. 1 and 2) was a low-power transmitter/receiver (TX/RX) portable field or vehicle set widely used by the USA. Its design originated with the Avco Mfg. Corporation (USA) at the end of WW2. Later versions were built under licence in Europe by TRT (Paris), Telefunken (Germany) and others. The radio was used by forces during the Korean and Vietnam wars, and well into the 1960s. It was also deployed by NATO. Germany and France built copies with various improvements, such as especially external power amplifiers. It saw considerable service in Africa, Indonesia, and across many other areas around the world.

The radio was also used (1950-1970) by the Dutch armed forces, and saw action in New Guinea and Suriname; it helped for communications in Holland during the disastrous floods of 1953 and was operated by the Dutch Navy and Marines for various other operations in that period. It was also in service in the French Foreign Legion, as late as 1979.

It replaced the SCR-284, SCR-288 and SCR-694 models and was, in turn, replaced by the AN/PRC-62 and AN/PRC-74. The designation AN/GRC-9 refers to AN (Army/Navy), G (Ground, general use), R (Radio), C (Communications), Serial 9.

Table 1 lists the key specifications of this memorable radio.

The vibrator had two independent power supply systems with a three-level selectable input of 6, 12 and 24V from the vehicle's battery. A heavy-duty circuit powered the receiver and transmitter for normal two-way communication. A smaller one powered the receiver only, for long periods of listening.

For portable operation, a hand-operated generator (GN-58, Fig. 3) was cranked at 50-60 rpm. When it was used alone, the transmitter output was less than when the vibrator unit was used. When carried in the field, the set was removed from its metal mounting and carried in a canvas rucksack.

On a foot patrol, three men carried the set and its accessories. One of them carried the TX/RX, the second one the hand generator and a third soldier the accessories, including the antenna reel, Morse key (Fig. 4), rope reel (to stretch the antenna), connecting cables for the generator and TX/RX, head-phones, and instruction manual.

The Dependable 'Angry-9': Workhorse of the Special Forces

Tony Smith returns to the subject of vintage radios and looks at a famous portable military field- and vehicle-radio, which remained in use long after the WWII ended.

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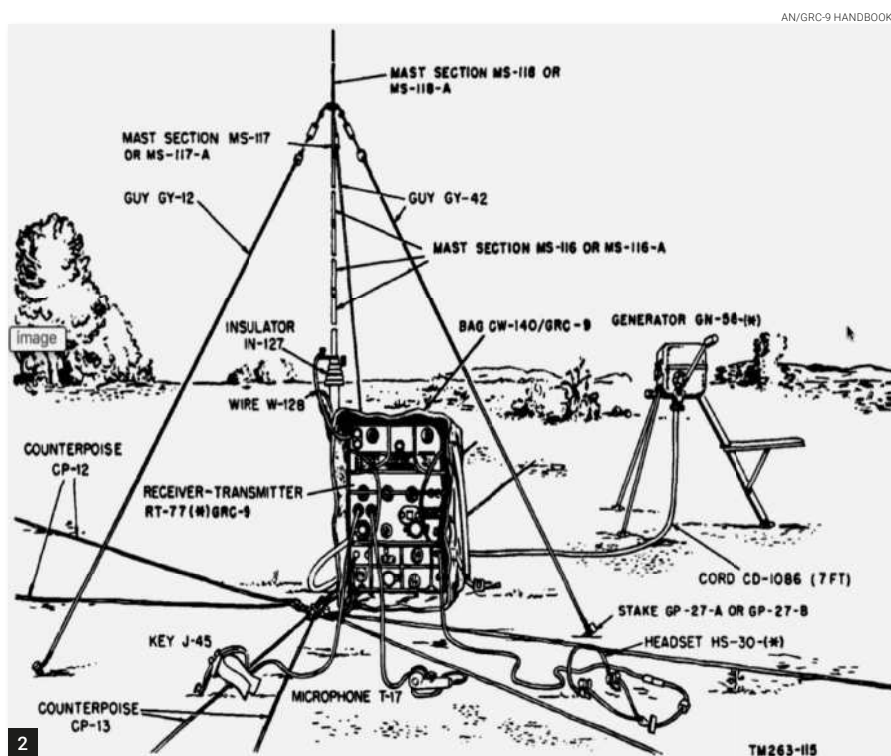


Fig. 1: The 'Angry-9' Radio. Fig. 2: Typical ground installation with a whip antenna. Fig. 3: The 'Angry-9' Generator (GN-58; Illustration: AN/GRC-9 Handbook). Fig. 4: A J-45 Morse key (a standard US Army J-37 key, mounted on a leg clamp). It was used with the 'Angry-9'. Fig. 5: Melbourne 1997: Demonstration of an 'Angry-9' used by the Australian Antarctic Field Expeditions in the 1960s.

In the Antarctic

Army surplus AN/GRC-9 units were the main sets used by the Australian National Antarctic Research Expeditions (ANARE) in Antarctica in the 1960s for fieldwork on the ice (Fig. 5). The transmitters were carried by *Snowtrac* and *Weasel* vehicles and operated on 2.720 and 4.040MHz to work back to the base camp at Mawson, using a whip aerial. Tractor trains travelled hundreds of miles into the interior of Antarctica for up to three months at a time, using the 'Angry-9' with CW to keep in contact with their base. Dog teams also carried the set, which was powered by the hand-cranked generator. A whip aerial was ordinarily used, but it was found that, on the plateau-ice, dipoles could be laid out on the ice to load and transmit without a problem.

In Amateur Use

Well made, rugged, and ready for use on several bands without conversion, the 'Angry-9' was popular with amateurs, possibly more so in the USA than the UK, when it became available on the surplus market in the 1970s and 1980s. The short ranges are detailed in the specification; they are related to the official requirements for equipment of this type.

However, as any QRPer (low power operator) knows, rigs of this power, with a good antenna, are capable of communication over very considerable distances (Fig. 2). The only drawback is that the lettering on the front panels was painted with radioactive radium paint to make it visible in the dark. Misleadingly, with age, the lettering will no longer glow in the dark, while the level of radiation remains almost undiminished. The paint may have become flaky creating a risk of radioactive dust inhalation if disturbed. It is not necessarily a high level of radioactivity, but caution needs to be exercised

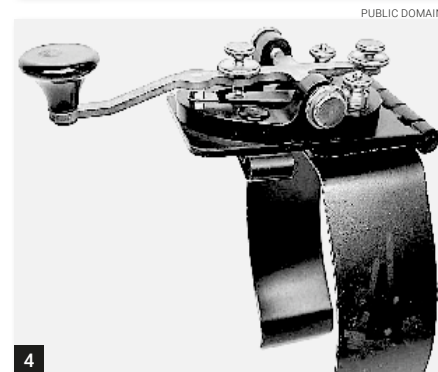
Radioactive Lettering

Luminescent radium paint was widely used in vehicle instrumentation and other military applications until the 1960s, at around the time the 'Angry-9' was beginning to be replaced by later models.

Therefore, all surviving sets are likely to be affected.

The following advice is given by David Stinson AB5S in his article 'Radiation', on the Wireless Set No. 19 Group's website:

<https://www.qsl.net/ve3bdb/hazards.html>
 "There is no need to be nervous if you arm yourself with the proper knowledge and



respect [...]. The radiation levels emitted by some military gear and aircraft instruments are not threatening with normal use even if you are sitting in close proximity. Hams have a generic inability to keep screwdrivers out of things, so there are times you might need to open your equipment for maintenance [...]. Casual contact on a surface won't hurt you; ingestion will. Since all or most of us don't have vent tables available, here are my guidelines for working with very low-level radioactive materials (Table 1). Sealing exposed radium paint on surfaces... with clear-coat should be a good idea. I've never personally had to do this. I would ask the experts because, if you use the wrong paint, the clear-coat could eventually flake off the aluminium and carry the radium with it. Someone out there knows which would be best to use."

Caution Required

Considering the large number of these sets that were in use over the years, it doesn't sound as if the radioactive lettering has posed too much of a problem; but clearly, caution needs to be exercised when cleaning, repairing, or maintaining old equipment particularly where the paint may have become 'flaky' with age.



A search of the internet has not found a suitable clear paint or lacquer to cover exposed radium paint as suggested by AB5S. If any readers of *RadioUser* have experience of taking such a precaution, it would be interesting to hear from you.

Now of Historical Interest

In the 1990s, complete 'Angry-9' working stations could be obtained for around £180-200, and some are still advertised today for around the £300 mark. However, they are now more of a historical than practical interest, attracting collectors rather than potential operators. Even so, 'Angry-9s' can still be heard occasionally, working from a special event or special interest station.

It is good to hear them helping to keep the heritage of amateur radio alive.

With thanks to David Stinson AB5S for permission to quote from his article 'Radiation' on the *Wireless Set No. 19 Group* website.

Further Information

An informative web site: AN/GRC-9 Radio Set: Includes many recollections by both military and amateur users:

<https://tinyurl.com/ym7tv65p>

Condensed *Operating Instructions* for AN/GRC-9, *Dept of Army Technical Manual TM 11-263*, June 1956.

<https://tinyurl.com/m9uyyx3h>

Key Specifications: AN/GRC-9

- Frequency range: 2-12MHz in three bands; 2-3.6 / 3.6-6.6 / and 6.6-12.0MHz.
- Transmitter frequency control: Master oscillator or crystal control (two crystals in each band).
- Modes: CW (Morse), MCW (Morse), AM (speech).
- Output power: High output - R/T (Speech), 7 watts; CW, 15 watts.
- Low output - R/T, 1 watt; CW, 5 watts.
- Range: From moving vehicle - R/T, 15 miles; CW, 30 miles. Stationary - R/T 25 miles; CW, 75 miles.
- Morse key: U.S. Army type J-45. (Standard J-37 key mounted on leg clip; Fig. 3).
- Valves: Transmitter 5. Receiver 7, with 1.5V filaments.
- Receiver: Superheterodyne.
- Calibration. Built-in crystal oscillator.
- Antenna: 15 ft (4.57m) whip antenna, or long wire 244.5 ft (74.5m).
- Power supply in a vehicle: Vibrator unit powered from the vehicle battery, providing 105v HT and 1.4v LT.

Taking Radioactivity Precautions

- NEVER eat, drink or smoke while working with radioactive items.
- Work only in a well-vented area like a garage with the big door open. Don't work in a house where people can be exposed.
- Place a fan blowing gently ACROSS your work area toward the outside. This will blow any particulates away from your lungs. A fast breeze will just create eddy currents. Make sure the path to the door is clear so no eddy currents carry particles back to you. Radium is heavy and wants to sink to the floor. Let it. If you don't want to do this, I very much recommend at least a painter's cloth breathing mask.
- Wash your hands with soap and water when you're finished.
- The best way to clean a radium-painted surface is DON'T! But people will. Remember that any brushing, wiping or scrubbing you do WILL pick up particulates. You now have a radioactive cleaning cloth!
- DO NOT attempt to remove the paint to 'get rid of the problem'. You'll end up with LOTS of particulates and run a serious risk of contaminating yourself and everything around you, not to mention creating a waste product for which you could go to jail if you were to throw it in the household garbage.

Table 1: Specs and Precautions.

Radio News



LOST TAPES FOR NEW DOCUMENTARY SERIES:

Jazz FM is to broadcast a three-part series of long-lost interviews with some of the giants in classic jazz thanks to a new partnership with the UK's National Jazz Archive. The new series comes following on from the spring broadcast of a lost interview tape of jazz saxophonist Stan Getz. Hosted by Helen Mayhew, these three-hour-long programmes will feature the highlights of many hours of interviews with long since departed legends – jazz pianist Oscar Peterson (d.2007), singer Sarah Vaughan (d.1990) and drummer Art Blakey (d.1990). Recorded by journalist Les Tomkins who bequeathed the library of recordings to the National Jazz Archive when he himself died last year, these interviews have never been heard before and were used to help him write his jazz articles for, amongst others, *Jazz News*, *Crescendo* and *Melody Maker*. Jazz FM's Content Director Nick Pitts said: "We were scratching our heads as to how to top our amazing Clive Myrie fronted ten-part series on the history of jazz and most recently the beautiful six-week-long love letter by Sir Michael Parkinson to the music, and then this amazing opportunity comes along! The programme will just scratch the surface of these extensive interviews, amongst so many more in the NJA, but I'm hoping that our audience of inquisitive jazz hungry lovers will find this as fascinating as I will. I'm grateful to the National Jazz Archive for partnering with us on this landmark opportunity to shed some intimate light on these great names." "The Lost Tapes..." host Helen Mayhew added: "These interviews give us a chance to hear the voices of some of the greatest names in jazz, providing a unique insight into their music and lives. Oscar Peterson, Art Blakey and Sarah Vaughan are all hugely influential and important figures in the music, and all have great stories to tell." "The Lost Tapes..." with Helen Mayhew is on each Sunday at 9 pm.

(SOURCE: Jazz FM | Radio Today)

<https://tinyurl.com/48cfrjv>

Robert Connolly
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The weather – we all love to comment on and complain about it. It is too hot, it is too cold, it is too wet, it is too dry, it is too windy! Those are all the comments we hear about, and the view you take depends very much on the type of work that you do. For example, an office worker during a heat wave would say it was too hot, whereas somebody on a seaside holiday would say that the weather was fantastic. On the same theme, a farmer would be unhappy as there was no rain to help his crops grow, or too much preventing him from harvesting his crops.

Many professions depend on accurate weather forecasts to enable them to do their job. For example, pilots need to know about wind direction and strength, visibility, and so on, to optimise their flight for safety and fuel economy. Those who work on the sea also need to know accurate weather information, especially wind strength and associated wave height to enable the vessel to operate safely and keep its crew members safe.

We have all seen weather forecasts on the television or heard them on the radio.

Maritime and Aeronautical

Those of us involved in the radio hobby will also be aware of other sources of up-to-date weather information. Maritime Safety Information (MSI) voice broadcasts on marine MF/HF and VHF channels carry weather forecast information for those at sea. In addition to this, maritime weather information is transmitted by NAVTEX and RTTY, along with weather charts transmitted by Radiofax stations, such as Northwood (UK) and *Deutscher Wetterdienst* (DWD, Germany) in Europe.

Precise weather forecasting requires metrological forecasters to have extensive current actual weather reports for them to forecast the weather for hours and days in advance. These reports come from various sources on a regular six-hour (or less) basis.

The Heavens Above

Airports produce weather observation reports every 30 minutes (or less if there are rapid pressure or other significant changes). These observation reports are made either by using a trained meteorological observer stationed at larger airfields or an automatic weather station. While the data is used by Air Traffic Control (ATC) to keep aircraft up to date on

Maritime Weather Resources

Robert Connolly checks out weather reports via the International Voluntary Observing Ship (VOS) Scheme, by MSI Voice, WX FAX, and RTTY. He also uses the Digital Atmosphere software suite.

ZCZC 133
SMGL04 KWBC 040600
AAXX 04064
04220 07481 70000 10027 20023 30055 40106 57010 60052 75186 333
10050 20025 55300 20054 60027 70058 85/19 87/25=

ROBERT CONNOLLY

ZCZC 133
SMVX41 EDZW 040000
BBXX
DBEA 04001 99540 10082 46/// /0803 10163 20153 4=130 57007 22220 00154=

ROBERT CONNOLLY

weather conditions, these weather reports are also transmitted via the Aeronautical Fixed Telecommunication Network (AFTN) to the national Met Office and the World Meteorological Organisation (WMO) who, in turn, forwards relevant data to other bodies and organisations.

<https://www.metoffice.gov.uk>
<https://public.wmo.int/en>

Aircraft flying over oceans include wind and temperature information with their regular position reports. The Meteorological services have also many land-based automatic weather reporting stations located around the world. In addition to these, there are some specialist buoys anchored at sea around the British Isles that transmit regular weather information. Their position and latest available weather data are available here:

<https://tinyurl.com/ur6jh7wx>

There are also some dedicated satellites monitoring global weather and transmitting images back to Earth. Moreover, weather balloons are used to send back information on such values as atmospheric pressure, temperature and humidity. By tracking them

using radar, radio direction finding (RDF) or satellite-based GPS technology, wind data can also be obtained.

The Seas Below

The maritime world has, of course, long been involved with providing weather information. For example, before the advent of satellites, special weather ships were positioned at various points in the Atlantic Ocean to carry out weather observations, I will be looking at the role of former weather ships in a future column.

More generally, vessels have been taking metrological observations for many years. Almost 150 years ago, an international scheme was developed, through which ships plying the various oceans and seas of the world were recruited for taking and transmitting meteorological observations.

The scheme was called the International VOS (Voluntary Observing Ship) Scheme and is still functioning today providing weather observations for use in forecasting.

<https://tinyurl.com/2uy3nn2s>

Lieutenant Matthew Fontaine Maury of the US Navy was the first man to realise

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Fig. 1: RTTY synoptic weather report from a *land-based* source. Fig. 2: RTTY synoptic weather report from a *ship-based* station. Fig. 3: A radio facsimile (radio fax) weather chart generated with *Skyview*. Fig. 4: A DWD weather fax from more recent times (March 2020). Fig. 5: *Digital Atmosphere* screenshot showing pressure tendencies. Fig. 6: Another *Digital Atmosphere* screen grab displaying the isobars. Fig. 7: The most recent edition (31st) of the 2021/2022 *Klingenfuss Guide to Utility Radio Stations*.

the scientific and commercial value of weather information collected from ships. Owing to his initiative, the first *International Meteorological Conference* was held in Brussels in 1853, to consider international cooperation and a uniform system of observation.

<https://tinyurl.com/233jn9bb>

The VOS Scheme

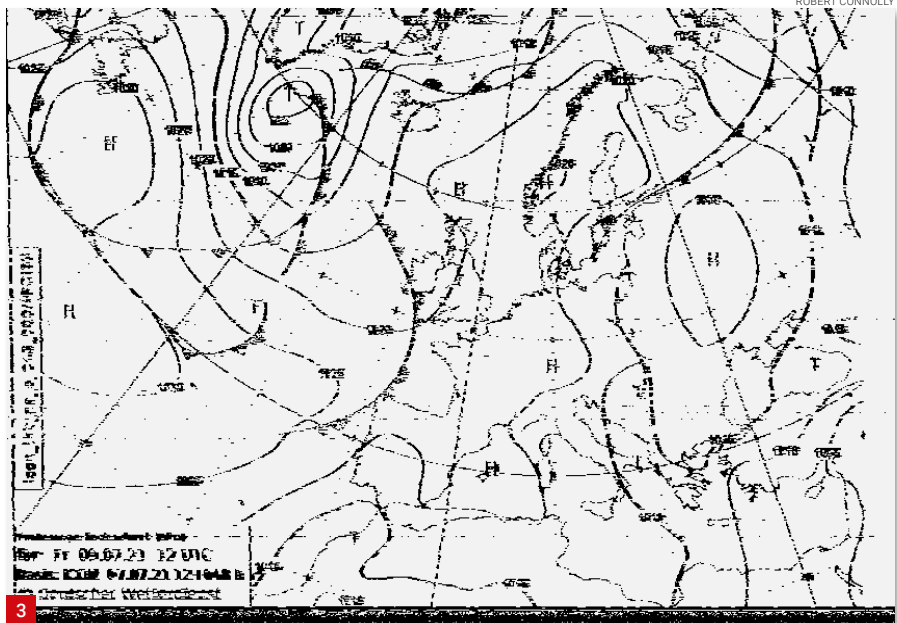
With the advent of radio communications early in the 20th Century, it became possible for observations from ships to be transmitted to meteorological offices ashore; what is more, warnings of dangerous conditions could also be transmitted to ships. The number of ships registered with the VOS scheme reached a peak in around 1984/85 when about 7,700 ships worldwide were on the *WMO VOS Fleet List*.

Since then, there has been a marked decline and in June 1994, the Fleet strength had dropped to about 7,200 ships. These numbers have continued to decrease and are currently estimated at only about 4,000 ships worldwide. Real-time reports from the VOS are heavily concentrated along the major shipping routes, primarily in the North Atlantic and North Pacific Oceans.

However, there are sparse areas, mainly in the Southern Hemisphere oceans, reflecting the relatively small number of ships sailing in these waters.

Under the VOS Scheme, ships are recruited by National Meteorological Services (NMSs) to record and transmit meteorological observations (the most critical data being air pressure, wind speed and direction, sea state, humidity, visibility, air and sea surface temperature), to shore stations in real-time to assist in the provision of more accurate marine forecasts and warnings.

Meteorological observations made by officers onboard the vessels participating in the programme are traditionally compiled every six hours. Electronic logbook software



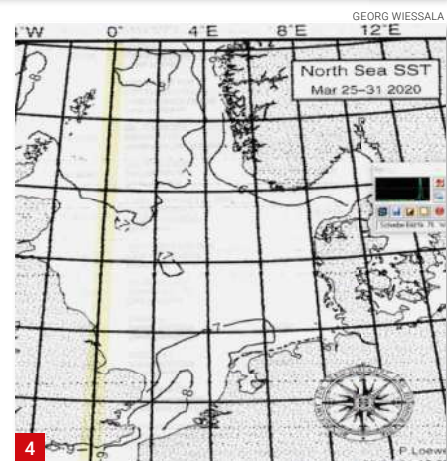
is now used to compile the observation reports. The officer enters data read from instruments and observed visually, and the software codes this information into a recognized format for immediate transmission to shore.

Voice and Sat Transmissions

Years ago, when the UK GPO/BT coast radio stations were still operational, the observation reports were transmitted by voice on HF to them for onward transmission to the WMO. I am sure that those of you who are old enough to recall monitoring the old coast stations will recall hearing these reports being sent. In those days it was every four hours, and I recall many nights hearing ships contacting the coast stations just after 0003 UTC (following the mandatory three-minute silence period to allow for possible weak distress transmission being received), ready to pass their metrological reports.

In our time, many of these observations are sent via INMARSAT C, using a special access code, which relays the report free of charge to the ship, or by e-mail with the cost of the small text message being borne by the ship. Once ashore, the observations are then routed around the world on WMO Global Telecommunication System (GTS) for use by meteorologists, in numerical weather prediction models, ship routing services, and for other clients.

There are three types of ships in the VOS scheme: *Selected* ships (1); *Supplementary* ships (2) and *Auxiliary* Ships (3) (cf: Table 1). The data types referred to below refer to these types of vessels (1-3).



Data Types

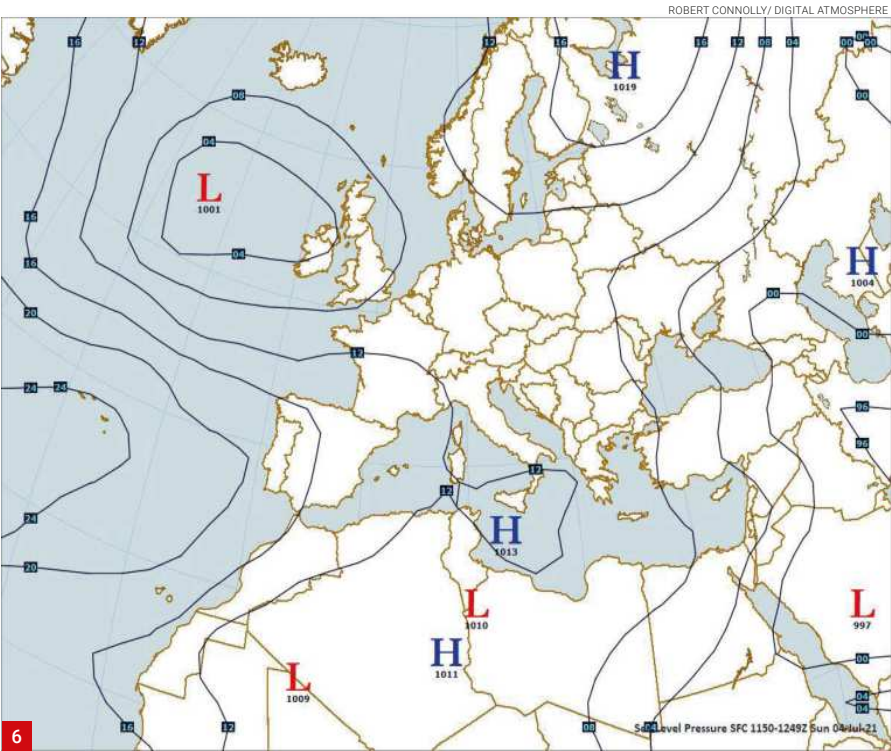
The organisation and categorisation of the weather data collected by each type of vessel (1-3) are explained in Table 2. The weather reports made by observation stations are referred to as 'synoptic' (synop) reports. The term 'synop' denotes is a numerical code used for reporting weather observations made by manned and automated weather stations.

When you look at received RTTY decodes you will notice that in the headers either 'AAXX' or 'BBXX'.

These indicate if the report has been sent from either a land-based station (AAXX), for example, an airport station (Fig. 1) or an observation post on board ship (BBXX), as in Fig. 2.

In the case of a land station report, the station number is given after AAXX.

In the example of Fig. 1, you will see that this is '04064'. According to the station code numbers in my old 1994 *Klingenfuss Air and*



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Wiessala, G. (2012) 'My Weather Day' (*RadioUser*, May 2012: 52)
 (2020) 'Weather Watching and Radio - A Natural Fit' *The Spectrum Monitor*, June 2020

Table 3: Eight Years of Radio-Weather Hobby.

DDH47 147.3kHz, (Programme 2) DDK2 4583kHz (Programme 1), DDH7 7646kHz (1), DDK9 10100.8 kHz (1), DDH9 11039kHz (2), and DDH8 14467.3kHz (2).

The latest schedules are here:

<https://tinyurl.com/wk7xmtjj>

For the novice, this link can be slightly difficult to find, so I suggest that you bookmark it.

According to the 2021 DWD schedules, there is also a voice transmission on 5905 and 6180kHz between 0555-0635, 1155-1235, 1555-1635, and 1955-2035 UTC.

The latest (31st) edition (2020/21) of the *Klingenfuss Guide to Utility Radio Stations* lists meteorological radio fax and radio telex services, NAVTEX transmissions and aeronautical mobile services, amongst many other things (Fig. 7).

<https://klingenfuss.org/utility.htm>

Last but not least, William Hepburn's website is an excellent resource for marine broadcast frequencies, schedules, and related information.

In addition to maritime radio information, this resource also details broadcast, time signals, and aeronautical, and metrological information. William seems to put a lot of



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effort into this resource; not only does he keep it up to date but he also adds new stations where they are.

www.dxinfocentre.com

Another useful store of maritime weather information is *Frank's Weather Pages*, at the *mailasail* Satellite Comms website:

www.mailasail.com

Table 3 points to a few more resources on the subject of radio and weather.

Until next time: "Fair winds".

Radio News

CHANNEL ISLANDS DIGITAL RADIO:

The Channel Islands has DAB digital radio from today following the launch of the new commercial multiplex from Nation Broadcasting. Over 20 radio stations are available, all broadcasting in DAB+, making it the first multiplex to launch without standard DAB services. Nation Broadcasting is offering seven stations, including a brand new rock format, Nation Rocks. The other services are Nation Radio UK, Nation Love, Nation Dance, Nation 70s, Nation 80s and Nation 90s. Global is providing Capital, Heart and Smooth, whilst Tindle is transmitting Channel 103, Island FM and a new easy listening service called *Soleil* (Sun). BBC Radio Jersey and BBC Radio Guernsey are listed along with BBC Radio Jersey Extra and BBC Radio Guernsey Extra. Wireless has talkSPORT, Times Radio and Virgin Radio, but no talkRADIO, talkSPORT2 or Virgin Radio brand extensions. There are also community radio stations Angel Radio and Quay FM. Later this year, Bailiwick 1 and Bailiwick 2 will launch, along with UCB 1 and UCB 2. At launch, there are two transmitters, one for Jersey and one for Guernsey, and a third transmitter is expected for Alderney by the end of the summer.

This will serve one of the smallest communities of any local DAB multiplex, installed and managed in-house [...] Multiplexing and encoding are provided by Factum *Radioscape* using the *Enmuxa* platform, and the multiplex uses DAB slideshow.

(SOURCE: *Radio Today* | Soundcloud)

<https://tinyurl.com/yzmfvx7>

PODCAST RADIO STARTS ADVERTISING IN CINEMAS:

A deal between *Podcast Radio* and *Digital Cinema Media* will see *Podcast Radio* advertised in *Cineworld*, *Curzon*, *Odeon*, *Picturehouse* and *Vue* cinemas around the UK. The 30-second black and white animated ad highlights the large choice of podcasts available and how *Podcast Radio* can help people choose the best.

Over a percussive backing track, a voiceover says: "Two million podcasts, 52 million episodes, one radio station. Discover the world's best podcasts. *Podcast Radio*." Among the voices of podcasters featured in the ad is Hollywood star Alan Alda, as his *Clear + Vivid* podcast series is scheduled on the station.

(SOURCES: *Podcast Radio* | *RadioToday*)

<https://tinyurl.com/w9678nak>

Reader's Shack

We recently received a very nice letter from our regular reader, **Mr M McInnes** from Cockenzie, East Lothian. Mr McInnes described how he caught the 'radio-bug' a long time ago; he was kind enough to enclose photographs of his radio shack, which we are reproducing here, with his kind permission. Mr McInnes wrote, "My radio shack was featured in RadioUser many years ago, and I was quite often in contact with (former editor) Andy (Thomsett) and Bill Robertson. The layout has changed since then, as it does."

"The Palstar, along with the R-75 are probably my two favourite radios".

Mr McInnes goes on to say how he had the (uniquely recessed) tuning knob on the Palstar replaced by a new, slightly smaller one that did not 'rub' on the casing.

I can relate to this issue, Mr McInnes since I have just acquired a second-hand Palstar R30A myself for medium wave broadcast listening. Luckily, the radio is in good nick, but I am aware of this issue.

Mr McInnes closes by saying, "I also have several portable radios, and – after many years of



side-by-side tests with the 'big boys' – I feel that the portables, in some situations, can even out-perform the table-tops."

Have any of our readers had a similar experience to share? If so, you may wish to write in and

let us know. Make sure that you do not miss our forthcoming series on Ultra-Light Radios (ULR) by **Clint Gouveia**.

Thank you, Mr Mc Innes, for getting in touch and best wishes from the team here – **Ed**.

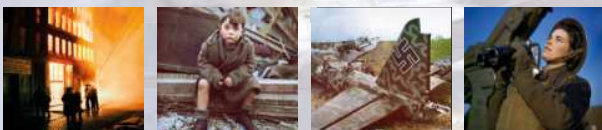
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Putting a Quart into a Pint Pot: The ICOM IC-M94DE

Robert Connolly has tested the new ICOM IC-M94DE VHF portable transceiver and shares his findings here.

Robert Connolly
gi7ivx@btinternet.com

Sometimes words can fail me for two reasons; first, due to something being absolute rubbish and not even fit for the waste bin, or second, something that is so good it does not seem possible to find the words to do it real justice. In my opinion, the Icom IC-M94DE (Fig. 1) falls into that second category.

This is *much* more than a routine marine VHF portable transceiver and in a mariner's worst-case scenario could well increase the chances of saving a life, compared with standard run-of-the-mill portable transceivers.

So, what is different about the IC-M94DE handheld transceiver?

Well, not only is it a fully functioning marine VHF radio with GPS, Digital Selective Calling (DSC) and a 6W transmitter providing some extra range (many portables are 5W).

It also has a Li-ion battery that provides up to ten hours of operating under normal conditions. In addition to this, it offers an inbuilt AIS receiver.

This is, as far as I can see, a world-first.

The *AIS Target Call* function allows you to set up a DSC individual call. It should be noted that the AIS is receive-only and will not *transmit* AIS data.

DSC distress calls can be made with the rear panel distress button (Fig. 2).

The IC-M94DE also has a navigation function, for which you can assign up to 50 favourite spots, destinations or waypoints.

Other highlights of the Icom IC-M94DE include *Float'n Flash*. If you drop it, the radio floats and the LCD screen, menu key and distress button flash to help you retrieve it from the water. Pressing the distress button while *Float'n Flash* is working will activate the MOB distress signal. The MOB location will also show on the AIS display of the IC-M94DE.

Moreover, Icom's *AquaQuake* function prevents audio degradation from a water-logged speaker. The radio is also submersible to a depth of one metre of water for 30 minutes.

The radio features a dual and tri-band watch facility, active noise-cancelling technology and supports four-digit channels. Four-digit channels are the former duplex channels that were revised a few years ago into two simplex channels.

The UK version of the radio includes CH 1037 (157.850MHz) and P4 (161.425MHz), the UK marina channels M1 and M2. The IC-M94DE has a loud 1500mW audio output with improved acoustic clarity to cope with noisy marine environments.

Setup and Use

Switching on the receiver for the first time brings up a menu item for you to enter your personal Maritime Mobile Service Identity (MMSI) number, the unique nine-digit number that is assigned to a (Digital Selective Calling) DSC radio or an AIS unit and allocated when you apply for your marine fixed or portable VHF license.

If you currently have no MMSI number, this can be obtained via accessing your marine VHF license via a dedicated Ofcom portal.

<https://tinyurl.com/8zxf9xb>

It is possible to use the IC-M94DE without assigning an MMSI number, but this will disable the DSC function.

Instructions on how to do this are given in the radio's extensive manual; this needs to be done every time the radio is switched on. All other non-DSC associated functions will work as normal. For DSC transceivers, it is only possible for the user to enter the MMSI number once.

If you have entered your personal MMSI number, the transceiver will be ready for use after pressing the power-on button located on the unit's side. On switch-on, the main screen (Fig. 3) displays your MMSI number (if



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ALL PICTURES: ROBERT CONNOLLY



Fig. 1: The new Icom IC-M94DE marine portable VHF with integrated AIS. Fig. 2: The DSC distress button is located under the protective shield on the rear of the transceiver. Fig. 3: The main IC-M94DE display showing selected channel and other information. Fig. 4: The IC-M94DE AIS display. Fig. 5: The IC-M94DE AIS target list display. Fig. 6: The AIS information for a selected 'target'.



entered), the selected channel, the main use of the channel and the coordinates of your position, obtained by the integrated GPS. It will also display whether or not the dual or tri watch option has been selected.

What do you get in the box? The main IC-M94DE transceiver measures approximately 145.8 (H) x 60.9 (W) x 43.8mm (D), excluding the antenna; it weighs in at 357 grams (12.6 oz) including the supplied battery pack, antenna and battery clip. The battery pack is negative ground 7.2V DC, and the transmit power is selectable between 1 and 6W.

The set comes with a 'rubber-duck' type aerial, hand strap, belt clip, battery pack, a 76-page user manual, desktop charger and mains power adapter, complete with two screws for mounting the charger. The review model did not come with a cigarette lighter cable, for those who maybe wish to recharge the radio while at sea and do not have a mains power supply available, but this can be purchased separately along with other optional accessories.

The user manual is well laid out and easy to follow, even if you are a novice using marine DSC portable transceivers. The radio sits comfortably in your hand when in use and all buttons are easily handled.

GPS satellite acquisition is quick when the radio is outdoors with the main screen displaying not just the channel number but also position information along with the date and time.

The main screen also shows if dual or tri-watch mode has been selected, and it also displays the main usage allocation of selected channels. The received audio is loud and clear and at my location on the southeast

coast of Co. Down, Northern Ireland, Belfast, Dublin and Holyhead coastguard stations were easily receivable.

As I had not entered our MMSI number into the review transceiver, I was unable to test the DSC function. However, I was able to test between vessels that were about 6.5 nm apart using the high-power 6W output.

The AIS receive function (Fig. 4) has several user-selectable display ranges (0.125, 0.25, 0.5, 0.75, 1.5, 3, 6, and 12 nm), with the user option of displaying all targets, only 'friends' or only 'danger-targets'.

The *Target List* screen (Fig. 5) displays the AIS of up to 200 targets that the transceiver detects.

The *Friends List* screen displays up to 100 targets that you set as a 'Friend'; other vessels that you know, for example, other yacht club vessels.

Moreover, three types of AIS lists are available through a sub-menu at the bottom of the AIS display. Selecting a 'target' in these lists will display its AIS information (Fig. 6). If DSC is enabled, it is possible to use the DSC *Compose Other* screen to send an individual message to that particular vessel.

The *Danger Target* information displays the MMSI code or name of the target, along with the *Closest Point of Approach (CPA)* and the time (TCPA) to the CPA in minutes. *Danger Targets* are vessels that may pose the risk of collision if the speed and course of both vessels remain the same.

Meanwhile, the AIS display may be set to either North up (N-UP) or the top of the display representing the direction your vessel is heading (C-UP).

The MOB (Man Over Board) function may

be set to ON or OFF. When selected ON, the function is activated only when your current position data is valid, the AIS target is within the set range (user-selected between 0.1 and 6 nautical miles), and when water is detected.

The closest AIS target is automatically selected on the *Target List* screen to immediately transmit an individual DSC call.

Conclusions

There is an old saying along the lines of that you cannot put a quart into a pint pot; well, Icom seems to have managed to do this with this radio.

The Icom IC-M94DE has a recommended retail price of £350. Given that it offers DSC, GPS and AIS built-in and does not require any external equipment, such as a computer, the price represents good value for money.

The IC-M94DE would be ideal for smaller yacht owners, workboats, day-fishing boats, or even commercial vessels, where a crew may be at risk of falling overboard. Imagine a situation where either you and your vessel have parted company or your boat has capsized, and you are floating in the water trying to hold onto it; just pushing a button will send a distress call and the radio will show an acknowledgement.

The inbuilt AIS display will show assistance coming to you, once it is in range, along with an estimate of its arrival time. If need be, you can communicate with any assistance vessel approaching, to update them on your position and situation.

It is in a situation like this that you will consider that this radio stands for money well spent. My thanks go to Icom UK for the loan of the IC-M94DE for review.

Tim Kirby

tim@livingland.wales

This month, I would like to highlight the story of NASA's *Voyager* spacecraft, launched in 1977, discuss the original aims of their missions and explore how this has evolved. We will look at how technology has evolved to continue to communicate with the spacecraft now flying further and further away from the planet we all call home, Earth.

Although the *Voyager* spacecraft were launched in 1977, the mission as such had been approved as early as May 1972. Ed Stone has been the project scientist on the *Voyager* mission since that time and even now, at age 85, remains deeply involved with the mission, as well as some other NASA missions. Stone has coordinated the efforts of 11 teams of scientists in their investigations of Jupiter, Saturn, Uranus, and Neptune.

He also became nationally-known as the JPL public spokesman during the planetary flybys, explaining the *Voyagers'* scientific discoveries to the public. Highlights of his decade of leadership (as JPL Director) include the five-year orbital *Galileo* mission to Jupiter, the launch of *Cassini* to Saturn, the launch of the *Mars Global Surveyor*, a new generation of Earth science satellites such as *TOPEX/Poseidon* and *SeaWinds*, and the successful *Mars Pathfinder* landing in 1997. Stone retired from JPL in April of 2001.

The *Voyager* mission consisted of two spacecraft, *Voyager 1* and *Voyager 2* (Figs. 1-3) Their original mission was the exploration of Jupiter and Saturn. Back in 1965, calculations showed that it would be possible for spacecraft launched in the late 1970s to be able to visit all four giant outer planets (Jupiter, Saturn, Uranus, and Neptune), using the gravity of each of the planets to 'slingshot' the spacecraft onto its' next destination. Such an alignment occurs once every 176 years.

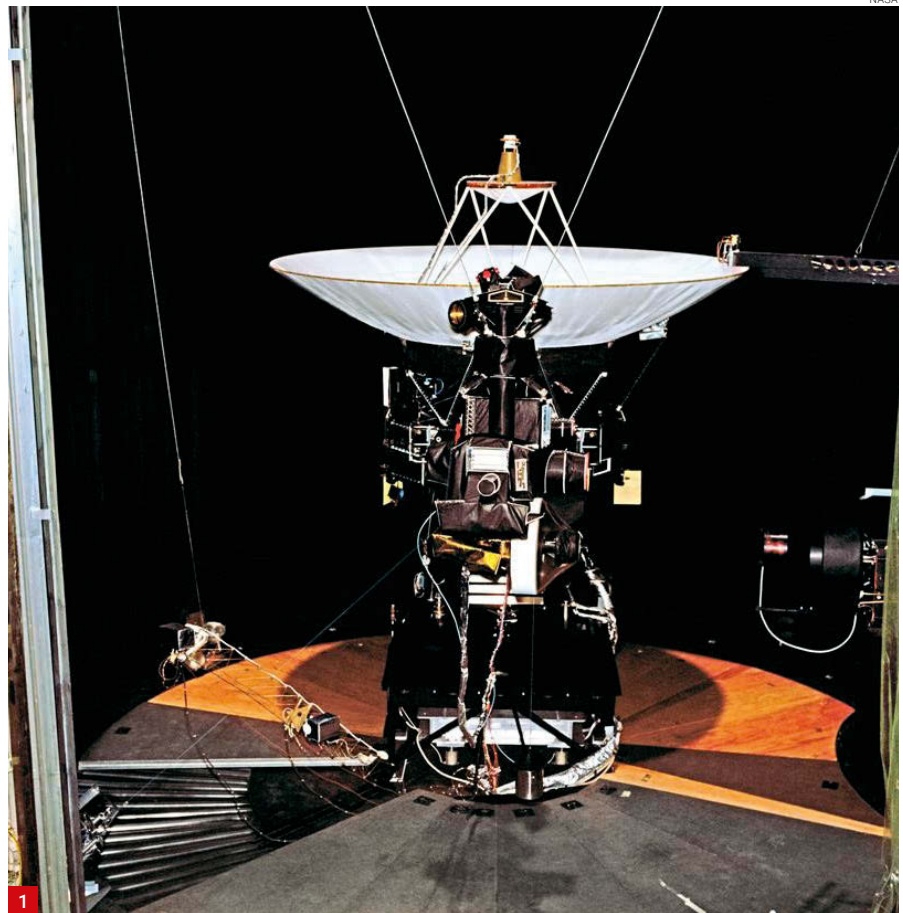
<https://tinyurl.com/vcvv9kss>

Launch and Mission

The original project approval in 1972 only committed to fly-bys of Jupiter and Saturn. In March 1977, the project, originally named *Mariner Jupiter/Saturn* was renamed *Voyager*.

On August 20th, 1977, *Voyager 2* was launched from Kennedy Space Centre.

Voyager 2 was so named – despite launching *before Voyager 1* – because it was scheduled to reach Jupiter and Saturn



Deep-Space Radio: The Voyager Missions

This month **Tim Kirby** looks at the history of NASA's *Voyager 1* and *2* missions, explaining how the ground stations on Earth continue to be capable of receiving signals from these remote spacecraft

after Voyager 1, which launched a few days later on September 5th, 1977 (Fig. 3).

In March 1979, *Voyager 1* made its closest approach to Jupiter, highlights of the fly-by being the discoveries of the first active volcanoes (away from Earth) on Jupiter's moon, Io. Two new moons were discovered, as well as the Jovian ring system as was the fact that the 'Great Red Spot' is, in fact, a huge cyclone-like storm.

The spacecraft made other discoveries about Io; ions stripped from the surface create a toroidal field around Jupiter, which increases the planet's magnetic field, and

Io thus acts as a generator in Jupiter's magnetic field, sending around 5 million amps along the magnetic field to Jupiter.

Those of you who read the last *Signals from Space* column about radio signals from Jupiter (*RadioUser*, July 2021: 56-58) will now have a little more insight into what exactly triggers this effect.

In July 1979, *Voyager 2* made its closest approach to Jupiter, making further discoveries including a new moon, later named *Adrastea*, and a close approach to the moon *Europa*.

Voyager 2 also showed that the vol-

- Fig. 1: The pre-flight prototype of the *Voyager* spacecraft undergoing testing.
- Fig. 2: *Voyager 2* in its payload housing ready to be attached to the launch vehicle.
- Fig. 3: *Voyager 1* leaves the launch pad at Kennedy Space Centre at the start of its epic mission.
- Fig. 4: *The Pale Blue Dot*: The most distant image ever taken of Planet Earth from *Voyager 1*.
- Fig. 5: Part of the Deep Space Network DSS-43 dish, located in Canberra, Australia.
- Fig. 6: The wider context of human space exploration, with many official NASA documents.

canoes on Io – seen by *Voyager 1* some months previously – were still active.

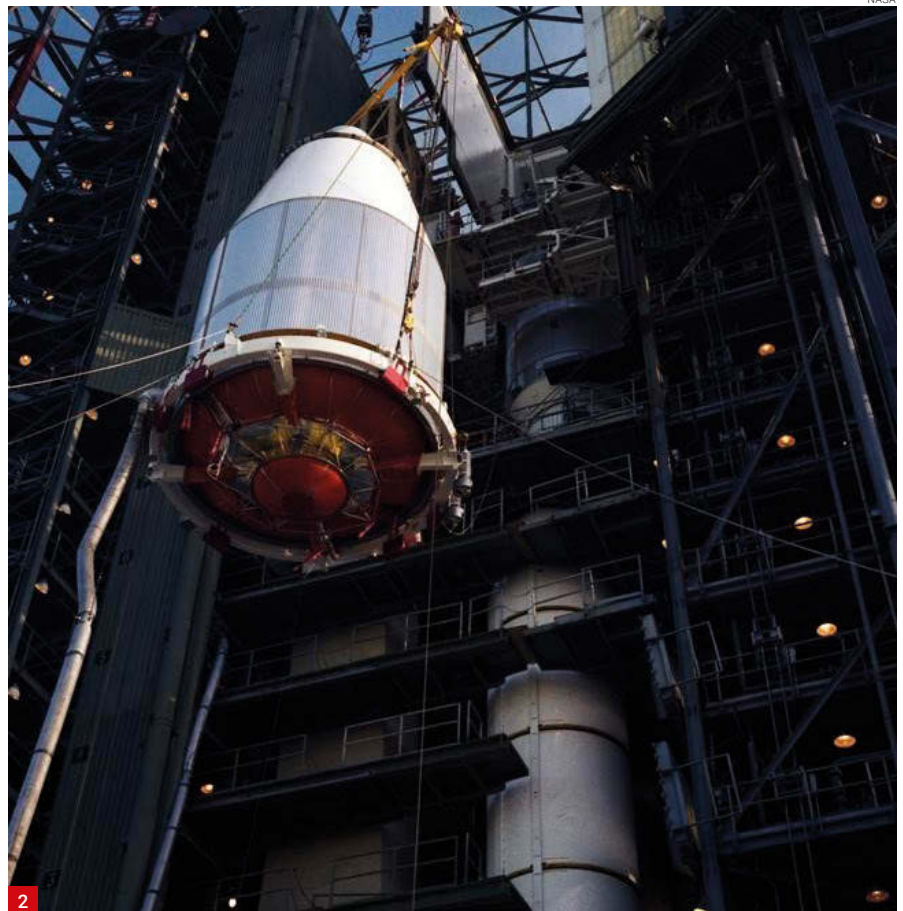
In November 1980, *Voyager 1* reached Saturn, making its closest approach, including a look at the largest moon in the Saturnian system, *Titan*. Three new moons were discovered, later named *Atlas*, *Prometheus* and *Pandora*. *Titan* revealed a thick, Earth-like atmosphere with the possibility of seas of liquid methane and ethane on the surface. Leaving Saturn, *Voyager 1* began its new mission, a trip out of the Solar System and headed upwards, away from the orbital plane of the planets.

Voyager 2 still had more business within the Solar System to complete though. In August 1981, the spacecraft made its closest approach to Saturn and had some close encounters with some of the moons discovered by *Voyager 1*. Images taken of the North Pole of Saturn, and later ‘stitched together’, showed a hexagon-shaped weather feature circulating the pole.

In January 1986, *Voyager 2* made its closest approach to Uranus, the first opportunity for an in-depth study of this planet. On approach, 11 new moons were discovered by the *Voyager 2* cameras (*Puck*, *Juliet*, *Portia*, *Cressida*, *Desdemona*, *Rosalind*, *Belinda*, *Perdita*, *Cordelia*, *Ophelia*, and *Bianca*). Scientists also learned that Uranus’ magnetic field is tilted, so its poles are closer to the equator. *Voyager 2* is the first probe to image Uranus’s very dark rings and to detect temperatures as low as minus 214C, making Uranus the coldest planet in the Solar System.

Watching and Listening

This encounter was also the first opportunity to use NASA’s Deep Space Network (DSN), using ground stations designed to capture the very weak radio signals from distant spacecraft. In August 1987, NASA’s DSN completed its expansion of dish antennas at all three of its ground stations; Goldstone in California, Madrid in Spain and Canberra in Australia. The dishes were



expanded in diameter from 64m to 70m, increasing the gain of the antennas to allow for increasing weakly signals from the ever more distant spacecraft.

Two years later, in August 1989, *Voyager 2* reached Neptune. Six new moons were discovered, and the first opportunity arose to image the rings around the planet. Also, discovered in Neptune’s southern hemisphere was a huge storm, named ‘The Great Dark Spot’.

In late 1989, *Voyager 2*’s cameras – both wide-angle and narrow-angle – were turned off by engineers executing a remote command. Switching the cameras off allows the power, memory and data bandwidth on the downlink for other purposes. It’s amazing to think that the spacecraft will never again fly close enough to any astronomical object to warrant having a camera.

In a short while, we will come to the all-important power budget of the spacecraft.

The cameras on *Voyager 1*, however, were still on. On February 14th, 1990, at a distance of around 4 billion miles from the sun, *Voyager 1* took the last images of the mission, known as the ‘Solar System Family Portrait’.

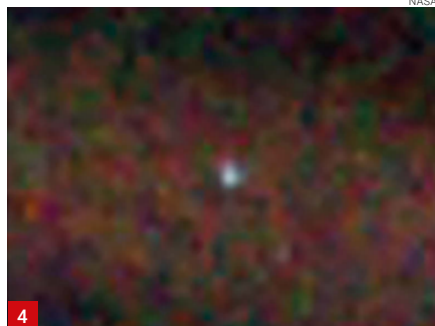
It is the only series of pictures ever taken



that shows Venus, Earth, Jupiter, Saturn, Uranus and Neptune grouped around the sun. Earth is seen as just the tiniest speck in the now famous ‘Pale Blue Dot’ image (Fig. 4) which inspired Carl Sagan (1934-1996) to muse about the fragility of life on our planet.



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To Boldly Go ...

By 1998, *Voyager 1* had surpassed the distance of the *Pioneer 10* space probe, becoming the farthest human-made object from Earth in space. Later on, December 16th, 2004, was a significant day for *Voyager 1*, as it crossed the 'termination shock'. This is where the solar wind abruptly slows down and heats up as it meets the interstellar medium. The area marks the inner boundary of the heliosheath.

This is the outer layer of the bubble-type area created by the Sun, surrounding it and all of the planets.

Unfortunately, ground stations were not 'listening' for *Voyager 1* on the day that this occurred.

This was not the case with *Voyager 2*, which crossed the 'shock' on August 30th, 2007, so that mission scientists were able to analyse data from the spacecraft as it passed this milestone.

Five years later, on August 25th, 2012, *Voyager 1* became the first human-made object in Interstellar Space. Interstellar Space exists beyond the boundary of the solar bubble and the debris created by the explosions of other stars.

For the first time, *Voyager 1* was able to detect the full intensity of cosmic rays in this region. Intriguingly, in April 2013, *Voyager 1* detected the 'ringing' in Interstellar Space caused by a Coronal

Mass Ejection from Sun reaching the spacecraft causing the plasma in space to vibrate and ring.

The high pitch of the ringing shows that the density of the plasma is more than 40 times higher than previously measured before crossing into interstellar space. *Voyager 2* reached Interstellar Space on November 5th, 2018, becoming the second human-made object to get there.

Into the Future

At this point, *Voyager 2* was somewhat more than 11 billion miles from Earth, and communication from Earth to the Spacecraft took around 16.5 hours (remembering that radio waves travel at the speed of light).

Will the spacecraft leave the Solar System? They should, but not for a while. The edge of our Solar System is considered to be beyond the outer edge of the Oort Cloud.

The exact extent of the Oort Cloud is unknown, but it is estimated that the Voyagers may take 30,000 years or so to fly beyond it.

What about the spacecraft themselves? The NASA website describes the *Voyager* space probes and their communications and computer systems as shown in Table 1.

Should any civilisation ever encounter either of the *Voyager* spacecraft, they will find a 'Golden Record' attached, with

Voyager Resources

- Bell, J. (2016) *Interstellar Age; Inside the Forty-Year Voyager Mission* (Dutton)
- Evans, B. (2003) *NASA's Voyager Missions: Exploring the Outer Solar System and Beyond* (Springer Praxis Books)
- Impey, C. (2013) *Dreams of Other Worlds: The Amazing Story of Unmanned Space Exploration* (Princeton UP)
- Logsdon, J. and Nye, B. (2018) *The Penguin Book of Space Exploration* (Penguin)
- Pearson, E. (2020): *Robots in Space: The Secret Lives of Our Planetary Explorers* (The History Press)
- Pyne, S.J. (2010): *Voyager: Seeking Newer Worlds in the Third Great Age of Discovery* (Viking)
- Sichla, F. (2018) *Kosmische Kommunikation* (beam-Verlag) (German).

Websites

- Canberra Deep Space Communications Complex
<https://www.cdsc.nasa.gov>
- Deep Space Network (JPL)
<https://tinyurl.com/4h4ft8us>
- Jet Propulsion Laboratory (JPL)
<https://www.jpl.nasa.gov>
- Mission Overview and Timeline
<https://voyager.jpl.nasa.gov/mission>
- NASA / JPL / Voyager 1
<https://www.nasa.gov>
<https://voyager.jpl.nasa.gov>

images and sounds from the Earth, which the spacecraft left behind in 1977.
<https://voyager.jpl.nasa.gov/golden-record>

Communications Systems

Communication with the Voyager spacecraft is managed through the Deep Space Network. At Madrid, the huge 70m dish is the most suitable for receiving data from *Voyager 1*. However, that dish is offline at the moment owing to work being undertaken at the site. The smaller 34m dishes can be phased together to provide enough gain (just!) to receive the spacecraft.

The *Voyager 2* probe can only be received by ground stations in the Southern Hemisphere, meaning that Canberra in Australia is the only station capable of handling the communication. Canberra also has a 70m dish, DSS-43 (Fig. 5). This weighs more than 3,000 tonnes and rotates

The (Radio) Technology of the Voyagers

Each Voyager probe consisted of a decahedral 'bus', 47 cm in height and 1.78 m across from flat to flat. A 3.66 m diameter parabolic high-gain antenna was mounted on top of the bus. The major portion of the science instruments was mounted on a science boom extending out some 2.5 m from the spacecraft. At the end of the science boom, there was a steerable scan platform on which were mounted the imaging and spectroscopic remote sensing instruments. Also mounted at various distances along the science boom were the plasma and charged particle detectors. The magnetometers were located along a separate boom extending 13 m on the side opposite the science boom. A third boom, extending down and away from the science instruments, held the spacecraft's radioisotope thermoelectric generators (RTGs).

Two 10 m whip antennas (used for the plasma wave and planetary radio astronomy investigations) also extended from the spacecraft, each perpendicular to the other. The spacecraft was three-axis spin-stabilized to enable long integration times and selective viewing for the instruments mounted on the scan platform. The command computer subsystem (CCS) provides sequencing and control functions. The CCS contains fixed routines such as command decoding and fault detection and corrective routines, antenna pointing information, and spacecraft sequencing information. What NASA doesn't mention here is that in 1977, the CCS, which you can consider that the spacecraft's 'firmware', was reloaded remotely to allow new functionality and better use of memory. Imagine that wait, 16.5 hours, while you wait to see if you have 'bricked' your spacecraft. You can read much more about this on this website:
<https://tinyurl.com/t3r3mdj7>

The Attitude and Articulation Control Subsystem (AACS) controls spacecraft orientation, maintains the pointing of the high gain antenna towards Earth, controls attitude manoeuvres, and positions the scan platform. Uplink

on a small film of oil around 0.17mm thick. The reflecting surface consists of 1272 aluminium panels with a surface area of 4180m².

If you would like to read more about the missions, I recommend NASA's Voyager website

<https://voyager.jpl.nasa.gov>

If you are on Twitter, you might enjoy fol-

lowing Richard Stephenson (@nascom1) who works in Operations at Canberra Deep Space Communication Complex. Richard sometimes mentions Voyager and the comms challenges which occur from time to time.

Ed Stone was asked by *Space.COM* in 2017 how much longer would the *Voyager* spacecraft be able to keep gathering data and sending it back to Earth. His reply is truly fascinating: *"The power supply is the natural radioactive decay of plutonium-238, which creates heat, and that is converted to electricity with thermocouples. So, we can predict fairly accurately how much power we have, and how much less power we'll have each year, because of radioactive decay – it's decaying away. Every year now, we're in a mode where we have to turn off something that uses 4W because we will have 4W less next year than we have this year. We have about 10 years or so of power remaining until we have only enough to power the spacecraft itself, without any of the instruments. That's on the order of 10 years from now (2017) – But even after we no longer have the power to send any data back to Earth, the two Voyager spacecraft will continue their orbit around the Milky Way, around the centre of the galaxy with all the stars. Every 225 million years, they will complete another orbit around the Milky Way. And they will be doing that for billions of years, long after the Earth has been enveloped by the red giant sun. They'll be our silent ambassadors, with messages about where the place was that sent them so many billions of years earlier."*

<https://tinyurl.com/93a9cvmx>

<https://tinyurl.com/4ssjfh5h>

For a more general look at the history of NASA-led space exploration, you might enjoy the title shown in Fig. 6.

Keith Rawlings

Keith.g4miu@gmail.com

The latest update of the AN-SOF aerial modelling software package (Version 6) has now been out for some months, and it offers some useful new features (Fig. 1).

For example, there is now a pre-set list of soil types (Fig. 2). In this option, the soil conductivity and dielectric constant are automatically set (According to the *Oxford Dictionary of Electronics and Electrical Engineering* (2018), the *dielectric constant* [relative permittivity] is a dimensionless property of a material, or medium, equal to the ratio of the permittivity of the material or medium to the permittivity of free space).

This option means that the user can determine the soil type that best matches their location, such as *good, average, poor, cities, rich soil, fertile land, sandy, freshwater, seawater, ice*, and so on.

A screen of buried radial wires can be added by setting the number of radials, radial length and wire radius. These screens are frequently used under monopole antennas to reduce ohmic losses in the ground below the aerial. Furthermore in this update, real-ground calculations have been improved. These are based on the *Sommerfeld Norton Theory* for vertical and parallel dipoles above an imperfect ground plane.

<https://tinyurl.com/2hxbx3y>

Wires very close to the ground are now permitted, due to stabilized calculations and double-precision arithmetic used in the programme. Wire connections to a ground plane are also allowed on two types of ground model: Real Ground and PEC (Perfect Electrical Conductor, Fig. 3).

Each type has advantages over the other depending on wire types and configuration.

Last but not least, some changes have also been made for Microstrip Patch Aerials; these can now be modelled using a dielectric substrate of finite size.

<https://www.antennasimulator.com>

<https://www.facebook.com/groups/ansof>

The Future of EZNEC

The author of *EZNEC*, Roy Lewallen W7EL, is retiring and withdrawing support for the software from the end of the year. Therefore, there will be no more updates or improvements to the software.

What does this mean for the end-user?

Aerial Modelling Software and Loop-on-Ground Experiments

Keith Rawlings offers an expert overview of some capable and well-known contemporary aerial modelling software packages and continues his testing of a Loop-on-Ground type of aerial.

Well, quite simply, *NEC2*-compatible *EZNEC Free*, *EZNEC 6* (US\$99) and possibly *EZNEC 6+* (US\$159) will no longer be available. Furthermore, the *EZNEC 6 Pro/4* (US\$675+\$500 for the non-US *NEC-4* license) version will no longer be available from the end of 2021.

The silver lining is that from January 2022 the powerful *NEC-2* integrated *EZNEC 6 Pro/2* will be entirely free. Ordinarily, this would cost US\$575. Additionally, *Pro/2* will also be able to run externally-compiled *NEC-4.2* and *NEC-5* (see below) programs provided by the user. However, this version will not have the optimised *NEC-4* engine supplied with *EZNEC Pro/4*.

Hopefully, it will be a long time before Windows gets yet another 'revamp' that will make this and other software unusable. If this were to happen, you can run *EZNEC* on a standalone PC with a compatible operating system (O/S).

I feel certain that all users of *EZNEC* would like to thank Roy for all of his efforts over the last 30 odd years producing first-class modelling software and wish him a happy retirement.

For full details see.

<https://www.eznec.com>

The Development of NEC-5

In addition to the two software packages mentioned above, *NEC* (Numerical Electromagnetic Code) has been around for many a year now. Although its origins date back to earlier years, it seems to be accepted that it became 'NEC' in the early/mid-1970s. It was written by Gerald Burke and Andrew Poggio and is

distributed, for the time being at least, by the Lawrence Livermore National Laboratory in the USA.

Written in the *Formula Translation (Fortran)* programming language, the code was made public; quite naturally, it found its way into PC systems.

The most common version of the software is *NEC-2* (dating from 1980) and is used in software such as *EZNEC* and *4NEC2*, and so on. While *NEC-2* was made freely available later versions such as *NEC-3* (1983) and *NEC-4* (1990) have distribution controls in place and fall under United States export control.

Consequently, they are only available after signing a license agreement and the payment of a fee.

Presently an *NEC-4* license is US\$500 for a non-US, non-commercial, user; is \$1500 for a non-US commercial user. Once obtained, the *NEC-4* 'processing engine' could typically be used with user-friendly PC based GUI (Graphical User Interface) packages, such as *4NEC2* or the soon-to-be-discontinued *EZNEC Pro/4*, which costs around US\$675.

So, depending on the route taken, a considerable investment can be made.

NEC-5 (Fig. 4) is the latest release, and it has been out for some time. I understand that its code has been re-written completely and that it offers some improvements over *NEC-4*.

What is more, the *NEC5* license now costs just US\$110 (about £80-85), and it also offers a GUI. Sadly, Gerald Burk passed away in February 2021. He was closely involved with the developments of *NEC* throughout its history, and he

ALL PICTURES: KEITH RAWLINGS

Fig. 1: AN-SOF 6 plot of a 40m vertical with a ground mat. Fig. 2: The AN-SOF 6 'Environment Panel', showing various soil types. Fig. 3: The AN-SOF 6 'Environment Panel' showing ground plane selection. Fig. 4: NEC-5 demonstrating a model in the context of the Graphical User Interface (GUI). Fig. 5: NEC-5 demonstrating a polar plot of a 12-element log-periodic beam. Fig. 6: Close-up view of my transformer used in the LOG evaluation.

assisted with the code both technically and operationally.

Just before his death, Gerald completed rewriting the base NEC-4 engine, and it became NEC-5.

What this loss means to the development of NEC remains to be seen, but one hopes that such an important code will still find an organisation to continue to support it.

NEC-2 is more than capable for most users, but NEC-5 brings affordable modelling to those that need the extra features of this later coding (e.g. Fig. 5).

User manuals of NEC5 and the GUI are not currently available for download until after a license is obtained.

However, a validation manual can be downloaded which describes NEC-5.

<https://tinyurl.com/cvxk7kvk>

<https://tinyurl.com/zys7j5xj> [see 'A Brief Look at NEC-5'; Radcom, March 2021 – KR].

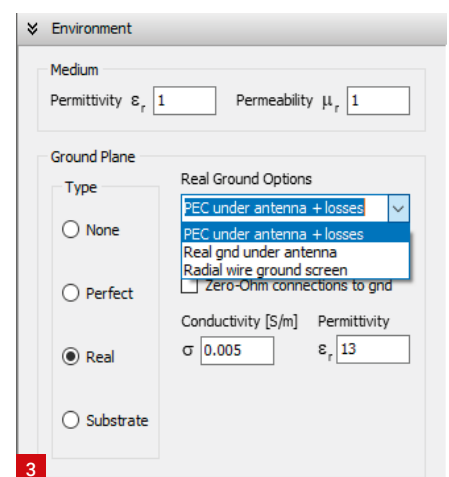
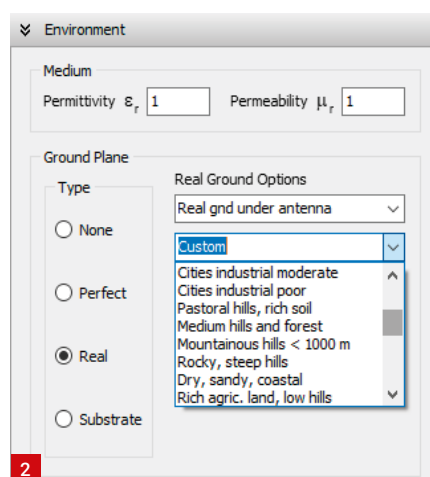
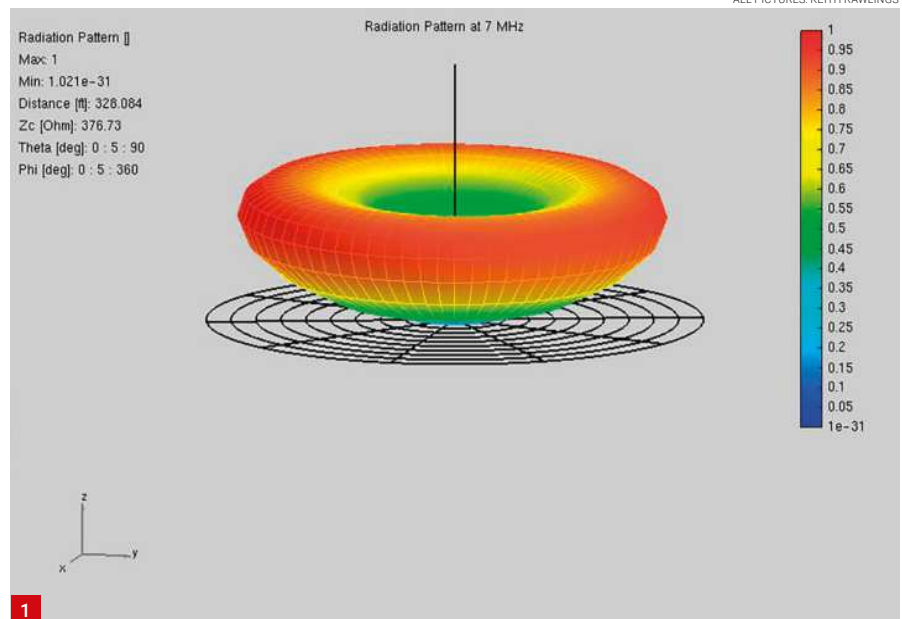
The LOG, Continued

Last month (*RadioUser*, August 2021: 54-56), I considered the KK5JY Loop-on-Ground aerial. This type is an HF loop for receiving purposes, intended for noisy environments, and aimed at achieving an improved SNR (Signal-to-Noise ratio). It consists of 60ft of wire, squared into a loop with 15ft sides, which rests on the ground and is fed via a simple matching transformer. To save time, I initially tried a loop fed by the matching transformer from my 66ft Inverted-L aerial (I/L). This has an impedance matching value of 1k Ω , and I made some comparisons against a Wellgood Loop, which in itself is known to be reasonably quiet.

The results from this setup were quite good, down to around 2.5MHz, although below this I found them poor. Moving higher in frequency, results were average on 14MHz but good on 17m (18MHz).

Further tests revealed that, at this location at least, it worked at its best, roughly between 4 and 10 MHz.

Between this range, it seemed to have enough output to hear most signals



that the Wellgood could hear but with a considerable noise reduction.

It was difficult to determine exact figures, as results varied between signals, frequency and also the time of day. The directivity of the loop also had to be considered, as did the arrival angle of signals. I found that below 7 MHz at night it was effective in returning reasonable signal strengths and a beneficial reduction in noise.

After writing about this, I tried the matching transformer described by KK5JY. This consists of 2 turns and 5 turns for the receiver and loop windings respectively, wound on a BN73-202 binocular core. I noted that using this transformer overall signal strength increased slightly with a small increase in noise level (Fig. 6).

I next tried a preamplifier to increase the output of the LOG.

Although not ideal I used a spare M0AYF loop amp that I had to hand.

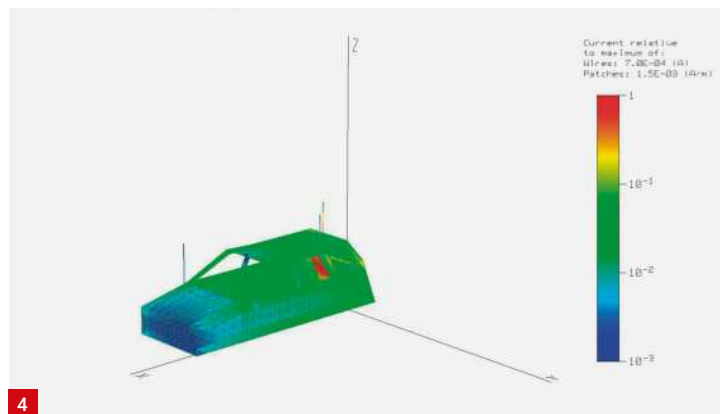
<https://tinyurl.com/2p6pmn3t>

<https://tinyurl.com/z4sfa3d9>

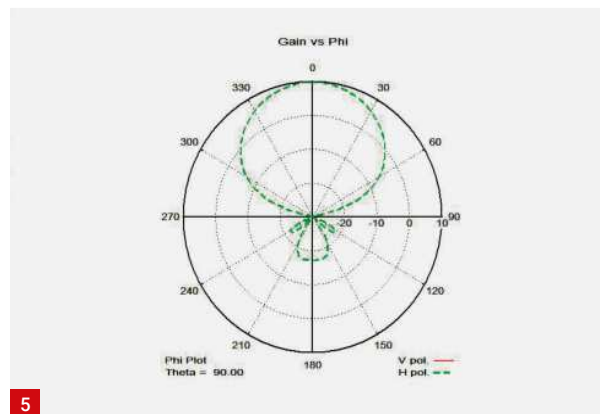
I connected the LOG to the amplifier via my Wellgood/PA0RDT cable run and powered the loop through the coax feeder. This meant I was now in a position to compare the amplified LOG against my 66ft I/L.

My Results

As a result of these tests, I found that on 20m there was a higher gain, with an increase in signal strength and a slightly better reduction in noise over the I/L. The picture on 30 m was much the same, but with a tad more gain on the LOG. Tuning to 40m, the amplified LOG returned more gain. I did notice, however, that there was also an increase in noise. On 60m (5MHz), I found a little less gain and



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some reduction in noise. Trying 80m, the LOG had a considerable noise reduction. Some signals were better on the LOG some on better on the I/L. Going down to 160m, the LOG was still poor, with most signals clear on the I/L and inaudible on the LOG. Finally, on medium wave, the gain was similar to the I/L, but there was a noticeable increase in noise levels.

My conclusion was that this is not a practical combination to use. However, something to try might be a more suitable 'straight' amplifier with 50Ω input and output, but feeding the LOG via the KK5JY matching transformer.

Larger Loop

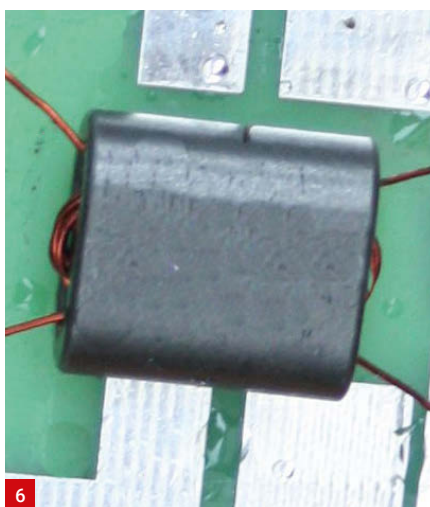
I subsequently tried a larger loop of 100ft circumference, which was roughly squared to 25ft each side and fed with the matching transformer. Loop size was restricted by area in the garden, due to our exuberant Black Lab Dylan! Once again, bear in mind that the LOG will have different radiation patterns over other aerials, so the following is just a comparison against my 66ft I/L.

Table 1 lists the results from one listening session, but which are typical of the LOG's performance.

The larger LOG provided an improvement on medium wave, compared to the one with 15ft sides.

BBC Essex, on 765kHz (transmitting is closure message), was S9+40 dB on IL and S9 on LOG with a similar SNR. On 729kHz, signals were S9+30 and S9 respectively, with a noisier signal but much less background QRM; 648 kHz Radio Caroline on the LOG was S8 but with severe background QRM. The I/L returned S9+20 and a much better SNR, although the noise floor varied due to QRM.

I noted results on the LOG were improving on the lower bands during the evening.



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Incidentally, the larger LOG worked well on 8MHz during evenings with plenty of signals received that are usually down in the S9+ VDSL-generated noise on my other aerials.

One option would be to raise the loop off of the ground. Martin G8JNJ has carried out tests on a LOG in this configuration, as you can see here:

<https://www.g8jnj.net/loop-on-the-ground>

Martin's website is well worth a look as it has a lot of interesting articles on Loop-on-the-Ground receiving aerials and other topics.

Overall Conclusion

The larger LOG resulted in higher signal levels than the smaller one and offered similar SNR improvements.

However, since it is larger and covering more ground area, it may be more difficult to position the entire loop away from potential noise sources.

I found the 15/60ft reasonably effective at my location and, to be honest, the 25/100ft loop needed to be a bit larger for it to have a bigger impact on the lower frequencies.

Amateur Bands

- On 10m, the LOG was surprisingly swamped with an unknown QRM.
- Trying 12m, the LOG had a lower noise floor with an equivalent drop in signal levels. I/L signals of S4-3 were almost inaudible on LOG.
- On 15m, I found the LOG with a better noise floor at S3, and signals were about 4 S-points down compared to the I/L.
- On 20m, the LOG now picked up wideband low-level QRM but still had an overall noise floor of around S3, compared to S6 on the I/L.
- Turning to 30m, signals were some 3-4 S-points down but with a better SNR on the LOG.
- On 40m the noise floor was typically S3, but signals were also about 2S-points lower than on the I/L.
- At 80m, the LOG noise floor was S2-3, and signals were about 3 S-points less on the LOG than on the I/L.

Broadcast Bands (mid-evening)

- On 25 and 31m, broadcast reception was very good.
- In the 41m band, the I/L had an edge over the LOG, in terms of the SNR.
- Looking at the 49m band, the I/L had a slight gain over the LOG, but with a similar SNR.
- The 60m band was the same as the 49m band.
- On 75m, results were similar to the 80m band.

Table 1: My Test Results with a Larger Loop Aerial.

The hook-up wire I used was not ideal and thicker wire may have reduced losses. A LOG aerial might provide a reasonable solution to listeners suffering interference and noise problems on the HF bands, and it is well worth considering.

Remember that signals on a LOG are not going to be as high as those received on an aerial mounted up in the clear. What we are looking for here is an improvement in SNR.

The LOG does seem to be able to deliver this. See you next month.

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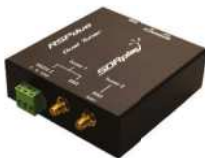


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On 10 May 1940, German forces launched their attack on France and the Low Countries and what followed in Belgium, the Netherlands etc, was the complete collapse of these countries under the overwhelming might of German military power. Across France, German forces rolled inexorably towards the English Channel and while the French and British tried desperately to stem the advance, the situation made it impossible to hold a further right-flank offensive. In the end, the evacuation of Allied forces from Dunkirk was the only way to escape the jaws of the German pincer movement. The evacuation of the BEF from France comprised largely of light bombers and Army Co-operation squadrons. Eventually, however, the 'situation' became the 'situation'.

BACKGROUND TO BATTLE

Left: A Hurricane of 501 Squadron on the ground in an operations base at Beaulieu, France, May 1940. An RAF Hurricane fighter is seen in the background. Right: An RAF Hurricane fighter in flight over the English Channel, May 1940. The aircraft is seen in flight over the English Channel, May 1940. The aircraft is seen in flight over the English Channel, May 1940.



THE RAF FIGHTER PILOT



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