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RadioUser

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Review

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Cold War comms

Fascinating radio tales in a secret nuclear bunker

Portable valves

How radios worked before the advent of transistors

Network Radio How the times are changing

A look at the growth of NR to a respected branch of the hobby

New Products News of all the latest gear

CB radios, magnetic loops, innovative amplifiers & more

Digital Radio Now | Drones | NDB DX Quarterly | Reliable Radio News
Tecsun PL-990x | US Radio | VLF Solar Monitoring | Wellgood Aerial

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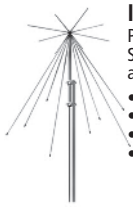

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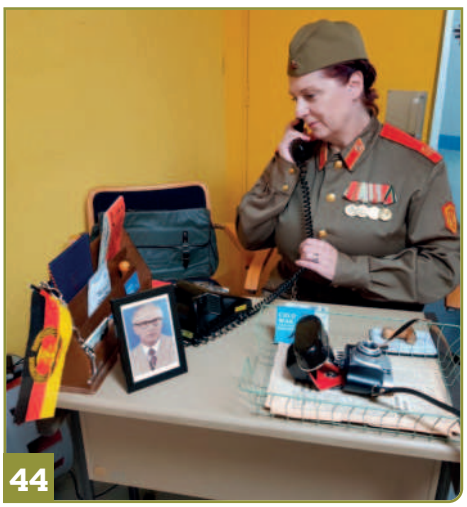
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Win a fabulous Moonraker MHR-100 portable maritime transceiver, reviewed in this issue (see p. 30).

End of Year Bumper Issue

Hello and welcome to the December issue of *RadioUser*. Another year has come to an end, and I do hope that you have enjoyed this magazine throughout what has turned out to be a challenging time. At the time of writing, *Lockdown 2.0* is in full swing, and enthusiasts across the world are either rediscovering their legacy radios or venturing into new areas of this fascinating pastime.

I would like to think that this issue is no different from the other 11 ones this year, in that we are offering you a wide choice of radio-themed features and regular columns. In terms of the former, Duncan James digs into history and unearths a richly illustrated survey of those beautiful portable valve radios. Here, once again, the radio meets art. Next, Tony Smith is here to go behind the scenes of the invention of Morse code.

In our review section this month, Scott Caldwell completes his two-part review of the new Tecsun PL-990x receiver, looking at some special features and signals. We also carry Robert Connolly's evaluation of the new Moonraker MHR-100 Handheld Maritime Transceiver, which is – pardon the pun – making waves right now.

By the way, you can win one of these radios in our competition this month.

And while we are talking about a 'Lockdown Radio Renaissance', Tim Kirby brings you Part two of his Introduction to CB Radio, a subject, we are going to continue to cover in 2021. Finally, in this section, I am reporting on my efforts to monitor solar events with a Very Low Frequency (VLF) receiver from our hobby friends at the UK Radio Astronomy Association, with astonishing results, which you can easily replicate.

In our panoply of regular features this month, Chrissy Brand evaluates international radio in terms of its reliability as a trustworthy news resource, and she offers key radio and podcast listening suggestions involving secret nuclear bunkers and other locations. Furthermore, you will learn how drones and planes can share the same air space, using radio technology. Robert Connolly offers our final 2020 survey of the thriving Non-Directional Beacon (NDB) DXing scene (on the *Radio Enthusiast* website), and Kevin Ryan focuses on the construction of a Wellgood loop, an aerial that has been doing the rounds among hobbyists recently.

Last but not least, Chris Rolinson contributes his final monthly column on Network Radio, taking this opportunity to survey the evolution of this part of the hobby over the last few years.

From January 2021 onwards, you may notice some minor changes in how we present the world of two-way communications in all its diversity and variety, ranging from CB and PMR446 Radio to Network Radio, Amateur Radio, and beyond. I am currently putting together the plan, and I am still looking for potential contributors for 2021, please note the call for new team members elsewhere in this issue.

As is now customary for *RadioUser*, our Annual Index of all articles in this magazine throughout 2020 will be published in the January 2021 issue. Do not forget to take a look at our *Radio Enthusiast* companion website, for more on new products, events and up-to-the-minute developments in the varied world of radio.

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

What's New

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

New SDR Transceiver

SWLing.com carried an extensive review of this new SDR transceiver. The reviewer concluded his test as follows: *"Would I buy the TX-500 myself? Well, since I'm a heavy field operator, yes, without hesitation. Moreover, I believe the $800 price tag is reasonable for a radio with its feature set and rugged military-spec type design. I confess I have been looking forward to getting the TX-500 in hand for a year now. So when HRO put up a product page and started accepting orders, without much thought, I placed mine. Yet within an hour, I was rethinking my decision, and soon I called to cancel it. Why? A bit of buyer's remorse. For although instinct told me I'd like the rig, common sense said I was getting ahead of myself. The truth was, at that time the TX-500 didn't have CW memory keying, and without that, I knew this field radio would not get a lot of use during my park and future summit activations. Moreover, I've no less than six-eight QRP transceivers––not to mention an Icom IC-705 on order for review––so it wasn't as though the need was great. Instinct or no, I felt I'd made the decision in haste, and my head said my heart should take a few beats before committing. Yet, after taking the TX-500 review unit to the field––and, of course, lab599's addition of that all-essential memory keying––all of a sudden the TX-500 became much more appealing. And I'll admit, this radio grew on me over that evaluation week (ah, the dangers of reviewing radios…you do often become attached). There's also been comfort in knowing the TX-500 wouldn't be harmed should I be caught in a pop-up shower and anxious for the safety of my equipment. But there's something more: it turns out my initial instincts were correct. I just happen to like this radio. The way it feels and functions suits me as an operator and its performance exceeds expectations. And that's a thing I couldn't have known until I gave it a spin. While no radio is perfect, I nonetheless suspect the TX-500 will gather a loyal customer base soon; indeed, it had a following well before anyone laid hands on it. Including me. So now I am seriously considering purchasing the TX-500 for keeps".* (Source: *SWLing.com*)

https://tinyurl.com/y5wwpos6
https://lab599.com/downloads

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

Desktop MkII, ATT2 and LLC1 Units from bhi

bhi has recently introduced the ATT2 high-level-to-low-level audio converter (audio pad) for the bhi ParaPro EQ20-DSP range of amplified parametric equaliser units. The new ATT2 pad was designed to be used with amateur radio transceivers and receivers enabling a wider range of AF/volume adjustment before the overload LED on the bhi ParaPro EQ20 unit comes on, making it less sensitive and easier to use.

The ATT2 accepts mono or stereo speaker level signals up to 1W (2.828 Volts p-p into an 8Ω Speaker) and will attenuate the audio down to a line level of around 1V (line level at 10kΩ). The ATT2 is housed in a small ABS plastic enclosure and measures 55 x 25 x 18mm. Connections are a 3.5mm socket for the input and a 3.5mm plug lead on the output. Retail price is £24.95.

The company has also updated the LLC1 isolated line level converter unit so that it can also be used as an isolated attenuator pad on the input side of the bhi ParaPro EQ20 range as well as a line-level converter on the audio output side. This helps customers suffering from RFI or ground loop issues. The LLC1 is still priced the same at £39.95.

Both units are available from bhi on 01444 870333 or from one of their authorised dealers.

Last but not least, bhi has upgraded its popular DESKTOP speaker to the new DESKTOP MKII. It now includes the latest bhi DSP noise cancelling technology for much-improved speech quality. The DESKTOP MKII 10W amplified DSP noise cancelling speaker is suitable for use with most transceivers and receivers but can also be used with SDR and line-level signals, due to the 3.5mm stereo line-level input socket on the rear of the speaker, making it suitable use with a wider range of radios. The new DESKTOP MKII price £199.95.

https://www.bhi-ltd.com

Radio News

CAROLINE COMMUNITY RADIO LAUNCHES IN ESSEX: A community radio station using the 'Caroline' name has launched in the Maldon District of Essex. *Caroline Community Radio* is using the brand of the former pirate with permission but has no official connection with the current Radio Caroline. The service started on Monday morning from Burnham-on-Crouch and has Ray Clark on *Breakfast*, Peter Philips on *Daytime* and Johnny Lewis on *Drive*. It has support in the form of technical and programming from the Radio Caroline team, which also operates a community radio licence covering a large part of East Anglia and Essex with a 1,000W transmitter. *Caroline Community Radio* comes two years after another station by the same team, *Saint FM*, ceased broadcasting when it won a new licence for a larger area
(SOURCE: Radio Today)
https://tinyurl.com/yybu3tyt

WORSHIPPERS IN LOCKDOWN: People of faith can hear broadcasts from clergy, musicians and the occasional celebrity during lockdown via their local BBC radio station this lockdown. Since March, the network of 39 stations has been broadcasting a 30-minute Christian service at 8 am each Sunday. This weekend features a special Remembrance Sunday service led by the Anglican Bishop to the Forces, the Right Reverend Tim Thornton. The next eight weeks see services from the likes of new Archbishop of York Stephen Cottrell, Methodist minister Jenny Pathmarajah and world-renowned hymn writers Keith and Kristyn Getty. Each Sunday the service is led by a different Christian denomination. Meanwhile, Muslim, Sikh, Hindu and Jewish reflections take place throughout the week across the local stations. More detail is at this URL:
https://tinyurl.com/y6o8fez3

Nevada: New SSB Masthead Amplifiers

Nevada has announced the introduction of the new SP-400 4m (70MHz) Low Noise Masthead preamplifier, from SSB Electronics Germany. The SP-400 is housed in a UV and weatherproof casing using N-type connectors and with all mounting hardware supplied. It uses coax relays, which can handle up to 750W PEP when sequentially switched, or 200W PEP with Vox operation. The front end has a noise figure of 0.7 dB with a gain variable from 9 to 18 dB. designed to handle strong signals without issue and be very stable. This is an ideal addition for the new data modes WJST etc. where it can handle 400W sequential switching or 100W Vox switching. The SP-400 sells for £345.95 and is available from Nevada
www.nevadaradio.co.uk

LAMCO: Vine Antennas IC-705 Product Range

Joe from LAMCO wrote in to report on an exciting new product range from Vine Antennas. **The Vine Antennas RST-705-9A Power Supply Unit** is the perfect solution for making your ICOM IC-705 fit and look perfect in your shack. It is ideal for taking away on holiday, in the caravan. It comes complete with protection against over-voltage, cross-polarity, overheating, overcurrent, and critical power failure, when accompanied with the optional Vine Antenna RST-705 battery backup. The **Vine Antennas RST-BBB Battery Backup Box** is designed to fit underneath the desktop supply and radio assembly with the IC-705 Combo and includes a 7Ah lead-acid gel battery, presenting all three components as one tidy desktop assembly. The battery backup box also includes a speaker (mounted on the front of the unit) for those wishing to use hands-free radio operation. Last but not least, the **Vine Antennas RST-BNC right-angled BNC-SO239 Fly Lead** can make your ICOM IC-705 shack look neat and tidy. No horrible cables sticking out of the side of your IC-705. The lead fits perfectly to the side of the Icom IC-705 making your shack looking perfect. It also works with the **LC-192 Rucksack**.

Compact waterproof transponder from Icom

The MA-510TR is a new compact, waterproof Class B AIS transponder, which will actively notify other vessels of your position, as well as displaying real-time vessel traffic information. This all in one standalone unit combines transponder and display in a smart, compact design featuring an attractive wide-angled colour display which is easy to read, even under direct sunlight. This advanced AIS transponder features a whole host of important collision risk management functions as well as a navigation function that guides the operator to their destination. The MA-510TR is very easy to both view and use. Real-time information is displayed on the MA-510TR's large, wide viewing, high-resolution 4.3-inch colour TFT display. The display clearly shows your, and other vessels' positions and information.

Large, easy to use, backlit buttons make the unit easy to operate even in severe weather conditions. The transponder has several collision-risk management functions. It identifies a target list (those in a local area), dangerous list (those you could potentially pose a threat) and what the Closest Point of Approach (CPA) and Time to Closest Point of Approach (TCPA) is. The 'Friend' list screen displays the detected AIS targets that you set as friends. A useful MOB function automatically marks a waypoint when the MOB button is pressed should the worst happen and someone falls overboard. A collision alarm and external alarm connection to optional external audio equipment give the yachtsman extra warning of potential impact. As well as transmitting and receiving AIS data, the MA-510TR can be used to navigate a specific route. You can assign a maximum of 100 favourite locations or points of interest. The Navigation function is started by just selecting a waypoint or an AIS target on the display. When integrated with selected Icom fixed radios, the MA-510TR allows you to transmit individual DSC calls to a selected vessel instantly without manually entering its MMSI number.

You can register up to 100 friends' vessels by MMSI which will appear coloured in yellow on the display. The MA-510TR's compact size means that it can, for example, be installed in a convenient place near the chart table, in the wheelhouse, on the flybridge or a steering pedestal in the cockpit and would make an invaluable safety addition to small vessels, workboats or pleasure craft. The MA-510TR AIS data output uses either NMEA 2000 & NMEA 0183 formats for easy connectivity to most radars, chart plotters, and navigation systems. The MA-510TR comes complete with GPS Receiver. It is available now from Icom marine dealers nationwide.

RadioUser STOP PRESS!

Midland Alan 78PRO at Nevada

Nevada is pleased to announce the release of the new Midland Alan 78 Pro CB radio. This is a compact 80 Channel Mobile AM/FM CB Radio, suitable for Europe and the UK, with both 12V and 24V capability.

New features include automatic digital squelch (which eliminates background noise) and a noise blanker with automatic noise limiter filters, to reduce continuous local background noises.

The radio also includes last channel recall, Channel 9 emergency button, external S meter socket and scan control. It is priced at £99.95 and available from Nevada Radio.

https://www.nevadaradio.co.uk

Radio News

COMMERCIAL RADIO CALLS FOR MORE SUPPORT: Radiocentre has written to the Government requesting additional support measures as new tiered restrictions introduced across the country impact local economies and businesses. Siobhan Kenny, Radiocentre CEO, has today written to the John Whittingdale MP, Minister for Media, to request an urgent meeting to discuss how the Government can help. In the letter to the Minister, Siobhan Kenny wrote: *"Smaller operators, for example, whose revenues derive significantly (up to 90%) from local advertisers have been particularly hard hit. This means that there is an immediate crisis that still needs to be addressed, as high fixed costs and dramatic falls in revenue still beset stations across the country. Alongside this is the longer-term support for economic recovery, as well as other measures to ensure that broadcasters can operate in the most effective and efficient way."*

Siobhan told RadioToday: "Commercial radio broadcasters continue to provide an essential public service role to listeners through news bulletins and information, which is even more important as regional restrictions are introduced. *It's imperative that the Government understands that while economic recovery is important, many broadcasters are still under significant pressure right now."*

(SOURCE: *Radiocentre, Radio Today*)

https://tinyurl.com/y5wvuk4e

A Magnetic Loop Antenna for the Icom IC-705

The AL-705 is a new, versatile portable magnetic loop antenna from Alpha Antenna. As part of a special agreement with Icom, the AL-705 is now an official partner product for our ground-breaking new radio, the IC-705. The AL-705 operates on the 10 to 40-metre amateur radio bands. The antenna's compact design allows it to be stored in the lower section of our LC-192 backpack for easy storage and transportation. Once deployed, the antenna's maximum diameter of 26.5 inches or just over 67.3 cm, means it is easy to manipulate and mount conveniently wherever needed. Maximum power handling is 20W SSB, and 10W CW & Digital. The AL-705 comes with 15 feet/4.57 metres of feedline, with BNC and PL-259 connectors. The AL-705 will be available for sale from authorised Icom amateur radio dealers from November 2020!

https://tinyurl.com/y4m5bne9

Stampfl RF Shark

The Swiss-made *Stampfl RF Shark* receiver works according to the double-superhet principle and is designed for the frequency range from 40kHz to 30MHz.

It is characterized by an elaborate circuit with several quartz-stable oscillators and a DDS frequency processing. Besides, it has a tuneable preselector, high-quality ceramic filters in the second IF position and a product detector for SSB and CW reception. For AM, 6 kHz and 9 kHz bandwidth are available. A TCXO ensures high-frequency stability of local oscillators. (The letters 'TCXO' stand for 'Temperature- Compensated Xtal Oscillator'; 'Xtal' is short for 'crystal' and implies a quartz crystal resonator - Ed.). Thanks to a detailed, illustrated construction manual, it is also possible for beginners without knowledge of HF technology to build this kit successfully. The adjustment work is limited to the LCD contrast adjustment and the levelling of the S-meter. Required are multimeter, soldering iron, pliers and screwdrivers as well as a steady hand and patience.

The only SMD component of the kit is already pre-assembled. The kit contains all required boards, assemblies and components as well as a machined and printed housing.

https://qrznow.com

Radio Receiver from Belka

The Belka-DX radio receiver is designed for listening to radio stations with AM, NFM and SSB modulation as well as to CW signals at a frequency range between 1.5 and 31MHz. The radio has a case size of 85x50x20mm and weighs little (ca. 100g).

High sensitivity is realized when receiving on a telescopic antenna.

However, the Belka-DX also works excellent with a full-size antenna. Audio bandpass filters are adjustable. In telegraph mode, the frequency band is about 300Hz with a regulated pitch from 500Hz to 1kHz.

The settings of favourite radio stations can be stored in any of 32 memory cells. There is no built-in speaker, but there is a fairly powerful bridge-mode audio amplifier that provides sufficient volume when working on an external speaker or headphones.

The built-in LI-Ion battery allows you to work with this radio for about 24 hours. In addition to the built-in battery, the receiver can also work from an external DC voltage source of 5V. The Belka-DX has now analogue IQ output for viewing a panorama on a PC.

(Source: Belka)

http://belrig.by/belka-DX
https://tinyurl.com/y256b4za

ML&S Latest

The **MyDEL Quick release Antenna Bracket** is a new accessory added to the IC-705. It is built from a solid billet of aluminium assembly & attaches to the side of an IC-705 allowing a larger PL-259 terminated antenna to sit vertically alongside the transceiver. ML&S realised that using the BNC connector fitted to the IC-705 for anything bar a terminated lead could cause damage to the radio housing. Available from stock at £34.95 for more information see

Meanwhile, the **MyDEL IC-705 Tripod Stand** allows you to mount the Icom IC-705 on your shack table. Priced at £24.95, this light-weight alloy construction item has a locking swivel head system allowing you to position the transceiver to the correct angle for operation.

The three legs have rubber feet stopping the entire mount from slipping on the tabletop surface. Moreover, ML&S now stock the latest edition of covers for your rigs and accessories: The new **IC-705 Cover** from Prism. All covers are handmade and embroidered in the UK. These are very well produced covers, and they are ready to ship at £27.95.

Finally, the **TyT TH-9800 Quad Band Mobile** 50W 10m/6m/2/70cm FM radio is now in stock at ML&S. Compact and ideal for mobile or base station operation, the TH-9800 has a remote head, offers AM receive on Airband (108-136Mhz), 800 memory channels, dual-receive with dual-display, and it is available from stock for £199.95.

www.HamRadio.co.uk

New from Moonraker

This rugged bag contains all you need to get your portable radio hobby up and running. The contents include End fed half wave (40-10m) with QRP 49:1 transformer, 9-1 Unun, Two 10-metre lengths of antenna wire, two wire winders, Two ten-metre coax cables terminated in moulded PL-259 plugs, a two-metre and 70cm dual-band mag-mount antenna kit, SO239-BNC male adaptor, BNC-SMA adaptor, BNC-SMA reversed adaptor, four 'dog-bone' insulators, plus a Baofeng UV5R dual-band FM handy.

Yours for £169.99.

https://www.moonraker.eu

Radio Geeks News

Tom Morris, of *AirAntennas*, has been in touch to bring us some news. Tom said: *"We are moving premises this week and will now be based in Alloway in Ayrshire, in 'Robert Burns country'. Our large detached outer building will be converted over the next 2 months, into a full retail outlet, so when COVID allows us, our Ham & SWL friends can visit for a tea & a look at the new equipment, Our new website is up and running. Our new UK wide Service & Repair service will start in about 10-14 days, we have a fully-equipped service department, also based in Ayrshire, and a very capable engineer. The Yaesu sales are doing well, and we will be introducing 5-6 new antennas.*

www.radiogeeks.co.uk

David Harris
mydogisfinn@gmail.com

Populism, Superfans, Shock-Jocks, and Unpredictable Programming

David Harris evaluates a new compilation of essays on radio in the USA. The title covers a wide range of relevant topics, such as radio formats, streaming, religious stations, podcasting, and women in radio.

This month's title, *Radio's Second Century*, is a very readable, well-researched collection of 15 essays by US and Canadian academics on various aspects of radio. It reviews the last 100 years of broadcasting but also looks forward to our new multi-platform world.

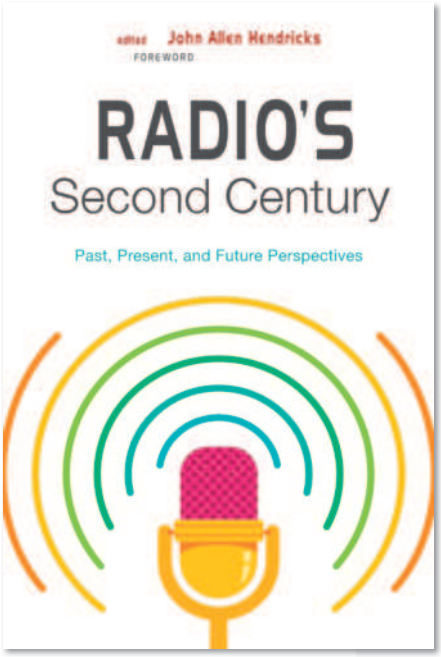
I feel that the text is primarily aimed at undergraduates study media and related disciplines. Although the book is mainly focused on US broadcasting it is of sufficient interest to attract a global audience.

The title begins by assessing the health of US radio, some 100 years after KDKA, Pittsburgh became the first US station to broadcast in November 1920. In the US today, some 92% of adults listen to the radio, and some 3 billion are tuning in globally. By 1922, the US, which never had a state broadcaster, had over 400 private stations. Radio has survived the impact of television and has adapted to the digital world through streaming on the internet, smartphones and satellite broadcasting.

The latter, in particular, is very important in the USA where the Sirius XM satellite service has 33 million subscribers (mainly for in-car reception) and hundreds of channels. The role of podcasting and music streaming is also recognised as being more important in radio's second century.

One chapter that drew my attention was *The Shrinking Electronic Town Square*. It considers the decline of local radio, and how this has helped shape a national political agenda. Many parts of the US are described as 'news-deserts', where no local stations are reporting on local issues.

The consolidation of ownership of US radio stations has resulted in a few big corporations controlling most stations. The big broadcasters syndicate programmes of national interest. This has, arguably, helped fuel the populist uprising which brought US President Trump to power. The authors make the point that, when people are disengaged from their local communities, they tend to blame the national government, when in fact their situation is unlikely to change, regardless of who is in power. The demise of local radio (and newspapers) as one of the drivers of populism is a fascinating and original point.



Radio's Second Century. Past, Present and Future Perspectives
by Hendricks, J.A.(2020)
Rutgers University Press. 270 pp. Pbk. £33.95.
ISBN 9780813598468
www.rutgersuniversitypress.org

The text has a chapter on US 'shock-jock' Howard Stern (b. 1954) who earns $90 million (£69 million) as a presenter for Sirius XM. This makes BBC football pundit Gary Lineker seem positively cheap at £1.75 million.

Furthermore, the book explores the concept of Stern's 'super-fans', and how Stern exploits the unregulated nature of satellite broadcasting to remain provocative and attract millions of listeners.

The world of spoof broadcasting is explored by considering the impact of Orson Welles 1938 *War of the Worlds* programme, which many people thought was a news programme announcing alien invasion.

An earlier BBC broadcast, *Broadcasting the Barricades* (1926) was held up as the first example of this genre of programme.

The chapter on 'unpredictable programming' is intriguing too: It examines the concept of 'freeform-programming' (where the *presenter* chooses the music) as opposed to the 'playlist' format where a *computer* algorithm will choose the records played by a station. As a former freeform community radio station presenter, I was very fortunate to be able to have complete freedom to choose the records I played.

The concept of radio formats began in the USA in the late 1940s with a top 40 singles playlist. This has now developed into a vast range of different formats (Radio User, August 2020: 14). This book argues that free-format stations can attract listeners and compete against the 'dreary' computer selected music which dominates the airwaves both in the US and the UK.

Religious broadcasting in the USA receives very critical scrutiny in *Radio's Second Century*. As any short wave listener will know religious broadcasting is very big in the USA. There are over 3,000 AM and FM broadcasters in the USA, many of which are owned by big corporations. The authors make the point that these stations suffer from a lack of diversity: Most presenters are white males, and much of what they preach is about consigning women to 'domestic' roles.

Finally, this title also has excellent chapters on *Audience Research, Social Media Analytics, National Public Radio (NPR), Canadian Community Radio, Podcasting, Greek Radio*, and *Women in Broadcasting*.

I would recommend this book to anyone with an interest in broadcasting, and I wish some British academics would soon write something comparable about UK radio.

[Any authors out there? - Ed.].

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The World of Portable Valve Radios

Duncan James explores the beautiful miniature thermionic valve (vacuum-tube) radios which were on the UK market before the advent of the transistor, and some of which were aimed specifically at women.

There have been many changes in the man-made world over the last century but there are few that have had such a profound effect on every one of us as the advances that have been made in electronics. The evidence is there in every smartphone, a miracle of miniaturisation that is now the constant companion, or so it seems, of everyone on the planet.

At its heart is a computer of staggering complexity, in terms of its microscopic hardware. This has evolved from the invention of the transistor junction in the late 1940s. This was followed in the 1950s by a race to bring reliable devices to the market for many applications, including portable radios. In those, the small size, coupled with low voltage and power requirements, were the key advantages over the use of thermionic valves.

The Miniature Valve

By the time the transistor was invented, the valve had been through 50 years of development to become a sophisticated device with a complex internal structure. It had also been miniaturised in America in 1939 by the RCA company for use in a very small, portable superhet receiver, the RCA Victor BP-10. The valves used in it were the 1R5, 1T4, 1S5, and 1S4.

The radio was so popular that in just two years over 200,000 were sold until the bombing of Pearl Harbour brought America into the war. Production had to stop, although the miniature valves did find uses in military communications equipment.

Battery Makers

It was only in the late 1940s that these small valves found their way into British portable radios. In this way began a decade or so of their use in battery-hungry sets before they were eclipsed by the new, increasingly reliable and efficient transistor radios of the 1960s.

Because these valve portables needed power to heat the valve filaments (1.5V) and supply the high tension voltage (either 69V or 90V) they were heavily dependent on specially-manufactured batteries. This explains why the majority of the portable radios of this period were produced by (or for) battery makers such as Ever Ready and Vidor.

1

Marconi and Ever Ready

One of the first of these small, valve radios to arrive on the British market was the Marconi P17B of c.1947, which was also made, with a different fascia plate, as the Ever Ready Model B (Fig. 1). These appear to have been influenced by the American RCA design but the internal layout was radically different (Fig. 2).

The Marconi and Ever Ready radios measured a mere 9 x 5 inches and were

just 2 inches thick. This was smaller than many of the transistor radios that would enter the market ten years later. They had a plastic case but the chassis was metal, with the valves and two IF transformers arranged as a very compact group.

The receiver was a superhet with a circuit design similar to other portables that followed in this period. The valves used, which were essentially equivalent to the RCA series, were DK91 (heptode), DF91 (pentode), DAF91 (diode pentode), and DL91 (pentode).

Both the Marconi and Ever Ready models were manufactured by Plessey but with slightly different designs to the front panel. Taking up almost half the interior, the battery (B114) supplied 1.5V for the valve filaments and 69V for the HT. The receiver was automatically switched on when the lid, which contained the frame antenna winding, was raised. There were just two controls, tuning and volume. These can be glimpsed at each end of the two-gang variable capacitor in the interior view.

A disadvantage was the fact that there was no provision for long wave reception which, for the British listener would have meant missing out on the *BBC Light Programme*, broadcast on 200kHz at that time.

Marconi's 'Jewel-Box'

These rather austere looking radios were followed by the Marconi P-20-B (Fig. 3) which was another miniature unit. This one was designed and advertised to appeal to the ladies. It was released in December 1948 and offered medium and long wave reception with a wave-change switch on the front panel. Opening the lid turned the radio on by switching on both the HT and LT.

Unusually, the metal case was die-cast with a mock-snakeskin finish. But the base, and lid which contained the antenna coil, were plastic. This remarkably diminutive Marconi radio had, for the time, a very modern look and feel. It had small components, including a miniature output transformer to the three-inch diameter speaker (Fig. 4). One almost expects it to have been fitted with a tiny headphone socket.

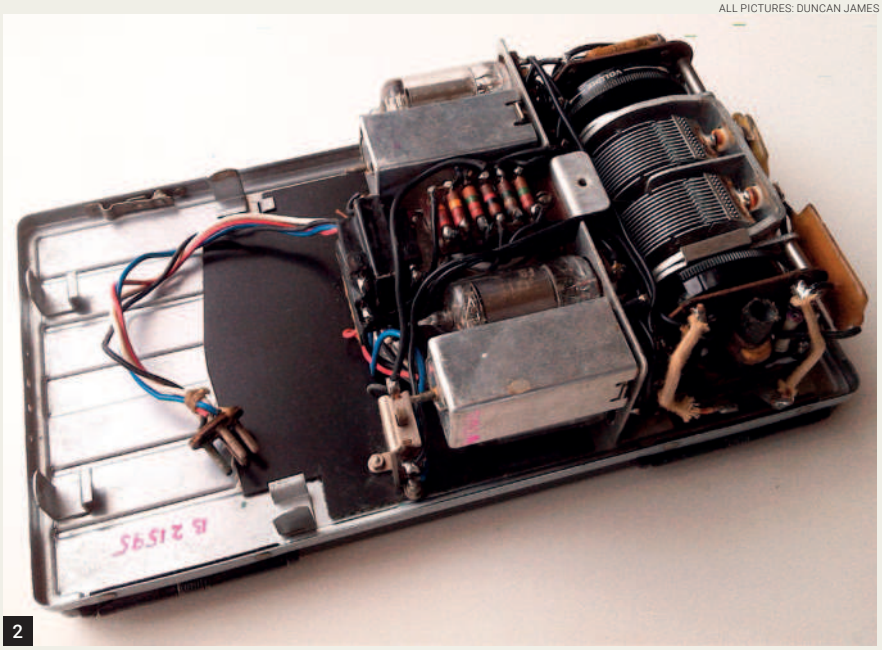
The Superhet Circuit

The P20B circuit (Figs. 3 and 4) is shown with its four valves. V1 (DK91) was a heptode that amplified and mixed the incoming signal with the oscillator signal to produce the intermediate frequency of 365kHz. It was then fed to the tuned circuits of the first IF transformer. The resulting signal was amplified by the pentode, V2 (DF91) and fed to the second IF transformer. Valve V3 (DAF91) was a diode-pentode. It served to detect and amplify the signal and feed it to the output pentode V4 (DL91) thence to the output transformer and the loudspeaker.

Making Room for Batteries

Until the introduction of these miniature valves, portable radios had been cumbersome affairs. One of the last of this line was the first version of the stylish Ever Ready Model C of 1946 (Fig. 5). This used a large metal chassis with octal valves and tall IF transformers.

ALL PICTURES: DUNCAN JAMES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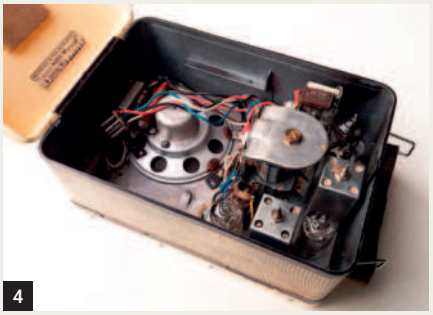
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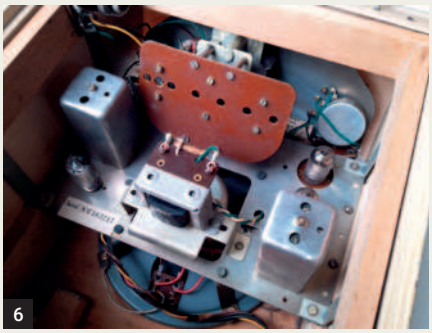
Fig. 1: The Ever Ready, Model B.
Fig. 2: The interior of the Ever Ready, Model B.
Fig. 3: The Marconi P-20-B.
Fig. 4: Compact layout of P-20-B components.
Fig. 5: The Ever Ready Model C.

Fig. 6: The chassis of the Ever Ready model C. Fig. 7: The Vidor CN426. Fig. 8: The Vidor CN426 with mains transformer and selenium metal rectifier. Fig. 9: The Roberts RMB. Fig. 10: The spacious layout of the RMB. Fig. 11: The stylish Vidor *Lady Margaret*. Fig. 12: The Vidor *Lady Margaret* batteries. Fig. 13: The Ever Ready *Sky Countess*. Fig. 14: The printed circuit of the *Sky Countess*. Fig. 15: The *Sky Countess* ferrite rod aerial. Fig. 16: The Ever Ready *Sky Leader* of 1958. Fig. 17: Ever Ready *Sky Leader* with Mullard transistors between the IF transformers.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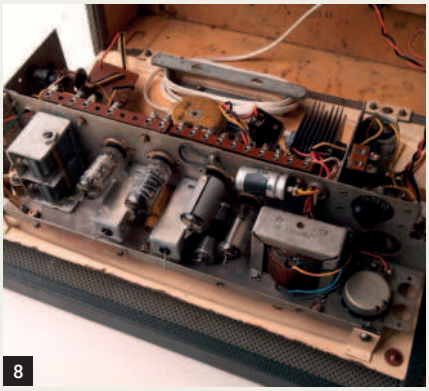
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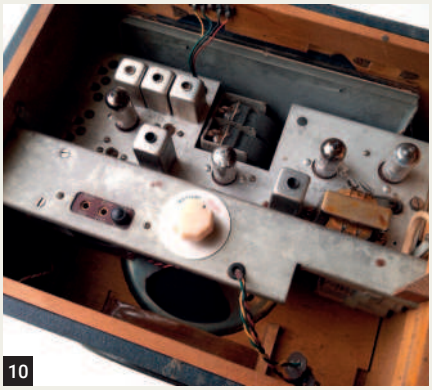
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It did have advantages because there was room in the plywood and plastic case for a generous size of loudspeaker and a large frame antenna. The battery compartment could accommodate a big battery (B103). This was particularly valuable because the valve filaments drew a total current of 250mA. It also supplied 90V for the HT. Within a year, a revised model was produced. It had been modified to use miniature valves, still with the same high filament current. The rest of the set remained virtually unchanged, offering a metal chassis, tall IF transformers, and a generous spacing of the components (Fig. 6).

The Mains-Battery Compromise

The power requirements of these portables led to a compromise. Batteries were expensive and heavy. If you make the plywood case bigger to create room for larger batteries there is extra space; so why not add a mains power supply, especially since, by the 1950s, most houses were now connected to the grid? One of the many examples of this is the Vidor CN426 of 1953, the size of a small suitcase and weighing in at nearly six kilos (Fig. 7).

The construction was traditional, with a steel chassis and point-to-point wiring with the help of a long tag strip (Fig. 8). The mains transformer had a centre-tapped secondary winding feeding a selenium rectifier to give 90V high tension and, via dropper resistors, 7.5V to the valve filaments, which were connected in series.

Safety Issues

The extraordinary thing is that – although the chassis and front panel of the Vidor (Figs. 7 and 8) were metal – there was no earth connection as the supply was a twin feed. An additional safety issue was that to fit batteries, it was necessary to open up the radio to reveal potentially live terminals. Therefore, there was a stern warning label instructing the owner to *"disconnect mains before opening panel further"*. The frame aerial was in the lid with separate tuned windings for long and medium wavebands. The four control knobs were not labelled. Therefore, unless the radio was opened up to read the instructions inside, one was left to discover what they did, by trial and error.

The Triple-band Roberts

A more traditional design of the period was the Roberts RMB of 1951 which also used miniature valves (Fig. 9). It offered long, medium and, unusually, short wave reception from a carefully constructed (and costly) radio. There was space for batteries beneath a mains power supply of superior quality that used a selenium bridge rectifier complete with capacitor and choke smoothing for the HT circuit, while the LT of 1.5V was also rectified and smoothed, all of which helps to explain the very considerable weight of this 'portable' In this receiver, there was no opening lid. Despite the amount of metalwork inside (Fig. 10), the frame aerials were within the radio case. The base was fitted with a turntable to enable the radio to be rotated for optimum reception.

Improved Valves

A popular, and reasonably compact, portable produced by Vidor was the *Lady*

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Margaret of 1954 which, as the name implies, was aimed at the rising spending power of women in the post-war years (Fig. 11). Vidor called it a *"personal attaché battery portable"*. The radio's secret was that it made use of a new series of miniature valves (DK96, DF96, DAF96, DL96).

These were the same size and specification as the RCA valves and the DK91 series but with the important difference of having 1.5V filaments that operated at half the current levels of the earlier types. This was a valuable improvement that gave a much longer battery life and it was readily taken up by other manufacturers.

The set had long and medium wave reception, a frame aerial in the lid, and attractive design. Lifting the lid turned the radio on. The construction, however, was traditional, with a steel chassis and tag-strip wiring, but at least the loudspeaker was a generous size (Fig. 11).

Here the batteries are the B126 (90V) and the AD35 (1.5V) (Fig. 12).

Ever Ready batteries in a Vidor radio – whatever next!

The rolled-up piece of paper helping to secure the batteries is from the Daily Mirror, April 8th 1957.

Radios Aimed at Women

Continuing the trend for naming rather than just numbering the radios, Ever Ready produced the *Sky Countess* in 1958 (Fig. 13). It was a neat, good-looking product that - like Vidor's *Lady Margaret* - had the female listener in mind. It too, made use of the more efficient DK96 (etc.) series of miniature valves. It also had technical features that were beginning to be

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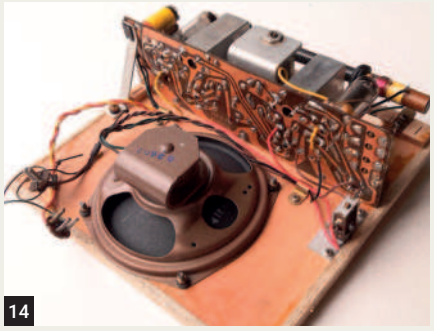
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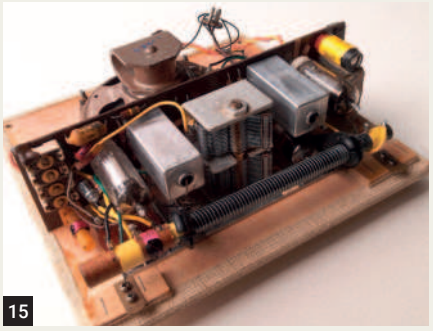
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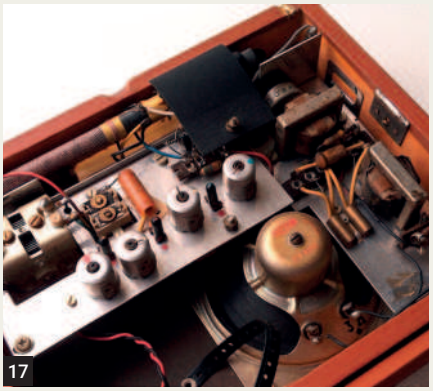
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used widely. Firstly, there was a single-sided printed circuit board although it did not have the component labelling on the upper side that is usual today (Fig. 14). The components were small and individually soldered into place. Gone were the tag strips and steel chassis because the wiring had been laid down in copper.

The second 'new' feature was the use of a ferrite rod antenna (Fig. 15). This replaced the frame aerial; however, whether or not it was more efficient is a matter for debate. It still meant that the orientation of the radio influenced the strength of the

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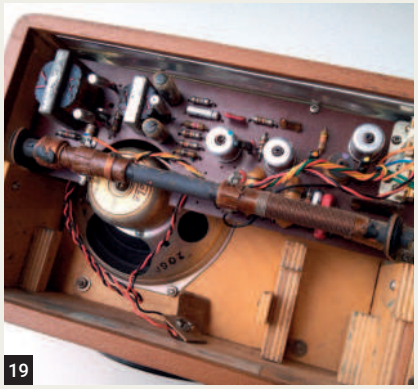
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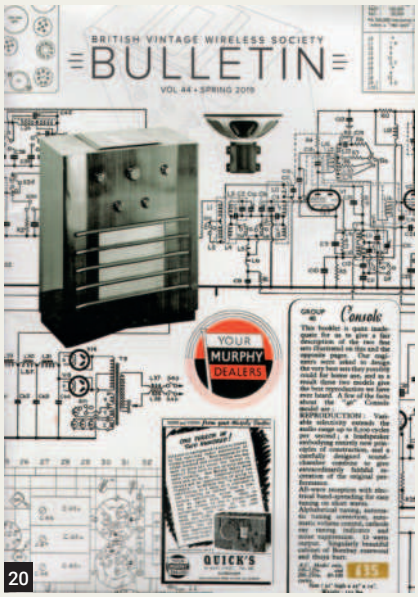

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signal. Ever Ready was intent on selling more than just the radio; not only were their batteries specified but so too were the valves which also carried the Ever Ready name, although it seems they were manufactured by Mullard.

The Arrival of the Transistor

A revolution was taking place: In 1958, the very same year that the *Sky Countess* portable valve set was in production, Ever Ready came out with the aptly named *Sky Leader* portable. It made use of the increasingly reliable Mullard transistors, the OC44, OC45, OC78, & OC78D, that were then on the market (Fig. 16). But although the *Sky Countess* with its valves had used a printed circuit, this feature did not find its way into the new transistor set, which had an aluminium chassis in two parts: one for the HF section, the other one for the audio, with a pair of transformers and a push-pull output circuit (Fig. 17). A modern touch was the slug-tuned IF transformers which were radically reduced in size; even the two-gang tuning capacitor was smaller than usual.

The 'Portables' Becomes Portable

Up to this time, transistors had mostly been used in 'pocket' radios, beginning with the American Regency TR-1 in late 1954. Their reliability had been steadily improving. At the beginning of the 1960s, many new portable transistor radios began to enter the market. Firms such as Roberts moved to transistors in 1958 with the RT1 (presumably for 'Roberts Transistor No.1' - Fig. 18).

This model made use of all the recent developments; it was on a printed circuit board with wired-in transistors, small components, a push-pull audio circuit and a ferrite rod antenna (Fig. 19). All this in the plywood case that became the trademark appearance of the brand and is one that survives to this day as a 'retro-look'.

The Valves Retire

The uptake of the transistor was particularly rapid in portable radios: For this consumer product, it offered such sweeping advantages, in terms of low voltage and power consumption. As the transistor was improved, it soon replaced valves in almost every piece of electronic equipment. The changeover took a little longer with mains radios, where power demand was not a limiting factor. When it did, it was no longer necessary to wait as the valves warmed up because with switch-on the transistor radio would instantly spring to life.

By the 1960s the transistor had come of age; the thermionic valve, having carried us so far down the road, began its inevitable retirement.

Fig. 18: The Roberts RT-1 of 1958.
Fig. 19: Roberts RT-1 with transistors, printed circuit and ferrite rod antenna.
Fig. 20: Consider joining the BVWS.

Further Reading

- British Vintage Wireless Society (BVWS): **https://www.bvws.org.uk/links.php**
- Evans, G. (2016) The Transistor (Digswell) (reviewed in *RadioUser*, October 2020: 14)
- Hawes, R. (1991) Radio Art (Greenwood)
- Lawson, P. (2016) Restoring Old Radio Sets (RSGB)
- Thompson, T. (2nd. ed. 2015) Vintage Valve Radios: A Practical Guide for Restorers (VRW Publications)
- Tim's Radios: **https://tinyurl.com/y6bh2bbe**

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NIJWAM SWARGIARY ON UNSPLASH

1

How to Find Reliable News on the Radio

Chrissy Brand
chrissyLB@hotmail.co.uk

Chrissy Brand looks at whether – in an age of 'fake news' – it is still possible to turn to international radio for accurate news & to help us form a balanced & objective view of the world.

In an era where fake news and conspiracy theories gain ever more publicity, how can we keep in touch with reality? How can we know which of the many news and features that we hear, watch and read we can actually believe? What news stories are not being covered in the bulletins that we hear? How can we ensure that we only consume reliable information from the radio, when we have so many stations to choose from?

News coverage, by most local and national radio stations, concentrates on major or breaking domestic issues, but coverage of international affairs has minimal coverage. In the UK, news items about the USA or major countries in Europe get prominence but the only times any other countries are mentioned is when there is war, natural disaster or famine. Most countries' domestic radio stations operate in a similar vein, concentrating on national news, often only giving coverage to other countries when they are closely connected.

This inward-looking tendency may be one reason why many people turned to short wave radio listening decades ago; to hear real news from other countries, presented in-depth and with local knowledge and experience. This is still possible and the experience is enhanced by having access to nearly any station of your choice, online.

Beware, Broadcast Bias

International broadcasters provide news and features that possess a certain *gravitas*, honed with a reputation over many decades. The news being broadcast is usually accurate, and it reports events that have been witnessed by reliable sources. It provides a useful

CONVERT KIT ON UNSPLASH

2

TOMAS WILLIAMS ON UNSPLASH

3

TAPIO HAAJA ON UNSPLASH

4

Fig. 1: We can't believe everything we hear, see or read. Fig. 2: In the USA, iHeart Media now shares Black perspectives on a dedicated radio station. Fig. 3: Downtown Vancouver, home to Co-op Radio, a small station with a global view. Fig. 4: Reliable news and views from Finland in YLE's All Points North. Fig. 5: An excellent historical primer by Simon J. Potter (2020).

overview for the audience, in digestible 'sound-bites' with simplified analysis.

However, it should be remembered that most state-funded public service broadcasters are telling news stories from a particular angle. If the broadcaster is publicly owned, it can still have a bias and a pro-establishment viewpoint.

Some state broadcasters directly influence the programme content of their radio stations, others keep away from editorial policy. Some governments choose to change or dismantle the broadcasting apparatus, which in itself, restricts the availability of reliable news sources.

International broadcasting has expanded considerably in the first twenty years of this century. Alongside long-established radio and television, satellite news services have arisen. The most well-known are Al-Jazeera, RT (Russia Today), France 24 and Venezuela-based teleSUR, all of which have English services. There are many others.

This explosion, according to Colin Sparks, a professor in media studies, writing in 2016, *"has been almost entirely the result of state action designed, directly or indirectly, to promote state objectives."*

The notion of 'soft power' as a tool used by governments via state-funded broadcasters has also been raised, with Harvard University International relations theorist Joseph S Nye defining it as being, *"the ability to get what you want through attraction rather than coercion or payments …ability to shape the preferences of others."*

Another valid argument was put forward in 2003 by Monroe Price, who described international broadcasting as being an, *"elegant term for the use of electronic media by one society to shape the opinion of the people and leaders of another."*

Obstructions and Lies

The *Committee to Protect Journalists* recently reported that, in Venezuela, *"180 radio stations that provided news and information went off the air between 2009 and 2020. The vast majority of cases are straightforward shutdowns by authorities, who pull stations off the air for a myriad of alleged violations, such as breaching legal provisions or expired licenses. In other cases, local authorities purposely cut off power. Some stations were pushed off the air due to a lack of basic services, such as persistent power outages and shortages of gasoline for staff to go to work."*

Certain stations are less discreet than others. Perhaps the clumsiest of radio stations in this regard is the DPRK's Voice of Korea. Its programmes are full of untruths and an argument that North Korea operates with a single-minded unity, all supporting leader Kim Jong Un, fools very few.

Another example is Radio Thailand, whose programmes appear to be neutral and uncensored if a little heavy on praise and coverage of the country's King Vajiralongkorn. Yet it is illegal to defame or even insult the monarchy. Even a protest or a voice of opposition is punished severely.

The starting point of most public service broadcasters in all royal countries is deference to the monarch, another example of how state broadcasters are close to establishment figures. You only

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

+ On 1386kHz medium wave
*Relayed on short wave by other organisations
Domestic services on short wave

Table 1. State Broadcasters in English on Short Wave.

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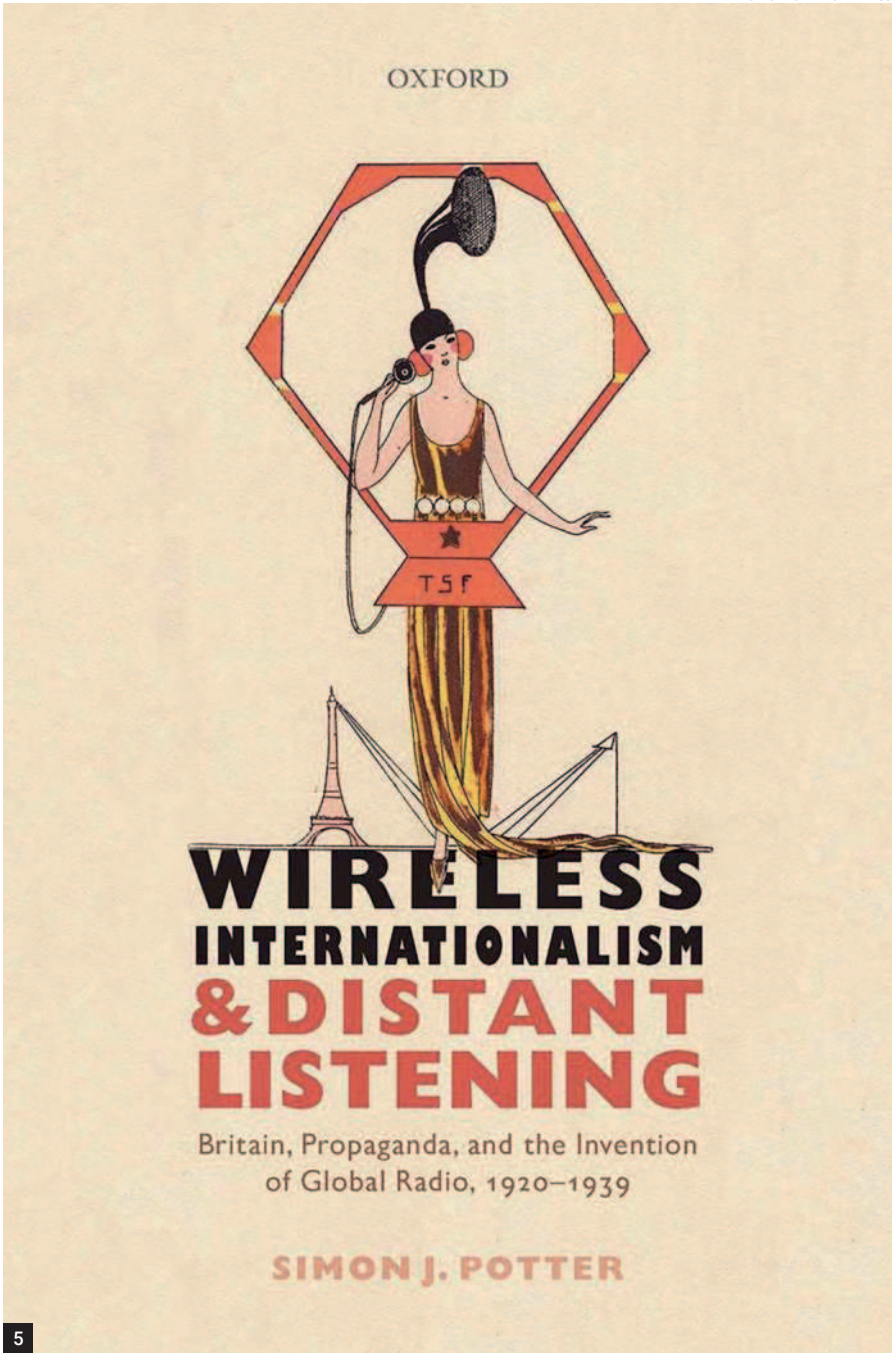

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have to listen to coverage of the monarchy, from Jordan to the Netherlands, to realise that little coverage is given to any republican voices.

There is a degree of fake (false) news and also biased news, on radio, television, in the press and on social media. Often the two get lost and confused and dangerous conspiracy theories can arise. Every individual needs to have a strategy to recognise truth, lies and bias.

BBC tech reporter Jane Wakefield was light-heartedly labelled as the 'BBC Misinformation Correspondent' on BBC World Service's *Tech Tent* programme on September 25th. when she and host Rory Cellan-Jones examined how misinformation spreads across online platforms.

This topic was covered very well at the *2019 Radiodays Europe Conference* session. I reiterate part of what I wrote in *RadioUser:* June 2019: 46-48, There was a session entitled *"Fake News – a Threat to the Democratic Conversation"*.

Flora Carmichael of BBC World Service spoke on combating this with verification tools artificial intelligence and training of journalists.

In this context, Ulrik Haageup, CEO of the Constructive Institute, in Denmark made an interesting statement: *"It is the grey-haired who are spreading fake news because they were brought up to believe what they read in newspapers"* (Fig. 1). There was agreement over how vital it is that people 'face-check' stories before sharing them, whether on the air or through social media. This applies equally to radio, television and print journalists, podcasters and the public.

In 1997, then-Senator, Joseph R Biden, fought against the Voice of America being

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- Flew, T. (2018) *Understanding Global Media* (2nd ed., Palgrave)
- Heil, A. J. Jr. (2003) *Voice of America, A History* (Colombia University Press)
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- Mills, T. (2016, Repr. 2020) *The BBC, Myth of a Public Broadcasting Service* (Verso)
- Potter, S. J. (2020) *Wireless Internationalism* […] (OUP).

Book Chapters and Journal Articles

- Price, M. (2003) *Public Diplomacy and the Transformation of International Broadcasting* **https://tinyurl.com/y3m48ma3**
- Sparks, C. (2016) *Global Integration, State Policy and the Media* (Palgrave) **https://tinyurl.com/yxnawbcg.**

Websites

- Black Information Network **www.binnews.com**
- CFRO FM, Vancouver Co-op Radio **www.coopradio.org.**

placed inside a State Department, saying it would be the equivalent of a death sentence, threatening both the budget and the journalistic integrity of all the services. He stated, *"Although the government pays your salary, you are all journalists and don't let anyone tell you differently … Credibility and accuracy must remain the watchword of you all."*

I think this can all be best summed up in the words of the great historian Edward Hallett Carr, who said, *"Study the historian before you begin to study the facts."*

Short Wave and Online

From the dawn of radio broadcasting until the advent of the internet, listening on a short wave radio was a key way to hear news about a certain country. Stations such as All India Radio and Radio Argentina al Exterior invariably carried information that did not get reported elsewhere, or certainly not to the same degree.

I would maintain that, to a large extent, this is still the case today. On short wave radio, there are now around 25 state broadcasters with an English service for you to garner your news coverage from (Table 1). In addition to these, some domestic stations are broadcasting in English, although many are unlikely to be heard beyond the continent they are based on unless you locate an internet stream.

If you speak more than one language, then you are in a stronger position. An understanding of Arabic, French, Portuguese or Spanish, for instance, allows you to access a far wider choice of news bulletins.

For English speakers, FM and medium wave broadcasts throughout Canada, New Zealand, Australia and the USA offer thousands of radio stations to hear online.

News to Choose

With the caveat that this is a subjective point of view, there are a handful of broadcasters that I turn to for more balanced news. With these, headlines and details are delivered in a professional and trustworthy manner. This helps me to weave my way through what can be a 'minefield' of radio news coverage.

As well as the short wave stations mentioned above, YLE Finland and Radio Sweden still provide news and features in English that you can trust. Along with their take on international events, there is a sense of measured calm in the way that the Nordic world runs. Perhaps it is the enshrined system of social democracy that helps.

I have heard many well-thought-through features covering Brexit, and many other social, economic and political developments, from SBS Australia (Special Broadcasting Service, a hybrid-funded Australian public broadcaster), Deutsche Welle and Radio France International, and I can also recommend the English services of Deutsche Welle and France 24 television.

YLE Finland's English service broadcasts on domestic radio in Finland and online. There is a weekly programme *All Points North,* while YLE Radio 1 and YLE Mondo air a daily three-minute news bulletin at 1230 UTC (Fig. 2).

Other sources I choose for my news, both in audio and in text, include Radio Prague International, Radio Slovakia International, Doubledown News and Kafka Desk. The latter is a service that began in 2019. It delivers reliable and diverse news and magazine features, in English, from Central Europe.

Kafka Desk could be another good example and champion of civic journalism, empowering and giving access to breaking news, features and inspiring stories, campaigns and community spirit that would usually not gain mainstream media coverage. The only audio, so far is, the *Kafka Tunes of the Month*, but I hope reporters will file reports in a spoken word format.

Outside of Europe, CFRO FM Vancouver Co-op Radio has been on the air since 1975, launched by activist groups in Vancouver. The station airs programmes in four categories: public affairs and news, music, multi-lingual, and the arts (Fig. 3). Co-op Radio also often reports on protests and movements that are ignored by the news agenda in their own country. When I listened on FM, whilst in that city in 2017, the station gave coverage of a 100,000-strong *People's Assembly Against Austerity* demonstration in London (which I had participated in the day before). It was largely ignored by UK radio.

In Los Angeles, *Rising Up* is hosted by Sonali Kolhatkar on KPFA 94.1MHz. A daily digest of independent news analysis, investigation, education, artistic expression, and activism in the public interest, emphasising the connection between global issues and those in local communities. *We Act Radio* is a media corporation broadcasting from Anacostia in Washington, DC. It combines broadcast and new media, delivering original audio content; progressive, diverse, up-and-coming opinion-makers given access to the airwaves for the first time, as well as established, trusted talk show hosts, such as Bill Press and Thom Hartmann.

We Act Radio started in 2016 when, *"a collaboration between independent producer Katie Davis, WAMU 88.5, NPR, Corporation for Public Broadcasting and Association of Independents in Radio produced a radio series about land: Who has it, who wants it, and what happens when it starts to change hands."*

At the end of June, iHeartMedia group launched an all-news radio station called BIN (Black Information Network) which carries the strapline of "*Because Truth Matters*"**. I**t is dedicated to, "providing an objective, accurate and trusted so*urce of continual news coverage with a Black voice and perspective."* (Fig.4).

In terms of radio, I listen to the stations mentioned above, plus more. For a more comprehensive overview, I listen to specific news features on podcasts, in order to hear more in-depth discussion or specialist coverage. Moreover, the book in Fig. 5 is an excellent introduction to 'international radio-diplomacy' and should be part of every shack library.

[This title will be reviewed in one of our next issues – Ed.].

1

Tecsun PL-990x (Part II)

Scott Caldwell
Scottandrew.caldwell@yahoo.co.uk

Scott Caldwell continues his review of the new Tecsun PL-990x portable receiver, looking at long and medium wave performance, SSB reception and some lesser-known features of the radio.

This is Part Two of my review of the Tecsun PL-990x (Figs. 1 and 2, *RadioUser*, November 2020: 50-52).

In this instalment, I am looking at the radio's performance on long and medium wave, as well as with some weather fax and radioteletype (RTTY) signals, with the aid of a PC and appropriate software.

To provide some further insight, I have done some remote listening, testing the receiver's sensitivity and dynamic range, without the hindrance of household electronic interference.

With the start of the DX season in the Northern Hemisphere, there is no better time to engage in some (socially-distant) outdoor DXing.

Long wave Reception

Against this background, I decided to connect the PL990x to my outdoor Wellbrook loop, and the initial performance was very encouraging (Table 1). On long wave, the PL-990x received European stations very well, and, once again, the sound quality was excellent.

The radio even managed to receive the two main stations from Iceland (Gufuskálar [189kHz] and Eiðar [207kHz]) with exceptionally good signal strength.

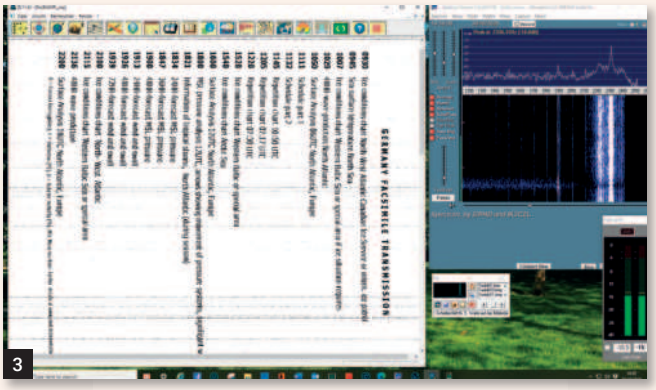
The only issue I encountered was slight overloading, which seemed to be confined to the medium wave band. Radio Warrington normally broadcasts to the local community on 1332kHz. However, it was also ghosting on 1494 kHz when connected to the Wellbrook. This was to be expected.

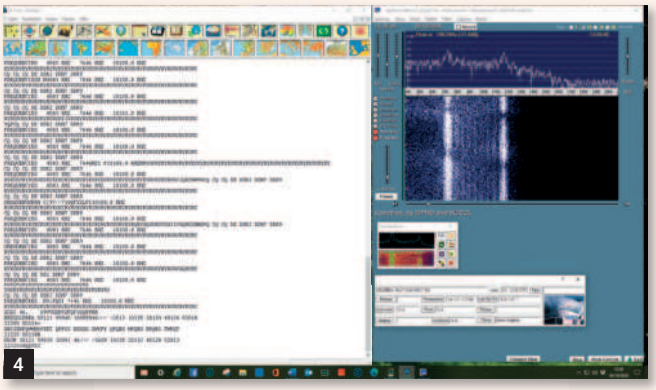
I encountered this problem as a young listener when my random wire antenna overloaded my portable radio, resulting in variable short wave reception.

From Lancashire to Hamburg: The Tecsun PL-990x on SSB

The reception on SSB is much improved when compared to Tecsun's previous receivers. As far as SSB voice

PICTURES: GEORG WIESALA





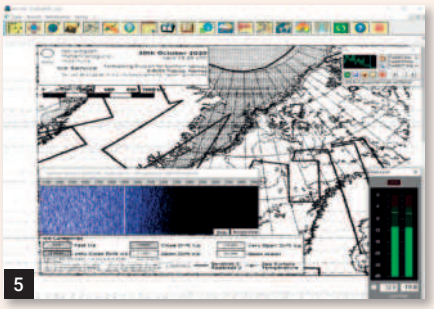


Fig. 1: The Tecsun PL-990x.
Fig. 2: Part of the SSB test setup, using a rechargeable power supply and (192Hz) soundcard.
Fig. 3: Easy FAX (radio facsimile) reception with the PL-990x.
Fig. 4: Resolving synoptic weather data into illustrations and photographs.
Fig. 5: Example of a weatherfax from *Deutscher Wetterdienst* (DWD) in Hamburg.

transmissions are concerned, I was able to receive, for example, Shannon Volmet on 3413kHz (USB), utilising just the supplied wire antenna.

Overall, the radio's noise floor is much lower on the PL-990x, most noticeably when in direct comparison with its predecessor, the PL880. I suspect that the refinement of the bandwidth functions is the reason behind this improvement.

For some more special testing, I passed the radio on to our editor, who summarised his SSB experiments with the PL-990x as follows:

"I hooked the Tecsun PL-990x up to my external aerials (Moonraker GPA-RX Vertical, 2-90MHz, and Wellbrook ALA 1530), which, by the way, it was happy with, no overload here. PC connection was via my external 192kHz USB sound card and high-quality audio cable.

I began with SSB (USB) reception of the RTTY weather signal from Hamburg (7646 [ca. 7645.1] kHz USB – DDK2, DDK9, DDH7), with the results shown in Fig. 3. Signals were received flawlessly and decoded by Zorns Lemma 11.4*, my regular decoding program. You might also wish to try out* Black Cat Weather Fax Decoder, JV32, SeaTTY, *or any number of data decoding programs, of course.*

With some weather software, any synoptic data reports (rows of encoded numbers) are translated, in 'real-time', as it were into pictures of the actual buoys and vessels the data came from (Fig. 4). This is quite a test for any receiver, and, given that this is not a dedicated marine weather receiver, this was great news. It would be possible to take this radio out on your boat and stay in touch with the weather, at least temporarily, and using a good external aerial by day. By night, the internal telescopic is more than enough to pull in most data.

Moving on the – slightly more difficult – reception of WEFAX (also known as Weatherfax, HF-FAX, Radiofax, and weather facsimile), I chose the more challenging daytime frequency first (4610 [ca. 4608.15] USB). Again, the radio delivered very useable - and sometimes remarkable - results. On the maps, country borders, coastlines, isobars and features such as wind-arrows, were plainly visible, and the resulting data were, therefore, of practical use.

On the 'easier' frequency of 7880 [7878.15] kHz, from the Deutscher Wetterdienst (DWD)*, the reception was near nigh impeccable, but do remember the 1.9-1.9kHz offset when you chase USB/LSB signals (Figs. 5 and 6). With that in mind – and preferably deploying an external aerial – weatherfax is a breeze with this versatile little radio. For hobby use, this radio certainly works well on RRTY and FAX signals. Switching between external wave-catchers and the radio's telescopic, showed that there was slightly more noise on the internal one. However, for (indoors daytime) RTTY/ FAX reception, the results were still impressive - on a signal-attenuating rainy and dull day."*

https://tinyurl.com/y7ldmltf
https://tinyurl.com/y5wm566c

Remote Listening

Thankfully, I had the opportunity to conduct some 'socially distant' remote listening away from the house and the interference caused by my children and their electronic devices. The PL-990x is ideal for remote listening, and the grips on the stand platform assisted in preventing the receiver from falling off my car's dashboard.

I decided to take my Tecsun AN-200 loop antenna because of its small size and its passive receiving capacity (i.e. there is no electrical power supply required). For short wave listening, I utilised the supplied wire antenna. When I had finished listening and started to reel in the wire, it jammed up and I had to unscrew the casing to release the wire; luckily, the cable protector had not become broken.

Therefore, you should be careful when reeling in the wire. I decided to set up a listening post in my car at a local park early on Sunday morning. It was very nice to operate the user-friendly PL-990x in

Frequency	Station	Location	Date	UTC	SINPO	Remarks
153 kHz	Antena Satelor	Brasov ROM	23/10	00:31	34333	Traditional Folk MX, Good, Moderate Noise, ID, ROM
189 kHz	RUS 1	Gufuskálar ICE	23/10	00:20	43333	MX Eraser – Little Respect to Me, ID, ICE
207 kHz	RUS 1	Eiðar				
ICE	23/10	00:27	33333	MX, Good, Moderate Noise, ID RUS 1, ICE		
225 kHz	Polskie 1	POL	23/10	00:41	44444	MX Jazz Version Blue Moon, Good, Slight Noise, ID, POL
234 kHz	RTL	Beidweiler LUX	23/10	00:52	54444	MX, Very Good, ID, RTL, FF

Table 1: Some broadcasting stations received on long wave.

Frequency	Station	Date	UTC	SINPO	Remarks
590kHz	VOCM St Johns NL	01/11	04:45	33333	POP MX, VOCM.Com, ID Your VOCM, EE
750kHz	CBGY Bonvista Bay, NL	01/11	05:00	22222	CBC NX The World this Hour, Weak Signal, ID, EE
930 kHz	CJYQ, St Johns, NL	01/11	04:05	22222	KIXX Plays the Classics, Signal Fading, ID, EE
1010 kHz	WINS, New York, NY	01/11	04:20	32222	1010 WINS Weather High of 54, ID, EE
1130 kHz	WBBR, New York, NY	01/11	05:08	32222	Bloomberg The World is Listening, ID, EE

Table 2: The *Warrington Wave Wanderer* – A few outdoor medium wave catches.

the dark confines of my car, and it required little in the way of setting up. I selected this location based on the apparent lack of electrical interference, which often limits my ability to enjoy DXing on the short and medium wavebands.

Table 2 shows some of the stations received with this radio on that day.

The battery life is excellent, and the USB based charging process is relatively fast. The bandwidth function came into its own when listening to medium wave broadcasts, particularly when listening to CBC Radio 1 (CBGY) Bonvista Bay, NL on 750 kHz and CJYQ St Johns, NL on 930 kHz.

When the 2.3 bandwidth setting was selected, this reduced the noise and interference levels, allowing the weak signal from CBC to be resolved well. This is another first for one of my portable radios and suggests that it will operate much better in low noise environments.

In this respect, I suggest that the PL-990x has the slight edge when compared to the PL-880, in terms of medium wave listening. The sound quality produced by the earphones was once again excellent, and the issue of the older PL-880 producing a slightly better sound is irrelevant in my opinion.

The fine-tuning control proved to be greatly beneficial when listening to two stations broadcasting on the same frequency. I managed to test the fine-tuning control when listening to RNE 855khz, whilst reducing the level of co-channel interference from BBC Radio Lancashire.

The PL-990x certainty holds its own when compared against the other high-end portable receivers (for example the Sangean ATS 909x) in terms of performance-to-retail-price-correlation. It will be interesting to see how the new Tecsun H-501 and the Eton Satellit, which have both been delayed due to the global COVID 19 pandemic, compare to the PL-990x.

These are certainly exciting times for short wave DXers and international radio fans.

There is much more to say about this exciting radio, and the table at this URL unlocks several hidden features on the set, which expand both its ease of use and functionality.

https://tinyurl.com/y4lrdd9y

Overall Conclusion

In my opinion, and having tested the new Tecsun PL-990x over the last two months (see: *RadioUser*, November 2020: 50-52), the PL-990x represents excellent value for money, with its retail price of £259.99.

It is versatile, feature-laden and will appeal to both novice and experienced listeners. In fact, I have bought the review model to add to my listening shack.

For the future, developers might want to think about adding an SD card recording function. However, overall I feel that the PL-990x represents a slight improvement over the PL-880, especially in terms of synchronous detection.

For the serious medium wave DXer and broadcast listener, this represents a major advantage.

TIM KIRBY

1

CB Radio Now

Tim Kirby
longworthtim@gmail.com

In the second part of his general introduction to CB Radio, **Tim Kirby** has put together a varied column containing thoughts on the current CB scene, regular nets, videos, and vintage gear.

In the last column (*RadioUser*, October 2020: 23-25), I concentrated more on my experiences of CB in the earlier days (e.g. Figs. 1 and 2). It is nice to be able to bring this up to date, with this excellent piece from Paul Maybin who originally posted this on Facebook, but kindly said that I could use it here

Paul wrote: *"It is very interesting to see some of the knock-on effects of the Covid lockdown, subsequent furlough and working-from-home situation. One of these has been a resurgence of Amateur Radio and Citizens Band Radio use. Some people have used the time to study for their Foundation Ham licence or M7 callsign, some are working to build on a current licence they already have.*

"But it is CB Radio that I find very interesting. It's nearly 40 years since CB was legalised in the UK with the 27/81 frequencies – yet those frequencies and the additional CEPT (mid) frequencies are still in regular use. I started using CB in about 1982/83; at that time, every one of the UK 40 channels was in use, and you would see at least 3 or 4 GPA aerials in most streets. Nowadays, CB is still in use and although it is by far not as crowded as all those years ago, it still has regular users, both home-based and mobile, from around the country.

2

"Some channels have fallen by the wayside, 14 is no longer used as a calling channel, with that moving to channel 19. A lot of 'breakers' use the 19 for conversations, arguments (as ever) and a bit of music too; some things never change. Channel 9 is no longer needed as an emergency channel (just use your mobile) and is treated as just another channel. CB Handles also seem to have fallen out of favour with most people using their name and location, although now and again somebody calls in with a handle.

"There are regular channels that hold daily networks and 35 (27.94125MHz) in London is one of those channels. It has regular users, who are home-based, and also mobiles that call in. It even has its own club Facebook page, which issues Lima Tango (London Town) callsigns for 11 metres. I have an Intermediate

FIG. 3: TIM KIRBY; FIG. 4: MOONRAKER

3

4

Amateur licence and am studying for my Full licence, but I will never forget that my love of radio use came from CB. I really would like to see more people returning to CB. The art of conversation is dying out with our constant use of our addictive, habit-forming smartphones.

"With radio, you have an 'in-the-moment' conversation, rather than 'WhatsApp' or texting. It really makes a change to talk and has played a great role during lockdown for keeping people in contact, some of whom are mobility impaired or live alone. If you are a breaker from the past or have an interest in radio, CB is there to be used still. One of my worries is that without use, Ofcom may deem that we no longer need those frequencies and allocate them for other uses. CB Radio is no longer a licenced (I actually had a CB licence), regulated and monitored service, although 4W is still the limit for output power […]. Anyway, I thought I'd let you know that CB is still alive, albeit in need of an injection of some new, younger users. It would be so good to see some people back on the rig!"

Buying Vintage CB equipment

After I wrote the first column about CB radio in the October issue (see above and Figs. 1 and 2), I realised just how much interest there is in 'vintage' CB equipment from the 1980s. I put something up on Twitter asking for people's pictures of their old CB rigs and had a tremendous response (thank you!).

As Paul mentions in the previous section, there is plenty of equipment, both new (main traders) and vintage (e.g. eBay). It can be really fun looking through the adverts – and quite hard to keep the finger off the 'Buy now' button at times, reacting to the *I-always-wanted-one-of-those* impulses.

If you do go down the route of buying older equipment, then at some point, you may find a fault which you would like to fix. In this regard, Phil from Bury in Lancashire recommended Richard Shireby's 'UK CB Radio Servicing' channel on YouTube which has many videos about fixing older and newer radios. You can find the channel here: https://tinyurl.com/yxzrto7v

If you search through the videos – there are lots – you will find plenty to interest you! Richard also does reviews of newer equipment, both mobile and handheld, as does former *RadioUser* columnist Simon ('The Wizard') Parker: https://simonthewizard.com

A few days ago, I found a video about the Realistic TRC-1001 handheld and enjoyed it. I had one of those. It always seemed a nice idea to be able to operate portable on CB, although I think it would have done better if I had been able to take it to the top of a hill, which at the time, I could not do because I could not drive!

The rig had a telescopic aerial, but I had a 'rubber duck' type antenna which you could fit. Knowing what I know now, but did not at the time, I am not surprised that it did not work very well! On a decent aerial, though, as Richard shows, the 3.5W from the handheld works very well.

New CB Equipment

I asked Chris Taylor at Moonraker what was new and exciting in the way of CB equipment at the moment.

First, Chris mentioned a new handheld produced by TTI, the TCB-H100 (Fig. 4). It is interesting to contrast it with the 1980s Realistic model. This newer rig is much smaller and runs AM/FM across 26-28MHz. If you have an amateur radio licence, it can be made to work on 10m, I believe.

Fig.1: *A Cobra 148 GTL-DX* CB Transceiver. Fig. 2: The *President Madison* CB Transceiver. Fig. 3: Part of the *Moonraker Micro Multi-Standard CB Transceiver Pack*. Fig. 4: The *TTI TCB-H100* Transceiver. Fig. 5: The P*resident McKinley* Transceiver. Fig. 6: The CB Museum in San Roque, near Cadiz in Spain. Fig. 7: Part of the collection at the San Roque CB Museum.

The radio comes with a desktop charger. The antenna looks quite short for 10/11m. If you look on the *UK CB Radio Servicing* site, there are some videos, showing the set in use on the bench as well as out in the field. Richard tried the set on the bench, connected to an external aerial. In the second video (below), Chris's 'partner-in-crime', Richard (*Mr Chippie*) tries the set whilst out and about.

https://tinyurl.com/y47pmdq7
https://tinyurl.com/y3cx2ywm

The small aerial works, but has relatively limited range, as you might expect, depending on the terrain you're in. The set has a fun look about it. It would be intriguing to see how far you could get with it. It is programmed for the various channel schemes including the UK FM and the CEPT channels.

If you are interested in multimode CB equipment, then the new President McKinley (Fig. 5) may well be worth a look.

It will operate on FM on the UK FM channels, as well as AM/FM/SSB on the CEPT channels. The rig is 4W on AM/FM and 12W on SSB, and it runs on either 12 or 24V. I must admit that, with SSB on CB being a no-no back in the 1980s, I still find a fascination with SSB capability on the CB band.

Chris' final selection was the Moonraker Micro Multi-Standard CB Transceiver Pack (Fig. 3), containing one transceiver and one micro CB aerial. The aerials are quite small, compared to full-sized CB aerials, but will work over some miles, mobile-to-mobile, depending on the terrain.

Of course, from a hilltop, you will get even further! Perhaps this would be a fun purchase for a family with two cars or a couple of friends to keep in touch over the radio.

www.moonraker.eu

A Correction

In the last column, I made an error. I described noting hearing 'chuff-chuff' noises on a 27MHz FM signal and saying that it was an illustration of the Doppler Shift. I think I had satellite communications on my mind! Sorry. It isn't an illustration of Doppler Shift at all, but an example of a multi-path signal.

The reflected signal from the aircraft as it moves may be in phase or out of phase with the terrestrial signal received at my aerial. If they are in phase, the signal will be louder, if they are out of phase, they will be weaker. It is this variation from one state to the other that causes the sound. My thanks to Miroslav from the Czech Republic for his kind email pointing out, very gently, my error! It was great, purely by chance, to run into Miroslav on the 3.5MHz amateur band for an enjoyable Morse contact, a day or so after he'd written his email.

Some SSB Nets

Look out for the *Southern and South Coast SSB Net* on 27.395MHz USB (Channel 39 CEPT) on a Thursday night from 8 pm local time. Judging by the reports on Facebook, this is a very popular net with call-ins from as far away as Wales, Yorkshire and Shropshire.

Also, on a Thursday night, from 7 pm to 9 pm, there's the *Mid Wales DX Group* net on 27.365MHz (Channel 36 CEPT), so if you are in range – or fancy listening out for some Welsh stations give this one a go too.

The San Roque CB Museum

Kev from Gibraltar wrote in with some wonderful photos that he'd taken at the CB museum in San Roque, Cadiz in Spain (Figs. 6 and 7). I had no idea that there was a CB museum! The museum has a website, but the latter is currently being restructured; hopefully, it will return in due course.

http://www.museo-cb.com
museo-cb@museo-cb.com

[Check out our regularly-updated list of UK and international radio museums on our website – Ed.].

www.radioenthusiast.co.uk

FIG. 5: MOONRAKER; FIGS. 6 & 7: KEVIN HEWITT

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7

Readers' Correspondence

Justin from Ireland wrote in about his early times in the radio hobby and in particular, on CB. He wrote, "*I started with a Sharp 40 and a DV27 on a ground plane, (a heavy sheet of metal), in the attic back in the early 1980s. I borrowed a Cobra 148GTL SSB rig (Fig. 1) from a trucker neighbour. When I used it to make my first DX contact into Venice, Italy, and then Zagreb, Yugoslavia I was hooked on DX. I bought the rig and got it converted to cover from 26.500 to 28.000MHz. I put a 5/8 wave ground plane vertical on top of our old TV mast on the apex of the house roof. The tip of the antenna was about 75 feet above the ground and 4 Watts AM would hit the Eastern USA on AM 'roaring 40s' when 'the skip was in' and 12 Watts SSB worked surprisingly well around the world. I had a 29-AT callsign and also joined about 30 worldwide clubs, each giving me a callsign.*

"I passed my radio experimenters exam in 1983 but at 15 was too young to get my ham licence so I had to wait another year! That year waiting was a good year for 11m DXing. At night, when there was no skip, I would spend many hours chatting to local breakers and going on 'Eyeballs' at the weekends. However, at 16 when I got my ham licence, my interest had moved away from radio and more towards real-life socialising and girls! I only got interested again when I was married with a couple of kids about 27 years later!

That's it for this time. Stay safe and stay in touch.

Robert Connolly
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The Moonraker MHR-100 Handheld Marine Transceiver

Robert Connolly evaluates a new handheld maritime transceiver from Moonraker, looking at its key features and functions, reception and transmission range, and its use in practice.

Regular readers know from my *Maritime Matters* columns just how important I feel that it is to keep safe at the seaside, be it boating, windsurfing, paddle-boarding or any other marine leisure activity. With that in mind, the editor asked me to review the Moonraker MHR-100 Marine Handheld Transceiver.

It is advertised as "*an entry-level marine transceiver that is able to satisfy the communications requirements for most marine users*". Like most basic marine handheld transceivers, it is not Digital Selective Calling (DSC) enabled. The MHR-100 comes in a blister pack containing the transceiver, a flexible antenna, five 1.2V Ni-MH AAA size rechargeable batteries, a USB auxiliary cable, a dedicated mains charger, a cigarette-lighter 12V charger, a belt clip, a hand strap, and a double-sided A4 user manual.

The use of AAA size rechargeable batteries is much better than a battery pack, as it provides an option to use alkaline AAA batteries, should the rechargeable batteries become drained at a crucial time. It is important to note that both the dedicated mains and cigarette lighter adapter chargers have an output of 13.8V.

Main Features

The unit display screen, approximately 3.5 cm by 2.5 cm, provides a clear, backlit LCD display of both the channel numbers and other functions. The parameters for the light and the channel display mode can be changed by the user. The easy-to-use buttons are of a reasonable size and illuminated by the backlight.

The transceiver has a selectable 3W/1W (high/low power) transmitting power with a frequency range of 156 to 162MHz in 25kHz channels. The receiver covers 156 to 163.275MHz, again in 25kHz steps. It is user- selectable between US, Canadian, International and ten NOAA weather channels.

Outside North America, the 'International' setting should be selected, and NOAA weather channels are not available. Other listed features include large keys for easy operation, falling water flash alarm with vibration draining function, 200 programable channels with quick channel selection, call channel function, dual- / triple-watch, scan function, and a two-step power-saving function. The transceiver is comfortable to hold measuring 63mm x 119mm x35mm (WxHxD) and a weight of 136 grams including batteries.

The MHR-100 is waterproof to IP67 standard, this means up to a depth of one metre of water for up to 30 minutes. Should the MHR-100 be submerged in water, the Vibration Water Draining Function can be activated via the menu button. This will activate a deep vibration sound for 10 seconds to clear water from the speaker housing. When this function is activated no other keys can be used. Using the supplied Ni-MH rechargeable batteries, I estimated that the battery life would be in the region of nine hours at 3W, based on 5% TX, 5% RX and 90% Standby. This would increase to 12 hours if 1W were used. Using alkaline batteries, those figures would be 26 hours at 3W and 33 hours at 3W.

In Operation

Reception on the MRH100 is excellent with clear audio. While sitting in my shack/office I had it on my desk, powered up on CH 12 and received a very clear signal from the passenger/vehicle ferry that operates across Carlingford Lough located some five miles from me. The signal was as strong as if it had been in our local harbour half a mile away; to cap it all, the transceiver was on its back with the antenna horizontal.

In addition to the usual CH16 distress and calling channel a second call channel can be programmed for use with triple-watch. I found the transmit range and audio quality standard for a marine handheld. With a power output of 3W, it obviously would not have the transmit range of a fixed transceiver on 25W.

As in the case of most marine handheld transceivers, the press of a button directly selects CH16, the distress and calling channel. When you are about to transmit a *Mayday* or *Pan* call, you do not have time to mess about with menu or channel up/down keys. When in dual-watch mode, it will not only monitor the selected channel but also constantly monitor CH 16 emitting a beep to alert the user that there is a call on that channel. The triple-watch operates similarly when using a working channel monitoring CH 16, a nominated call channel for the area you are operating in. Tri watch will automatically switch to dual-watch when a signal is received on the nominated call channel.

To enable the MRH100 to scan channels they need to be tagged (selected) via the menu key; the radio will then scan those tagged channels. Activation of a scan is accessed via the menu button and is selectable between a 'normal' or 'priority' scan with 'scan' appearing on the sub-channel display.

The scan pauses when a signal is received with the pause length user-selectable. If used in priority scan mode, 'CH 16' will flash in the sub-channel display.

Being a maritime transceiver, the radio will not receive CH 0 (156.000MHz) as this is a private channel for coastguard use and not part of the International Channels. It also does not have the marina channels M (157.850 MHz) and M2 (161.425 MHz) as these too are private UK-only channels. However, communication with marinas can be established using the duplex CH 80 (157.025/161.625 MHz).

In my opinion, the Moonraker MRH 100 is an easy-to-use, low-cost marine transceiver that easily fulfils the requirements of anyone who enjoys coastal maritime activities and wants a handy transceiver that can be used to summon assistance when things go wrong or keep up to date with maritime safety information during their activities.

The inclusion of a hand strap is fine but from a personal point of view, I would prefer a neck strap instead, thus leaving hands free to handle an ongoing emergency.

I also feel that the single A4 sheet manual contains rather basic user information and would like to have seen the inclusion of a Mayday call-template in the manual.

Last but not least, please remember that transmitting on a marine VHF (handheld or fixed) radio does require a licence, available from Ofcom free online, although nobody is going to ignore you during an emergency if you do not have a licence.

https://tinyurl.com/yahtctg6

[You can win one of these fabulous radios in our competition this month – Ed.].

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Mobile/Base

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

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

LEATHER CASE for TRX-1 £29.95

FlightAware

Live Flight Tracking

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

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

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Redefining The Radio Experience.

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

HF+ Discovery 0.5kHz – 31MHz VHF 60-260MHz SDR receiver **£199.95**
R2 VHF/UHF 24-1800MHz SDR receiver **£209.95**
MINI VHF/UHF 24-1700MHz SDR dongle..... **£119.95**
Spyverter R2 extend your AIRSPY coverage **£59.99**
NEW YouLOOP indoor HF Antenna 0.5-52MHz **£29.99**

TECSUN

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

Portable

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

MFJ

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

Receiving Products

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

Bonito

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

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

ALINCO

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

Handheld

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

Base

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

Accessories

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

SDRplay

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

RSPDUO is a dual-tuner wideband full featured 14-bit SDR which covers the entire RF spectrum from 1kHz to 2GHz giving 10MHz of spectrum visibility..... **£239.99**
RSPDX covers all frequencies from 1kHz through VLF, LF, MW, HF, VHF, UHF and L-band to 2GHz, with no gaps **£194.95**
RSP-1A it is a powerful wideband full featured 14-bit SDR which covers the RF spectrum from 1kHz to 2GHz. All it needs is a PC and an antenna to provide excellent communications receiver functionality..... **£99.95**

AOR

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

Handheld

AR-8200MK3 super wide band 100 kHz-3000 MHz 1000 channels analogue scanner..... **£459.95**
AR-8200D same as AR-8200-MKIII with the following added features. * APCO25 Decoding * Voice Recording * MicroSD Card Slot * 4GB MicroSD card Included * USB Port * CTCSS built-in * Voice Inversion built-in **£669.95**
AR-DV10 100 kHz-1300 MHz Digital scanner with TETRA DMR. NXDN. dPMR. APCO25. D-STAR **£939.95**

Mobile/Base

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

Accessories

DA-3200 25-3000 MHz professional discone antenna **£169.95**
DA-5000 700-3000 MHz professional compact discone antenna... ..... **£269.95**
LA-400 10kHz – 500 MHz Magnetic receiving loop **£399.95**

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PERFECT CHRISTMAS GIFT!

WS200 V2 Professional Solar Weather Station

This Moonraker Weather station utilises a solar panel for the outside unit which sends the collected data to the indoor display unit wirelessly. The indoor unit displays Indoor and outdoor humidity, Indoor and outdoor temperature, Wind speed, Wind direction, Rainfall, Time, Date and available memory **Only £64.99**

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Observing the Sun and Ionosphere on VLF

Georg Wiessala
wiessala@hotmail.com

The editor investigates signals in the Very Low Frequency (VLF) band in order to learn more about wave propagation, the Ionosphere, and the daily and seasonal activities of our Sun.

There can be little doubt that the recent period of enforced confinement, due to the Coronavirus (COVID-19) outbreak, has led to a massive surge in interest in all things radio. From where I sit professionally, as the editor of this magazine, I have seen a large increase in sales of all kinds of radios and accessories, and a rising appetite for radio-related reading and what you may call 'radio science'.
www.radioenthusiast.co.uk

The hobby, in its many facets, has gained in popularity and has won many new followers, be it through amateur radio, medium- and short wave DXing, network radio, and in many other guises. I am no exception to this, and I have found that my interests have motivated me to experiment, tinker and listen much more, both from inside my home shack and when out and about.

Where Radio Meets Science

In a nutshell, I have always been fascinated by those aspects of radio, where radio and science meet, for example, propagation studies, radio astronomy, time signal stations, 'nature radio', or extreme frequencies monitoring. In connection with the latter, in particular, I retain a strong interest in the Very Low Frequency (VLF) band, and in how (man-made) signals and (natural) electromagnetic emissions ('spherics', 'tweeks', 'whistlers') in this 'basement-band' can be monitored, unlocked and visualised (Fig. 1).

They can reveal clues as to the state of our atmosphere, magnetosphere, or the terrestrial or 'space-' weather in which we are, at all times, immersed. In this context, Stephen P Mc Greevy's work on 'natural radio' and the *Music of the Magnetosphere* (*Chorus, Sferics [Statics], Tweeks, Whistlers, Fig. 1)* remains exhaustive, underpinned by experiment, and quite unparalleled. You might also want to check out the *NASA INSPIRE* Project in the USA if you are into 'Nature' Radio.
http://www.auroralchorus.com
https://theinspireproject.org

A Band Full of Signals

The VLF band (3-30kHz, wavelengths between 100 and 10km, Fig. 2) is far from containing the sounds of silence.

Useable signals range from those in radio astronomy and weather observation to metal detectors (8kHz) and much else: There are also Navy submarine transmitters in around 50 countries worldwide. Moreover, you will find time signal stations (for instance, Russia: RJH77, RJH63, RJH90; RAB99 [25kHz]; EU: 60kHz [MSF; USA: WWB], 66.66 kHz [RBU] and 77.5kHz [DCF77]).

In the days before GPS, VLF radio was also used for navigational purposes. Consider, for instance, the Russian RSDN-20 system (*ALPHA*) or its former NATO counterpart, *OMEGA* (1967-1997). Even today, you will occasionally resolve sporadic Russian hyperbolic navigational signals on 11905, 12649 and 14881kHz. There are still some LORAN-C signals (100kHz) and experimental amateur radio signals ('sub-9kHz').
https://tinyurl.com/bqzxytg

And this is not all: Much geological (and bathymetric) mapping happens in the VLF band, and nuclear detonations can be traced here too. VLF is useful for research into the Magnetosphere and Ionosphere, and for tracing meteor emissions, solar activity, eclipses and Coronal Mass Ejections (CME).

Table 1 contains just a few examples of the kinds of signals that can be found in the VLF band.

Fundamentals of VLF Propagation

The VLF range is at 3-30kHz (100-10km wavelength), but there are also the ULF (300-3,000Hz), SHF (30-300Hz), and ELF (3-30Hz) sectors (Fig. 2). A few well-known science projects call this band

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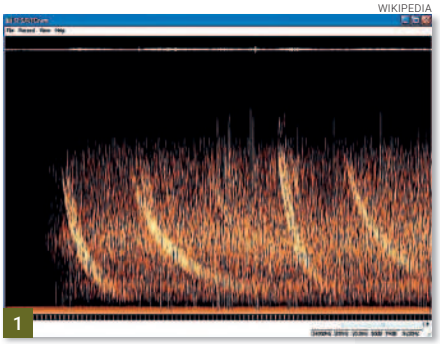

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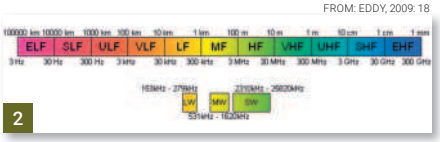

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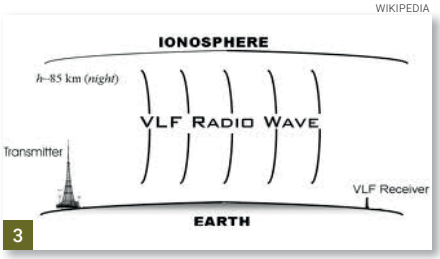

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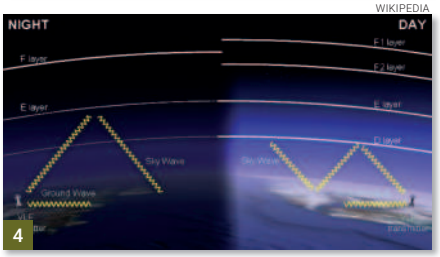

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home, such as the awkwardly-named *Antarctic-Arctic Radiation Belt Dynamic Deposition VLF Atmospheric Research Konsortia (AARDDVARK)* project, the *INFREP European LF and VLF Monitoring Network* (19.58 to 270kHz), and the former *High-Frequency Active Auroral Research Programme (HAARP)* – the latter much afflicted by conspiracy-theory.
www.vlf.it/frequency/bands.html
www.gi.alaska.edu/haarp

A few words on propagation, before I launch myself into my experiments: VLF propagation is contingent on a range of factors, like frequency, terrain and propagation medium. Ground wave VLF is an 'Earth-hugger'. There are losses, and the waves are slowed down by the

Fig.1: 'Nature-Radio': The Typical Shape of atmospheric 'whistlers'. Fig. 2: The Electromagnetic (EM) Spectrum. Fig. 3: VLF: From Transmitter to Receiver. Fig. 4: VLF Propagation, Night and Day. Fig. 5: The *UN Day* transmission e-QSL card from SAQ Grimeton. Fig. 6: The VLF Receiver sold by the UK Radio Astronomy Association (UKRAA). Fig. 7: DHO38 on 23.4kHz from Germany. Fig. 8: The UKRAA Loop, matching the receiver. Fig. 9: The matching UKRAA ATU, ready-assembled. Fig. 10: My setup, including the LabJack U3-HV DAQ.

dielectric constant – the conductive properties of ground or water (Fig. 3). By contrast, skywave is refracted by the variable Ionosphere and it dissipates on account of absorption losses (Reeve, 2019). This plays out differently on VLF than it does, say, on SW. Both ground- and sky waves exhibit interference both ways (*constructive* and *destructive*), and both are subject to skip and additional ionization, for example, from meteor-scatter (Fig. 4). By day, LF propagation exhibits negligible absorption loss, signal increase, and more variability, while during the night, there is greater absorption loss, a decrease in signal, and generally more stable propagation (Reeve, 2019).

Magnetic disturbances – and this is vital to our theme here – can *boost* ionospheric conductivity for VLF signals (and for the *Schumann Resonance*) significantly – not *attenuate* them like in the case of SW. Thus, the use of VLF signals to observe the changes that happen in the Ionosphere – and which are the result of great solar variability – can help to understand how different layers of the Ionosphere depend upon the Sun and its flare radiation. These layers are vital in determining and forecasting space weather and its impacts, for instance on our terrestrial and satellite-derived vital communications infrastructures.

The Earth-Ionosphere Waveguide

The reason for this lies in the existence of the spherical *Earth-Ionosphere Waveguide*, containing ground- sky- and space wave. Reeve (2019) distinguishes two waveguide-modes, *transverse magnetic* and *transverse electric*. He also points out that the ionosphere moves up at sunset and down at sunrise.

It is the D-Region of the Ionosphere, which often serves as a conduit for very low frequencies. Therefore, signal propagation on VLF is approximately 'in sync' with the Sun. And this is what we pick up when we observe the Sun via VLF (see below).

PETER NEWTON

For many of the more intricate phenomena of this kind of wave propagation, I respectfully defer to my colleagues Nils Schiffhauer, Tomas Hood, Stephen P. McGreevy and Whitham C Reeve, whose knowledge on this topic is nothing short of encyclopaedic. However, the following URL points to an easy-to-follow general introduction to how VLF propagation works.

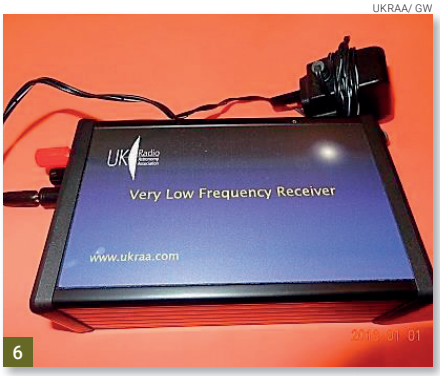
https://tinyurl.com/24yck6w

VLF signals are reasonably stable by day, and variable by night. They require transmitters with significant power and sporting massive aerials and counterpoises. They circle the world and can penetrate seawater to some degree – hence their military/ naval use.

However, their bandwidth – and consequently information content – are severely restricted.

Last by not least, bear in mind that at least three larger phenomena impinge on VLF reception: First, the terrestrial electrical network transmission frequencies (50Hz in Europe / 60Hz in the US); second, the Earth's Equatorial Ring Current (ERC); and third, solar activity. The ERC is a (westward- flowing) ion stream (mostly protons) in the equatorial plane, at a distance of about 3-5 Earth radii. When it comes to solar storms, the Disturbance Storm Time (DST) Index measures magnetic activity derived from near-equatorial geomagnetic observations of the ring current.

UKRAA/ GW



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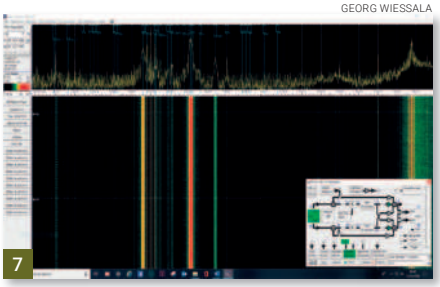
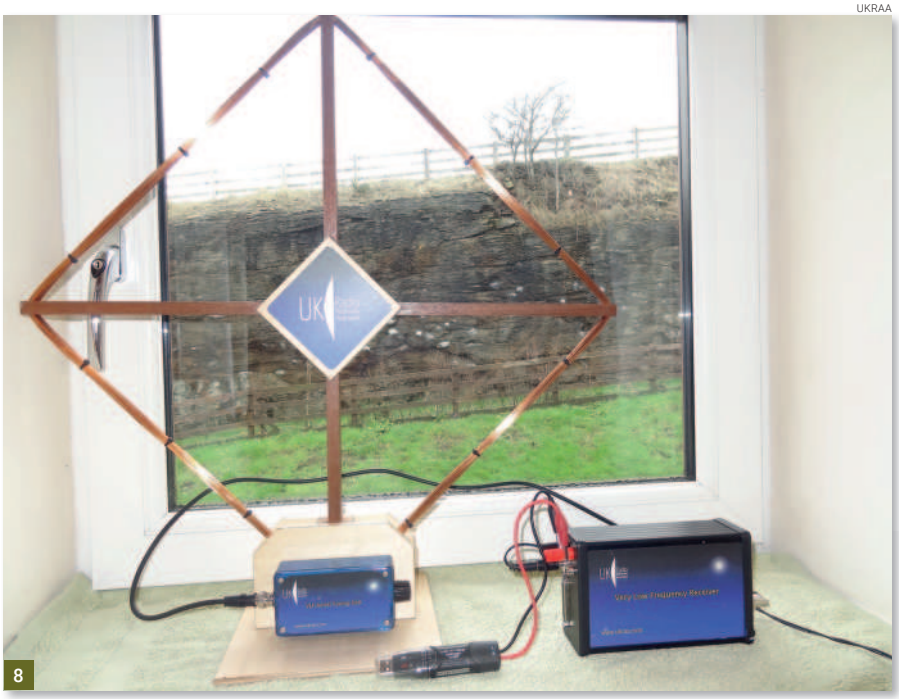


You can refresh your memory of all these issues by re-reading Robert Gulley's article on Propagation banners, in the October issue (*RadioUser*, October 2020: 52-56).

Experiments, Now and Then

Of course, I am not the first enthusiast to study VLF sounds and signals and their relationship with our Sun, the Ionosphere, Magnetosphere and Atmosphere. Even the great Nikola Tesla explored VLF signals,

UKRAA



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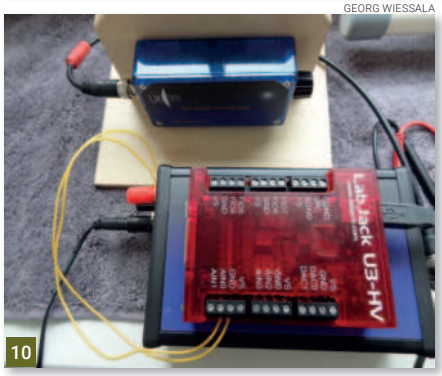

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Fig.11: The Radio *Sky Pipe* software suite can help to visualise signals over time. Fig.12: With Wolfgang Buescher DL4YHF's *Spectrum Lab*, you can trace changes in signal levels. Fig. 13: The Bonito GI1000 galvanic antenna isolator. Fig. 14: A three-step attenuator (-10, -15, and -20dB). Fig. 15: The bhi NES 10-2 MK4 noise-eliminating speaker can be of use in this field, for instance, with time signals.

the Schuman Resonance (7.8Hz, with harmonics at 8.5, 14.7, 20.8 and 26.8 Hz), and the phenomenon of standing waves in his facility in Colorado Springs. Many followed after him – not least, belatedly, the US Navy.

Scientists like Kristian Birkeland (1867-1917, RadioUser, July 2018: 62) studied the *Aurora Borealis* and its sounds. Others may follow the transmissions of the automatic machine transmitter UNESCO Heritage station *SAQ Grimeton* in Sweden (on 17.2kHz, Fig. 5) to log transmissions, wonder and learn about VLF signals.

https://tinyurl.com/y2sojuna

SAQ is an Alexanderson 'alternator' (mechanical oscillator) named after the radio pioneer Ernst F. W. Alexanderson (1878-1975). Like many worldwide, I am glued to my receiver when one of the annual Christmas or Marconi Day A-1 mode Morse code transmissions occur.

https://tinyurl.com/y3x2rq77

Table 2 shows some the frequencies of some very powerful worldwide VLF transmitters.

In terms of my more recent – and more modest – experiments, I have been inspired by the book *The Radio Sky and How to Observe It*, by Jeff Lashley (Springer, 2010), and by the work of Alan Melia and Whitham Reeve of the American Society of Amateur Radio Astronomers (SARA). Whitham has used the VLF receiver from the UK Radio Amateur Association (UKRAA) to document VLF stations received at his QTH in Alaska.

Stan Nelson in the USA and Nils Schiffhauer in Germany are also important pioneers in this area. Whit and Nils have both written in *RadioUser* too.

https://britastro.org/node/20957
https://tinyurl.com/q5dltk7
https://tinyurl.com/ybanewt9

Home Solar Monitoring

To briefly recap then: VLF radio signals are used to monitor the Sun and the ensuing geomagnetic storms on our planet, by means of looking at changes to VLF signals emitted by, for example, time signal stations and military VLF transmitters. Sudden Ionospheric Disturbances (SID, i.e. variations caused by solar flares) in particular, leave definite traces. As we saw earlier, solar flares result in ionospheric disturbances.

These, in turn, *enhance* VLF signals.

In this context, special radio instruments, such as the *UKRAA VLF Receiver* (Fig. 6) can be deployed to monitor the *indirect effect* of changes in the Ionosphere as they impinge on Earth-based VLF transmitters and other radio beacons. Like the *SuperSID* device of the University of Stanford and a small number of similar receivers, the UKRAA device records SIDs. It does so through continuous, long-term, monitoring of the transmissions from terrestrial VLF stations.

https://tinyurl.com/zqnlnfd
https://tinyurl.com/y5y2oqug

The signals I am primarily interested in are VLF communications to the submarines of the world's navies. The strong and stable signals from these beacons can be used to observe solar activity and space weather.

The 23.4kHz transmission from Germany is of particular interest to me (DHO38, Fig. 7, green trace, centre).

Table 2 displays some of the other frequencies of interest on VLF, military, scientific and otherwise.

Picking Up Signals

The UKRAA VLF unit measures approximately 16.5 by 10 by 5.5 cm and weighs in at a mere 468g (Fig. 6).

The special matching loop antenna (Fig. 8) comes fully assembled, with the ATU attached, or you can get this in kit form. The ATU (Fig. 9) measures a mere 11 x 6 x 3 cm.

I found that a peak signal quality is reached when the small tuning knob on the ATU is in a middle position.

The antenna's cross-arms extend to 30cm in each direction. This dedicated VLF aerial responds to the magnetic component of a radio wave. It is directional and less sensitive to

- Alarm clock controllers
- Composers of electronic and experimental Music
- Geologists investigating the inside of the Earth
- Navies (of ca. 50 countries, worldwide)
- Radio amateurs (sub-9 kHz, 137 and 472 kHz)
- Radio astronomers (Lightning-trackers, Aurora-watchers, Low-Frequency Array for Radio Astronomy (LOFAR))
- Researchers probing the Magnetosphere and Geo-Space
- Researchers seeking to remote-sense the lower Ionosphere
- Seismologists working in earthquake prediction
- Solar Physicists analysing Space Weather
- Standard Frequency and Time Signal / Navigation / NDB signals

Table 1: Some VLF Users.

16.4	JXN, Gildeskål, Norway
17.2	SAQ Grimeton (Sweden, see main text)
18.1	RDL, Russian Navy (various sites, mode: CIS36-50 FSK)
18.2	VTX3, Indian Navy
18.3	HWU, French Navy (Rosnay, France)
19.58	GBZ, UK Royal Navy (Anthorn, UK)
19.8	NWC, Harold Holt, Exmouth (Northwest Australia)
20.0	South Pole (Stanford University)
20.27	Italian Navy (Isola do Tavolara, Italy)
20.5	RJH6x Russian Navy
20.9	FTA, French Navy (St. Assise, France)
21.1	RDL, Russia
21.4	NPM Pearl Harbour (Hawai'i)
22.1	Royal Navy (Skelton, UK)
21.75	HWU, French Navy (Rosney, France)
22.2	JJI, Japan
22.6	French Navy (Rosnay, France)
23.4	DHO38 German Navy (Marinefunksendestelle Rhauderfehn)
24.0	NAA Cutler (Maine)
24.8	NLK Jim Creek, Washington
25.2	NML, La Moure, North Dakota
26.7	Turkish Navy, Denizköy-Bafa, Turkey
29.7	Israeli Navy, Negev
33.3	NGR, Greece
37.5	NRK, Grindavik (Iceland)
45.9	NSY US Navy, Sicily (Italy)

N.B.: Many Navy signals are: STANAG-5030/MIL-STD-188-140, time-division multiplex (TDM).

Table 2: Selected VLF Signals (kHz).

electrical interference.

The UKRAA VLF receiver unit requires 15V DC at 35mA and ranges over 12 to 35kHz. It comes pre-tuned to the Ramsloh (German) Navy transmitter on 23.4kHz. It can be re-tuned to other frequencies. The manual describes how to do this, and UKRAA is happy to offer further advice and assistance.

I think that the choice of 23.4kHz has been made because many (European) VLF stations (at least here in the UK) are too close to take into account sky wave propagation and refraction from the Ionosphere for more accurate

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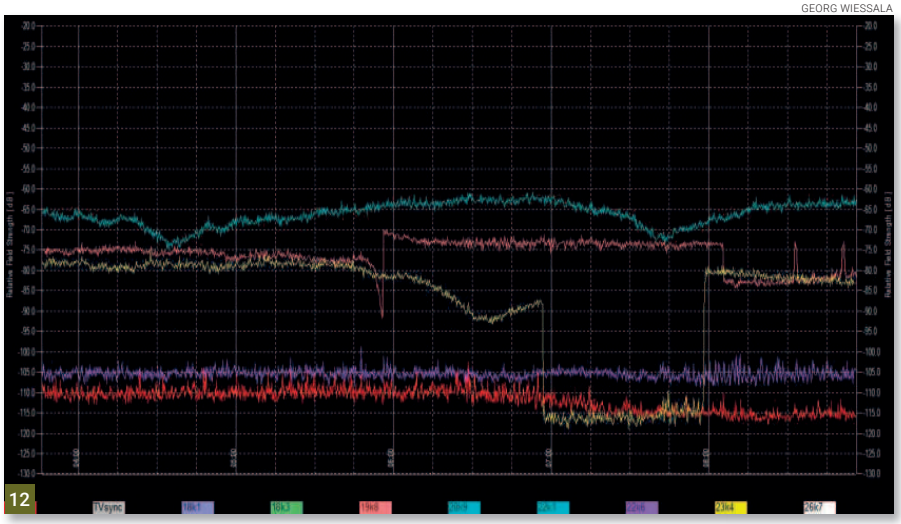

12

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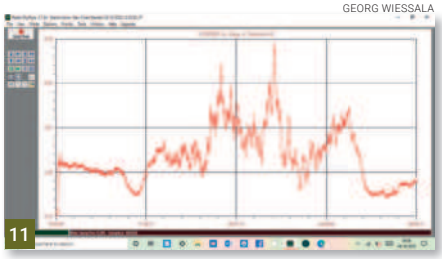

11

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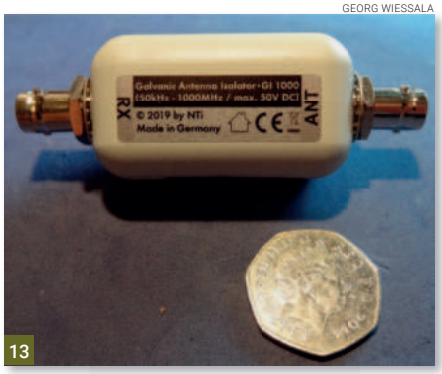

13

BONITO/ GEORG WIESSALA

14

measurement and logging. The ideal distance, according to the UKRAA manual is between 500 and 1,000 km. Things will, naturally, be a little different if you are reading this in the USA.

The UKRAA VLF Unit In Practical Use

The list of items in Table 3 shows some of the equipment I still use – or have used in the past – to receive, display and interpret VLF signals and other emissions in the 'basement-band', such as 'nature-radio'. www.radioenthusiast.co.uk

In practical use, the UKRAA VLF receiver can be deployed in two different ways:

You can connect a stand-alone multimeter/data logger and PC to download your data, or you can get an analogue-to-digital converter/ data acquisition (DAQ) unit and use this with a PC.

By this method, the magnetic part of the RF signal is converted (via induction) into a small electrical impulse, which is subsequently amplified. This gives the monitor clues as to how much ionisation has occurred, and at which level of the ionosphere the VLF wave bounces back.

This then is the actual cause of the changes in the strength of the VLF signal.

For a while, I connected a run-off-the-mill Maplin USB Data Logger (N70DP) for 0-30 DC Voltage to the UKRAA Receiver and downloaded the data to my PC, to see a simple graph, with software provided with the logger. I sometimes do this when I do not want to start up any other equipment, especially overnight.

Instrumentation and Observation

However, like Victor Frankenstein, I soon needed a bigger (electric) buzz. I began experimenting with a more sophisticated method, by linking the LabJack U-3 HV Analogue-to-Digital Converter to the voltage output terminals of the UKRAA

device and connecting it via USB cable to my PC (Fig. 10).

Having gone through the driver installation routine, and using the latest version of *Radio Sky Pipe*, I was soon rewarded with a thin red line showing fluctuations in voltage emitted from the UKRAA VLF Receiver.

Remember the receiver is centred on 23.4kHz. Adjusting the UKRAA VLF receiver ATU, I could make the graph move up or down. *Radio Sky Pipe* has a good menu, which allows you to stretch or compress the line, move it, make a recording, zoom in and out, plus a range of other functions.

The next day, my ELF/ VLF environment was noisier, and the software recorded the chart in Fig. 11. The almost 'textbook' shape of the imprint of a solar flare on VLF is said to be like a shark's fin, so, although I am not certain of this, it could be that this is what has been captured here.

It is what to look out for anyway.

Several years have now passed between the screenshots in Figs. 11 (2016) and 12 (2020). I have only recently taken up this hobby again, with a new UKRAA VLF receiver and LabJack U3-HV.

Fig. 12 neatly shows the change in signals levels from day to night. The ups and downs of signal levels overnight, is something you can also study when you just use your PC as a VLF receiver with a sound card. For this case scenario, many hobbyists rely on Wolfgang Buescher DL4YHF's *Spectrum Lab* software with its 'Plotting' function (Fig. 12).

https://www.qsl.net/dl4yhf

Changing my receiver instrumentation further, to an SDRPlay RSPdx, I have used this with the most recent version of *SDRuno*, to see VLF signals at the following parameters:

Mode: CW, 250Hz
Bandwidth: Span: 10-40Hz
Antenna-input: Hi Z; Sample rate: 2MHz/ 8 decimation = 250Hz
RF gain: 36.1dB, AGC Off;
Noise-blanker: Wide

I am still learning much about this aspect of the radio hobby, and only time will tell what else can be seen; this encourages me to continue this form of monitoring.

Accessories and Analytics

In terms of meaningful receiver accessories, if you do use an SDR, such as the SDRPlay RSP2Pro or RSPdx, you might try and switch a low pass filter between antenna and receiver (e.g. the Mouser 139-VLF-120).

https://tinyurl.com/y3dntgaa

With SDRs, a galvanic antenna isolator, like the Bonito GI1000, *might* also be of some help to you to lower the noise floor (Fig. 13). RU contributor Clint Gouveia has tested such a setup on his *Oxford Short Wave Log*.

https://tinyurl.com/y3zdjp5l

I have occasionally deployed a simple step-attenuator (-10, -15, and -20dB) for some of the strong local Navy VLF signals I can receive up here in Lancashire (Fig. 14).

On the listening side, when you monitor, for instance, time signals on 60 or 77.5Khz, you might find connecting a bhi noise-cancelling unit, such as the NES 10-2 MK4 noise-eliminating speaker, might make a perceptible difference to your listening comfort levels (Fig. 15). It is not guaranteed that it will, and hearing is a very personal matter, of course, but it did help me distinguish signals more clearly.

Last but not least, if you wish to analyse these signals further, there is the possibility of undertaking a Time-difference-of-Arrival (TDOA) direction-finding exercise using the *KiwiSDR Net* (Schiffhauer, 2018).

https://tinyurl.com/yyx9v2r2

COURTESY OF BHI / GRAHAM SOMERVILLE.

Special Aerials – Mostly Magnetic

In terms of aerials, the UKRAA VLF Loop (Fig. 8) has been my 'go-to' device for use with the UKRAA VLF Receiver and the LabJack U-3 HV DAQ. More generally, if the cost is not such an issue, try the excellent range of magnetic ferrite aerials by *BAZ Spezialantennen*, for instance, the LFM/5-50 (5-50kHz), LFM/SN-1 (15-70kHz) and LFM/ZZ1-N (Time Signal Stations) models.

High-performance and Direction-Finding models (e.g. the 'HFA-3') may still be available for professional applications and labs – at a substantially elevated price. Alternatively, and for the best in adaptability and adjustability, the VLF models by *Grahn Spezialantennen* are still in regular use with enthusiasts. Consider the GS5-SE/ GS5 Basic Unit, in conjunction with, for example, the VLF-2 module ('*Alexanderson*'). You might also wish to investigate the offerings of US company *Stormwise* (ships to US/ Canada only) or simply resort to some 'home-brew' projects.

http://www.spezialantennen.eu
http://www.grahn-spezialantennen.de
https://www.stormwise.com

The list in Table 4 contains some suggestions for further reading in this area, just in case this article has stirred your 'VLF vibes'. Stay safe and healthy, and my best wishes from the UK.

[Many thanks to PN, Andrew Thomas (UKRAA) and Nils Schiffhauer, for some significant additional information and advice offered in the research for this article. A more comprehensive list of resources on VLF monitoring is on the Radio Enthusiast *website (Table 4).*

www.radioenthusiast.co.uk

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- Reeve, W. D. (2019): Monitoring LF Propagation with an SDR: **https://tinyurl.com/y69y572a**
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- Wiessala, G.(2014) 'Signals from Space and the Radio Sun' (*RadioUser*, February 2014: 54-63)
- (2020) A Solar Flare Monitor on VLF **https://tinyurl.com/y2o9zajm.**

Table 4: Reading (see also RE website).

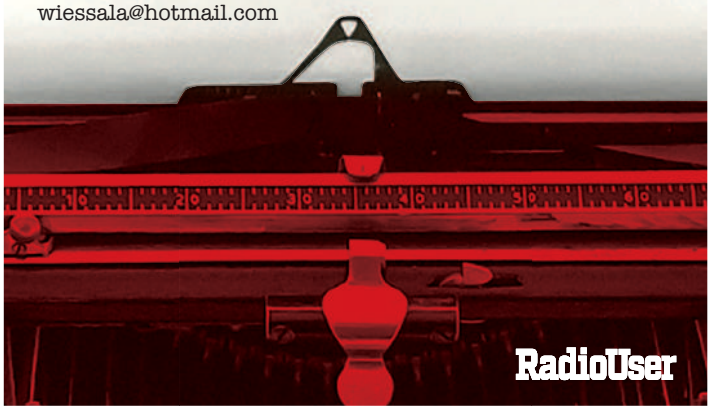
Join the RadioUser Team

You love your regular monthly radio magazine. Could you also write for us? The editor is looking for new authors to join our team in 2021, potentially in the following areas:

- **Network Radio**
- **CB and PMR446 Radio**
- **Software for Radio, and Software-Defined Radio (SDR)**
- **Propagation, Space Weather, Radio Astronomy**

If you would like to share your expertise and enthusiasm with our readers, and if you enjoy testing equipment and software, then please drop me a line. Previous experience in writing for publication is an advantage but not a prerequisite.

Georg Wiessala
wiessala@hotmail.com



Who Invented Morse Code?

Tony Smith G4FAI
g4fai@btinternet.com

Tony Smith continues his exploration of the life and work of Samuel F.B. Morse and his contemporaries, in connection with the development of several divergent versions of the eponymous telegraphic code.

The inventor and patent holder of the electro-magnetic telegraph system named after him was the American painter and inventor Samuel Finley Breese Morse (1791-1872). https://tinyurl.com/y5333ss2

His first experimental code, in 1832, was a numerical dot, line and space code linked with a numbered dictionary. Numbers represented words, phrases, or individual letters to spell unusual words, which were pre-loaded into a crude sending device called a *Correspondent*. Copies of the dictionary were held by both the sender and recipient of a message to decipher the meanings of the numbers.

Morse created a new, alphabetical, dot-and-dash code for a demonstration of his invention in 1838.

The machinist, inventor and son of a factory owner, Alfred Vail (1807-1859) witnessed the demonstration and offered financial and practical help to develop the telegraph commercially.

The final code evolved in 1844. Years later, there was – and there still is – a dispute about who created this version, the original 'American' Morse code.

While not denying that Morse (Fig. 1) invented the electro-magnetic telegraph, some have claimed that he wrongly took credit for the invention of the code as well; that it was really devised by Vail, and that it should properly be called the 'Vail Code'.

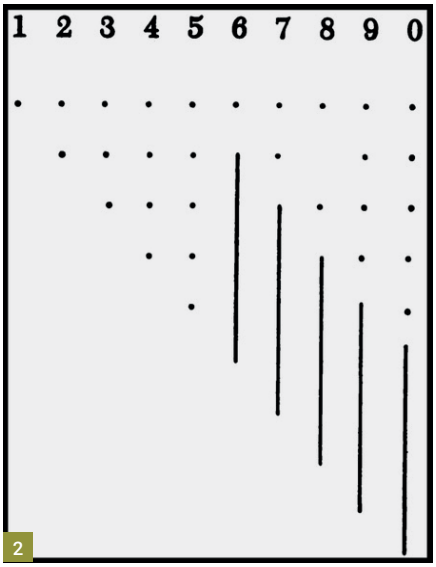
Patented in his Name

It is easy to see where this idea came from: Morse entered into partnerships with others, including Vail, and they agreed that everything, including improvements devised by any of them, should be patented in Morse's name to protect the interests of them all in the courts.

As a result, when the patents were challenged or needed to be defended, Morse was able to claim that he had personally invented everything, and the other partners never disputed it.

This is the main reason why there is so little information about who invented what, or evidence to support the allegations made in later years (Fig. 2).

1



2

3

Previous Codes

What is known, is that there were at least two other codes devised and tried by Morse before the final American version and that he experimented with at least six others.

Alfred Vail, himself, was the source of this information. In 1845, he published a booklet, *The American Electro-Magnetic Telegraph*, describing the instruments and code used on the government-financed first telegraph line between Washington and Baltimore in the previous year.

In this booklet, he gave Morse full credit for devising the code used for that demonstration.

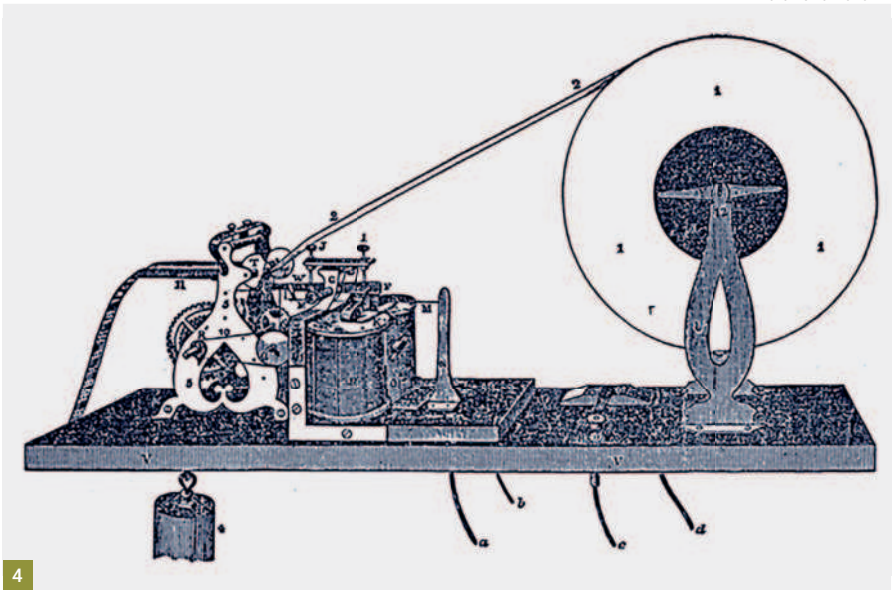
Then the mystery begins. Vail could have simply been following the agreed 'party-line', that Morse was the inventor of everything, leaving it wide open as to who *compiled* the code. It may have been Morse; it may have been Vail; it may have been both of them working together. While Morse, through his patent, claimed that he was the inventor, as far as is known, Vail did not lay claim to anything, not even in private (Fig. 3).

Historic 'Evidence'

The only 'evidence' known is a statement by William Baxter in 1885, 26 years after Vail died, claiming that Vail, and not Morse, had devised the code. When he was 15, he said, he had been an apprentice at the Vail family's factory. He claimed that he worked closely with Vail when he made the first telegraphic instruments and devised the code to use with them.

This story was reported three years after Baxter's death by Franklin Pope, a telegraph engineer, author and journalist, in an article in

ALL PICTURES: PUBLIC DOMAIN



4

	First Alphabetical Code 1838	American Morse 1844		First Alphabetical Code 1838	American Morse 1844
A	·–	·–	O	– –	– –
B	– · · ·	– · · ·	P	· – – ·	· – – ·
C	– · – ·	– · – ·	Q	– – · –	– – · –
D	– · ·	– · ·	R	· – ·	· – ·
E	·	·	S	· · ·	· · ·
F	· · – ·	· · – ·	T	–	–
G	– – ·	– – ·	U	· · –	· · –
H	· · · ·	· · · ·	V	· · · –	· · · –
I	· ·	· ·	W	· – –	· – –
J	· – – –	· – – –	X	– · · –	– · · –
K	– · –	– · –	Y	– · – –	– · – –
L	· – · ·	– –	Z	– – · ·	– – · ·
M	– –	– –	&		· – · · ·
	– ·	– ·	Evolution of American Morse		

5

6

Fig.1: Samuel F.B. Morse, inventor of the electro-magnetic 'Morse' telegraph.
Fig. 2: Morse's first code, as recorded in his original notebook; used with a numerical dictionary to send letters, words or phrases.
Fig. 3: Alfred Vail provided funds and facilities at his family's ironworks to develop the technical side of the telegraph.
Fig. 4: The original 'Register' (receiving instrument) invented by Alfred Vail, 1844.
Fig. 5: The Evolution of American Morse 1844.
Fig. 6: Friedrich Clemens Gerke, the originator of the International Morse code.
Fig. 7: Gerke's code of 1848. From his Handbook for the *Hamburg/Cuxhaven Morse Line* (1848).

The Century Illustrated Monthly of May 1888. Vail's family supported the claim but had no direct evidence to confirm it.

One wonders if, in those days, apprentices were the confidantes of their masters, and why Baxter waited 48 years to make his statement. It was also a pity that, when his claim appeared in print, he was no longer available to answer questions about it.

A Handwritten Note

Alfred Vail made an important contribution to the development of the telegraph, by providing funds and facilities at his family's ironworks. He enabled new instruments to be designed and made, but the only known assertion he made was that he was the inventor of the first 'Register' (a tape-embossing receiving instrument).

When he died in 1859, he left the original 1844 instrument to his eldest son Stephen. In 1871, a handwritten note, signed by Alfred, was found attached to the bottom of the instrument, describing its origin: *This lever and roller were invented by me… in 1844, before we put up the telegraph line between Washington and Baltimore... I am the sole and only inventor of this mode of telegraph embossing writing. Professor Morse gave me no clue to it... and I have not asserted publicly my right as first and sole inventor, because I wished to preserve the peaceful unity of the invention, and because I could not, according to my contract with Professor Morse, have got a patent for it.*

He left no claim regarding authorship of the code (Fig. 4).

American Morse

The new code, when it appeared in 1844, had a structure based on the frequency of use of each letter in the English language. One account describes Morse visiting a printing office to count the different quantities of the type used by the printers to decide which were the most frequently used letters. Another says it was Vail who visited a newspaper office for the same purpose.

An undated note by Morse shows what was done after the most frequently used letters were identified. Every letter was given a separate symbol, unlike the previous code, which had the same symbol for phonetically similar letters (for example G/J; I/Y, and S/Z). They were weighted to determine their length, enabling the shortest symbols to be allocated to the most commonly used letters and the longest to those letters used the least. A dot counted as 1; a dash was 2; a space between groups of dots 1; and a long dash (letter L) 4; while no letter was to exceed a count of 5.

An unexplained exception was the letter J, shown as - - - - and counting as 5 while the final symbol adopted was – - – - which broke the rules by counting as 6. The rejected - - - - was used for the ampersand (&) and survives to this day in International Morse as ES with the same meaning (Fig. 5).

No Dispute

This became the standard operating code on the internal landlines of the USA and Canada until the Morse telegraph began to be phased out there, well after WW2. To those brought up with it, American code was known as 'Morse', while the International code was known as 'Continental' or 'Radio'.

Probably the best that can be said regarding authorship of the American code is that either Morse or Vail devised it, or that they worked on it together. However, Morse's original 1832 numerical code, linked to a numbered dictionary, did make use of dots and dashes, as did his 1838 alphabetical code, so the basic idea was undoubtedly his own.

This may, or may not, have relevance in the dispute about the later code but it is a possible pointer towards the solution.

Vail's contribution to the technical and engineering aspects of the telegraph has never been disputed and Morse himself acknowledged that contribution. It is possible of course that Vail, as an engineer concentrating on the design and manufacture of improved instruments, never attached much importance to the code. It was changing frequently as it evolved, and he may have been quite happy to let Morse work on it alone.

Whatever the facts, they remained friends and maintained a cordial correspondence for several years after Vail withdrew from active involvement in the telegraphic industry, and there is no evidence of any dispute between them.

Unauthorised Success

Morse visited Europe in 1845, but he was unable to introduce his telegraph in any European country. Two years later, three Americans, not authorised by Morse, succeeded where he had failed. Morse wrote to the *Chargé d'Affaires* of the United States at the Court of Austria: "*… yesterday Mr Wm. Robinson, his stepson C. Robinson, and Mr Chapin all of this city sailed in the packet ship Northumberland for Liverpool. They have taken with them two of my Telegraphic instruments with a view of seeking their fortune with them in Europe. They have not gone under my sanction.*"

Robinson was unable to introduce Morse's system in England and France, where other telegraphs were already in use. He enjoyed more success in Germany. In 1848, an optical telegraph, which transmitted and received shipping information between Hamburg and Cuxhaven, was replaced by a wired circuit equipped with Morse instruments supplied by Robinson.

German Adaptation

Friedrich Clemens Gerke (1801-1888; Fig. 6) the first Inspector and technical manager of the new telegraph line, used Alfred Vail's 1845 booklet, *The American Electro-Magnetic Telegraph* as his handbook, but with reservations about using American Morse for the German language. Translating the booklet, he wrote: "*For our general use in German communication I have set up another easier system... naturally with the same character elements…*"

For his revised version he used dots and dashes as in American Morse but did not use the extended spaces in Morse's characters. The long dash, for the letter L, was eliminated, and the letter J was omitted from the alphabet. There was now only one type of dash, equalling 3 dots in length, and within any character there was only one type of space, equalling 1 dot. The space between two characters equalled 3 dots, and the space between words or groups of figures equalled 6 dots.

Twenty of the American Morse alphabetical characters were retained, although several of them had their meanings changed; he also retained the American numerals, including the long dash for 0. Despite Gerke's efforts, there was still room for confusion. Hamburg was one of 39 sovereign states comprising the German Confederation (*Deutscher Bund, 1815*).

When the telegraph spread to the other states, and Austria, each state, apart from Prussia (*Preussen*), devised its own variation of his code, necessitating manual translation from one code to another as messages crossed state boundaries (Fig. 7).

More Variations

A further book, *The Practical Telegrapher*, published by Gerke in 1851, included a modified version of his code, in which the letters O, P, X, Y, and Z were changed to those still in use today. Morse's original numbers were also abandoned and replaced by today's numbers.

In 1852, this version became the official code of the newly formed Austro-German Telegraph Union. Establishing common regulations and operating practices in Austria, Bavaria, Prussia, and Saxony, this was the first attempt to simplify telegraphic communication between different countries.

The International Telegraph Union (ITU), founded in 1865, recommended that, with the addition of two accented letters, É and Ñ, the Austro-German code be adopted by all European countries and this code eventually became the International Morse code (Fig. 7).

Unsung Memorial

Gerke (Fig. 6) died, in Hamburg, on 21st May 1888. His unsung memorial is his code, which is still in use today. Further amendments have been made over the years, mainly relating to punctuation and the length of symbols or spacing between words, but the basic code remains unchanged.

It has an honourable history, on land, sea and air. It has saved many thousands of lives and has provided worldwide communications for an infinite variety of purposes. Today, when commercial Morse operation has disappeared, it provides a fascinating and enjoyable hobby activity for amateur radio operators around the world. Very few of them, however, are aware of the debt they owe to Friedrich Clemens Gerke.

In the circumstances, the dispute about whether it was Morse or Vail who devised the American Morse code is somewhat academic. The code we know today, and the only code that has ever been known in this country is the International Morse code, which dates back to Morse's original concept, later modified and improved by Gerke. It is difficult to see where Vail came into the process. Perhaps it should be called the 'Gerke Code', but after all these years this is not very likely to catch on!

A	·—	N	—·
B	—···	O	———·
C	—·—·	P	·——·
CH	————	Q	——·—
D	—··	R	·—·
E	·	S	···
F	··—·	T	—
G	——·	U	··—
H	····	V	···—
I	··	W	·——
J	Not used	X	—··—
K	—·—	Y	—·——
L	·—··	Z	——··
M	——		

Gerke Code 1848

7

Further Reading

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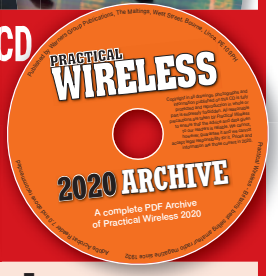

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chrissyLB@hotmail.co.uk

Chrissy Brand takes you on an autumnal tour of the radio dial and the web, choosing a selection of fascinating programmes and podcasts for your listening delight.

On a sunny September Saturday, I enjoyed a chat with Ian Sanders, host of the highly successful *Cold War Conversations* history podcast. We met at the "*Soviet Threat*" re-enactment weekend at *Hack Green Secret Nuclear Bunker* in Cheshire (Fig. 1).
https://hackgreen.co.uk

Today, the bunker is a museum that is both a relic of – and a paean to – the Cold War era. The 27 rooms within are all equally scary, even the canteen is a spooky and austere place, where 1940s music drifts around. The red white and blue patriotic bunting looks misplaced, and the war posters give a sense of unease. All of this is preceded by the bunker's entrance with bombs and other weaponry.

Cold War Calling

Hack Green creates the fear of being surrounded by ultimate danger, and the flawed idea of a 'nuclear deterrent' gave me no reassurance. You can wander through a communications centre, a BBC Studio, a government HQ room, women's dorms, radiation chamber, RADAR tracking, map rooms, and a sick bay. A radio played some stirring Russian music, while the video theatre aired *The War Game*, a 1965 pseudo-documentary film that depicts a nuclear war and its aftermath. At the time, it was banned by the BBC (Fig. 2).
https://tinyurl.com/y8o2v6m2

The BBC Studio is a chilling reminder of how the UK government was preparing for nuclear war, with compliance of publicly-owned organisations, the BBC and BT.

Part of a planned *Wartime Broadcasting Service*, the BBC studio looked laughably outdated with its reel-to-reel tapes, dated engineering and uncomfortable, functional, furnishings.

Engineers would have operated the equipment for broadcasts which would include emergency announcements and orders of the commissioner. Officers from the Central Office of

Fig. 1: A Cold War Conversation: An 'East German soldier' (Susie Be) on the line at Hack Green. Fig. 2: The BBC banned *The War Game* when it was made in 1965, airing it 20 years later.

Information would also provide bulletins and information to be transmitted, both in the build-up to war and afterwards. The Commissioner could speak directly to survivors from the BBC studio if she or he deemed it necessary.

Living in a current-day pandemic gave the bunker visit an additional eerie edge. Covid-19 warning tapes were in place (for instance, you were not allowed to operate a radio in one of the rooms) alongside radiation signs and tapes.

The *Atomic Hobo Podcast* included a tour of Hack Green in September 2020. This is a weekly podcast presented by Julie McDowall, on the subject of "*how we prepared for nuclear war*". Julie is a fabulous presenter, it is available on *Soundcloud* and all the usual podcast apps.

There is also a *YouTube* channel, where you can see, as well as hear, Julie's enthusiasm and passion for the subject, as well as learn why she became a nuclear war writer.

https://soundcloud.com/user-494087291
https://youtu.be/cambruEx3lk

Returning to *Cold War Conversations,* which has broken into the mainstream, even being featured a few times in the *Daily Express* this autumn. The website and podcasts have also been used as a secondary school teaching aid.

Ian has made some great connections and interviewed some big-name players. I am in the process of trying to set up a possible panel of CND and other anti-war activists, to bring that side of the story more into a future episode of the podcast.

https://coldwarconversations.com

Best and Wurst Programmes

The convivial chat with Ian inspired me to offer you a selection of podcasts that deal with different aspects of the history from that cold war era. These dark long nights evoke, for me, a certain atmosphere, of short wave propaganda from west and east, numbers stations, double agents, and dead letter drops.

The *Live Drop* podcast covers the current day as well as past espionage activity. Along with the usual suspects, episodes to date have also covered Covid, Lebanon, Laos, fake news spotting and the purpose of satirical imagery. Join host Mark Valley plus a team of spies, spy catchers, analysts, diplomats, security experts and storytellers.

www.buzzsprout.com/533251

The *Skybrary* podcast was started in 2017 by Welshman Shane Whaley. One of his aims is to encourage people to read new spy novels, revisit an old espionage classic and discuss them with the community of like-minded spy fans. There are now over 120 episodes available.

https://spybrary.com

Shane is also the man behind the podcast called *Radio GDR, The Life and Times of East Germany*. I have covered this in detail after I met with fellow listeners in Berlin a year ago (*RadioUser*, February 2020: 28-32). Season 2, which started in August, included a mini-series of everyday lives in the DDR (Deutsche Demokratische Republik, GDR, East Germany). The human stories are moving, fascinating and took place, not that long ago really, certainly during the lifetime of many of us.

In the USA, Christiane Nickel gives voice to a lesser-heard side of the GDR, presenting the *East German Fashion History* podcast. It covers a lot of ground, from 1950s fashion, 1980s underground fashion collectives, and even an episode exploring architecture and fashion (*Whose Bauhaus is it Anyway?*)

https://anchor.fm/egfhp

To follow Deutsche Welle's stories about East Germany today, and from the past, search the Deutsche Welle website, and the relevant pages will be grouped together for your perusal.

For example, this autumn there was an interesting thirty-minute discussion on what reunification means for young Germans today. The people debating this were artist Mai Thu Bui, a strategist for the *We Are The East* organisation Melanie Stein and journalist Vladimir Balzer.

I also read a fascinating article from Deutsche Welle about DEFA (*Deutsche Film Agentur*), the East German film industry.

https://tinyurl.com/y53f4dn9
https://tinyurl.com/y5yf8l5h
https://wirsindderosten.de
https://tinyurl.com/y32wtvjk

Remembering Yugoslavia started in the summer and takes us on journeys, "*through the memory of a disappeared country, exploring how the people of the former Yugoslav republics remember and imagine their former homeland, which no longer exists.*"

Created and hosted by Peter Korchnak, there are fortnightly episodes. The first ten included Partisan songs, pop culture, digital afterlives and Yugodom, which is a

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"*stay-over museum of mid-century modern Yugoslav design and Yugonostalgia*". You can follow the *Remembering Yugoslavia* project and podcasts at its website, supplemented by visuals on Instagram.

Instagram.com/RememberingYugoslavia

https://rememberingyugoslavia.com

From the side of the UK peace campaigners, *Greenham Women Everywhere* is a podcast that appeared in August 2020. The ten episodes feature female peace activists from the Greenham Common peace camp.

Without Ann Pettit and Karmen Thomas, the *Greenham Peace Camp* would not have existed, "*Believing women's voices needed to be heard in a male-dominated world of politics and anti-nuclear movements, they initiated the 1981 Women for Life on Earth walk from Cardiff to Greenham Common USAF base. Their aim was to initiate a public debate with the government regarding nuclear weapons, in particular Cruise missiles, to engage the media.*"

Nagorno Karabakh Radio

The dispute over Nagorno-Karabakh (Artsakh) has reignited recently (Fig. 3). Armenia and Azerbaijan last fought over this territory in the 1990s. Wanting to follow developments, it soon became apparent that little remains of any external service broadcasting in English in Armenia or Azerbaijan.

The 2020 World Radio and TV Handbook lists Nagorno-Karabakh under Azerbaijan and is known as Mountainous Karabakh. There is one station listed, *Lernayin Gharabagh Hanrayin Herustaradioyin Kerutyun* (Public Radio and TV of Mountainous Karabakh).

I assume it is pro-Armenian as it broadcasts daily, in Armenian, on 9677kHz (subject to jamming) and a range of FM frequencies. These include relays from

Date	Time (UTC)	Station	Programme	Podcast	URL/ Stream/ Frequency
Daily	1230 to 1330	TRT Voice of Turkey (English Service)	News, features, Turkish music	Most podcast apps including Google	www.trtworld.com/turkey Satellite and 15450kHz
Weekdays	1810 to 1820	Voice of Barbados	Once upon a Time (children's stories)	http://vob929.com/onceuponatime/	http://vob929.com and 92.9 MHz locally
Tuesday repeated Friday	0400 to 0600 0000 to 0200	2RRR, Ryde-Hunters Hill, Australia	There Goes That Song Again with Brian Crabbe	http://2rrr.org.au	http://2rrr.org.au/listen-live and 88.5 MHz locally
Thursday (fortnightly)	1700	Radio France International (English Service)	Spotlight on France with Sarah Elzas and Alison Hird	Most podcast apps including Google	www.rfi.fr/en/podcasts/spotlight-france
Sunday	1000 to 1400	BBC Sussex & BBC Surrey	Dig It, garden phone-in with Joe Talbot	BBC Sounds app	www.bbc.co.uk/sounds/ stations and DAB, FM
Sunday	2100 to 2130	BBC World Service	Comedians Vs. the News	BBC Sounds app	www.bbc.co.uk/programmes/w13xtvb4 Short wave and DAB

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

LORA OHANESSIANON, UNSPLASH.

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BIANCA ACKERMANN, UNSPLASH

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Sputnik Radio, Armenian Public Radio, Mix FM and Radio Smile. Public Radio of Armenia no longer broadcasts on short wave in English but has been covering the conflict, and other news, in English, with audio and text at its website.

https://en.armradio.am

An alternative is to search 'Nagorno-Karabakh' in your podcast app.

When I did this, it produced a large number of programmes covering the subject, including NPR's *This Morning*, Politico Audio's *Political Newsroom*, Free Atlantic Radio, Global Dispatches' *World News That Matters*, SBS's *News in Depth* and Michael Hilliard's *The Red Line*. The latter covers many important news stories, *"Three experts, one story. Each fortnight we host a panel of international experts diving into the biggest geopolitical stories shaping the news both here and overseas."*

The Voice of Turkey has been supporting Azerbaijan in the conflict, carrying on from where it left off in 1994. On another note, its time pips at the top of the hour are unusual as there seems to be a jump after the third pip of six. Azerbaijani radio stations in English are hard to find, so please let me know if you discover any. The British Council offers Selector Radio in Azerbaijan but that concentrates on cultural items. It is broadcast on Khazar FM on Saturdays and online.

Selector Radio is part of the *Metronom: Electronic Music Hour* programme on Khazar FM, featuring popular electronic music creations from Azerbaijan.

https://tinyurl.com/y67t26ou

On Short Wave

The short wave bands are still alive, although in marked decline. However, there is much to be said for spending an evening turning that analogue dial or listening on an SDR. There is still a frisson of excitement in discovering esoteric music, lesser-heard languages, faraway signals and entertaining programmes.

Some of us are sadly plagued by RFI, that is to say, Radio Frequency Interference (not the excellent Paris-based state broadcaster, Radio France International). Heading for the hills to a cabin, or at least to an outside destination such as a park or hilltop can help improve signals (Fig. 4).

Graham Smith has recently heard several English broadcasts from German relay *Shortwave Radio*, on 6160kHz, and 3975kHz. A range of music and entertainment programmes is broadcast, including *Scorribande*, *CQ-Serenade*, *Stafford's World*, Radio Netherlands' *Media Network* rebroadcasts and Shaun Geraghty's *Prog Mill*. Graham also heard a German signal emanating on 5905kHz. This was *Deutscher Wetterdienst* (DWD), a German meteorological information service.

www.shortwaveradio.de
www.dwd.de

Lionel Clyne logged Radio Thailand at 2002 UTC on 7475kHz, broadcasting in German from Udon Thani (with a SINPO of 45444) and the Voice of Vietnam at 2012 UTC on 7280kHz. It was also broadcasting in German, but from Hanoi-Sontay with a SINPO of 55444.

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Fig. 3: The region of Nagorno-Karabakh is in the (radio) news once again. Fig. 4: Why not try out DXing from a mountain cabin? Fig. 5: Folk embroidery on a Radio Slovakia International 2014 QSL card.

He also noted something difficult to explain. Lionel wrote, *"Listening to these two stations nearby, both in time and frequency, proved to be a very strange experience. As noted, they shared a common language. However, when I switched frequencies from 7475kHz to 7280kHz via my key-pad I continued to hear not only the same language but the same news-broadcasting voice!*

"I thought that I had mis-keyed but I shifted between the two broadcasters several times and there was a noticeable movement in the S-meter. At one point the women announcer's voice was joined by a male voice: this too was identical on both stations. Radio Thailand's transmission ended at the appointed time of 20:15 while that of the Voice of Vietnam continued on air. I have checked my key-pad it is working as it should."

In a more regular occurrence, Lionel heard English from The Voice of Vietnam on 7280 and 9730kHz at 1920 UTC, with good SINPOs of 54444 and 53444. At 1930 UTC the French service transmissions form Hanoi began on the same frequencies.

Lionel's research found that ownership of radios in Vietnam was forbidden by the French authorities. It was not until the broadcast by Ho Chin Min in 1945, declaring the independence of the country, that Vietnam became a self-regulating broadcaster. However, Vietnam only initiated short wave broadcasting in 1968.

Radio Websites

Not to be confused with the *European DX Council (EDXC)* and its *YouTube* channel, the YouTube *European DX Blog* channel is packed full of wonderment. It contains recordings and images of radio from the distant past which include Peace and Progress, Radio National Kampuchea and Pirates for Peace.

The videos span most of the radio decades, from Caruso singing on Italian radio in 1916, Radio Budapest 1956, up to the current day.

Somehow, even videos of Roy Wood and Slade singing live are uploaded there too. **https://tinyurl.com/y2yboww2s**

How about listening to a selection of BBC World Service 'bloopers' and other programme items that were originally recorded on a reel-to-reel by former BBC employee, Andrew Piper?

BBC's *Waveguide* programme, news headlines, poems for Christmas and sports extracts from the 1960s to the 1990s await you.

There are also similar BBC World Service vintage recordings at Andy Walmsley's oft-quoted *Random Radio Jottings*. If you fancy a spoonful of nostalgia with an early mince pie, then grab yourself an earful of classic BBC World Service.

www.seansaunders.co.uk/andrew/bbc
https://tinyurl.com/y2m5pegk

The patterns on Radio Slovakia International's beautiful 2014 series of folk embroidery QSL cards make want me to knit a winter jumper (Fig. 5). Check out the whole range of QSL cards from this traditional Slovak handicraft printing of fabrics, where patterns are created by printing a wooden form on cotton fabric.

www.rtvs.sk/clanky/29452

Radio News

OFCOM AND THE IMPACT OF BBC SOUNDS: Ofcom is calling for evidence and information about the market position and impact of BBC Sounds. The regulator says the audio and radio sector is undergoing a period of rapid change due to the evolution of streaming services, including the entry of global players such as *Spotify* and *Apple Music*. It adds that audience expectations are also changing; increasingly they want to listen to the content of their choice, when and where they want to, and there is a tendency for younger audiences, in particular, to listen online. The investigation was prompted after concerns were raised over the need for Radio 1 Dance by Radiocentre and the Chair of the APPG, MP Andy Carter.

The BBC has responded to these audience changes and competition by developing and expanding BBC Sounds. Given the incremental changes that the BBC has made to BBC Sounds, Ofcom considers that now is the appropriate time to take stock of the market position of BBC Sounds and assess whether any issues need to be addressed, via regulatory action or other means. As a result, Ofcom is now seeking evidence from stakeholders about the impact of BBC Sounds on the market, including information about the market context in which BBC Sounds sits. The regulator is also keen to understand the BBC's strategy for BBC Sounds, the role it expects the service to play in fulfilling its Mission and Public Purposes, and how this may impact on competition.

(SOURCE: *Ofcom*)

https://tinyurl.com/y5l37ka6

RADIO SILENCE: Kaylee Golding spoke up about a new podcast from *Radio Silence*. She said, *"Radio Silence is a podcast created, presented and produced by the founders of the #RadioSilence movement; myself, Pulama Kaufman and Sara Hebil-Motiea. It's a movement that aims to bring attention to the diversity gap in the UK radio industry by being transparent and informative. The podcast will carry on this mission by facilitating honest conversations between myself and minority groups within the radio industry. The conversation will be raw and candid and will highlight personal stories while also asking high ranking media personnel what is being done to create a diverse and equal industry. Each season will cover a different issue of diversity within the industry; our first season will be looking at the race gap in the UK radio industry to better understand the lack of black creatives in managerial, front-facing and producer roles. We will also be speaking with managers and editors across the sector to understand the steps being taken to increase inclusion and diversity and ask them about their thoughts on the current industry climate."*

David Smith
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David Smith features Covid stories, advanced radar in Scotland, and a potential quantum leap in drone technology. He also outlines the Aerodrome Flight Information Services at Northampton Sywell Airport.

DAVID SMITH

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Drones & Aircraft to Share the Same Sky

At the end of March 2020, the lack of medical supplies in Europe was acute, and there was news of a couple of flights carrying supplies from China to Spain. Controllers from Madrid were able to locate the first flight on *Flightradar24* when it was still overflying Kazakhstan. They wanted to give it as direct a route as possible, so they called Bordeaux and negotiated a direct route to Madrid-Barajas Airport.

The French controllers, aware of the cargo in the aircraft and taking advantage of the low level of traffic, coordinated with other colleagues. In the end, half of the controllers on duty in Europe helped coordinate a direct route from Polish airspace to Madrid on that day.

NATS Reveals Land Sale Plans

Air traffic service provider, NATS, is putting acres of land at sites across the country up for sale as part of its response to the Covid-19 crisis. NATS owns several sites on which it has traditionally sited multiple radars, radio masts and accommodation. However, advances in technology mean many of these sites now stand largely empty and unmanned and can be sold without impacting NATS' ability to provide a service. With air traffic volumes at only 40% of where there were in 2019, NATS is seeking buyers for these excess acres to both reduce its costs and bring in revenue.

The move will also see these disused sites brought back into practical use for their local communities. In the words of a NATS spokesman: *"This is absolutely not about selling off the family silver – we are maintaining full ownership and access to all our critical infrastructure, but where we have land and accommodation we no longer need, it makes sense to find a better use for it, while also helping us reduce our maintenance and running costs at what remains a very difficult time for the aviation industry."*

NATS has a total of 70 acres of land available for sale at sites in Prestwick, Debden in Essex, Pailton in Warwickshire, Preston, Stornoway, and Hillingdon in Greater London, with more being sought. There has been some interest from potential buyers, including home builders and local entrepreneurs. Moreover, one of the sites NATS has sold is Burrington in North Devon, which is being converted into a facility for local artists.

As part of its broader Covid response strategy, NATS has also partnered with the company *Shared Access* to begin leasing space on its sites to different mobile network operators. The spokesman concludes: *'We have 124 sites all over the country that would be perfect locations for mobile phone networks to put their own masts and antenna, helping to improve coverage in harder-to-reach locations and giving us a new source of income."*

Advanced New Radar at Lowther Hill in Southern Scotland

NATS is also investing in a new advanced radar to replace its facility at Lowther Hill. The new radar has enhanced capabilities that will allow it to alleviate the interference caused by wind turbines. The project is expected to enable the release of large amounts of renewable energy by allowing turbine developments to proceed that would otherwise be blocked due to air safety concerns. NATS is working with several turbine developers to discuss how they may benefit from the new installation.

Wind turbines can be picked up by radar and appear as 'clutter' on a controller's screen, creating a distraction and possible risk to safety. Traditionally, NATS has worked with developers to find some form of mitigation, such as blanking out the affected area, but that is not always possible and technology-based solutions have long been seen as a more sustainable answer.

The new radar is expected to be installed and operational by the end of 2021.
https://www.nats.aero

Introducing Arrow Drone Zones

The Thames Valley to the west of London will be the site of what is expected to be the world's first commercial drone corridor in open and unrestricted airspace, according to plans submitted to the Civil Aviation Authority (CAA). Operated and managed by *Altitude Angel*, the site will be available to support fully automated drone flights beyond visual line-of-sight (BVLOS) from any drone company which completes a series of basic technical integrations which, crucially, don't require specialist hardware onboard the drone.

Fig. 1: The editor's choice: Robin DR-400 G-HXTD at Llanbedr, North Wales.

The proposed zone, for which the necessary infrastructure deployment will begin within weeks, is situated south of Reading, Berkshire. It will be approximately 8km in length and 500m wide and will serve to extend enhanced detect-and-avoid capabilities to drones flying within the Zone.

Drones flying within the 'Arrow Drone Zone' will be tracked and monitored via *Altitude Angel*'s Unmanned Aircraft System Traffic Management (UTM) platform, GuardianUTM O/S.

This system communicates with the ground and aerial infrastructure to provide automated navigation for drones flying within the zone, pre-flight authorisations and automatic separation assurance. Nearby manned aviation, and other non-participating drones, are mapped in real-time, so that safe distances are maintained, and appropriate avoidance actions can be taken if they are predicted to be breached.

If a conflict is detected, drones involved will be automatically given appropriate avoidance instructions, such as an order to change the flight path, hold, return or land. A remote pilot will also be alerted, and manual control of the drone can be taken at any time. Drones flying within Arrow Drone Zones need no specialist equipment, such as new sensors, to utilise the zone.

Unlike existing drone corridors or research facilities – where airspace is restricted or closed to general aviation traffic by redefining the airspace as a Temporary Danger Area (TDA) – the Arrow Drone Zone will be in open and unrestricted airspace. This means drones and general aviation will be sharing the same airspace in a real-world environment.

The zone will be open to any company which completes the technical integration. This is in contrast with other drone corridors; these are often closed to organisations not directly involved in their funding, management or as part of a specific project.

Once complete, *Altitude Angel* will 'package' the Arrow Drone Zone technology, allowing any organisation, airport, town or city which wants to establish and operate an Arrow Drone Zone to do so quickly, easily and cost-effectively through a simple licencing agreement.

https://www.altitudeangel.com/news

My aircraft photograph this month (Fig. 1) shows a Robin DR-400 G-HXTD at Llanbedr, North Wales.

ATC & Aerodrome Flight Information Service Profiles 26: Northampton Sywell

ICAO Code: EGBK IATA Code: ORM www.sywellaerodrome.co.uk

Frequencies	(MHz)	Hours of Operation	
Sywell Information	122.705	0800-1700	
NAVAIDS	GNSS (Global Navigation Satellite System)		
	Approaches to Runways 03 Left and 21 Right		
HOLDS	No holding provided		
RUNWAYS	03L	1258 x 30m	
	21R	1258 x 30m	
	03R	671 x 30m	grass
	21L	671 x 30m	grass
	05	602 x 30m	grass
	23	602 x 30m	grass
	14	799 x 25m	grass
	32	799 x 25m	grass

Notes (A-Z)

Cat II/III Operations

Not applicable.

Circuit Procedures

Fixed-wing circuits 1,000ft QFE Left-Hand Runways 03, 14 and 23; Right-Hand Runways 05, 21 and 32. Helicopter circuits 800ft QFE opposite direction to fixed-wing circuits. Non-radio and aircraft experiencing radio failure to join via the overhead to observe the signal square for active runway and fit into the traffic pattern. Standard fixed-wing join is via the overhead not below 1,500ft above aerodrome level, helicopters may be operating up to 800ft deadside (opposite that of the normal circuit). Straight-in, base leg or downwind joins subject to traffic. Helicopters are to land in the grassed central area to avoid active runways. 'QFE' denotes atmospheric pressure at aerodrome elevation (or at runway threshold).

Ground Movement

No apron markings, caution when parking to ensure adequate wingtip clearance. Aircraft should not block access to the refuelling area and hangar access gate when parking on the concrete apron. All parking self-manoeuvring, assistance available on request. Aircraft commanders requested to use minimum power on the hard apron/refuelling area due to possible proximity of microlights. Start-up and taxi clearance must be received from the Aerodrome Flight Information Service (AFIS).

Helicopters

Helicopter circuits opposite direction to fixed wings 800ft. No overhead or crosswind joins for helicopters. Helicopters should enter/exit the Aerodrome Traffic Zone via either: Heli West (northern tip of Pitsford Reservoir) to the western airfield boundary (departures via the reciprocal until clear of the aerodrome boundary avoiding all villages). Heli East (water tower near Earls Barton) inbound track 325° True until clear of Mears Ashby then direct. Departures via the reciprocal until leaving the Aerodrome boundary avoiding all villages. Heli East is not to be used when Runway 14/32 is in use. Heli Northeast (south-eastern tip of Wellingborough Golf Course) towards the Runway 23 threshold not above 500ft avoiding Great Harrowden, Hardwick and the farm buildings on the south-eastern aerodrome boundary. Departures via the reciprocal. Heli Northeast is not to be used when Runway 05/23 is in use.

Instrument Approach Procedures (IAPs)

Since IAPs are established outside controlled airspace, there may be other airspace activity not known to Sywell beneath the London Terminal Manoeuvring Area (LTMA).

Use of Runways

Parallel usage of Runways 03L/03R and 21L/21R is not permitted. When Runway 03 or 21 is in use, pilots to advise AFIS of intention to using either hard or grass runway. When grass runways are unusable, expect lengthy backtracking of Runway 03L/21R.

Warnings

Public roads run along the east, south and southwest boundaries. The aerodrome is used by significant numbers of light helicopters in a training role. Helicopter circuit flying takes place on the dead-side and parallel to the active runway up to 800ft above ground level. All grass runways are marked by non-standard white chalk centre-line markings. A formation aerobatic team is located at Sywell. Practice and corporate displays take place throughout the year, during licensed aerodrome hours. 3nm radius up to 5,000ft. No movements are permitted during displays. Aerodrome strictly PPR, during which details of any displays can be obtained.

The End of DGPS and Irish VHF Changes

Robert Connolly
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Robert Connolly reports on the end of DGPS, provides his quarterly Non-Directional Beacons (NDB) update, looks at aerial maintenance, propagation conditions and changes to the Irish Coast Guard VHF frequencies.

It is that time of the year again when I offer an update for Non-Directional Beacon (NDB) reception over the last few months.

I know that some of you also monitor Differential Global Positioning System (DGPS) signals. As you may be aware, the US has closed many of its DGPS stations down over the last couple of years.

There is further bad news regarding this transmission mode: The General Lighthouse Authorities (GLA) of the UK and Ireland (*Trinity House, the Northern Lighthouse Board* and *Irish Lights*) have recently announced that they will cease transmission of the DGPS signal after 31 March 2022.

DGPS was introduced in 1995 as part of the mix of marine Aids to Navigation (AtoN) provided to safeguard mariners within their combined waters, and to help protect the environment. The system became fully operational in 1997. It consists of 14 DGPS reference stations, six far-field monitoring sites and three monitoring and control sites, maintained and operated as a single network by the three GLAs.

Following consultation with users, they say all mariners reported using the GPS, with around 40% also making use of the Global Navigation Satellite System (GLONASS). Around 9% were using the Galileo system.

From the responses received, it is expected that more mariners will move to multi-constellation receivers, making use of GPS, GLONASS, Galileo and BeiDou over the next five to ten years. The BeiDou navigation satellite system is a Chinese network.

Following a change in maritime receiver standards in 2003, all receivers now include Receiver Autonomous Integrity Monitoring (RAIM). RAIM is a means of determining whether the resulting position estimate is safe to use through an algorithm within the receiver. Differential corrections are also available from other sources, including Satellite Based Augmentation Systems (SBAS), which are primarily provided for aviation users.

Work is underway in Europe to introduce a maritime service to the European Geostationary Navigation Overlay Service (EGNOS), the European SBAS.

https://tinyurl.com/y2llyyga
https://tinyurl.com/y38czbpc

This service is expected to be available in around 2022. Vessels that need high accuracy position and integrity for operations mainly utilise commercial, satellite-based, services; the decision to discontinue DGPS has no operational impact on these services.

While this is bad news for those who listen to DGPS signals, on the positive side it will open up the UK DGPS frequencies to possible reception of more distant DGPS signals. It may also make DXing of some aeronautical NDBs possible, which still transmit in that segment of the band.

Q2/2020 Beacon Report

Summer was never a great time for beacon reception due to the short hours of darkness unless one was a total insomniac and quite happy to sit in front of a conventional receiver in the early hours. Fortunately, the advent of SDR radio provides a solution. The software used – *SDRuno* or *SDR Console* – provides a facility to *record* a selected section of the airwaves on an automated basis in a similar fashion to setting the timer on your digital television recorder. Then you can play it back at a time that is convenient for you. I would normally record a 300 or 500kHz segment covering the NDB band.

As regular readers know, I have a problem with a neighbour's sodium security light causing QRM across the beacon band, although it used to switch off on a timer at local midnight. However, my neighbour must have forgotten to change its timer as over the summer it has not been going out until 0100 local time. In the meantime, over the summer and early autumn period, I relied on using timed recordings with my SDRPlay RSP1A software-defined receiver.

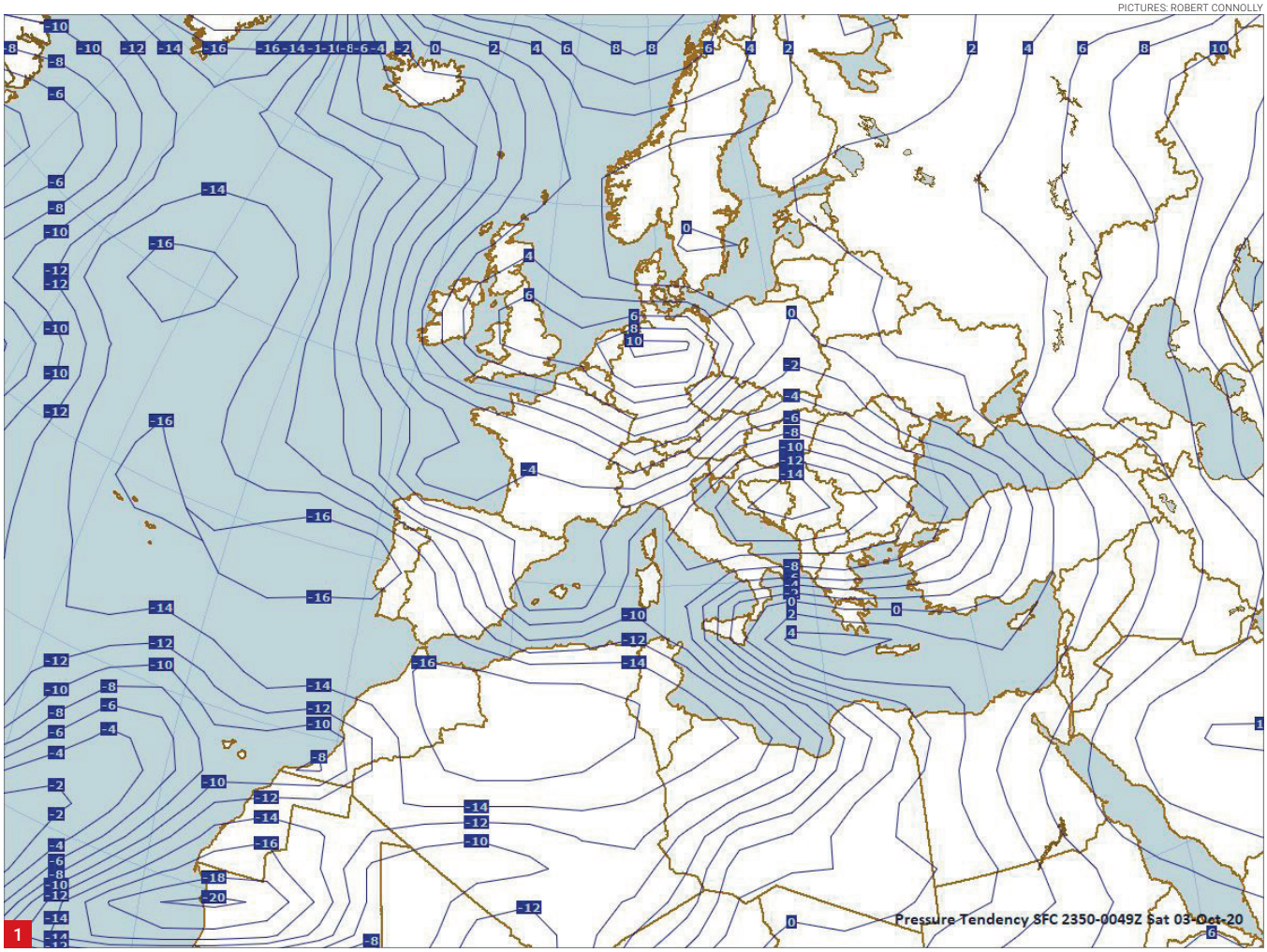
I set the recording timer for 0110 local time and recorded the beacon band segment for ten minutes, in order to listen to it the following day. Mainly using *SDR Console* (my personal preference) and a bandwidth of 500kHz, I can set two (or more) timed recordings for the same session that I can use to compare reception and propagation; for example, one for my usual 0100 recording time and the second for an hour later at 0200.

The recorder in *SDR Console* has another useful feature. Once you have set up a recording session, you can opt to run that session on a scheduled basis. After recently updating my *SDRuno* software to the latest version, V 1.40.1, I have noticed that NDB reception has improved when I used *Decimation 8*, providing 300kHz of bandwidth. Currently, I have not yet established if this is due to my imagination, the new version of *SDRuno* with improving sensitivity, or to overall propagation conditions.

Normally during the summer months, I do less NDB listening, mainly due to the longer hours of daylight. I believe that my JRC NRD525 receiver is much more sensitive on the NDB band, compared to my RSP1A SDR.

Having said that, my timed recorded sessions using the RSP1A still produced several beacons heard here for the first time. As I was busy using timed recordings of the beacon band I listen to the following day, one thing became noticeable: The powerful Greenland NDB Prins Christian Sund, OZN on 372kHz is a regular feature

PICTURES: ROBERT CONNOLLY



in the winter months here, it is often still audible at 1000 UTC. When checking the timed night recordings, I noticed that during the summer months OZN was still receivable here on most nights with a strong signal at 0100 local, despite local darkness falling between 2200 and 2300 local.

www.radioenthusiast.co.uk

Drone-Assisted Aerial Care?

Now is the time to check your aerials and ensure that everything is secure for the forthcoming winter storms. This can save a lot of hassle and aggravation on a cold winter's day trying to repair or prevent your system from doing secondary damage to your, or maybe even a neighbour's, property after it has come down during 60 mph plus winds.

On this topic, an idea came to me the other day that I have not yet tried out. Cheap camera drones are readily available these days for relatively little money. I wonder if anyone has used one of these to inspect their antenna system in situ rather than lowering the assembly for inspection. If you have tried this please let me know how you got on! I am getting to an age that makes lowering antenna systems (and, in particular, raising them again) increasingly difficult without help. Would a drone camera have enough definition to show the various required parts of an antenna array, such as clamps, cable connections and so on?

I would imagine that some practice in controlling the drone would be required to ensure it did not become entangled in antenna elements, cables or any support stays.

First-Time Beacons and Propagation

Having been DXing NDBs for well over a quarter of a century, one would think that reception of beacons for the first time would have become a thing of the past, especially given the fact that the number of available NDBs is decreasing, as closures happen around the world. However, it is always pleasing to receive an NDB for the first time, and I believe this is one of the things that keeps us interested in this area of the radio hobby.

Fig. 1: The connections between Isobars and propagation conditions.
Fig. 2: My JRC NRD 525 receiver with the Timewave DSP- 9+ Filter.

During the current reporting period, in early October, I was pleased to receive the following for the first time here: 334kHz YN La Roche-sur-Yon (France), 337.5kHz; GNT Gannet Alpha (North Sea) 386kHz; FM Fulmer Alpha (North Sea), and 416 KUN Kunovice - Czech Republic.

Fig. 1 shows the pressure tendency across Europe for that night.

Propagation plays an important role in DXing NDBs; not only can one night be different to the next night, and one hour different to the next one, but even propagation differences can be heard within a ten-minute time span.

Listening to a ten-minute SDR recording of the beacon band on repeat as you work through the band at your leisure allows

more time to be spent on each frequency. 'Live' listening to a frequency for a few minutes before moving onto the next frequency can sometimes produce an NDB becoming briefly audible before quickly fading away again. Listening to a recording set on a particular frequency for more than a few minutes can sometimes show that several beacons fade in and out on that frequency.

One thing regarding NDB DXing is the fact that no two nights are the same. Certainly, you may get a run of poor conditions while on the other hand surprises pop up from time to time, even for the most experienced of us.

During last year's period of reception, I had reports of trans-Atlantic reception in Europe beginning in early September. At the time of writing this column, in early October 2020, I have not only not heard any North American NDBs yet – I have also not come across any reports of transatlantic reception at all.

Normally, this requires both Europe and North America to be in established darkness. After the hour change at the end of October, the chances to such reception should improve with the longer hours of darkness. This is when we enter the principal NDB Dxing season.

More often than not, the summer months are very noisy with thunder crashes and so on. However, this year reception conditions during the summer months were not as bad as in previous years.

As we move into the winter months, QRN across the NDB band generally quieten down, although there are still nights when the listener's ears can take a proverbial bashing.

The image in Fig. 2 shows my JRC NRD 525 receiver with the Timewave DSP- 9+ filter that I use.

2

Nautical Updates

Now an update of things nautical: My sincere thanks to reader Clive Kilgallen, who kindly reminded me of changes taking place to the VHF channels used by the Irish Coastguard as part of the international harmonisation of channels used for Maritime Safety Information (MSI).

The changes commenced in early October and were expected to take ten weeks to complete. The following stations using CH23 (157.150 / 161.750MHz) are changing to CH05 (156.250 / 160.850MHz) – Bantry, Malin Head and Rosslaire. Glen Head using CH24 (157.200 / 161.800MHz) is moving to CH03 (156.150 / 160.750MHz). Valentia using CH24 (157.200 / 161.800MHz) is moving to CH62 (156.125 / 160.725MHz).

Cork using CH26 (157.300 / 161.950MHz) is moving to CH02 (156.100 / 160.700MHZ). Clifden using CH26 is moving to CH03.

The following stations using CH83 (157.175 / 161.775MHz) are moving to CH03 – Belmullet, Dublin (Howth Head) and Mine Head. Malin Head Scalp Mountain – currently using CH85 (157.275 / 161.875MHz) – is moving to CH01 (156.050 / 160.650MHz). The remaining sites of Carlingford, Wicklow, Mizen Head, Galway, Clew Bay, Donegal Bay, Galley Head, Lough Ree and Lough Derg will retain their currently assigned channel.

https://tinyurl.com/y5ygoqkc

Coastguard Rescue 116: Report Delayed

You may recall the fatal Irish Coastguard *Rescue 116* helicopter crash that occurred at Blacksod, Co Mayo in 2017 killing all crew members on board. It seems that there has been a new delay into the long-awaited accident investigation report to be published by the Irish Air Accident Investigation Unit (AAIU).

http://www.aaiu.ie

A senior manager at the UK Coastguard had been appointed as a technical expert on the two-man review team for the AAIU report. However, in late September he resigned from that position after disclosing that he had a personal connection with a senior manager at the helicopter operator, CHC who was due to give evidence on behalf of CHC to the review board.

The AAIU is now actively seeking a replacement technical expert to complete the review. This will delay the final accident report.

With the Covid-19 pandemic continuing to cause havoc around the world, this winter may well be a good time to dust off your headphones, hunker down and spend some time during the winter nights in front of your radio listening to NDBs or any other area of the radio hobby that you are interested in.

To my mind, this is better than watching TV repeats – and currently much safer than going out to socialise.

The table of received logs is on the *Radio Enthusiast* website:

www.radioenthusiasts.co.uk

I will also duplicate the list on my website:

www.kilkeel.org.uk/RUlogs.

Until next time *good DXing, stay safe and fair winds.*

Further Resources

- AAIU: **http://www.aaiu.ie**
- BeiDou: **http://en.beidou.gov.cn**
- GLONASS: **https://www.glonass-iac.ru/en**
- Intern. Assoc. of Marine Aids to Navigation and Lighthouse Authorities (IALA): **https://www.iala-aism.org**
- Irish Coast Guard: **https://tinyurl.com/y43kdkby**
- UK General Lighthouse Authority: **https://tinyurl.com/yxjce2wp**

The WellGood Loop

Keith Rawlings
Keith.g4miu@gmail.com

Keith Rawlings builds a Wellgood loop aerial and reports on a perplexing problem one of his friends experienced with his remote car entry system.

Following up from the question from reader Ash regarding the 'Wellgood loop' I decided to take some time out and build one. To give a little background it seems the author of the Wellgood web article, George Smart, accidentally transmitted into his original loop and damaged it irreparably.

With some considerable work and ingenuity, the damaged unit was dissected both by X-Ray and also physically and the amplifier circuit reverse-engineered. The circuit diagram has been published on the Internet and looks simple enough to duplicate. Through a chance exchange of e-mail, I found out that Alex Wiecek VE3GOP, author of WWSU, has also disassembled a damaged Wellbrook. He confirms the Wellgood circuit to be pretty much correct.

Except for the ferrite cores, I already had all of the components needed. The cores used are BN 73-302. However, I have a large quantity of BN 73-202, which are slightly longer, so I substituted these and took five turns off of the 7x7 turns transformer T1, to allow for this. I etched a simple PCB, and when this was complete, I soldered the components in place. Initially, I used PN2222 for Q1-Q2 and a plain 100Ω pre-set for RV1, as I could not put my hands on a multi-turn pot at the time. This may have contributed to the problems I experienced later.

To power the loop, I used a Bias-T described in RU some months ago. It also incorporates an isolation transformer. With the amplifier sitting on my bench, I connected it up to a length of wire looped around the curtain rail and powered up the Bias-T. But, much as I tried, I was unable to balance the voltage across C3. I took my time but the voltage kept varying, no doubt because the temperature of the transistors changed.

ALL PICTURES: KEITH RAWLINGS, EXCEPT FIG.7: OXFORD UNIVERSITY PRESS

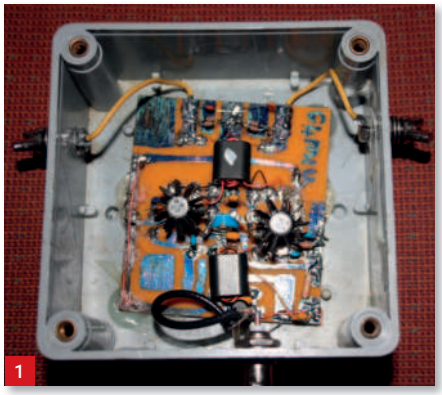

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Fig.1: The Wellgood loop amplifier.
Fig. 2: The amplifier in position.
Fig. 3: The Wellgood Loop is up and running.

I set voltage as best as I could and left it, intending to sort this out later.

'Frying Tonight ...'

Connected to a receiver, I had a quick tune around and was quite pleased with the quantity and quality of signals I could hear. However, had I paid more attention to the amplifier, rather than tuning around, I would have noticed that Q1 was sitting there slowly cooking itself with Q2 also getting quite warm, even though I had clipped a heat sink on both devices. The first I noticed of this was when signals started to become unstable.

Therefore, I removed DC from the Bias-T. However, it was too late to save Q1.

After a thorough check, to make sure everything was indeed wired as it should be, I soldered another in its place, and that too started to cook. Even though I powered down immediately, that device too was damaged.

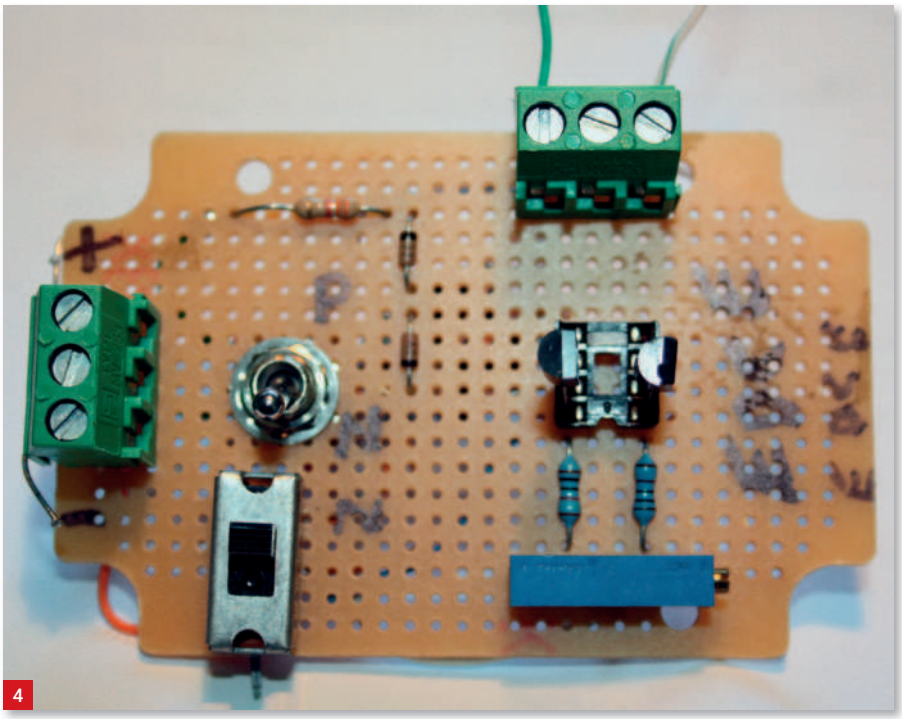
I wondered if my problems with the voltage across C3 were the issue, and I began to think that the transistors may have needed to be more accurately matched to one another. I had some 2N5109 transistors in my box. These are more 'beefy' than the PN2222 transistors and, more importantly, they were matched.

After soldering these in place and powering up again I found that, although I could not get the voltage across C3 *exactly* to zero, it was now possible to get it to below 5mV; neither transistor was getting anything other than slightly warm. I spent the rest of the evening tuning around the bands with the amplifier on the bench and the wire loop over the curtain rail feeling quite pleased with the results I was getting.

Outside Use, and Further Exploration

I decided to box the amplifier for use outside. I felt that I had gone from building a loop just to try it out, to thinking that this design might just be one to keep. I have the remains of one of my M0AYF loops that got damaged when a branch came down across it, so I removed the old amplifier from the waterproof box and replaced it with the Wellgood amplifier (Figs 1 and 2).

Later, I rigged up the same wooden frame I used to evaluate the Cross-Country Wireless (CCW) loop amplifier. I used a 1m diamond-shaped wire loop connected to



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the Wellgood at a height of about 9ft.

Turning the loop manually, I had a tune around, and I found that the results were very good. The only issue I noted was that on HF I could only get about a 20dB indicated null, but this may have been to do with either the balancing of the amplifier, the wire loop element, or both.

As I thought this design was worth further study, I took a look at the damaged loop element from the M0AYF.

This was a 1m-diameter circular loop, made from 8mm diameter aluminium thick wall tube, which was decidedly bent so I spent half an hour or so with a mallet putting the 'circle' back into it. Although it looks decidedly cobbled together, which in truth it is, it is working OK (Fig. 3).

After a period of use, I can claim that the Wellgood's background noise levels are, in general, lower than my surviving M0AFY design, which is now rather old. I have as yet made no measurements of the noise factor on my particular Wellgood; however, my feeling is that it might be a little high. That said, operation on HF has been satisfactory, and looking for Non-Directional Beacons (NDBs) in the evenings has resulted in a lot of new finds.

Some Future Projects

I have ordered some BN 73-302 two-hole ferrite cores to build another amplifier, and I think that I will persist with the use of PN2222 transistors.

After some 'mixing and matching' – and once I had sorted through them – all I managed to get was a couple of pairs. After they had settled, these had less than .01mV difference.

Therefore, I will be hoping that this may cure my problem of 'cooked' transistors (Fig. 5). Fig. 6 shows my two 2N5109 transistors.

A friend of mine, Ken G8PWC, has taken interest in this project and was kind enough to donate a length of Cell Flex LCF14-50 semi-rigid 15 coaxial cable and the correct Type-N plugs to fit. When time permits, I will use this to fabricate a 'solid' loop in either a shielded or Möbius form to see if this configuration will give me lower noise levels compared to a single-element loop.

Despite the issues I experienced with the transistors, the circuit is easy to build. Some care has to be taken with T1 as clearly explained in the text on the website at the end of this section.

Also, to get the full benefit of the back to back diodes on the input (D1-D4), I feel that this point should be earthed/grounded. The Wellgood is a great project and has certainly returned some excellent results. I suspect that to get the full benefit of a Wellbrook loop, especially as the current models are much improved, is to go and purchase one.

https://tinyurl.com/yxe2cckc

A Problem Unlocked?

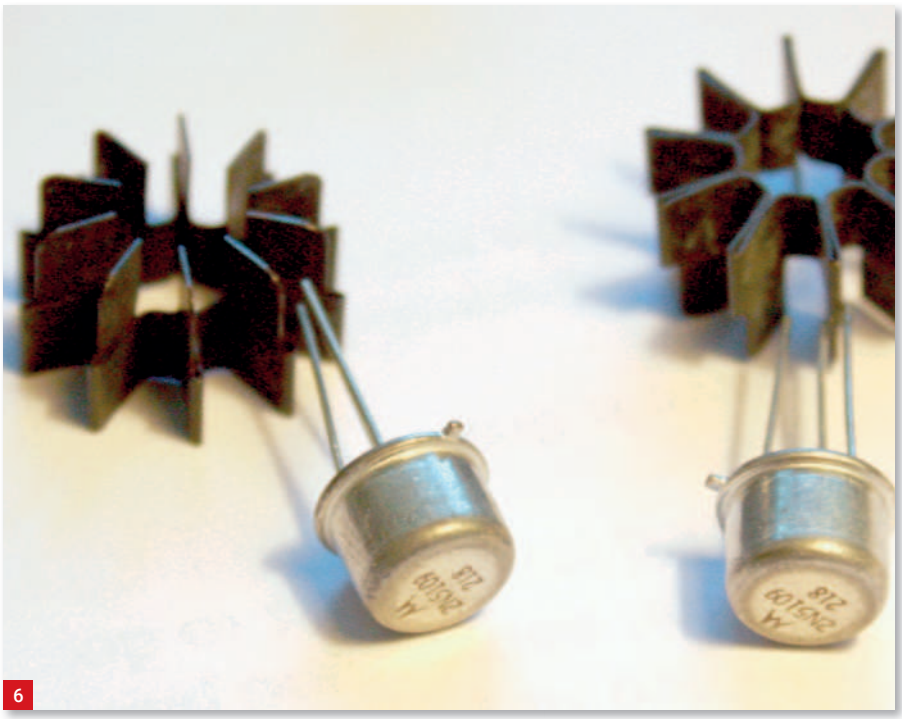
My friend came up with an interesting problem recently regarding his car's Remote Keyless Entry system.

Planning to install a newly-bought dual-band transceiver into his nearly brand-new car, he ran across a puzzling problem. As the car was still new, drilling holes into the

Explanations

A PN2222 is a common NPN bipolar junction transistor (BJT). A BJT is one of the two major classes of transistor – a semiconductor device, which consists of p-n junctions, back-to-back, close to one another, with one of the regions common to both junctions (Fig. 4). To overcome possible future issues with matching, I knocked up a jig (a device that holds the work when home-brewing and guides a tool) to pair-off a couple of matched PN2222 transistors, Fig. 4; see also Fig. 6). While going through the batch (a cheap pack bought off of e-Bay for use as switches) I found that the HFE of every device was very close to 305, which I was happy with, but when I measured the VBE, some devices in the batch demonstrated more than 90mV mismatch, compared with some of the others.

'HFE' stands for 'Hybrid Parameter Forward Current Gain Common Emitter'. It is a measure of the DC gain of a junction transistor. On a multimeter, it indicates a mode where the meter can measure (probably crudely) the HFE of a transistor. **'VBE'** is the voltage that falls between the base and emitter of a bipolar junction transistor. VBE is approximately 0.7V for a *silicon* transistor. For a *germanium* transistor (which is rarer), VBE is approximately 0.3V.



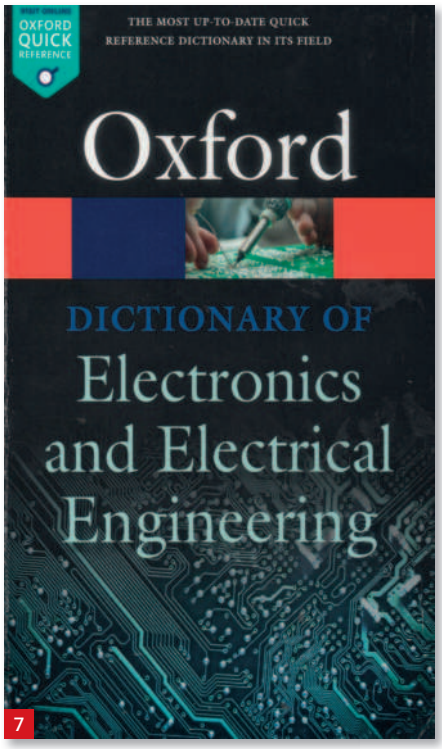


Fig. 4: Transistor matching jig. The design was found on *YouTube*. Fig. 5: A matched 2N2222 transistor pair. Fig. 6: A matched 2N5109 pair with heatsinks. Fig. 7: The *Oxford Dictionary of Electronics and Electrical Engineering* (5th ed., OUP, 2018)

bodywork to mount an aerial was not an option.

The alternative of using a magnetic mount was discarded too, as it might damage the paintwork. It would also make the care more prominent and stand out when parked. He thought that it may then be more prone to vandalism or theft.

The other option was an on-glass mount. This method of mounting one, the way it works and its drawbacks, can be described another time; suffice to say in this case it was his preferred option. It would in no way damage the bodywork, and, when parked, it would look nothing more than a 'normal' car aerial.

Mindful of the car being modern and full of electronics, my friend had programmed some channels into his radio that were set to a low output power of around 5W. The on-glass mount was fitted into position, and the coaxial feeder was routed under the trim as much as possible to the position where the radio was mounted.

Next, the aerial element was screwed into place and an SWR meter put in series with the line to adjust the element length. By mistake a channel was selected that was not set to low power and the radio's full 50W was applied to the aerial. After selecting one of the low-power channels the aerial was matched satisfactorily, the tools were cleared up and, as was usual, my friend walked away from his car expecting to hear it lock.

Only it didn't.

He went back to the car and away again, and it still it would not lock. Nothing he did would make the car lock so he had to use the key fob. He later assumed that his mistake of applying 50W had scrambled the keyless locking system.

As the car was due in for a service, he left it alone content to let the dealer sort the problem out. The day before the service was due, he decided to remove the aerial and its mount. It seemed that the problem with the keyless entry was due to him transmitting.

Not wanting a repeat of the problem once the car had been fixed, he thought it best to remove the aerial, the mount, and the radio. This was done.

Once again, the tools were picked up and as he walked away he heard the 'clunk', and the car locked!

He walked up to the car again; 'clunk', it unlocked; he walked away again; 'clunk' it locked!

My car is too old to have this system but it seems that just having the key on your person is enough to unlock the doors as the system is constantly monitoring for radio signals broadcast by the car. If the fob is in range, the car recognises this and unlocks the doors.

My friend's vehicle can detect when the fob is inside the car, the idea being that keys cannot be locked in by mistake. Presumably, signals were being exchanged via the aerial, and signals were brought into the car, making it 'think' that the keys were inside – and so it refused to lock!

Aerial Modelling

Version 5.12 of the *AN-SOF* aerial modelling software suite has been released. In this new update, two slices of the 3D Far-Field Pattern may now be plotted (The *far-field region* is a zone extending from infinity, to near an antenna, within which the radiation from the antenna can be considered to be travelling directly away from the antenna (*Oxford Dictionary of Electronics and Electrical Engineering*, 5th ed. 2018: 209).

Moreover, there are improvements to the display of values on the plots, which can now be shown by clicking on the diagram with the mouse. Users can also now select a triangular cross-section for 'wires'. This is great for simulating a mast or tower. There are other improvements and bug fixes.

Stay safe, have a great Christmas, and I will see you next time!

[If you are after a reliable reference book on electronic components, you may wish to consider the title in Fig. 7 – Ed.].

Tick-Marks and Smart Radios: Digital Evolution

Kevin Ryan
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Kevin Ryan offers an overview of the progress of digital radio around the world, three years on from his last survey of this topic. He reports on what has changed in the digital radio world.

ALL PICTURES: KEVIN RYAN

1

During the current Coronavirus (COVID-19) Pandemic I have had the opportunity to participate in several webinars mainly about DAB and DRM. These set me thinking about how much progress has been made since I last did this in the pilot Digital Radio column published in November 2017 (RadioUser, November 2017: 8-11). In three years, you would reasonably expect some measurable progress. However. most of the time, it appears that advances have been slow and have come in small increments.

ITU Digital Systems

The ITU recognizes six digital radio systems as standards for digital sound broadcasting above 30MHz and below 3GHz: DRM for 3-30MHz, and DRM and HDRadio (IBOC) below 3MHz. Above 30MHz, the defined systems are each given a letter designator.

System A is DAB/DAB+. This is almost exclusively used on Band III, but there have been a few transmissions on L-Band.

System C is HDRadio on Band II; the other mode designed for Band II is the Convergent Digital Radio (CDR) from China known as System H.

System G is DRM+ tested for use on Band I, II and III. This is the Japanese Integrated Digital Services Broadcast (ISDB). *System F* has been tested on Band III and S-Band (2. 5GHz).

Lastly, *System I* – known as Real-time Audio Visual Information System (RAVIS) – has been developed by Russia. I have listed the bands where the systems were tested, but technically many of them can be used in other parts of the spectrum.

In Reality

While all the above systems were very cleverly designed, only DRM and DAB are now considered as viable options by many countries. HDRadio has many cheap receivers available, but it comes with a catch: It incurs royalty payments to the owners of the technology, whereas DRM and DAB are open systems. The other systems have not been adopted outside their countries of origin and are not widely used inside them either.

Three Years On

The operators of HDRadio have confined their ambitions to North America but they have not managed to push much beyond the border regions into Canada and Mexico. The format has tried to break into markets like Switzerland, the Philippines, and lately India, but no country outside of North America has adopted it as a standard.

In fact, many countries, like Canada, cannot decide which standard to use and seem happy to let station owners decide. However, HDRadio is in competition with satellite broadcaster Sirius XM for the lucrative car radio market in the USA. The Japanese, Chinese and Russian systems are limited to test transmissions within their own countries.

DAB, Present and Future

I (virtually) attended the technical webinar put together by WorldDAB and the Arab States Broadcasting Union (ASBU). DAB has made inroads into North Africa and the Middle East with a lot of commitment to DAB. However, as far as I can tell, just Algeria, Kuwait and Tunisia are broadcasting regularly. ASBU receiver specifications are based mainly on the ETSI ones, but for ASBU members the receivers must support AM (presumably just medium wave) and FM reception and

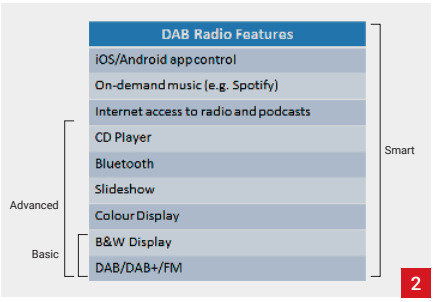

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Fig. 1: The new *Smart Radio* tick mark should appear on new radios in 2021. Fig. 2: A quick guide to DAB receiver types. 'Smart' or 'Hybrid' radios must give listeners access to all these media sources to qualify for the *SmartRadio* accreditation.

display Arabic text. There should not be a problem building these receivers; my car radio, for instance, tunes LW, MW, FM and DAB on both Band III and L-band.

The Webinar Presentations

Over three mornings, there were a total of 14 presentations covering the specific needs of the Arabic-speaking countries, how a DAB transmission is assembled for broadcast via a multiplex, DAB transmitters, DAB coding systems, making the business case for DAB and offering an overview of DAB receivers for the home, now and in future. All the presentations were of interest to me, but I will concentrate on consumer receivers:

Hybrid Smart DAB Radios

In 2021, we can expect to find some DAB receivers with a new tick mark called *SmartRadio* (Fig. 1). *Smart Radio* is an attempt to define a standard for a type of hybrid radio that provides access to analogue (FM-only), digital (DAB/

Fig. 3: If a DAB radio comes with a *Digital Radio* logo, it has been tested by a third party to make sure it meets the specifications for sensitivity and selectivity, and it can receive FM, DAB and DAB+.
Fig. 4: The PBC from Pakistan issued its proposed DRM transmitter installation schedule, starting with *Dera Ismail Khan* (currently on 711kHz) in the middle of the country.
Fig. 5: *Joe90*, received using *DABPlayer* and an *RTL.Com* SDR on a Windows 7 PC. All the stations on this multiplex had slideshows, some with several slides in the deck.

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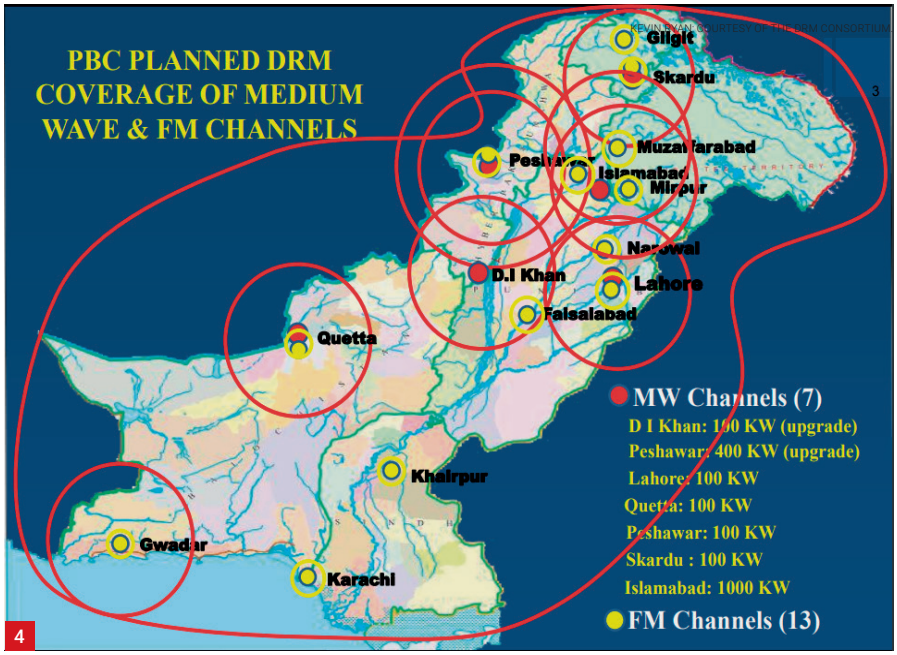

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DAB+ only) and online (Wi-Fi, not wired Ethernet) content.

The radio must support all three modes to be given the tick mark. The initiative comes from Frontier Silicon whose receiver modules are designed with this concept in mind. In a way, this is a move to bring domestic digital radio more in line with developments in car radios mainly in the USA and Europe.

Hybrid radio combines one-way terrestrial or satellite radio reception with two-way online connectivity and streaming content; it primarily allows drivers to listen to continue listening to their favourite radio station, even when they move out of transmitter range.

The scheme is supported by several leading consumer electronic brands, representing brands in the UK, such as JVC Kenwood, Majority, Pure, Roberts Radio, Ruark Audio, and John Lewis & Partners.

You can keep up with this development by visiting the *SmartRadio* website. https://www.smartradio.info

DAB radios can be split into three types called *Basic, Advanced* and *Smart* (Fig. 2). It is a good 'rule of thumb' type of guide, but I do not expect many digital radios to neatly fit into one of the categories. For example, my John Lewis *Octave* has all the features of a Smart Radio, except for the CD Player. Will it be designated as Advanced+? We will have to wait and see what happens.

Updated Tick Mark

On a related topic, Frontier Smart Technologies, a subsidiary of Science Group plc, has become the first company to receive an upgraded tick mark. The company has passed Digital Radio UK's recently upgraded technology provider testing programme overseen by DTG Testing (part of the Digital TV Group).

The *Digital Radio Tick Mark* (Fig. 3) indicates to consumers that devices are tested and approved to meet the UK Government agreed on specifications for digital radios and that they can receive FM, DAB and DAB+ stations. The idea is supported by the majority of digital radio manufacturers and retailers as well as leading technology providers.

The scheme was first introduced in 2014 when manufacturers self-certified that their digital radios met the *Digital Radio Tick Mark* standards. Now the rules require that DAB+ receiver core technology be certified by an independent third-party tester, using a single set of independently-created test files called ETI-files that meet the ITU specifications as well.

The new testing programme was launched in July 2020 with third-party testing lab DTG Testing appointed to carry out the tests and issue a licence and artwork if the radio module passes their tests. Frontier Smart Technologies is the first company to pass the updated tests with its Siena DAB+ module, which powers over 3.5 million radios in the market. Brands which use Siena to build their digital radios remain assured that their products will be ready to pass the end product *Digital Tick Mark* certification.

DRM at the IBC

The DRM Consortium appeared virtually at the 2020 IBC Conference in September. The usual receiver developers attended with their now large range of prototypes. The return of Korea in the form of RF2Digital with their prototype DRM receiver drew a lot of attention.

The second presentation concerned the Pakistan Broadcasting Corporation's (PBC) *Digital Migration Plan* to cover the whole country (Fig. 4) with DRM transmissions on the medium wave band, and most major towns and cities with DRM+ in Band II (FM). The project has three phases lasting seven years. The first two AM transmitters at D.I Khan and Peshawar will be completed in 2023.

PBC's transition plan is similar to All India Radio's strategy of broadcasting in both analogue and digital formats (simulcasting) for a period until gradually introducing periods when only the DRM format is broadcast. The PBC knows that the success of the project depends on the availability of cheap receivers and they want it made obligatory for car and

smartphone manufacturers to equip them with DRM receivers. For DRM reception I suspect that smartphones will only cover DRM+ and many car manufacturers already supply DRM capable receivers in India.

India

In general, India seems to be moving forward slowly with its transition to fully digital. All India Radio (AIR) slowly restarted its DRM transmissions in pure digital mode. According to a recent decision of AIR, stations with single DRM MW transmitters are to carry two digital audio channels in *simulcast* mode, and three audio channels in *pure* digital mode, including *Journaline*. Whether in simulcast or pure DRM, the first channel will be News 24×7 and the second one the local AIR channel. In pure DRM, the third channel will be the popular *Vividh Bharati* music programme. A significant change is that five major stations with two DRM transmitters each (Delhi, Mumbai, Chennai, Kolkata and Rajkot) will operate one of these transmitters in pure digital mode throughout the day. Six more stations (Hyderabad, Vishakhapatnam, Jagdalpur, Bhawanipatna, Sambalpur and Jeypore), which have digital-ready MW transmitters and will start DRM test transmissions.

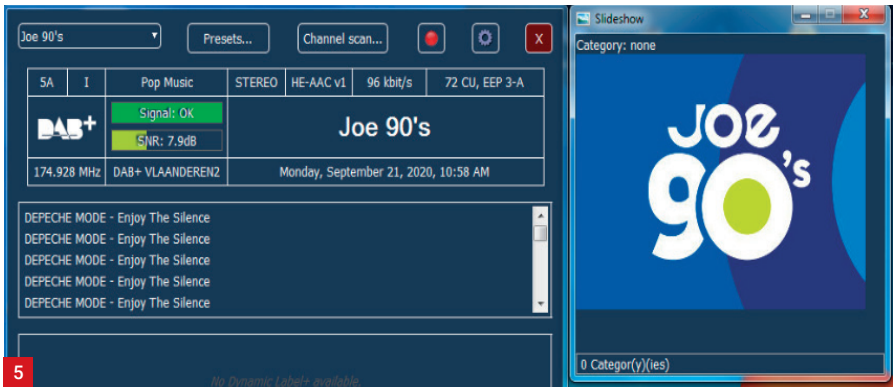
Brazil

The installation of a locally-made short wave digital radio DRM transmitter is currently lauded as a new era for Brazilian radio. The transmitter, one of a series made by BT Transmitters, will be sited at EBC's Rodeador Park and use one of the curtain arrays. This site is used to broadcast the Radio Nacional Amazonia broadcasts from Brasilia, aimed at the Amazonian region of Brazil. It seems strange to start broadcasting in DRM to the roughly 7 million riverside and indigenous people who live in this region. These are the most unlikely group of people to have any use for DRM let alone have a receiver!

The US NAB Radio Show

This show had many sessions including *RadioDNS* and an update on using the all-digital mode on AM, which is supposed to help 'revitalize' the AM band. Bryan Broadcasting petitioned the Federal Communications Commission (FCC, The US equivalent of Ofcom) in 2019 to allow stations to use the all-digital mode if they choose to do so. The FCC expects to issue a ruling about this by the end of the year. Interestingly, the FCC thinks that the relaxation of technical constraints on using FM translators has helped AM stations to remain viable. According to a recent report, the FCC is still considering allowing DRM trials, and that decision will also be part of the ruling.

The HDRadio modes (including all-digital, for AM stations only) allow one audio service to be broadcast because multicast technology is not available. This is in contrast to FM, where up to three other programme slots are available, albeit at a reduced audio quality. So far, only WWFD (AM) in Frederick, Maryland is using all-digital temporarily. Owned by Hubbard Radio, WWFD on 820kHz uses 4.3 kW on a non-directional beam during the day; it switches to a 430W two-tower array at night. WWFD listeners mostly tune into FM translators, so the station can experiment on AM. WIOE in Fort Wayne (Indiana) tried all-digital for a few days until listener complaints made them change their mind.



5

DAB vs DRM

So, who is winning the race to get countries to adopt their technology? DAB is the first choice for most countries in Europe, probably North Africa and the Middle East, as well as Australia, although DRM can be used for short wave broadcasts and also on Band I/II. DRM will be used in India, Pakistan and China, and very possibly also in Brazil and Russia. Other countries, such as South Africa and likely Indonesia, will use DAB in Band III and DRM+ to squeeze extra services into a crowded FM band. Unless DRM gets some receivers into production, they will ultimately lose out in many of their target markets. A DAB presenter highlighted that there are 500+ DAB receivers available and sales of about 95 million receivers worldwide. The DRM Consortium makes much of the eight or so prototypes shown at IBC 2020, and it thinks that about a million cars have DRM receivers in India.

DAB Hungary

Not all countries take to DAB. In September 2020, Hungary's National Media and Communications Authority (NMHH) announced that DAB+ broadcasts in Hungary would stop. The DAB+ service started in 2009 and only covered the capital Budapest. Hungary seems content with its AM/FM services.

DAB DX

On the 20th and 21st of September, I enjoyed a major lift in conditions, which brought in DAB multiplexes from Belgium, Holland and France. I saw a report of a Danish multiplex on 13D making it to the Reading area, but I did not think to tune that end of Band III. After an afternoon of listening, I do not think I am too far wrong in saying that these nations have gone for quality in their DAB transmissions, rather than quantity.

My digital television alerted me to a change, and a new scan soon revealed that two local TV stations had gone, and BBC 1 Kent was booming in. Using the manual scan feature on my DAB radio to let me check for a signal, I worked my way from channel 5A up to 9D and found that 11 channels had a new signal.

Over the next two days, I received stations from DAB2 VLAANDEREN 2, Hainaut 1, NAM-LUX2, and BX-BW2 from Belgium. Some of the stations were so strong I decoded them on the back lobe of my aerial, which points north. All the stations on the DAB2 VLAANDEREN 2 multiplex such as RTBF-MIX and Joe 90's (Fig. 5) had slideshows which *DABPlayer* decoded.

The *John Lewis Octave* Radio displayed them but only as thumbnails and did not transfer them to the *UNDOK* app on my mobile phone, as I had hoped would happen.

I wish you all a very Happy and Safe Christmas.

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Chris Rolinson
g7ddn@g7ddn.com

In his valedictory regular column on Network Radio, Chris Rolinson reviews an exciting new radio and charts the progress the Network Radio hobby has made in the last 3 years

SHENZHEN INRICO ELECTRONICS CO. LTD.

1

The Inrico TM-9 and a Stock-Take

Just in time for Christmas, well-known Network Radio manufacturer Inrico has announced their latest take on the Network Mobile radio concept.

The TM-9 (Fig. 1) is the latest successor to the very popular TM-7, TM-7+, and the (arguably slightly less popular) TM-8. It looks like quite the upgrade! The most striking change is to the screen - it is a bang-up-to-date 4" OLED unit with a 360 x 640-pixel density. This should be much improved from the original tiny & pixellated TM-7.

Another great addition is the dual-SIM capability – extra networks are always welcome

Like its predecessors, it runs from a typical mobile DC power supply. The chipset is supplied by MediaTek with an MT6739 system inside - it runs Android 7.0 Nougat. The 4G LTE bands are included – another big upgrade on the original TM-7. As you would expect with a mobile form-factor, GPS is built in, as are Bluetooth and Wi-Fi. Memory looks much improved at 8GB, but it will support up to 128GB, presumably via the external memory card.

A standard earphone jack is provided, which will be particularly useful for those wanting an external device, though the built-in speaker should be more than adequate, as it is rated at 5W – that's pretty hefty! I was always impressed with my TM-7's audio output so this should be quite something to hear!

Unsurprisingly, there is no camera but there will apparently be an option for one to be added on, if required. A DB25 connector is a more professional-looking option for the microphone input.

All in all, this looks like it will be a great device. Take a look at this video: https://tinyurl.com/y49k2q74

Inrico has built a solid reputation among the NR manufacturers – their TM-7 has been a go-to mobile radio for many enthusiasts, while the T-320 is probably the best-known (possibly best-selling) of all the handheld devices to date.

As often happens, Duarte CT1EIZ has some early samples for sale: https://tinyurl.com/y3lejy86

However, they are not inexpensive at around £400 plus. I suspect that other retailers may have them in stock by the time you read this; try some of the usual suspects to get a better idea of the current price.

Good-Bye

It is with a little sadness that I would like to inform regular readers of this column that, for the time being at least, this will be my last time authoring this section of *Radio User*.

I have been privileged to report to you the latest news and developments in the networked world for 2½ years now, but with the strange times we currently live in, I need to spend a little more of my time on my day job.

So with that in mind, I thought it might be productive to take a retrospective of Network Radio, looking at how far the mode has come since it became more popular. I will do this by referencing my previous columns so if any of these anecdotes pique your interest, you can always get hold of a back issue of the magazine, from the publisher or online.

Early Days

For me, Network Radio was somewhat puzzling, to begin with. In my first printed article on the subject, for *Radio User's* sister magazine, *Practical Wireless* (July 2018), I noted that, *"What? They are just adapted Android smartphones with a PTT button on them - what is the point of that?" I was nonetheless intrigued as I have always had a suspicion that Amateur Radio and Mobile Technology could have a mutually beneficial relationship, if only… After all, just about every person on the planet carries an RF transceiver with them these days!*

"However, to date, Amateur Radio has had a difficult relationship with smartphones. Whenever we try to explain our hobby to anyone remotely showing interest, they tend to smile at us (or worse still laugh!) and say, 'I can do all you describe with this electronic slab in my pocket - what do I need Amateur Radio for?' *And let's be honest, we haven't been very effective at answering what is a fair question."*

Now I totally get, as I always have, that radio has its own magic, but I could never quite understand those who were trying to say that this was not radio at all; clearly, Network Radio IS a form of Radio – just different from and complementary to – what we *traditionally* understand as 'radio'.

Once we accept that it is different, we can allow ourselves the possibility of

RSGB

2

STEPHEN LEGG

3

MIKE G6WTM

4

NR001

5

Fig.1: The all-new Inrico TM-9. Fig. 2: Eliot Mansfield 2E0EYW after passing his Amateur exams. Fig. 3: M6WVV and the (in)famous *Bluetooth Beanie Beatz Hat*. Fig. 4: Young Scouts operate GB4HDS using Network Radio. Fig. 5: Network Radio Belgian Style (with some appropriate beverages, of course!) Fig. 6: It's just a phone, isn't it?

exploring what Network Radio means for us. Personally, I immediately saw a training aspect as being one positive angle. What better way to interest newcomers to the hobby by allowing them to access what radio is like, on a device they already own and use – and, of course, without the need for taking an exam?

It's great to be able to say to newcomers, *"Now imagine what it would be like to experience communication like this but without the need for a cellular device at all and no subscriptions to pay"*. I even wrote about this online in my second- ever NR article in February 2018:

https://tinyurl.com/y69myj4b

The fact is that most people in the world these days already have a mobile device & SIM card - so using an existing cellular unit to 'play radio' still seems like a no-brainer to me.

Print Articles

There followed another article in the RSGB's Magazine *RadCom*.

https://tinyurl.com/yx9mqywe

Following that, I received quite a lot of mail, very much split of course, on the subject. However, I was struck by the number of people I spoke with on-air, who, without knowing who I was, told me they were coming back into the radio hobby largely because of that very article.

I felt, partially at least, vindicated. If nothing else, people were talking again about the very nature of radio, and it was getting people interested once more.

Add to that people like Eliot Mansfield 2E0EYW (Fig. 2) (*RadioUser*, January 2019), for whom Network Radio was the catalyst to help them gain their Ham licence. Clearly, the NR phenomenon was affecting the amateur radio hobby, just as CB had done in the 1980s. I seem to recall that many 'hams' were not happy about that at the time either!

Regular Columns

And so editor Georg invited me to write regularly for *Radio User* on the subject. And what a fantastic journey it has been! I started this column series in September 2018 with a primer on how to get into the networked side of the hobby.

The following month saw an extended interview with one of the movers and shakers of Network Radio, Karl Hobson G1YPQ – something I still think reads well over 2 years on.

Also that month, there was news on HAPs or High-Altitude Platforms – another term for solar-powered drones operating at around 65,000 feet to deliver broadband to remote areas. Network Radios certainly seems to be pushing the envelope in terms of technology!

The issue of November 2018 featured friend and fellow columnist Tim Kirby GW4VXE, with a review of the Moonraker 7S+ handheld, while my contribution was about the Southern Ireland Repeater Network.

https://tinyurl.com/y6lqu7nn

This is a group of interconnected repeaters covering the whole of Éire but also connected via Zello to users outside of the Republic. Also that month, Ian Bassett M5AXA got us up to speed with installing Network Radio in a car while Mick Knaggs M6ODZ showed off Zello working on an Android watch!

The final 2018 issue saw the '12 days of Network Radio Christmas' – 12 reasons why you might want a Networked Radio instead of (or maybe as well as?) a phone.

Network Radio Coverage in 2019

Stephen Legg M6WVV kicked off the New Year with a great review of an inexpensive Bluetooth beanie hat as an accessory for outdoor NR use (Fig. 3). I never cease to be amazed at the ingenuity of NR users for the unusual.

February hailed a new (false?) dawn as it appeared that Kenwood was getting into the NR market – well they have, but the radios we featured in that issue have not really surfaced in the UK and none of the usual retailers could seemingly get hold of them. Despite my best efforts with Kenwood's Press Office, they seemed reluctant to say why they were not available in the UK.

https://tinyurl.com/y5xhz8ea

The Telo TE590 handheld was the main feature of the March 2019 column, with an in-depth review contributed by Filip Everaert NR001 – many will know Fil, who though not a traditional radio hobbyist or indeed a licensed Ham, is a leading light in the NR world.

VARIOUS COMPILED BY G7DDN

6

By May I had managed to get my mitts on a Telo to review myself. That was the M5 Mobile (thanks to a friend of the column, Andrew at *G6 Global*.

www.g6-global.com

Karl G1YPQ and Filip NR001 happened to have purchased one at the same time, so a three-way review was published. One lucky reader won the review radio as a prize too!

'Hairy Paul' MM7WAB had contributed 10 very useful operating tips for Zello in the March 2019 issue, and by June Roy Blakemore G1IKF, another trailblazer in the NR world was adding his '12 tips for the Inrico T-320' – still very relevant today.

In July, I took a look at why people seemed to have closed minds about NR and address more fully why people felt that a Network Radio was a phone. I argued (and still would) that just because something runs Android, that it is inevitably a 'phone'; I used examples like a Watch, a Chromebook and an Amazon Firestick as examples of Android devices that were in a different form-factor and would never be called 'mobiles' by anyone (Fig. 6).

Going outdoors with NR is always a good idea – it's lightweight and portable – and thanks to enthusiasts like Rick Haughton M7FRD, I was able in the August issue to report on various fascinating outdoor experiments he had been trying out with external Yagi antennas in low-signal areas.

September 2019 was devoted mostly to a look at Network Radio in the USA via Denny Johnson's *DigiCommCafé*.

https://members.digicommcafe.com

However, the column also introduced us to Marc Huyghebaert ON3PHP and his fantastic innovation known as NRAPRS.

http://www.nraprs.be

Things have moved on a lot since that article, but suffice it to say that many users have loved playing with the positioning system set up by Marc and our Belgian/Dutch colleagues. By November, I was revisiting the outdoor life, this time with Mike Higlett G6WTM in the wilds of Scotland and it caused me to muse on whether Network Radio was beneficial to your health.

In December 2019 I looked into the life of a real-life 'private-eye' Melvin Rattenbury, who described the benefits that Network Radio were bringing to his working life.

https://www.investigateit.co.uk

Network Radio Issues in 2020

Despite the challenges of this year, the column saw three major reviews– the new Talkpod N59 had the treatment in the January issue, while the Boxchip S900A Plus was delved into by a 3-way committee of myself, Karl G1YPQ and Carrie MM0RKN in July.

In the following month, the Hytera PNC380 was duly dissected with contributions from Filip NR001 and Gareth Batchelor, a 4x4 responder from Leicestershire.

I took an in-depth look at Scoutsnet and its role in JOTA/JOTI events in February (Fig. 4). G1YPQ tried to walk up Helvellyn mountain on New Year's Eve with a Network Radio in hand (March); an interview with Sarah Hynes of the Radio Network channel suite appeared in April, and a look at using Network Radio off-grid in May – Hairy Paul was playing with setting up mesh Networks in remote parts of Scotland.

Furthermore, June saw a long look at the ZRB Channels over the water in Belgium, where I uncovered a large group of active enthusiasts (Fig. 5).

https://zelloradiobenelux.be

Then, to bring things up-to-date, September's column contained a look at the dangers, or otherwise, of the 5G rollout. Finally, last month's issue related to the intriguing story of Gareth Batchelor and his work using Network Radios in the context of voluntary work and the 4x4 Rescue scene.

Where Next for Network Radio?

I hope that brief retrospective has perhaps encouraged you to dig out some of those old columns and re-visit them. Looking back to the past is important as it informs our collective future.

As for the future of this column, that is for the editor to decide, but at the moment, Network Radio remains on the cutting edge of communications across the world and it will always be of great interest to many of us.

- IRN **https://tinyurl.com/y5cp7u6j**
- NRAPRS **http://www.nraprs.be**
- Duarte CT1EIZ's shop **https://network-radios.com**
- One of the best places to start **https://networkradios.weebly.com**
- Network Radios FB Group **https://tinyurl.com/y2682w6g**
- Andrew Clark - highly recommended supplier **https://www.g6-global.co.uk**
- Lamco **https://www.hamradio-shop.co.uk**
- Moonraker is a big seller in the UK **https://www.moonraker.eu/inrico**
- A great resource from Niko Caignie **https://www.nr515.be**
- For Zello software **https://zello.com**

Chris's Definitive Top-10 Network Radio Links.

I would like to thank all those many folks who have contributed to my column over the years and those who have taken the time to keep in touch with me on matters of interest. It has been great getting to know you.

Finally, may I wish readers young and old the very best for both a peaceful Christmas and a much more prosperous New Year.

73 and catch you on the Network!

[My warm thanks to Chris, for contributing the RadioUser Network Radio *column in such an open-minded, expertly-researched and entertaining manner. You have done wonders for this part of the hobby. We will continue to report on all matters NR in our new* Two-Way Radio Comms *column soon – Ed.].*

Radio News

SAQ GRIMETON: *"24th October 2020: I received SAQ for exceptionally long, about seven, minutes from Grimeton, Sweden. Using their 'old lady' 200kW alternator transmitter on 17.2 kHz with a message of health and wellbeing during the pandemic. I used a redundant laptop PC. It's relatively easy using 20 metres LW aerial 5 metres high and my web page tutorial below. Quite exciting using the PC sound card to detect Morse code."*
(SOURCE: Bob Houlston G4PVB)
https://tinyurl.com/y5j9ulpb
http://g4pvb.eu5.net/saq.htm

RADIO ACADEMY: Head of BBC Radio 2, Helen Thomas, has been voted as the new Chair of the Radio Academy, with Nick Pitts from Jazz FM taking over as Deputy Chair. Helen will replace Yvonne Thompson CBE in December, whilst Nick will take over from John Dash. Accepting the role of Chair of The Radio Academy, Helen Thomas said: *"It's an absolute honour to take up the position as Chair of the Radio Academy. Radio and audio have never felt more vital, providing a lifeline for millions of people across the country during the lockdown and throughout the tumultuous events of 2020, whether they were turning to it for information they could trust or sheer escape from the situation. The people who work in this industry are dedicated and passionate and it will be a privilege to represent them and their interests throughout my term. I'd like to thank Yvonne and John for steering the Academy so brilliantly over the last couple of years – they leave big shoes to fill."* Nick Pitts, who takes over as Deputy Chair having served as Chair of The Radio Festival and Creative Director of The ARIAS, said: *"I am thrilled to have been trusted with this role. I am looking forward to the exciting new things we will achieve with Helen at the helm to continue to evolve our Radio Academy as a relevant organisation to celebrate and support radio and audio people, who like me are so passionate about our sector."* The Radio Academy Trustees paid tribute to Yvonne Thompson and John Dash: *"Their contributions will be long-lasting, and they leave the Radio Academy in a significantly stronger position after three years at the helm."* John Dash is also standing down as Acting CEO, a role he has handled voluntarily for 16 months. The paid role of Radio Academy CEO will be advertised shortly. The new Chair and Deputy Chair will take up their roles at the Academy's Annual General Meeting, at a date to be announced this December.

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Entry is only via our website. Entries close at midnight on 7 January 2021. To enter you must answer the question correctly and answers received after the end date will not be accepted. The winner will be notified by email by 20 January 2021. Warners Group Publications Plc standard competition terms apply, to view visit warners.gr/compterms. For information on how your personal data is processed, secured and your rights, our Privacy Policy can be viewed here – warners.gr/privacy or available in hard copy upon request. The winner will also be announced in the February 2021 issue of RadioUser.

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SDR RADIO

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New Mid-range SDRplay Radio.

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Simultaneously monitor 2 separate 2MHz bands of spectrum between 1kHz and 2GHz. 3 software selectable antenna inputs, & clocking features ideally suited to industrial, scientific, Ham & educational applications. Windows 10.

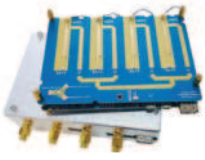
FUNcube Dongle Pro+

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

ML&S: £149.95

KerberosSDR

A Coherent RTL-SDR with 4x Channels.



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

ML&S: £179.95

HackRF One

HackRF One from Great Scott Gadgets is a Software Defined Radio peripheral capable of transmission or reception of radio signals from 1MHz to 6GHz.

ML&S: £219.95

DIGITAL & ANALOGUE

UNIDEN UBCD3600XLT

New digital TruckTracker V Professional Scanner Receiver, covers 25-1300MHz wideband frequencies.

The TruckTracker V operation allows this scanner to scan APCO 25 Phase 1 and Phase 2, DMR, Motorola, EDACS, LTR Trucked Systems as well as conventional analog and P25 digital channels.

ML&S: £449.95

ICOM IC-R6E

The 100 Ch/Sec Wideband Signal "Search Machine"

Communications handheld receiver. While retaining basic features of its popular predecessor the IC-R5, the IC-R6 contains many improvements including 100 channel per second scanning speed, 1,300 memory channels, 15 hours of continuous receive capability, optional drop-in charger stand and voice control squelch.

ML&S: £199.95

WHISTLER TRX-1 DIGITAL SCANNER

The Whistler TRX-1 Handheld Scanner is a multi-system adaptive digital trunking scanner with Motorola P25 Phase I, X2-TDMA, Phase II and DMR making it capable of monitoring unencrypted channels/systems.

ML&S: £419.95

AR-DV10

The ULTIMATE all mode digital handheld scanning receiver.

Latest firmware! 100kHz-1300MHz Analogue & Digital Modes.

ML&S: £969.95

ICOM IC-R30 SCANNER

The Icom IC-R30 has extremely wide coverage and supports all of the usual analogue modes (FM, AM, SSB, CW) as well a a few digital modes including NXDN, P25, DPMR and DSTAR. A worthy upgrade over the older IC-R20.

ML&S: £569.95

SF Screen Protectors

For Yaesu FT-1, FT-2 & FT-60. *Maintain the value of your radios with professional screen protectors. No more scratched displays, the screen protectors last for years and protect reliably even at daily use.* ***ONLY £7.95***

ANTENNAS

BONITO RANGE AT ML&S

ANTENNA JET AAS300

ML&S ONLY: £234.95

A USB powered antenna splitter designed to work between 9kHz and 300MHz. Now you can use your one antenna with up to 3 receivers simultaneously. Finally, you can listen to marine band traffic, The Archers on Radio 4 and the air band at the same time (provided your antenna will cover it all!)

ANTENNA JET ASM300

ML&S ONLY: £189.95

A USB controlled antenna switch and mixer. It can be used as a simple switch, or can be used to switch in more than one antenna, to aid receiving to an optimum performance.

BONI-WHIP (PSU needed)

The active antenna that is raved about. Covering 20kHz to 300MHz and ideal for times when you can't erect a wire antenna. For home, for travelling and for DX camps. And despite the whip being only 4 inches long, it actually works!

ML&S ONLY: £109.95

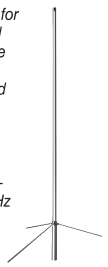
GigActiv GA3005

ML&S ONLY: £386.95

A portable active antenna capable of covering 9kHz to 3GHz. Perfect if you are say on holiday and want to have a listen to the bands. You'll need to provide it with 5V via a USB cable (included) and some coax but it is just ready to go.

Diamond D777

VHF/UHF air band receiving antenna, not for transmitting. 3.4dB on VHF (120MHz) and 5.5dB UHF (300MHz) with an approximate length of 1.7 metres. The antenna is constructed from fibre glass materials and it is pre-tuned and fully weatherproofed. Mounting components are included. It's fitted with an SO239 connector, so can be connected to a PL-259 without the need of an adaptor. Tuned to receive 108-137.975MHz civilian air band, 225-400MHz military air band.



RRP: £83.94 ML&S ONLY: £62.95

MyDEL Smart Wire Kit

The MyDEL Smart Wire Kit antenna pack includes; 132ft of high quality flex-weave wire, 2x 3 metres of nylon guy rope and 2x heavy duty dog bone insulators.

ML&S ONLY: £44.95

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