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AUGUST 2023

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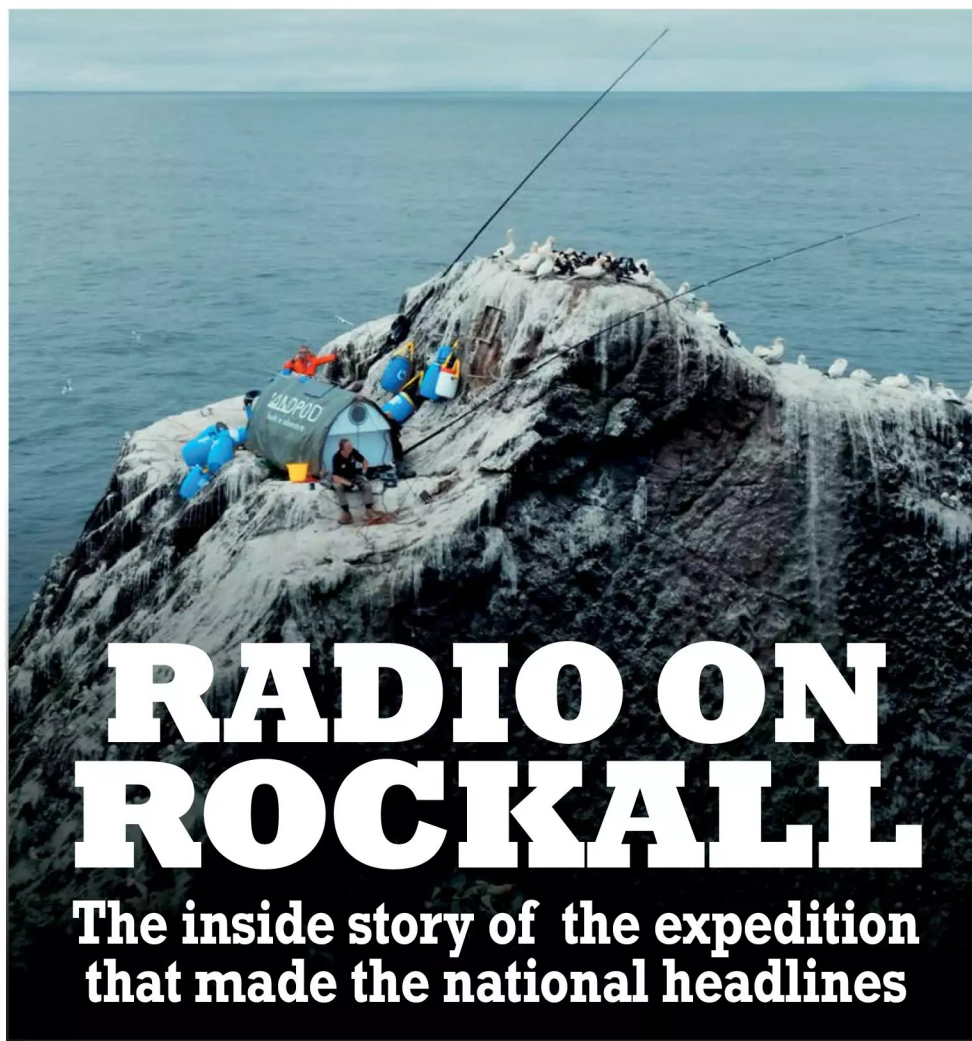
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Warners Group Publications plc

The Maltings, West Street

Bourne, Lincs PE10 9PH

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

Tel 01778 391000

## Editor

Don Field G3XTT

[practicalwireless@warnersgroup.co.uk](mailto:practicalwireless@warnersgroup.co.uk)

## Designer

Mike Edwards

[mike.edwards@warnersgroup.co.uk](mailto:mike.edwards@warnersgroup.co.uk)

## Advertisement Manager

Kristina Green

01778 392096

[kristina.green@warnersgroup.co.uk](mailto:kristina.green@warnersgroup.co.uk)

## Production Manager

Nicola Glossop

[nicola.glossop@warnersgroup.co.uk](mailto:nicola.glossop@warnersgroup.co.uk)

## Marketing Manager

Katherine Brown

[katherine.brown@warnersgroup.co.uk](mailto:katherine.brown@warnersgroup.co.uk)

## Marketing Executive

Charlotte Bamford

[Charlotte.bamford@warnersgroup.co.uk](mailto:Charlotte.bamford@warnersgroup.co.uk)

## Publisher

Rob McDonnell

[robm@warnersgroup.co.uk](mailto:robm@warnersgroup.co.uk)

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# Keylines

**I**'m writing this a day after my return from the Friedrichshafen Ham Radio event (see my report in this issue). It was great fun although yet again I suffered at the hands of an airline, this time Lufthansa! Thanks to delays I missed my onward connections in both directions, including, on the return leg, having to stay the night in an airport hotel at Frankfurt. The things I do for amateur radio!

But, as I say, it was an enjoyable event and great to catch up with lots of old friends as well as some of the latest products and ideas.

At home I've been continuing to operate on the 6m band and have also been active again on 4m, as you'll see from my brief report in **Tim GW4VXE's** VHF column. I get the impression, though, that the Sporadic E season hasn't been as good as the last two years, something which has been commented on before insofar as it seems the more sunspots we have, the less Sporadic E we enjoy. Can anyone explain why?

## Rockall

Most of you will be aware that **Nobby Styles**

**GOVJG** (see *The Face Behind the Call*, June) and others were active from Rockall, managing to pull off this extremely hazardous challenge. We are able this month to bring you the first account of Nobby's stay on the rock and the amateur radio operation conducted by him and **Emil DL8JJ**. I managed an easy contact on 40m SSB – it was quite remarkable how good their signals were considering the limited resources at their disposal but I guess being surrounded by nothing but sea does tend to help!

Nobby had been planning to return when 'Cam' **Cameron** was due to leave to rock, but just before going to press we learned that Cam had been airlifted from Rockall due to bad weather and without setting the new record. However, he has certainly raised plenty of money for the nominated charities.

## Ofcom Consultation

The big news for amateur radio in the UK is the release of the Ofcom consultation document *Updating the amateur radio licensing framework*. The introduction to the document on the Ofcom website says "Ofcom's changes are designed to provide radio amateurs with greater operating freedoms to reflect how the hobby has evolved. At the same time, we are seeking to make getting and using a licence simpler, as part of a broader effort by Ofcom to streamline, standardise and where possible further automate elements of our licensing work". The consultation is open until 4 September, after which Ofcom will review the responses and, hopefully, implementation will be in the early part of 2024.



Unfortunately but perhaps inevitably given that the document runs to 101 pages, a lot of hot air has already been seen on various internet forums and the like, from folk who have heard the headlines but have failed to read the detail. I have tried to summarise the main points in our *News* pages but I do recommend downloading and reading the whole document, especially if you are minded to make a formal response.

Incidentally, and much to my surprise, the headline figure for UK amateur radio licences in force at this time, according to Ofcom, is 101,000. I hadn't realised the numbers were now above 100,000 but, again, this also reflects the fact that many operators have ended up with multiple callsigns (for example, by retaining their Foundation callsign having upgraded to Intermediate or Full), something which Ofcom are wanting to put an end to.

My other surprise, it has to be said, is that Ofcom have actually issued such a document, given that I have commented with regard to one of this month's *Letters* that I consider Ofcom have much more important issues to deal with these days. So, actually, the arrival of this consultation document, shortly before we go to press, is a welcome reminder that Ofcom do still consider our hobby worthy of attention.

My personal view, while still not having read every page of the document, is that the changes suggested are broadly to be welcomed. But I realise that some of them will be divisive.

## This Month

Due to the welcome arrival of our report on the Rockall operation and my being able to put together a quick report on the Friedrichshafen event, I have unfortunately had to hold over a couple of items that were advertised for this month. Please be patient – they will certainly appear in next month's issue.

## Don Field G3XTT

Editor, *Practical Wireless Magazine*

Read more radio news and reviews at [www.radioenthusiast.co.uk/news](http://www.radioenthusiast.co.uk/news)



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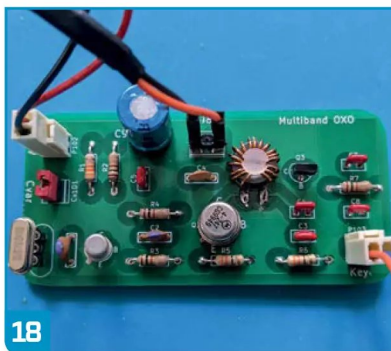
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Trying to key an older valve amplifier from a modern rig? **Billy McFarland GM6DX** offers a solution.

## 18 Amateur Radio on a Budget

**Daimon Tilley G4USI** offers two solutions for a cheap but useful transmitter.



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With the Sporadic E season in full swing and other news to report, **Tim Kirby GW4VXE** starts with a look at FT8CN, an FT8 program for Android.

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## 38 An Historic Slice of Pye

*PW* Designer **Mike Edwards** recently visited the exhibition at Cambridge Museum of Technology, celebrating the centenary of the BBC and the first radios made by Cambridge Company Pye. Some 25 of the earliest Pye radios are included in the display. We feature here some of the photos that Mike took on his visit.



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## 54 DataModes

This month sees another update to VarAC, plus **Mike's** continuing delve into SDR technology. This time he is tackling IQ signals and digital down conversion – all with no maths!

## 58 Airband News

**David Smith** brings news of recent developments in the world of air traffic management.

## 60 The Morse Mode

**Roger Cooke G3LDI** has the latest from the world of Morse Code.

## 62 Vintage Television & Radio

**Keith Hamer** and **Garry Smith** continue the special series looking back at the BBC's coverage of Coronations since 1937. There is also a Coronation vintage radio advertisement from the archives. The continuing sagas of the BBC Cymru-Wales Centenary and 100 years of BBC Scotland-Alba are also featured. The series about the development of Swiss Radio and Television since 1933 also continues.

## 67 Readers' Letters

This month's *Letters* cover near field measurements, licensing, the decline of amateur radio, using old HiFi speakers and more.

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**ROYAL RADIO** Charles coronation callsign plus radio's role in the past

**ARRIVING IN THE UK SOON**  
On sale date and price of the keenly-awaited Icom IC-905 all mode transceiver announced

**Loop Antenna Tests**  
HF & LF types are reviewed by our team of experts

**Find an ebay bargain**  
How to secure the best used kit online, and what to avoid

**HISTORY** Inside the Bijou Three receiver  
Archive pictures of this 'cheap and efficient' model from the PW vaults!

**GOING DIES**  
An alternative way to heat up y

**PEOPLE** The face behind the callsign  
Nobby Styles G0VJG and his ambitious Rockall expedition

**HISTORY** The General Coverage Receiver  
1970s multimode receiver for the 550kHz to 30MHz range remembered

**RALLIES & EVENTS**  
Hamfest is OFF, but there's still plenty more to do!

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Letters from fellow readers

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# Newsdesk

Have you got something to tell our readers about? If so, then email [practicalwireless@warnersgroup.co.uk](mailto:practicalwireless@warnersgroup.co.uk)



## Reviewing the Icom IC-905 SHF/VHF/UHF All Mode Transceiver

With the much-anticipated UK release of Icom's all-new IC-905 SHF/VHF/UHF All Mode Transceiver around the corner, Icom UK got hold of two of them and asked TX Films whether they would like to be the first to do a review.

In the resulting YouTube video **Bob McCreadie G0FGX** of TX Films, along with **Dave Crump G8GKQ** and **Noel Matthews G8GTZ** from the British Amateur Television Club, put the IC-905 through its paces, producing a video that demonstrates the IC-905's impressive features and capabilities.

In the video, Bob McCreadie takes us through various aspects of the IC-905 including:

- Introduction to the IC-905 SHF/VHF/UHF All-Mode Transceiver.
- Connectivity...an overview of the sockets and connections on this radio.
- Menu navigation on the IC-905.
- Overview of the RF Unit and Transverter.
- Field Test on Dorset's Bulbarrow Hill, with ATV and 10Ghz SSB Tests.

To view this film, follow this link:

[www.youtube.com/watch?v=0yLnjeEGx2s](http://www.youtube.com/watch?v=0yLnjeEGx2s)

## Pirate Radio legend Caroline goes Green

Veteran pirate station Radio Caroline has made history again by becoming the first British radio station to operate on direct solar power.

Caroline now broadcasts across England, The Netherlands, Belgium and beyond from the Orfordness Transmitting Station on the Suffolk coast. The frequency and site were previously used by the BBC World Service but were mothballed until revived by the ex-pirate station in 2017.

Solar panels now fully power Caroline's

transmitter with green energy and since the installation can create double the power needed surplus electricity is back fed in to the grid, making a small contribution to carbon reduction.

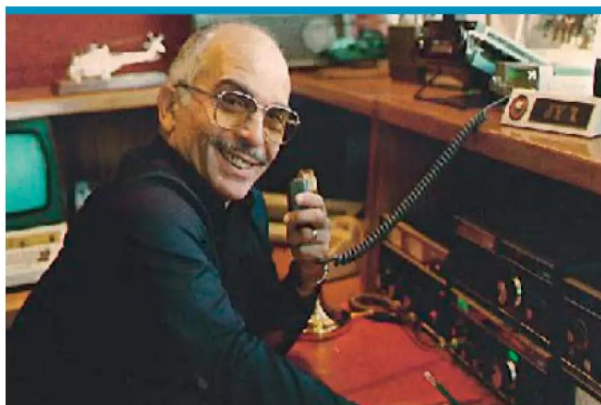
Radio Caroline spokesman **Peter Moore** said: "Other major radio stations, including the BBC, have been ceasing or cutting back their AM radio services due to high energy costs. We have taken the opposite tack by making our own electricity. Indeed, we wish to increase our AM

power, installing extra panels if and when a power increase is granted in the future, while helping the planet just a little. Maybe others will follow our example.'

In its 59th year, Radio Caroline broadcasts 24/7 from land-based studios on 648 AM, and also on DAB and multiple online streams. The station retains its former 'pirate radio ship' *Ross Revenge*, moored in the Blackwater Estuary, which is used for regular monthly offshore broadcasts and organised public visits.

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## Donation to the RSGB

The Radio Society of Great Britain is delighted to announce that **Her Majesty Queen Noor of Jordan** has chosen to donate the UK amateur radio equipment of **His late Majesty, King Hussein of Jordan** to the Society. His Majesty was a great ambassador for amateur radio and, whenever his official duties allowed him, his radio callsign JY1 could be heard on the amateur bands. In the UK he operated with a G5 callsign. His Majesty always operated modestly, never announcing himself as King Hussein, always just 'Hussein from Jordan'.

## Moonraker News



Moonraker have announced two new triband handheld radios for Wouxun. The announcement says they are packed with features, including crossband repeat, Vox, scrambler, priority channel, compander and more. Both have dual reception and come with high contrast backlit screen. The menu boasts all the useful features of battery saving mode, voice guide, GPS(GPS-SW), priority channel, scanning modes, CTCSS/DCS and an FM broadcast receive.

- **KG-Q332 Tri Band**  
6/2/70 £149.95
- **KG-Q336 Tri Band**  
4/2/70 £159.95

## Ofcom Proposes Multitude of Changes to Licensing Framework

Ofcom, the communications regulator for the United Kingdom, is requesting feedback to potential changes to the amateur radio licensing framework.

The following is taken from the Overview section of the Ofcom document but we recommend readers download and study the full document as there is a lot more, for example on using the internet to connect to and control our stations.

*We are proposing changes to our amateur radio licences and guidelines to ensure they meet the needs of today and tomorrow's radio amateurs and streamline the licensing processes. Our proposed changes would:*

### **1. Update the overall licensing framework:**

- Maintain the existing 3-tier licensing framework while streamlining Notices of Variation (NoV);
- Maintain lifetime licences while updating our mechanisms for revalidation;
- Allow anyone to operate amateur radio equipment under a licensee's supervision;
- Only permit licensees to hold a single individual licence, requiring surrender of lower licences as they progress.

### **2. Streamline and modernise call sign assignment:**

- Update our call sign allocation policy in a number of areas including (i) changes to the rules on the reissuing of call signs; (ii) changes to the number of call signs that can be held; (iii) enabling licensees to change their call sign; (iv) expanding the use of suffixes; (v) introducing a new M8 and M9 Intermediate call sign format; (vi) making Regional Secondary Locators (RSLs) optional and simplifying the process for using a special RSL; and (vii) simplifying rules around Special Event Stations.

### **3. Adjust technical parameters to reflect the evolving needs of the hobby and provide radio amateurs with greater operating freedom:**

- Increase the maximum permitted transmit power to allow (i) 20 Watts for Foundation and 100 Watts for Intermediate licensees in most bands; and (ii) 1000 Watts for Full licensees in bands where amateur radio has a primary allocation;
- Allow Foundation and Intermediate licensees to use the internet for remote control operation;

- Permit the deployment of repeaters, beacons and gateways without requiring a NoV in most cases;
- Allow Foundation licensees to build their own equipment and access the 2.4 GHz and 5 GHz bands; and
- Enable low power airborne use in some frequency bands.

### **4. Provide clearer updated rules (terms and conditions which are easy for everyone to understand):**

- Align various terms and conditions with other licences that Ofcom issues;
- Simplify conditions to remove unnecessary complexity and make them clearer; and
- Remove provisions not needed for spectrum management purposes.

We welcome responses to our proposals by 5pm on 4 September 2023. Following responses, we will publish a statement setting out our changes to the amateur radio licence. The overview section in this document is a simplified high-level summary only. The proposals we are consulting on and our reasoning are set out in the full document.

<https://tinyurl.com/26cdh35b>

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# Rallies & Events

All information published here reflects the situation up to and including **27th June 2023**. Readers are advised to always check with the organisers of any rally or event before setting out for a visit. The Radio Enthusiast website [www.radioenthusiast.co.uk](http://www.radioenthusiast.co.uk) has the latest updates, please check it regularly. To get your event on this list, e-mail the full details, as early as possible, to: [practicalwireless@warnersgroup.co.uk](mailto:practicalwireless@warnersgroup.co.uk)

16 July

**MCMICHAEL RADIO RALLY (RADARC/BBRC/BARC):** Co-organised and hosted by the Reading and District Amateur Radio Club (RADARC), Burnham Beeches Radio Club (BBRC), and Bracknell Amateur Radio Club (BARC). Entry from 9 am (traders set up 8 am). Entrance fees have been kept to last year's rates of £3 per person and £10 per table for traders. Berkshire Lowland Search and Rescue are providing a first-response service. No Dogs other than assistance dogs are allowed on the events field.

[rally@radarc.org](mailto:rally@radarc.org)  
[traders@radarc.org](mailto:traders@radarc.org)  
<https://mcmichaelrally.org.uk>  
 Facebook: McMichaelRadioRally  
 Instagram: @mcmichael\_radio\_rally  
 Twitter: @McMichaelRally

23 July

**FINNINGLEY ARS RALLY**  
**2023:** Belton Rd, Sandtoft, Doncaster, DN8 5SX. Near J2, M180. From 10 am. (CB | CR)  
 Martin M0HOM  
<http://www.g0ghk.com>

30 July

**WILTSHIRE RADIO AND CAR BOOT SALE:** Kington Langley Village Hall and Playing Field, Kington Langley, Wilts. SN15 5NJ. Starts at 9 am and finishes at 1 pm. Entry is £2. Traders Welcome. Indoor tables £10, Car booters £10, Vans £15. Further information:  
[Chairman@Chippenhamradio.club](mailto:Chairman@Chippenhamradio.club)

6 August

**BATC CONVENTION FOR AMATEUR TV 2023 (CAT 23) PART 1:** CAT 23 will take place on Sunday 6 August, as a meet-up, show and tell, test and fix it, and bring and buy event, from 10.30 am to 4 pm. There will be full ATV and Microwave test facilities available for QO-100, 5.6GHz FM, Portsdown, Mini Tiouner, Ryde, and power amplifiers and preamps.

6 August

**KING'S LYNN AMATEUR RADIO CLUB 33ND GREAT EASTERN RADIO RALLY:** Gaywood Community Centre, Gayton Road, King's Lynn, Norfolk. PE30 4EL. NGR TF638203. Doors open at 9 am. Admission is £2.50. Traders from 7 am, outdoor pitch £8; indoor £10 per table. (BB | CR | FP | TS)  
[rally.klarc@gmail.com](mailto:rally.klarc@gmail.com)  
[www.klarc.org.uk](http://www.klarc.org.uk)

11 August

**COCKENZIE & PORT SETON ARS 28TH ANNUAL MINI-RALLY NIGHT:** From 6-9 pm. Community Centre, Main Hall, Port Seton. Bring along your own 'junk' and sell it yourself. Tables on a First-Come-First-Served basis. The entrance fee is £2 for everyone (CR DA).  
 01875 811 723/  
 07795 100164  
 Facebook: CPSARC  
[bob.gm4uyz@talktalk.net](mailto:bob.gm4uyz@talktalk.net)  
[www.cpsarc.com](http://www.cpsarc.com)

13 August

**FLIGHT REFUELLING AMATEUR RADIO SOCIETY HAMFEST:** Radio, electronics & computers. Cobham Sports & Social Club Ground, Merley Park Rd, Ashington, Broadstone, Wimborne, BH21 3DA. Entry £4. Note: No dogs, other than assistance dogs, are allowed on site. (CBS | CR | FP | L | TS). More info & booking form:  
<https://www.frars.co.uk/hamfest>

20 August

**RUGBY AMATEUR TRANSMITTING SOCIETY ANNUAL RADIO RALLY:** Princethorpe College, Princethorpe, Rugby, CV23 9PY. Admission £3 NGR: SP395710 Lat/Long: 52.336N 01.421W Open 10 am to 4 pm; 8 am for sellers (CR | CBS).  
 Stephen Tompsett  
 07956 855816  
[rally@rugbyats.co.uk](mailto:rally@rugbyats.co.uk)  
[www.rugbyats.co.uk](http://www.rugbyats.co.uk)

20 August

**LINCOLN SHORT WAVE CLUB SUMMER RALLY:** The Festival Hall, Caistor Road, Market Rasen. LN8 3HT. Doors Open 09.30, Admission £2. Free Car parking, Refreshments available, Tables £10. (CR | FP). To book contact Steve:  
 07777699069  
[m5zzz@outlook.com](mailto:m5zzz@outlook.com)

27 August

**MILTON KEYNES ARS RALLY THE RALLY WILL BE HELD AT A NEW VENUE THIS YEAR:** Heron's Lodge Guide Activity Centre, Bradwell Road, Loughton Lodge, Milton Keynes, MK8 9AA (Opposite the National Badminton Centre). The site has excellent modern facilities. Entrance fee £3. Open to the public from 9 am. For trader and exhibitor enquiries, please e-mail (below). Outdoor pitches and indoor tables are available (CR | D | FP).  
[rally@mkars.org.uk](mailto:rally@mkars.org.uk)  
[www.mkars.org.uk](http://www.mkars.org.uk)

27 August

**TORBAY ANNUAL COMMUNICATIONS FAIR:** Newton Abbot Racecourse, TQ12 3AF. Doors open at 10 am. Indoor event with free parking. (BB | CR | RSGB)  
 Pete, G4VTO  
 01803 864 528  
 Mike, G1TUU  
 01803 557 941  
[rally@tars.org.uk](mailto:rally@tars.org.uk)

28 August (BANK HOLIDAY)

**HUNTINGDONSHIRE AMATEUR RADIO SOCIETY (HARS) ANNUAL RALLY:** Ernulf Academy St Neots PE19 2SH. Gates open for traders at 7 am and for the public at 9 am. Entrance Fee £3. Free car parking, RSGB Bookstall, Bring and Buy, Catering provided, indoor and outdoor stalls available. Talk in on 145.550MHz on GX0HSR. The Society is planning to hold the Rally but only in line with Government advice and the permission of the Academy.

Malcolm M0OLG

01480 214 282  
[events@hunts-hams.co.uk](mailto:events@hunts-hams.co.uk)  
[www.hunts-hams.co.uk](http://www.hunts-hams.co.uk)

2 September

**G-QRP CONVENTION:** G-QRP Club and Telford & District ARS: jointly organised Convention. Harper Adams University campus near Telford, Shropshire (TF10 8NB). Featuring the famous G-QRP 'Buildathon' ([www.gqrp.com/buildathon](http://www.gqrp.com/buildathon)).  
 Martyn G3UKV: 01952 255416  
 John M0JZH: 07824 737716.  
[www.gqrp.com/convention.htm](http://www.gqrp.com/convention.htm)  
[www.telfordhamfest.org.uk](http://www.telfordhamfest.org.uk)

3 September

**ANNUAL TELFORD HAMFEST & G-QRP CONVENTION (CONTINUED):** Annual Telford HamFest, and continued G-QRP Convention, at Harper Adams University, Nr. Telford TF10 8NB, continuing the G-QRP Convention and Buildathon the previous day (See also previous entry).  
 Martyn G3UKV: 01952 255416  
 John M0JZH: 07824 737716.  
[www.gqrp.com/convention.htm](http://www.gqrp.com/convention.htm)  
[www.telfordhamfest.org.uk](http://www.telfordhamfest.org.uk)

3 September

**DARTMOOR AUTUMN RADIO RALLY:** The DRC Autumn Rally at The Yelverton War Memorial Hall, Meavy Lane, Yelverton. Devon, PL20. Free Parking. There will be the usual Bring and Buy, Trader Stands and Refreshments available. Doors open at 10:00. Admission is £2.50. (BB CR FP TS)  
 Roger: 07854 088882  
[2e0rph@gmail.com](mailto:2e0rph@gmail.com)

10 September

**CAISTER LIFEBOAT RADIO RALLY:** Raffle, cafe, gift shop, museum. Free entry, open 9 am-2 pm (8 am for sellers). Inside tables £10 each, outside £5 each. Location: Caister Lifeboat station, Caister on Sea, NR30 5DJ. Entrance via the car park on Beach Rd. (CR | Gift Shop | Museum | RF)  
 Zane M1BFI: 07711 214 790  
[m1bfi@outlook.com](mailto:m1bfi@outlook.com)

BA Buildathon BB Bring-and-Buy CBS Car Boot Sale CR Catering/Refreshments CS Club Stalls D Disabled visitors FM Flea Market FP Free Parking LB Licensed Bar L Talks, Lectures & Demos MS Meeting Spaces RF Raffle RSGB (RSGB) Book Stall PWPW in attendance SIG Special-Interest Groups TI Talk-In (Channel) TS Trade Stalls Wi-Fi (Free) Wi-Fi

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# RADIO ENTHUSIAST BOOKSHOP

## The Magic Bands

Building on Don's earlier books the *6 Metre Handbook* and *Six and Four*, *The Magic Bands* adds lots of material on data modes operation, which has grown enormously in popularity in recent years with the advent of FT8. There is detail of the many new radios that have appeared in recent years with 6m and, increasingly, 4m capabilities. Readers will find two new antenna designs from Justin Johnson, G0KSC, of InnovAntennas especially produced for this book. There is detail of software too, not just for data modes but for remote operation, tracking of achievements and much else. There is even material highlighting the achievements of several of the leading operators on the 6m band.

The 6m band is now almost universally available across the amateur radio world, while in recent years 4m access has been granted to many more countries, often on a permanent basis. So why miss out on the 'Magic bands'? *The Magic Bands* is recommended for anyone who wants to try these bands out and is a comprehensive guide for those who are already hooked on these fascinating pieces of spectrum.

## THE MAGIC BANDS



A Guide to  
Amateur

By Don F...

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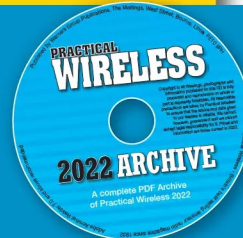


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## Don Field G3XTT

practicalwireless@warnersgroup.co.uk

**H**am Radio 2023 was the second such event following the Covid disruptions, so it was interesting to see whether attendance and trade support increased over 2022. It's too early for actual numbers to be released but the consensus from those who were there both last year and this was that things were definitely on the up. That said, there were some notable absentees among the exhibitors, not least WiMo (the largest European amateur radio retailer) and Yaesu. Also notable by their absence were the RSGB, something remarked on by many of the attendees, who enjoy the RSGB's usual extensive bookstore and the facility for dropping off QSL cards for the RSGB QSL Bureau.

## Exhibitors

One of the biggest stands this year was that by Aaronia AG. No, I wasn't familiar with them either! But they appear to be a large German manufacturer of measuring equipment, antennas and spectrum analysis software. In particular, they were showcasing their Spectran V6 series of remote spectrum analysers / vector signal generators, working up to 90GHz, with continuous 245MHz I/Q streaming. Rather out of the range of most radio amateurs, I suspect! But, of course, many of the attendees work in the industry and would have been very interested to see these products and, it has to be said, the demonstration was very impressive, showing on huge curved displays. But also an indication of the way SDR technology is moving and becoming more affordable.

Icom, as always, had the largest stand of the better-known amateur radio suppliers, but Hilberling were there as usual, and the Elecraft stand proved very popular, especially as **Eric Swartz WA6HHQ** was on hand to talk about the K4 transceiver in particular. Kenwood were displaying the TS-590SG and the TS-890.

Amateur radio amplifiers were shown on several stands, notably Acom, 403A, Elecraft, OM Power and RF-Kit. As well as the more traditional valve amplifiers, there are an increasing number of excellent products based on the ready availability nowadays of very resilient LD-MOS devices.

DX Patrol were of particular interest, with their range of equipment for working through the QO-100 satellite. And I should mention Messi & Paolini as their coaxial cables are becoming increasingly popular with UK amateurs.

Our friends from bhi were there, as usual, and it was good to catch up with **Graham Somerville**, albeit briefly.

I also took time to chat with the team on the *Funk Amateur* stand. In a sense, this magazine (a mere 70 years in publication!) is the German equivalent to *PW* – an independent magazine for German-speaking amateurs. We discussed the



## Friedrichshafen 2023

Don reports on this year's Ham Radio event in Friedrichshafen, southern Germany.

possibility of sharing material for our respective subscribers.

And, of course, there were the usual range of general suppliers selling everything from masts, rope and antenna hardware to connectors, components and much more.

## Flea Market

In some ways the Flea Market was disappointing this year, filling just one and a half halls where, in the past, it has run to as many as three halls. But there was certainly a great selection of stalls, with vintage radios, PCs and their peripherals, plenty of components from plugs and sockets to large vacuum variable capacitors, and much more. Fortunately, I had restricted myself to carry-on baggage so I managed to avoid being tempted!

## Talks

There was the usual extensive programme of talks and meetings, although I didn't actually get to any of them as I was also doing duty on the CDXC stand in my role as CDXC President. But I see, for example, that apart from plenty of sessions in German, English language events

included Eric Swartz WA6HHQ of Elecraft who gave an update on their products, including the K4 transceiver. **Greg Mossop G0DUB** chaired an International Emergency Communications Meeting. **Philipp Springer DK6SP** chaired an IARU Region 1 International Youth Meeting. **Cezar Trefu VE3LYC** ran the IOTA Forum. **Sylvia Auer-Specht OE5YYN** chaired a Summits on the Air (SOTA) exchange of presentations and experiences. And a whole stream was devoted to Software Defined Radio and was, I gather, well attended.

## Clubs

By far the largest presence, not surprisingly, was by DARC, the German national amateur radio society. This is always a huge event for them, an opportunity to showcase what they are doing with young people, to present trophies, to host a discussion about their contest programme and much more.

And the Bavarian Contest Club are always well represented but also host a Saturday evening dinner, this year attended by about 230 enthusiastic contesters from around the world, many of whom were staying on in Europe for the World Radio

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Photo 1: The impressive Aaronia AG stand.  
 Photo 2: Don (centre) with (left) Thierry F6CUK who was active recently from Crozet Island as FT8WW. Photo 3: The Elecraft K4, first shown in Europe at Newark in 2019 but now in full production. Photo 4: Some of the amplifiers on the Acom stand. Photo 5: Philipp DK6SP and friends on the Youth on the Air stand. Photo 6: Jacky ZL3CW (also F2CW) and Bernd VK2IA who will be competing at WRTC in Bologna. Photo 7: Messi & Paolini showcasing their coaxial cables. Photo 8: An historic radio in an old Citroen CV on the radio history stand.

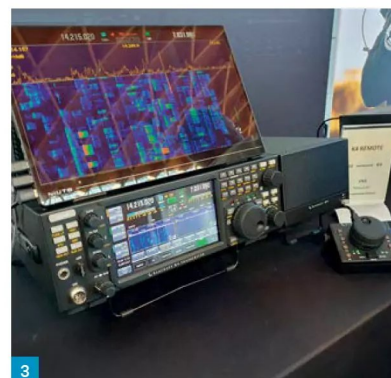


Teamsport Championship, due to be held two weeks later in Italy (and which your scribe will be attending as a Referee).

But there was representation from many national societies and clubs too, from Qatar (showcasing the Es'hail (QO-100) satellite), through Japan, Turkey, Israel and, of course, most of the European countries with the UK being represented by CDXC (the UK DX Foundation). There was a large YOTA (Youth on the Air) stand and plenty of young people on some of the other stands too, for example Hungary (who are hosting this year's YOTA Summer Camp). **Jamie MOSDV**, Philipp DK6SP and others were also publicising their forthcoming (February 2024) young people's expedition to Guyana. Apropos of which, the French Clipperton DX Club were promoting their 2024 Clipperton Island DXpedition. Islands on the Air (IOTA) Ltd were there to promote the IOTA programme. And, of course the American Radio Relay League (ARRL) were in attendance, as usual. I should also mention the International Amateur Radio Union (IARU) who not only had a stand but always use the event as an opportunity to host various preparatory meetings for their conferences and attendance at events such as the forthcoming World Radio Conference at which they will be working hard to defend our frequencies in the face of increasing demands from the commercial world.

## Socialising

Of course, a major part of attending Friedrichshafen is to catch up with friends from around the world, which I always very much enjoy but especially so this year as it's five years since I was last there. There seemed to be quite a good turnout from the UK, but it was great to meet up



with old friends from Australia, New Zealand, Thailand and, of course, the USA.

The beer garden was, as always, a great time to catch up on the gossip while enjoying a beer and some excellent German food. Obviously, the evenings provided a chance to meet and eat with friends, often down by the Friedrichshafen waterfront overlooking the beautiful Lake Constance (or Bodensee as the Germans call it). And **Derek G4XEE**, who came with his wife by camper van, tells me there was great camaraderie and lots of mobile antennas to be seen in the campsite adjacent to the exhibition halls.

This is not an event I attend every year and I do need to return to Visalia and/or Dayton one of these years so we'll have to see what 2024 brings! **PW**

Read more radio news and reviews at [www.radioenthusiast.co.uk/news](http://www.radioenthusiast.co.uk/news)



David Harris

mydogisfinn@gmail.com

**B**letchley Park was a country house and estate, which during World War Two housed the top secret Government Code & Cypher School (GC&CS). From modest beginnings at the outbreak of the war it rose to become a vast organisation employing around 10,000 civilian and military personnel in the sorting, decoding and analysis of German, Italian and Japanese military communications. The Axis radio communications were monitored by thousands of radio operators across the UK, including many radio amateurs who worked from home on a voluntary basis. The work undertaken was considered to be top secret and all staff undertook never to talk about what they did at Bletchley Park.

That veil of secrecy was lifted in 1974 by the publication of *The Ultra Secret* by **Frederick Winterbotham**. This book has been followed by many other histories of GC&CS and personal accounts by people who worked there. There have also been television series, films and even novels about Bletchley Park during the war. A quick search on Amazon reveals over 160 hardback and paperback books with Bletchley Park in the title. **Dr Greenberg** is a historian who has also written books about key Bletchley Park staff, including **Alastair Denniston** and **Gordon Welchman**.

This book differs from other Bletchley Park books in that it consists mainly of letters and memos written by key staff during and after the war. The bulk of the material is from the 1970s onwards following the publication of the Winterbotham book. The book adopts a bottom-up approach and is about the people who worked at Bletchley and what they actually did. It is not a guide to creating cyphers or decoding.

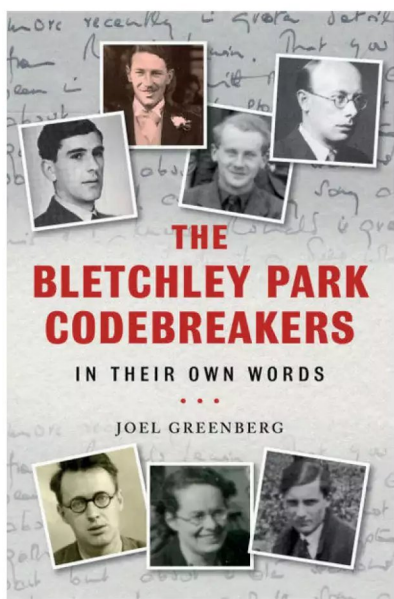
The first key player we meet is Commander **Alastair Denniston** (1881 – 1961). He studied languages at university and worked in decoding German naval signals during the First World War. In July 1939 he went to Poland where the Polish intelligence service had made inroads into decrypting German signals sent using the Enigma machine. He was responsible for recruiting at the beginning of the war a number of academics, “men of the professor type” at a salary of £600 p.a. (about £50,000 today)

**Gordon Welchman** (1906 – 1985) was a mathematician at Cambridge until he joined GC&CS in 1939 at Denniston's request. He is credited with developing a production-orientated approach to cryptanalysis. The popular myth about Bletchley was that lone genius types such as **Alan Turing** did it all themselves. In fact it was through the industrialisation of codebreaking that signals intelligence was collected and analysed.

There were a number of women recruited, including **Margaret Rock** (1903 – 1983) who studied Mathematics at the University of London and

# GC&CS Codebreakers

**David Harris** reviews yet another book about the work of Bletchley Park, but with a new and fascinating slant.



*The Bletchley Park Codebreakers in Their Own Words* by Joel Greenberg.  
Greenhill Books. 2022.

332 pp. Hbk. £25.

ISBN 9781784388119

[www.greenhill.books.com](http://www.greenhill.books.com)

worked prior to World War Two as a statistician. She was considered to be one of the best codebreakers at Bletchley. She stayed with GC&CS after the war when it became GCHQ where she remained until her retirement. She never wrote about her work but did leave some letters to her mother, which vividly describe being in London during a bombing raid and of the day-to-day life and hardships of living at Bletchley.

**Peter Twinn** (1916 – 2004) mathematician, **Keith Batey** (1919 – 2010) mathematician and his wife **Mavis Batey**, linguist (1921–2013), **John Herivel** (1918 – 2011) mathematician and later historian of science, **David Rees** (1918 – 2013) mathematician and **Dennis Babbage** (1909 – 1991) mathematician are just a few of the relatively unknown personnel at Bletchley who made huge contributions to cryptanalysis. After 1974 many of them got back in contact with each other and exchanged letters about their experiences and the moral dilemma of talking about events to which they were sworn to secrecy.

One weakness which many confess to in later

life is their failing memories, especially for points of detail about how decoding took place 40 years previously. Many were very modest about their contributions to Bletchley but it is clear that by harnessing such intellectual resources and effectively managing them Britain was able to decode much Axis communication. The author challenges the often published claim that Bletchley Park shortened the war by up to two years. He is highly sceptical and thinks at best it led to the war being shortened by just a few months.

There is a lot of technical detail in the book, which gives an insight into the early days of computing and the use of contemporary technology such as punch cards, tabulators, reproducers, collators and sorting systems. Up to two million punch cards were processed each week. The world's first electronic computer, Colossus, was developed at Bletchley Park. The author has gathered together some of the correspondence relating to its disposal after the war when it was donated to the University of Manchester in December 1945.

One consequence of the UK's ability to break codes was the formation of the 'special relationship' between the UK and the USA who agreed to share intelligence about codes and cyphers. This special relationship has survived the war and is still in place today. Even before the USA entered World War Two in late 1941 US intelligence experts were visiting Bletchley Park with strong personal friendships being forged between leading players.

The author makes a number of points about how **Alan Turing** had become the only well-known figure at Bletchley Park where in fact there were many significant people who played a big role such as **John Tiltman**, **Bill Tutte** and **Gordon Welchman**. He also states the Enigma machine was originally built for commercial purposes and examples of the machine had been obtained by the UK prior to the war.

This book is a major resource and will complement the many Bletchley Park titles that have already been published. Here are a few Bletchley Park books that I have reviewed and can recommend.

- *Bletchley Park and D-Day* by David Kenyon. Yale, 2019 (reviewed *RadioUser* Sept 2020)
- *Behind the Enigma* by John Ferris. Bloomsbury, 2020 (reviewed *RadioUser* April 2021)
- *Bletchley Park's Secret Source* by Peter Hore. Greenhill Books. 2021 (reviewed *RadioUser* August 2021) **PW**

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**Daimon Tilley G4USI**

practicalwireless@warnersgroup.co.uk

I put together a lot of portable radio kits and usually have a different key in each. As a result of this I have made a number of paddle keys, sometimes to my own design and sometimes to the design of others. Many of them I have 3D printed at home.

What has been common with all of the 3D printed versions I have made is poor reliability. I often find they work fine at first but, because often the paddles are hinged plastic on plastic, after a period of time the mechanism can get sticky and unreliable leading to frustration and poor sending.

Indeed, on a recent holiday to La Gomera in the Canary Islands (EA8) both of my home made paddles let me down and I had to resort to sending via the macros and PTT button of my IC-705 – far from ideal.

On my return I decided to find a good commercial solution, but at a sensible price. There are some models on the market that are either expensive or fairly low cost, but the ones from Chinese websites did not really appeal, and neither did high-end versions for occasional portable use.

On reading my latest copy of *SPRAT* (journal of the G-QRP Club) I again noticed an advert from G0EUL for the Ultra-Miniature Precision Paddle (UMPP). Priced from £50 and hand-made in Scotland, I made contact with **Peter**, the owner, and he kindly sent me a UMPP-1 for review in this magazine.

## Impressions

The key is presented in a tin box about the size of a mint tin. On opening the box, I saw the tiny key and an Allen key, neatly presented in a foam surround. I was really surprised by its small size, **Photo 1**.

Keys like this are often designed to be used by holding them in one hand and operating with the other. This key also has the advantage of a strong magnetic base, covered in a rubberised material, which holds the key firmly in place. You could use the provided tin as a base if you wish, or if your rig is steel cased, rest it on the top.

For most of my testing, which was done primarily at home, I actually sat the key on top of my Kent dual-paddle, allowing the magnet to do its work, and **Photos 2** and **3** give a good indication of this diminutive little paddle.

The keys are in a 3D printed case and are nicely finished. But in my experience it is all about the 'innards' and the action of the key that is important for a reliable paddle, and this key certainly delivers!

Peter uses high quality precision bearings inside with magnets to provide the repelling



# The UMPP-1 Morse Paddle from G0EUL Morse Keys

**Daimon Tilley G4USI** reviews a small paddle key that offers great performance at a sensible price.

mechanism as opposed to a spring. I connected the key with a 3.5mm audio cable (not supplied) and began to operate. It was a pure joy to use and I have used it with many of my rigs and on a couple of portable outings too – the mechanism is excellent and there has been no sign of 'sticky' keying. Stainless steel grub screws are used to adjust the contact

spacing, but Peter checks and adjusts each one before dispatch, at 30wpm, and I found no need to adjust it.

The key Peter sent me is the UMPP-1, which has small paddle levers and works very well. This costs £50, including postage within the UK. He also produces the Academy version, which is slightly different, comes with bigger

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paddle 'handles', mounting lugs and a 3.5mm lead for £60. Both keys come with a magnetic base and are also available internationally.

The use of 3D printing for this scale of production is sensible and Peter uses PLA, which is a plant-based plastic that is biodegradable. I use this extensively myself, but the only slight concern I have is that PLA can deform in hot conditions, such as if left exposed in car on a hot day, etc. I raised this with Peter and he tells me he has had no reported issues to date and would work with the key's owner to resolve that if and when it were to actually happen – a reassuring response.

Overall, I have to say I am incredibly impressed with this paddle and it is excellent value for money – so good in fact I have asked to purchase the review model rather than return it. The website is at:

[www.umpp-cw.com](http://www.umpp-cw.com)

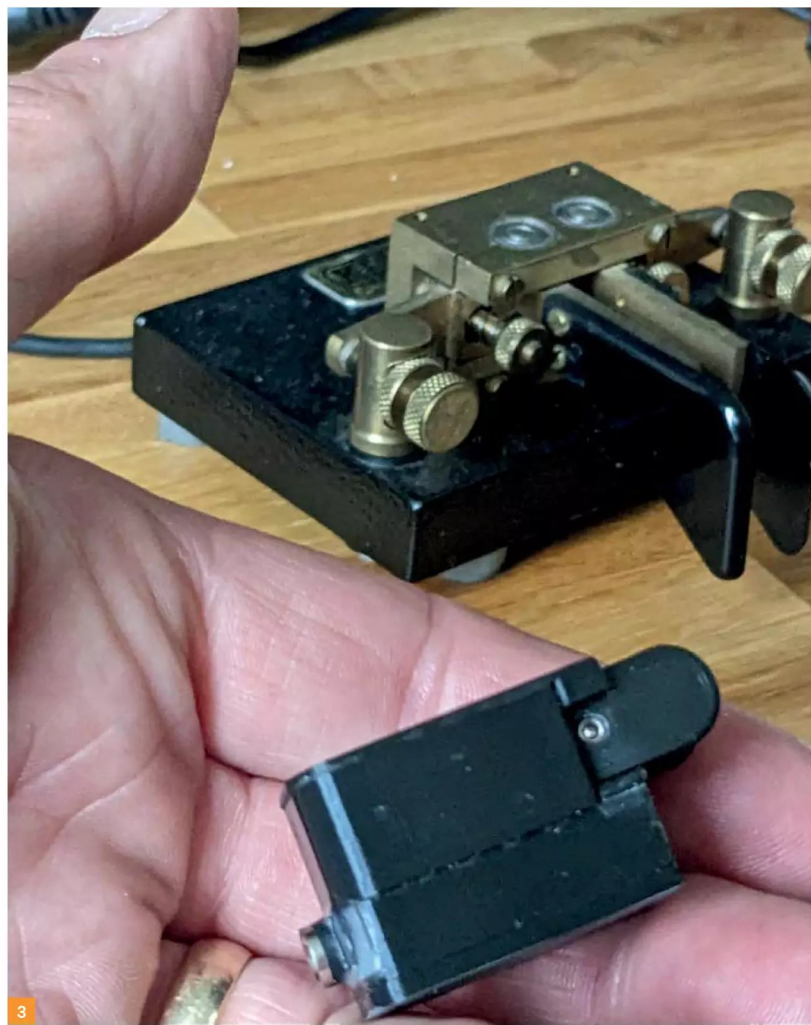


Photo 1: The key on arrival. Photo 2: Next to the author's Kent paddle, showing the key's small size. Photo 3: Another view, illustrating the size.

## NEWS EXTRA

### DISCOVER EXCITING POSTS ABOUT AMATEUR RADIO:

European radio dealer WiMo have announced "We are pleased to present you today our new knowledge page about amateur radio! On WiMo-Discovery you will find from now on a lot of interesting articles, videos and tips around amateur radio."

"It is important to us not only to offer you high-quality products, but also to provide a comprehensive information platform. On the new page you will learn, for example, what equipment you need to get started, how to establish a radio connection and what opportunities amateur radio offers".

WiMo-Discovery includes guides, videos, know-how and much more about amateur radio.

<https://tinyurl.com/ydb4xdsk>

**NORTH WEST FUSION GROUP:** North West Fusion Group came about in 2017 to support the use of Yaesu Fusion across North West England. It actually started as a simplex net a year earlier and is now the largest C4FM only network in the UK. They provide a network of repeaters and gateways across the North West of England and beyond connected to their NWFG WiresX Room: NWFG (44222) This room is 'bridged' to a reflector for Hotspot use: YSF GB-NWFG2.

Their regular nets are The Squirrel Net every morning 7:00am with **Linda G0YLM** and **Sue's Net** on Tuesdays at 7:30pm with **G10HH**.

The Bay Net is held on a Wednesday 7:30pm hosted by **Brian G0RDH**. The Fusion International net is held on a Friday at 4pm by **Ian G0VGS** on Kansas City Wide.

The reflector moves over to KC-Wide for the duration of this extremely popular net. North West Allstar Group (Allstar node 53573) is the analogue FM network with repeaters and gateways throughout the area. It has a popular 'Early Evening Net' starting at 6:30pm daily. NWFG also have a YouTube channel with over 1000 subscribers offering help to all C4FM users:

<https://tinyurl.com/495ddnn4>

<https://nwfg.online/nwfgwp>

<https://tinyurl.com/9mpdb63x>

**SEARS ARE MOVING:** The South Essex Amateur Radio Society will now be meeting at 1900 (local) on the second Thursday of the month at St Michaels church, St Michaels road, Daws Heath, SS7 2UW. 10 August features a talk by **Dave Taz M0TAZ** on 'what does the RSGB do for us'

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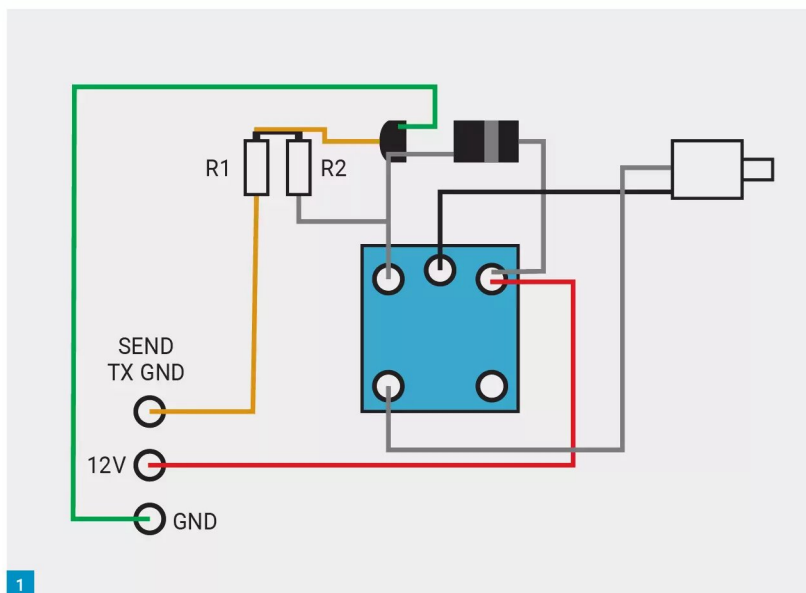
**Billy McFarland GM6DX**  
gm6dx@outlook.com

The advancement of modern transceivers such as the Icom IC-7300 or Yaesu FT-710 has resulted in many features now offered that were previously unthinkable. That being said, one issue which still troubles even the modern transceiver is the ability to safely connect and use your external RF power amplifier without the risk of damage to both pieces of equipment. The switching voltages in amplifiers, more so in older amplifiers such as the Kenwood TL-992, are high and can be too much for the rig to handle. In order to address this we need to create a buffer circuit between the transceiver and amplifier. This will allow the rig to key the amplifier and protect it from high switching voltages. My friend **John G17SBF** had this particular issue with an Icom IC-7300 and a Kenwood TL-992 amplifier, so I put together for him a buffer keying circuit using the following parts:

1. Piece of prototype board
2. 1 (R1) x 3.3kΩ resistor
3. 1 (R2) x 100kΩ resistor
4. 1 x 2N3906 transistor
5. 2 x diode
6. 1 x SRD-12VDC-SL-C relay
7. 1 x connector for your rig (such as 13 pin DIN for IC-7300)
8. 1 x cable/connector for your amplifier (such as phono cable)
9. 1 x phono socket
10. 1 x project box (65 x 55 x 45mm)
11. 1 x cable gland

This circuit will give isolation between the rig and amplifier where the relay can handle 230VAC at 5A and only requiring 9-15V DC at 40mA (approximately) as a power source. Take a look at **Fig. 1**. Here I have drawn out the components in basic form so that you can see how all the connections are made in this circuit. Throughout the build you should make reference to this drawing to ensure you have the connections correct.

The first step is to take your prototype board, find a space and fit the relay in place. You will probably find that the centre leg of the relay will need to be bent slightly to fit through one of the prototype holes for soldering. Make sure you have space all around the relay for other components; you can always cut the proto board down later once the circuit is complete. Take the two resistors and fit them onto the board, ensure R2 (100kΩ) resistor is the one that is positioned closest to the relay. You can see this first stage in **Fig. 2**. Solder these components in place leaving the legs of the resistors long. We will use them for electrical connections on the underside so don't trim them just now. Fit the diode and the transistor onto the board. Ensure the diode and transistor are facing the correct



## Buff my Amp

Trying to key an older valve amplifier from a modern rig? **Billy McFarland GM6DX** offers a solution.

direction as shown in the drawing. If you don't, they will not function correctly. Solder in place and start to connect the electrical connections on the underside of the prototype board as seen in **Fig. 3**. At this stage you should have the resistor connections made along with the diode and part of the transistor. The next step is to make the connection that will go to the phono socket/phono cable, which ultimately goes to the amplifier. On my drawing these are the purple and black wire connections from the relay. Take two pieces of short wire and connect these from the relay to a space on the board. This will allow a connection point for the phono cable or phono socket. I did this merely for testing. However, you can just leave the connections off the board and solder directly to the phono socket affixed to your project box. **Fig. 4** shows this although the colour of wires I use are black and white (as that is what I had lying around) rather than black and purple. Take a short piece of wire (green in this case) and connect it to the right leg of the transistor. This will get soldered to the ground wire from the transceiver connection. Take a short piece of red wire and connect it to the relay leg as per the drawing. This will get connected to the 13.8V (or any voltage from 9-15V DC) connection of the rig (on Icom rigs this is via the 13 pin or 7 pin DIN socket, on Yaesu rigs this is from the linear or tuner socket). Finally connect a piece of yellow wire to the remaining resistor leg. This will get connected to the SEND connection

on the Icom socket (or TX GND on Yaesu). **Fig. 5** shows the final PCB with connections made. **Fig. 6** shows the underside of the PCB having been soldered to connect the actual components electrically. Before we move on any further you must ensure that all electrical connections are made as per **Fig. 1**.

Take your project box and drill two holes, one for the phono socket and at the opposite end of the box one for the cable gland. The cable gland allows the cable (or cables) to enter the box without risk of damage. **Fig. 7** shows the box with gland and phono socket attached. Take some 5-core cable and insert it into the project box. We now need to connect the GND wire (green), SEND wire (yellow) and 13.8V wire (red) from the proto board wire connections to the 5-core cable, which will go to the 13 pin DIN socket (rig connector). You can of course connect directly from the 5-core cable to the proto board if this is easier.

### Completing the Project

Another point here is to consider ALC (which I didn't with the initial build). If you need the ALC connection, then install another phono socket to your project box and connect this straight from the 5-core cable (ALC and GND). Once the wires are electrically connected fit your prototype board in the box, you may need to trim it down to do this. Take two short pieces of wire and connect these from the phono socket

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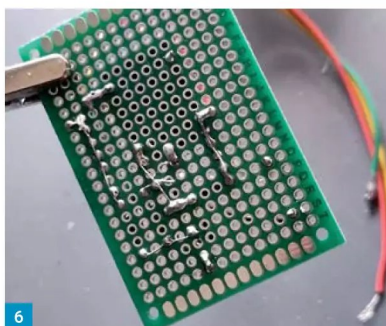
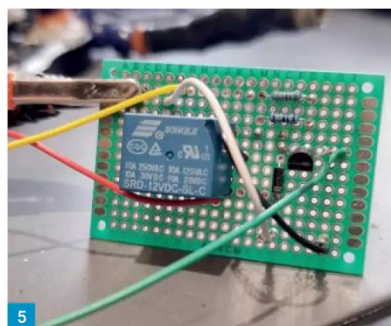
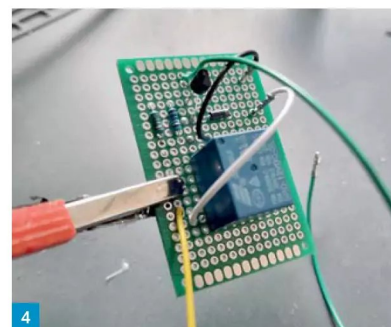
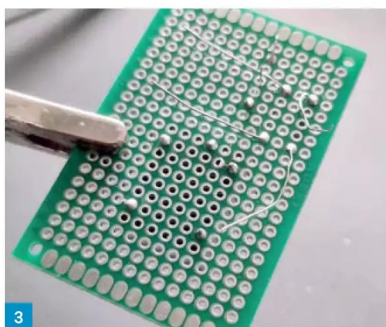
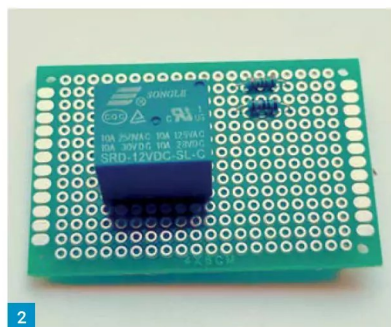
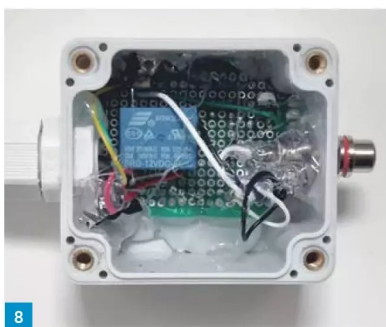


Fig. 1: The basic circuit. Fig. 2: Starting the build, with the relay and the first two resistors in place. Fig. 3: Making the interconnections on the underside of the prototype board. Fig. 4: Starting to put the connecting wires in place. Fig. 5: An angled view of the completed assembly. Fig. 6: The completed under board wiring. Fig. 7: The project box ready to take the circuit board. Fig. 8: The board fitted and hot glued. Fig. 9: An alternative with the author's self-designed PCB and including both PTT and ALC connections. Fig. 10: The completed project with DIN connector to work an Icom radio.



onto the two connections of the prototype board (black and purple on the drawing). Once these connections are all soldered up, simply hot glue everything in place as seen in **Fig. 8**. Fit the lid to the box and solder the 5-core wire onto the relevant pins of the 13 pin DIN plug, as needed for the Icom. During testing I noted 6.7V on the send and ground connections. This drops to about 0V when the rig is in transmit. The issue with voltage on these connections is that it prevents this buffer from working correctly, as the buffer circuit is really only functioning by breaking and connecting the ground connection. In order to get this working on the IC-7300 I had to install a diode. If you are doing this for another radio, then you will need to also ensure there are no voltages on the amplifier keying connections. A check of the transceiver's manual will tell you this as well as all the relevant connections such as GND, +V, SEND/TXGND/RELAY and ALC. **Fig. 9** shows my self-designed PCB of this buffer circuit as well as the additional PTT pedal and ALC connections. **Fig. 10** shows the basic



project at its complete stage.

This project is simple in nature and will allow you to keep in use the older amplifiers with a modern transceiver. Rigs are changed regularly in the shack but amplifiers not so often. Why

make redundant a perfectly good amplifier because of a keying issue? Have a go at making this relay buffering circuit and if you have any questions simply drop me an email at [gm6dx@outlook.com](mailto:gm6dx@outlook.com)

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**Daimon Tilley G4USI**

practicalwireless@warnersgroup.co.uk

**Q**RP is my thing, and QRP CW at that. A couple of years ago I went back to basics and started to build simple, crystal-controlled transmitters for the HF bands, before moving on to add Arduino-controlled VFOs.

In this month's instalment I am going to share with you two very simple and cheap, easy build CW transmitters capable of good results on HF.

In case you have not done this before I am offering two options. The first is a kit with all you need included, except for a CW key, and which is capable of operating on just about any HF band, but with best power output between 80-20m inclusive. The second is a scratch-build, where you source the parts yourself but this is designed really for 80m.

Even if you are not capable of a CW QSO yet (perhaps you are learning, or want to learn) then I still recommend having a go. By connecting to a dummy load, you could tune your shack receiver and use it like a code practice oscillator, and once you are confident, connect the antenna instead!

### The OXO Transmitter

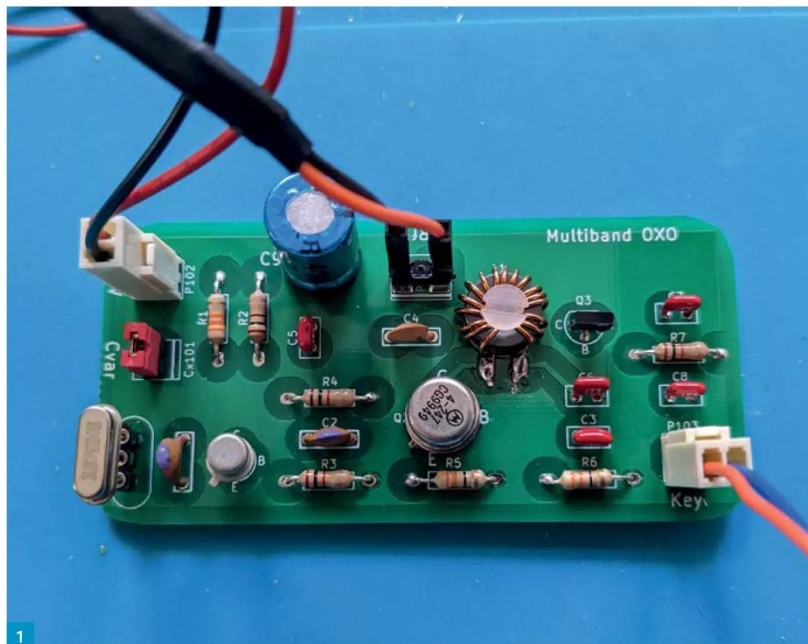
This is an absolute classic CW transmitter and was designed by the legendary **George Burt GM30XX**, now Silent Key. It was first published in the G-QRP Club Magazine, called *Sprat*, in edition 28, Autumn 1981, following a challenge from the **Rev. George Dobbs (G3RJV, SK)**, founder of the club, for the first George to try some 'simpler gear'.

The transmitter uses a free running crystal oscillator, to minimise chirp, but this means that you will always hear it in your receiver. Therefore, a simple transmit/receive switch in the 12V power line is required for proper operation – you switch power to the transmitter to transmit and disconnect power to listen on your station receiver. You need to source this yourself – it is not part of the kit but any on-off switch will work. There have been modifications to this circuit over the years, but it remains pretty much unchanged.

I thought of building the transmitter from scratch as it is simple enough, but I was aware that Kanga Products produce a kit of parts on a neat PCB. The PCB has plenty of space and it would make a good first soldering project. I decided to use the kit for a neat finish and purchased it from Kanga for £15.

<https://tinyurl.com/26wrycrp>

It arrived neatly packaged and the instructions for the build are online at the website above. It comes with a crystal for one HF band (usually 80m) but you can change bands by merely changing the crystal. Both Kanga and the G-QRP Club sell crystals in the QRP segments of the HF bands very cheaply. G-QRP Club sales are for members only and crystals cost £2 each. Kanga sell the



## Build a CW Transmitter for under £15!

**Daimon Tilley G4USI** offers two solutions for a cheap but useful transmitter.

crystals for £2.50 each. I personally have a number of different crystals for each band for use as and when required.

The kit is very easy to build and took me less than 45 minutes in total. There are three transistors, seven resistors, eight capacitors and some connectors to solder. The hardest part of the build (and even that is simple!) is winding 17 turns of copper wire on a ferrite core to act as an RF choke. There is a jumper that is shorted out with the supplied plug if you do not want to use a variable capacitor (not supplied) and this fixes you to a single frequency near to that of the crystal. Alternatively, you can connect a small trimmer capacitor or polyvaricon (of the type used in old transistor radios) across these two pins. Using a capacitor in the range of 60 – 100pF will give you some movement in transmit frequency of a few kilohertz. In my case, for the time being at least, I am just using the crystal without the variable capacitor.

Once built, **Fig. 1**, I connected a dummy load and measured the power output on my oscilloscope. Changing crystals, I measured a pretty consistent 1.1 watts of RF on each band from 80 – 15m.

At this point I should point out that the OXO kit as supplied should be used with a low pass filter

(LPF) for the band you desire to use it on. This is to prevent unwanted harmonics and interference. Designs for simple low pass filters are readily available online, but I personally use the excellent single-band Low Pass Filter kits from QRP Labs and which are just £3.69 per band. Postage is from QRP Labs in Turkey, so to keep courier costs down I recommend you order one for each band from the outset.

So, having connected my LPF for 20m, inserted my 20m crystal and connected to my SpiderBeam Yagi antenna, I began to call CQ. I didn't get any replies, but checked the Reverse Beacon Network (RBN) and was pleased to see I was getting out, with the best spot at 2,548 miles by RU9CZD (**Figs. 2 and 3**).

I then turned my mind to a case for the tiny transmitter, and found I had a vintage OXO tin, dating from around the 50s – what better? A cut-up old QSL card formed a non-conductive base and some very gentle work with my bench grinder to round the edges of the printed circuit board gave me a perfect fit, **Fig. 4**.

Later that evening I tried again, using my SDRPlay RSP1a as the receiver. I once more called CQ on 20m. It took a dozen or more calls, but I

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spotter	spotted	distance mi	freq	mode	type	snr
EA5WU	G4USI	786 mi	14056.6	CW	CQ	3 dB
OE9GHV	G4USI	642 mi	14056.6	CW	CQ	4 dB
S53A	G4USI	887 mi	14056.6	CW	CQ	6 dB
TF3Y	G4USI	1129 mi	14056.7	CW	CQ	5 dB
ES2RR	G4USI	1228 mi	14056.6	CW	CQ	16 dB
DR4W	G4USI	656 mi	14056.6	CW	CQ	8 dB
OH6BG	G4USI	1230 mi	14056.7	CW	CQ	15 dB
IK4VET	G4USI	801 mi	14056.7	CW	CQ	5 dB
2 RU9CZD	G4USI	2548 mi	14056.7	CW	CQ	8 dB

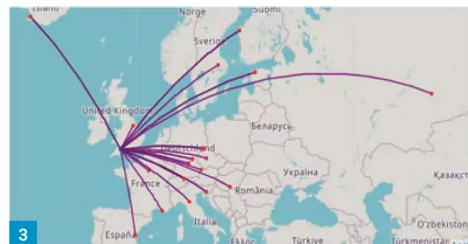


Fig. 1: The completed OXO board. Fig. 2: RBN spots with the OXO. Fig. 3: Map of the RBN spots. Fig. 4: Mounted in an OXO tin (of course!). Fig. 5: Marconigram from IZ00NL. Fig. 6: Circuit diagram of the OXO transmitter. Fig. 7: Internal view of the VK3YE transmitter. Fig. 8: External view of the completed project.

was pleased to be answered by **Graziano IZ00NL** in East Central Italy, about 800 miles away, with a 559 report. We were able to sustain a very pleasant 15 minute QSO and Graziano kindly later emailed me a note of congratulations on the transmitter along with a 'Marconigram' as a QSL card, Fig. 5.

I went on to have a couple of further QSOs on 20m in Europe and, most importantly, had fun and a great sense of satisfaction of working a station using equipment I built myself. Fig. 6 shows the circuit diagram of this very simple yet effective, one watt transmitter. Why not give it a go yourself?

### The VK3YE Two Transistor, 2 Watt Transmitter for 80m

I very much enjoy following the exploits of **Peter Parker VK3YE**. He has a very informative website and YouTube channel, as well as authoring some very good eBooks on QRP and QRP equipment. I have built a few of his circuits now and recently built another, which I will describe here.

This rig is even simpler than the OXO, in that it uses only two transistors, four resistors, and six capacitors. Two toroids are wound. There is no kit so you need to work out how to build this for yourself, and you could use 'ugly' or 'dead bug' style. In my case I used 'Manhattan' construction but using mint tin prototype boards, also from Kanga. These boards are great as they are double-sided with small islands on one side and larger islands on the other. These islands are your connection points for your components, which are soldered to them. The boards fit perfectly in the ubiquitous Altoids mint tin and similar.

The key difference between this and the OXO is that instead of a crystal on a fixed frequency, this transmitter uses a ceramic resonator. When combined with a polyvaricon capacitor of around 100 – 150pF, it is possible to move your transmitted signal across the whole of the CW portion of the 80m band and even outside of it too.

This is very significant. Many QRP operators will tell you that they tend to have most success an-



swering CQ calls rather than making them. A single frequency is limiting in this respect. By being able to transmit anywhere in the CW portion of the band you have flexibility to answer others wherever they may be calling, as well as move away from QRM, and most operators will do their best to try to resolve even a weak response to their calls.

Ceramic resonators are wonderful devices, but their frequencies tend to be mostly outside the amateur bands. Or at least the CW segments thereof. However, ceramic resonators are available at 3.58MHz, which is just above the QRP calling frequency of 3.560. The polyvaricon takes care of that nicely, however. My ceramic resonator was also from G-QRP Club sales for just 50 pence!

There is no proper printed circuit diagram for this transmitter. Instead, Peter holds up a drawing of his circuit within his video about it. You need to

do a screen grab of that and print it. Once printed, decide on your method of construction and design your layout. Here is the link to the video (actually there are two videos about this rig) and the circuit is shown around 17 mins 30 secs in:

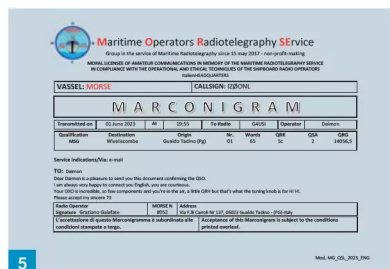
<https://tinyurl.com/3wfn5bce>

Unlike my OXO transmitter, where I didn't want to drill the vintage tin, in this build I planned the layout carefully to take account of drilling my tin for the variable capacitor, LED, power connector, key jack and antenna socket. The hardest part of the build was the metalwork as the metal in these tins is paper thin and deforms easily when drilled. A little persistence, a wooden backing for drilling and careful use of a hammer to straighten things up did the trick though.

In Fig. 7 you can see my build. By way of description, the connector at top left is the 2.1mm power

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connector with the LED just next to it. The bottom tin connector is the CW key jack, and there is a BNC socket to the right of the tin.

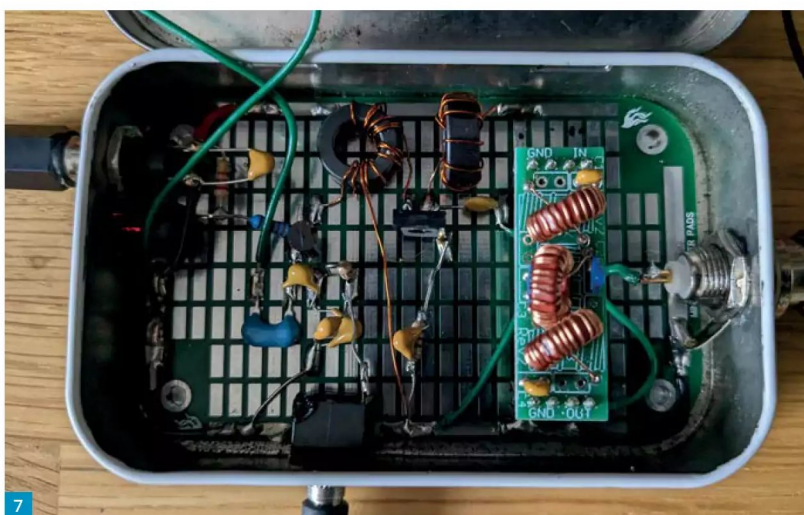
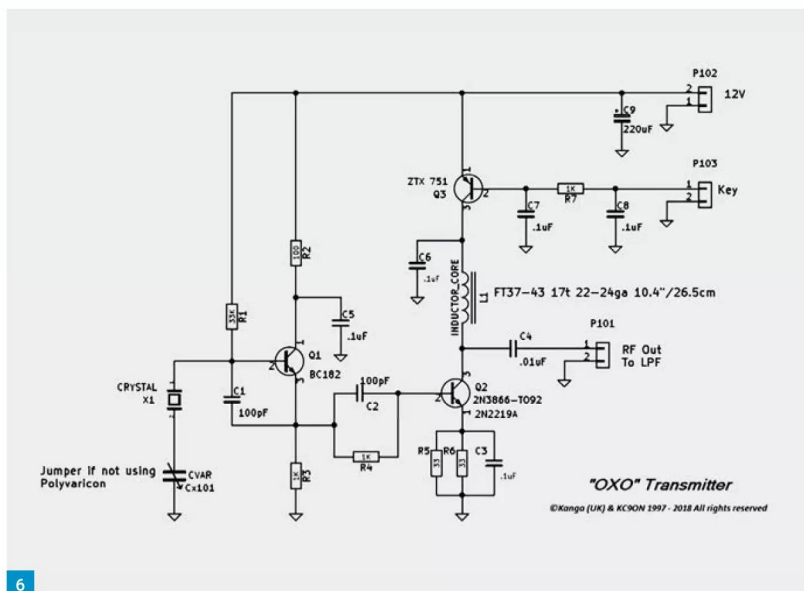
The ceramic resonator is the blue component centre left of the prototype board and the first transistor is just above the right-hand leg of the resonator, with the second transistor, the BD139, sat just underneath and beneath the two toroids. The green board with three toroids is the QRPLabs Low Pass Filter kit for 20m, which plugs into header sockets attached to the proto board. This allows me to remove the filter to use on other radios, but not shut the lid in use. I will probably use a dedicated LPF for this rig to get around that. Finally, the two green wires disappearing to the lid are for the polyvaricon capacitor, which you can see is mounted to the tin lid and has a 3D-printed thumb tuning wheel, **Fig. 8**. You may also spot a red-topped momentary switch. This is for a simple CW straight key, but I have not wired it across the CW key jack yet.

Firing up the rig at 2030 hrs local time, I used the RSP 1A as the receiver once more and tuned across the 80m CW segment. I soon had my first QS0, OK1DWF, and followed this up with DL1GBZ, G4JRD, DK1QG, G4SVC/P, G4HWK and 2E0IHM for another fun evening of radio.

Whereas the OXO has a free running oscillator, with power being applied only for transmit and not receive, the VK3YE design is different. In this case, the power is always applied to the rig and the oscillator is switched off and on by the key. This means that you cannot hear your oscillator on your receiver, except when transmitting, but a side effect of this is that the oscillator, being switched off and on like this for every character, results in some 'chirp' at the receiver end. This is not excessive however, and more than one operator has positively commented on the quality of my chirp!

So, to conclude, I cannot stress highly enough the sheer pleasure and sense of reward you get from making QSOs on homebrew gear. I hope that this article demonstrates it is easy to do so simply, quickly and ridiculously cheaply. Yes, they are CW only rigs, that is because these are the simplest rigs to make. So, if you fancy building your own transmitter, but don't know CW, I hope this will give you the incentive to learn this fabulous mode that continues to stand the test of time, build your first transmitter, and, above all, have loads of fun!

Until next time, best 72! **PW**





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Michael Jones GW7BBY/GB2MOP

michael@gb2mop.org

Many of us, both short wave listeners and licensed amateurs, have a number of receivers to be connected to one receiving antenna. The solution might be a manual switch or a set of relays operated by a switch. The main advantage of these solutions is that the insertion loss is minimal at HF, but can become problematical and expensive as one ventures into the VHF and UHF regions and you have to remember to switch! In this article we will discuss passive splitters and distribution amplifiers.

### Splitters

Splitters, or splitter/combiners to give them their full name, provide an answer that does not require switching but does carry the penalty of insertion loss. Splitter/Combiners are passive bi-directional devices. A three-port splitter/combiner takes an input typically from an antenna at one port and splits it into two, usually, equal outputs. Conversely, they can combine two inputs, perhaps from different antennas into a single output. For the purposes of this article I will refer to them as splitters as this is the main function that concerns us here.

Resistive splitters are easy to understand, can be made very compact and as they only use resistors are naturally wideband, working from DC to GHz if carefully laid out. However, being resistive devices some loss is inevitable but usually tolerable if only a few ports are required.

A typical three port, one input and two outputs resistive splitter is shown at Fig. 1. The ports on Fig. 1 have been labelled according to two conventions: 1) Simply marked Port 1, 2 & 3 as any port can be the input while the remaining two are outputs. Conversely, as a combiner any two ports can be inputs and the remaining one the output. 2) As a splitter the left-hand port is the input and the right-hand ones are the outputs. This is the convention I will follow in this article.

All three resistors are the same value, calculated as follows:

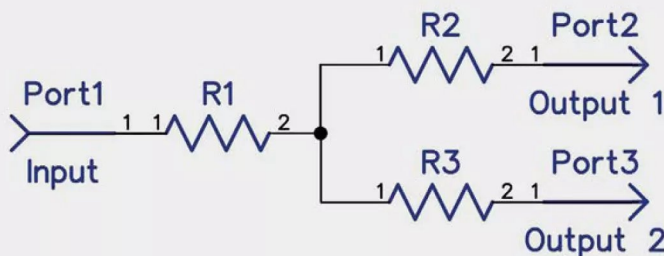
$$R = Z_0 \times (N-1) \div (N+1)$$

Where  $Z_0$  = characteristic impedance, 50Ω in this example, and  $N$  = number of output ports.

For the three-port example the resistors will be  $50 \times (2-1) \div (2+1) = 50 \times 1 \div 3 = 16.667\Omega$ . Using this formula the resistor values can be calculated for any number of ports.

### Insertion Loss

Splitters are not lossless devices, they exhibit a loss due to the splitting action, which we will call splitting loss and a loss attributable to the components used in its construction: resistors,



1

## Feeding Multiple Receivers from One Antenna

Michael Jones GW7BBY/GB2MOP discusses splitters and distribution amplifiers.

transformers, capacitors etc, referred to as path loss.

Insertion loss is the sum of these two losses. For the three-port device shown the splitting loss will be 3dB and the path loss will also be 3dB making a total loss of 6dB (or half the input) between input and any one output port. This is logical as the power input is divided between the two outputs. The loss increases as the number of ports increases.

The total insertion loss is calculated from: Insertion Loss =  $10 \times \log(1/N)$  + Path loss.

or Insertion Loss =  $20 \times \log(1/N)$

This formula will give the overall loss experienced from the input to any one output port. It includes the resistive losses in the splitter and the division loss.

Insertion loss can be compensated for by situating an amplifier before the input port, for the above example: a 6dB amplifier. For a small number of ports a low-gain amplifier is probably acceptable, but as the number of ports increases more gain will be required and the demands on the amplifier increase if unwanted artefacts are to be avoided.

### Port Isolation

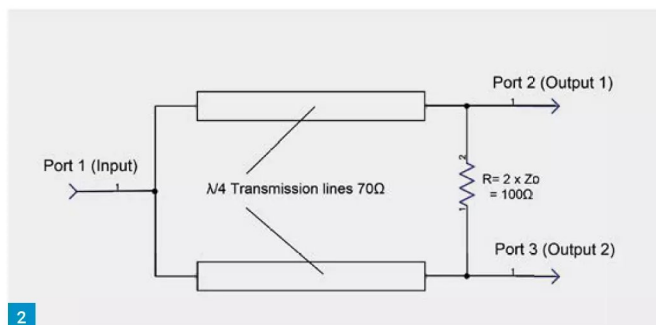
We need the signal at the input to be faithfully reproduced, less insertion loss, at all of the

outputs. This can only happen if all ports, input and output, are correctly terminated. We don't want a deficiency, or behaviour of one output to affect other outputs. The extent to which this is prevented is called Port Isolation. Isolation is measured between any two output ports with all unused ports terminated in the characteristic impedance. Port isolation for resistive splitters is poor. If you work out a few examples, you will see that with more ports the resistor values increase, therefore the insertion loss increases, as does the port isolation. By the time you get to a 6-output splitter the insertion loss is about 15.5dB as is the isolation between any two ports.

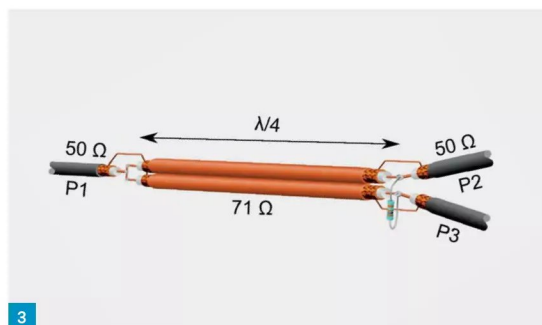
The figures for losses and isolation only remain true while all ports including unused ones are terminated in their characteristic impedance, 50Ω in the present case. This will probably be true if all your receivers hail from the 'Japanese era', say late 1970s, early 1980s to the present. Problems arise when older radios are connected as their input impedances are not consistent: ie HRO: 500Ω; AR88: 200Ω; RA17: 75Ω. Of course, you can design a splitter for unequal impedances. This assumes that you know the input impedance of your receivers and that they are accurately characterised: not always the case!

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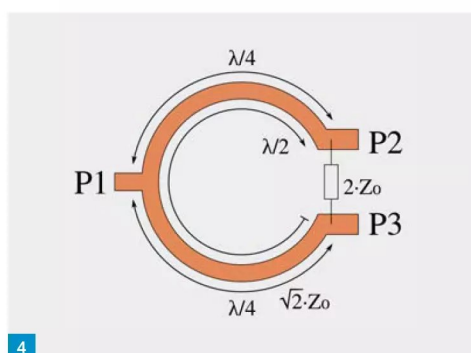




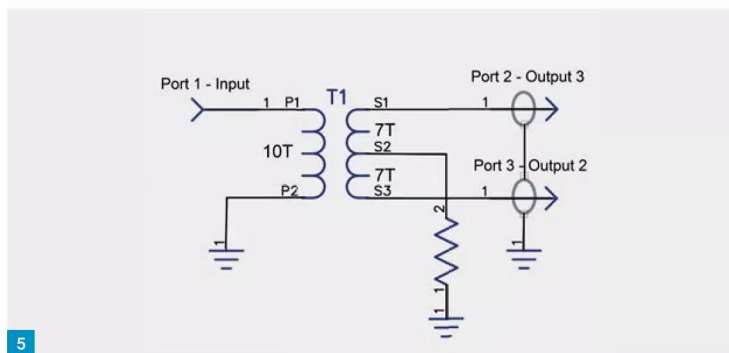
2



3



4



5

Fig. 1: 3-port, two output resistive splitter. Fig. 2: Wilkinson splitter. Fig. 3: 50Ω Wilkinson splitter using coax. Fig. 4: 50Ω Wilkinson splitter on PCB. Fig. 5: Hybrid Splitter. Fig. 6: BBC Tattsfield main receiver rack at Internal Fire-Museum of Power. The same antenna also feeds three ship's radio rooms. Fig. 7: Distribution amplifier circuit showing seven outputs. Fig. 8: Distribution amplifier PCB for up to 11 outputs. Fig. 9: First distribution amplifier built with SMA connectors on PCB outputs. Fig. 10: Another version with coax soldered directly to the PCB.

While an amplifier can compensate for insertion losses, nothing can be done about the poor port isolation characteristics.

Table 1 shows resistor values and losses for resistive splitters from 2 to 8 way.

### Other Passive Splitters

There are other types of passive splitters such as the Wilkinson that depends upon quarter wave transmission lines in either coax or PCB track, Fig. 2. Wilkinson splitters really only find applications at UHF and above where the quarter-wave transmission lines can be realised with short lengths of coax or, more usually, as PCB tracks. The two quarter wave transmission lines are required to have an impedance of  $\sqrt{2} \times Z_0 = 1.414 \times 50 = 70.9\Omega$  (Where  $Z_0 = 50\Omega$  for most of our applications). Examples of Wilkinson splitters constructed from coax and PCB layout are shown in Figs 3 & 4 [1].



### Hybrid Power Dividers

The hybrid splitter shown at Fig. 5 uses a transformer with a 10-turn primary and a 14-turn centre tapped secondary. This equates to a turns ratio of 1:1.4. The impedance ratio is the turns ratio squared so  $1.4^2 = 1:2$ . So, 50Ω impedance is presented at Port 1 (input) resulting in 100Ω appearing between ports 2 and 3, the centre tap is grounded via the 25Ω resistor giving 50Ω between each output port and ground.

Insertion loss for both the Wilkinson and the hybrid splitters is usually restricted to the splitting losses with minimal path loss. They can also exhibit good port isolation, but owing to the introduction of inductance have limited bandwidth.

The Wilkinson mainly finds applications in fixed or restricted frequency equipment while hybrid designs can operate satisfactorily at HF, they won't have the bandwidth of purely resistive splitters.

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antennas I am using are either long wires or End-Fed Half Waves, which do not have 50Ω impedances.

This circuit has a number of benefits, the most significant being very high port isolation in the order of 102dB and insertion loss of 0dB. It will be apparent that all the output impedances are set at 50Ω and the receivers I am dealing with have a range of input impedances. While there will be impedance mismatches on many outputs the losses associated with this are acceptable. One of the major advantages of this design is that the very high port isolation means that, unlike passive splitters, there is virtually no interaction between ports. It would easily be possible to tailor the output impedance of each op-amp by changing the values of the output resistors. However, for my application I needed the flexibility of using any output for any receiver. Finally, the MAX4384s are very low noise devices.

It will be seen from the circuit that only as many sections need be built as required to suit individual requirements. The PCB that I have developed supports 11 outputs from three MAX4384s. There is enough room on a standard Eurocard (160 x 100mm) to accommodate perhaps two more MAX4384s to add a further eight outputs. **Figs 8, 9 & 10** show the bare circuit board for 11 outputs and two examples of populated working circuit boards.

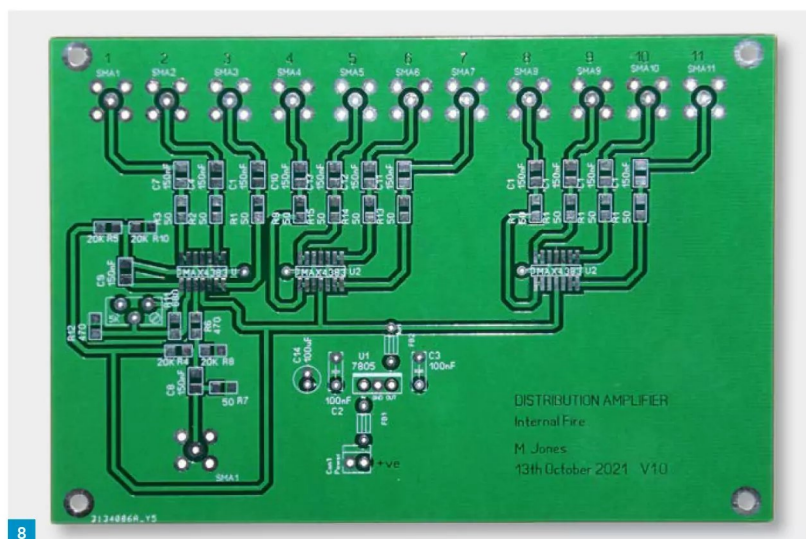
A row of SMA connectors as seen on my first PCB look very nice, but you will soon get tired of making up the connectors, the cost increases too! I found it was much easier and perfectly adequate to solder the coax to the output BNC connectors directly to the PCB.

If the receiving antenna is in close proximity to a transmitting antenna, it would be wise to add two back-to-back diodes at the input to the distribution amplifier to clamp the input voltage to ~0.6V. This will also give some protection against static build-up and close lightning strikes. (These were omitted in error from the original design)

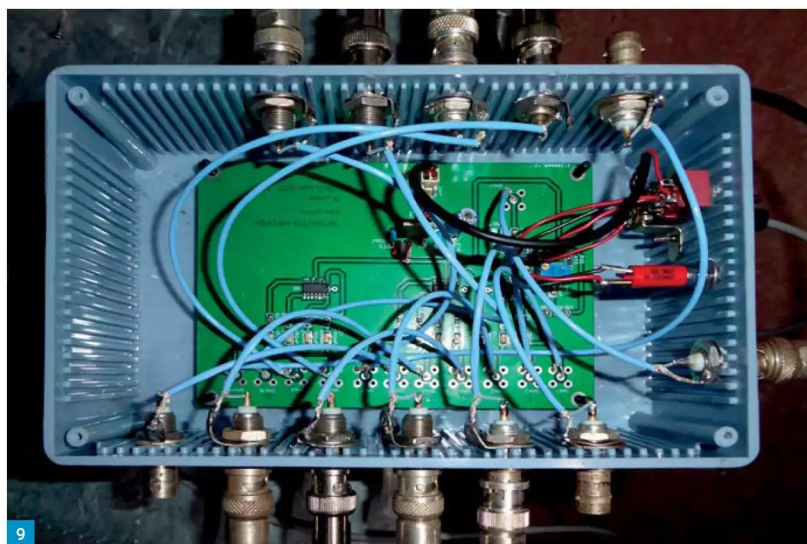
It may be obvious, but do not transmit into a distribution amplifier output as the IC on that output will be destroyed.

## Conclusions

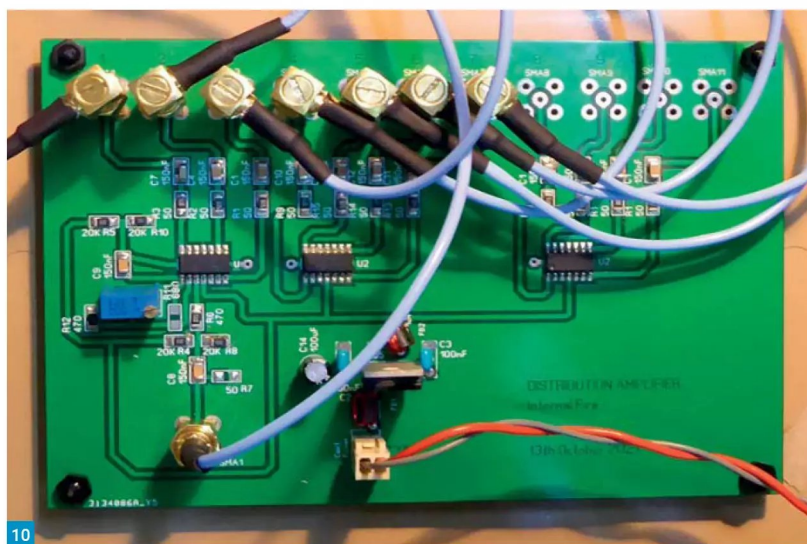
Passive splitters are good for applications requiring a small number of outputs, say two to four, and where the input impedance of all the receivers is well characterised. For larger numbers of outputs where very good port isolation to prevent interaction between output ports is required, then the distribution amplifier is the best choice. I have been very pleased with my distribution amplifiers. They have worked exactly as expected. **PW**



8



9



10

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Roger Laphorn G3XBM

practicalwireless@warnersgroup.co.uk

**T**he 28MHz (10m) amateur allocation spans from 28-29.7MHz. Being this large, there is room for all speech and data modes, including AM and FM and even experimental DATV (digital television). It is (arguably) the very best band for amateur radio operation. It is good for both DX and local communications and requires only simple, small, antennas and low powered equipment. If you've never tried 10m operation, you've missed some great fun. It should be good for several years.

### DXing on 10m

In sunspot maximum years (which we are currently approaching) the 10m band is often wide open for worldwide DX even with QRP power levels and when using the simplest of antennas. At most other times in the sunspot cycle it can open to somewhere in the world during daylight hours although DX is more usually found on N-S paths rather than E-W. In the quieter years, DX may be hard to find due to lack of activity rather than poor conditions. Monitoring the various 10m beacons gives a useful indication of propagation. The usual modes for DX working are USB and CW. In addition, data modes such as FT8, FT4 and WSPR have become increasingly popular as they offer better sensitivity. WSPR is a particularly good mode, being about 14dB more sensitive than standard speed CW.

### Propagation Modes

At times, most propagation modes are possible on the 10m band. Most DX contacts are via F2 layer propagation although short-skip sporadic E (Es) is a propagation mode that frequently brings unexpected contacts at high signal strengths, especially during the spring and early summer months. Sporadic E contacts usually range from 500-1500km, although multi-hop sporadic E may be quite common. There are other E layer long distance modes, possibly involving some sort of chordal hop. Even in sunspot minimum years Es can result in transatlantic contacts from Europe to the USA in summertime. It is not that uncommon for multiple modes to be possible. A summer sporadic E opening can join up with F2 propagation at lower latitudes and some amazing DX then becomes possible when least expected. Another useful mode is aurora, which can support DX out to about 1500km in higher latitudes at times of auroral disturbances. On 10m, auroral contacts on SSB are possible as the phase distortion is less severe than on the 6m or 2m VHF bands. Finally, good old tropo openings can support extended local communications up to several hundreds of kilometres, either just tropo or tropo aided by aircraft reflections.

# 10m Operation

Complementing last month's about converting a CB set for 10m and one planned for next month about 10m FM operation, **Roger Laphorn G3XBM** gives an overview of the 10m band.

This can bring surprise range extensions when operating 10m FM mobile, for example. Tropo openings on 10m are often at their best around sunrise. WSPR is an ideal mode to 'smoke out' fleeting openings as is FT8. In some ways it is surprising that co-channel beacons do not have an FT8 sequence.

### 10m FM

FM operation is centred around 29.6MHz, which is used as the calling frequency. Although when the band is not open this is used by many as a frequency to chat on, it is courteous to move off this frequency once contact has been established in much the same way that 144.3MHz is used in Europe. There are numerous 10m FM repeaters around the world. These use a ~100kHz shift and input frequencies start around 29.5MHz. 10m FM is especially ideal for local communications as ranges up to 40km are possible with just a few watts to a mobile vertical whip or CB half-wave vertical. DX operation using FM can be fun although the QRM level can be high at times unless you spot an opening at a time when few others have. Several people use converted CB equipment. These can be inexpensive and, in many cases, not hard to adapt to 29MHz operation.

### 10m AM

10m is one of the few bands on which AM operation is quite common. The band is wide enough to accommodate AM signals that would just not fit on many lower frequency bands. Look between 29-29.1MHz for AM stations. Often AM operators are using lovingly restored AM transmitters that date back to the 1940s, 50s and 60s. The modulation is frequently superb. Listening to 10m AM is like entering a time warp: this is how amateur radio sounded in the 1950s and 1960s.

### 10m WSPR Beaconing

WSPR is a mode that is perfect for QRP beaconing. This is an ideal mode to check propagation and to experiment with truly milliwatt or even microwatt transmitters. To check WSPR activity you will need (free) WSPR software on your PC and to tune your rig to 28.1246MHz on USB. This mode has shown worldwide openings that would not have been detected using more conventional modes.

WSJT-X software is freely available on the

internet and includes WSPR and FT8. JTDX is similar.

### 10m FT8

In the last few years FT8 has really taken off. It will be interesting to see how this mode will change 10m in the years to come. 28.074MHz USB is where the rig should be tuned. There is also a faster mode called FT4, which works well when propagation is better.

### Antennas

The most modest of antennas on 10m may be used successfully. Good results can be achieved with just a vertical or horizontal dipole or with a CB half-wave vertical antenna. These antennas are very small in size (a wire dipole is just about 5m long) and have a good 'neighbour acceptance factor'! Although a small beam would help at times, many have found that worldwide DX can be achieved without one. Using just an FT-817 with QRP SSB, DX over 11000km has been worked using just an indoor Miracle Whip antenna only about 1.5m long and a radiator ground! You may like to consider the Homebase-10 halo antenna that featured in *PW* in September 2008. This is a omnidirectional wire antenna that is low cost and simple to build. Of course, the simplest of all is just a wire dipole.

### Homebrew Equipment

10m is an ideal band for homebrewed equipment and antennas. A simple VFO (or VXO) controlled transceiver with few parts can be built 'ugly' style on a piece of copper laminate in a few hours. These days a synthesiser IC may be better. A basic 1W VXO controlled transmitter may be built in 30 minutes. Such rigs are capable of working thousands of kilometres and are enormously satisfying to use. Similarly, a small direct conversion transceiver is not much more difficult. At low power, DSB is a perfectly acceptable mode to use on 10m and there have been several circuits published. Simple verticals and beam antennas are easy enough to fabricate using readily available metalwork from the local DIY shop and can be erected without help, if care is taken.

### Conclusions

There has never been a better time to get on 10m. It is a great band with plenty of space. Gear can be simple and low cost and the world is your oyster. **PW**

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Discovery TX-500 has 11 discrete RF bandpass filters. The RF signal is only passed through one of the band-pass filters - any out-of-range signals are rejected.



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The transceiver's body is made of durable aluminum by the method of precision milling, to ensure a unique shock protection and provide good heat removal from the output part of the transmitter.

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Tim Kirby GW4VXE  
gw4vxe@icloud.com

**J**ef Van Raepenbusch ON8NT has been experimenting with FT8CN, an FT8 program that runs on Android. He writes, "FT8CN was developed by BG7YOZ and hosted by N0BOY:

<https://github.com/N0BOY/FT8CN>

"Keith GM4JKZ, one of our DDARS members, drew my attention to this app during our weekly digital net on Thursday evening on XLX305D. This app works perfectly, both on my Samsung tablet and (cheap) Nokia smartphone with the IC-9700 and IC-7300. Configuring the app is very simple and you can choose your transceiver in the settings. Your transceiver can connect via USB (+OTG cable), WiFi/LAN and Bluetooth, or even audio coupling. You can also adjust the time delta in the settings of the app, very handy for field operation. The app contains a map where you can see where the contacts are or which grid squares you have worked/heard. The app can connect over WiFi to the browser on your PC, where you get a dashboard with a lot of information, including importing your log data to a file: you can download all contacts, today (after a SOTA or POTA activation) or last month. I imported the data for April and May 2023 successfully into

## FT8CN: an FT8 program for Android

With the Sporadic E season in full swing and other news to report, **Tim Kirby GW4VXE** has a full column once again.

*my general log on my PC. Operating this app on my smartphone is very easy, and there are no problems in operating even on such a small screen. This is still in Beta, but I'm impressed!"*

### The 8m Band

**Roger Laphorn G3XBM** (Cambridge) says it's been a quieter Es season on the band than last year's, so far. Roger's best day was five spots in a single day of his 2.5W to a low dipole. Roger has also been able to apply for and get, an amendment to his T&I licence from OFCOM to allow him to run up to 20W, which he thinks might be useful for F2 propagation in the autumn but he has no plans to increase power at the moment.

Here at **GW4VXE** (Goodwick), I have tried some 10mW WSPR tests on the band, but have

not received any reports, so far. Having said that, I did not use a resonant antenna for my tests, which given the power level in question, might help.

### The 6m Band

One of the great things about the Es season on 6m is that if propagation is good, then all sorts of antennas will work on the band. A number of people have reported working excellent DX by tuning up a 40m dipole! **Carl Mason GW0VSW** (Port Talbot) discovered recently that he could tune up his G5RV on 6m. Fortunately, that evening the band was open with several stations active on both CW and SSB. Using 5W QRP, Carl worked EA3JI (JN11), EA4R (IM89), HA9RT (JN86), HB9CVQ (JN47), I5ECW (JN53) and OM8CW (KN09), all on CW. On SSB, Carl

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**Fig. 1: High Salvington Windmill, site of the special event station GB0HSM who were very active on 2m FM.**

worked EA5IYK (IM98), IZ7WEI (JN62) and OE9MON (JN47). Carl has just installed a Sirio Tornado vertical for the band and is interested to see how it will perform in comparison to the G5RV.

**Don G3XTT** (Wells) was very pleased to work EK/RX3DPK for a new country on 10 June (on FT8). Unfortunately, that same evening Don's PC copied OA1F for a good ten minutes or so, but Don was out walking the dog at the time! Don says that D2 and 3C have been his other new countries on the band this season.

**Steve Telenius-Lowe PJ4DX** wrote that the 6m Sporadic E season seemed to start quite late this year. *"There were a few openings to southern Europe earlier in May, but the first really long-distance opening I found was on the 15th, when I decoded (though didn't work) TA4/P65V and 9K2GS on FT8. I was finally able to work Abdallah in Kuwait on the 19th, along with SV5DKL for another new one on Six. I thought I had worked ZA/IW2JOP for a third new one in a single session, but unfortunately I don't seem to be in Dimitri's log. Other stations worked during that very good opening on 19 May included 403A, 9A6R, E73B, E78VV, IS0FWY, LZ1ZP, six more SV stations, and TA1BM.*

*"It was not until the 24th that I worked the first UK stations this season, in the persons of Tim GW4VXE and Don G3XTT, along with some French stations and two in the Azores. Two days later was another good opening, this time mainly to northern UK and Scandinavia, with MD0CCE, MM0AMW, GM00QV, GM4CXM and G4SNA worked (as well as G7RAU on the Lizard Peninsula of Cornwall, about as far south in the UK as you can get). SM7FJE, SM6CMU and several Danish and Dutch stations are also in the log, as well as John V47JA for a local 'new one' on 6m.*

*"On the 27th the opening was mainly to Germany and France. Signals from Vincent F4BKV were good enough to allow an exchange of 55/57 reports on 50.130MHz SSB.*

*"Propagation shifted on the 28th with a good opening to North America, including WB0ULX in South Dakota and several stations in Minnesota. Finally, on the 29th, Andy 5Z4VJ (G3AB) was a surprise QSO, no other mainland African stations having been heard for a month or two now."*

**Roger Greengrass EI8KN** (Co Waterford) sends an interesting log, working ZS6WN (KG46) and ZS6NK (KG46) on 23 May, 7X2KF (JM06), CN8YZ (IM63), PY1MHZ (GG98), PY2XB (GG66) and PU1JSV (GG87) all worked on 25 May. Roger worked 3B9FR (MH10) on 29 May.

Jef ON8NT (Aalter) listed the highlights of his log for the month, which included ZB2GI (IM76),

EA9QD (IM75), OH0Z (JP90) and IB0/IW0RLC all on FT8 while running 10W to a vertical.

**Kevin Hewitt ZB2GI** (Gibraltar) made over 300 QSOs during the month on FT8, from his home station. Highlights included 5B4AIF (KM64), 9H1LO (JM75), K9ZO (EN50), NV9L (EN60), VO1CH (GN37), VO1HP (GN37), WT1L (FN65) and WW1L (FN31). Kev was also active on SSB making around 45 QSOs over the month. Kev also used the ZQ2HRH call to celebrate the coronation of **King Charles III**. Over 200 QSOs were made on FT8.

**Andy Adams GW0KZG** (Letterston) put his 6-element Powabeam for the band up in the middle of May. Andy's best opening was on 26 May when he worked W4AS, LU1FAM, LU9FVS, LU2FGL, LU3FAP, LU3DI, LU4FW, PY1MHZ and LU5FF. On 4 June, Andy was pleased to work C07MS. Andy is about 5km away from me here at GW4VXE and it's interesting that we see quite different stations, even over that short distance, showing just how selective propagation can be.

**Ian Bontoft G4ELW** (Bridgwater) says he's given up on using his V-2000 vertical for 6m and is now using a loft mounted HB9CV fixed to the west. Ian uses 25W of FT8 and has worked VO1CH and HI3T. Ian also has a loft mounted dipole, which can be used to fill in other directions.

**Tony Collett G4NBS** (Cambridge) sent his interesting 6m 'diary' out of which I've had to extract the highlights for space reasons. On 24 May, Tony worked OJ0/LA1UW, 7X2RF, ZB2GO and EA9ACF. The afternoon of 26 May was very good with 85 QSOs logged – 3B9FR (MH10) was a particularly nice one. On 29 May, Tony made his first transatlantic QSO of the year with PY2XB (GG66). On the evening of 5 June, around 2130UTC, Tony worked KP4PR (FK68), HI8SDR (FK58), HI3MM (FK49), NP4TT (FK78), FG80J and FG5GP (FK96).

## The 4m Band

**Simon Evans G6AHX** (Twynning) made four Es contacts on 29 May; EA6AM (JM29), CT1DIZ (IM58), EA4LO (IN80) and CT7BIZ (IN60) – all these were on SSB. On 5 June, Simon worked EA7KI (IM76) on Es, again, on SSB.

Roger EI8KN caught the opening on 29 May, working a good number of EA stations on FT8. On 31 May, Roger found an opening to Finland, working OH2BYJ (KP10) and then on 1 June, a good opening to the east working Germany and the Netherlands.

Don G3XTT put up a lightweight 4-element Yagi on a 20ft scaffold pole to get back on the band, and on 13 June worked (among others) OD5ET and ZA/IW2JOP for new ones on the band, these on FT8.

Jef ON8NT has been using his V-2000 (6m/2m/70cm) vertical on 4m and finds that it tunes up OK on 70MHz. Using 25W of FT8

from his IC-7300 he has worked plenty of DX, including EA6SX (JM19), EA4T (IN70), EA4LO (IN80), OH2BYJ (KP10), OH8MGK (KP23), OH7RJ (KP33), OH3AWW (KP11), YO2NAA (KN05), GM8IEM (IO78), E77AR (JN94), HA3PV (JN96), 9A56R (JN83), EA1YV (IN52), EA8DBM (IL18), EA7HY (IM66), EA7Y (IM66), EA7AAF (IM77), EA4LO (IN80), EA7KI (IM76), DL1YDI (JO42) and EI4ACB (IO62).

Kev ZB2GI has been active on the band. On FT8, the highlights were 9H1PI (JM75), 9H1TX (JM75), EA9E (IM75) and EI9KP (IO54).

## The 2m Band

**Ed Spicer M0MNG** writes with a report of activity on the band from a windmill! *"The Worthing and District Amateur Radio Club took part in the Mills On The Air weekend from High Salvington Windmill in West Sussex. We used our traditional callsign GB0HSM on the Sunday only (14 May) [Fig. 1].*

*"Conditions on the HF bands were the worst that I have heard them in around 15 years of taking part. We only managed eight contacts during the whole day. Fortunately, we also put a 2m FM station on the air, and this definitely came to our rescue!*

*"We managed 24 simplex QSOs on 145MHz with our best DX being a station near the Dorset/Devon border. I had thought that conditions were flat, but the telltale mist along the horizon combined with slow and deep fading on some signals suggested that there might have been a bit of a 'lift'.*

*"The Dorset station said that it was really nice to hear activity on 2m, as the band is usually very quiet in his location. Proof that activity breeds activity, especially if you call CQ rather than waiting for somebody else to do it first! We didn't have to call CQ very often; as each QSO finished there was usually a new station waiting to 'tail end'.*

*"It seems like we weren't the only windmill to prefer 145MHz over HF. When we spoke with Stone Cross Windmill near Eastbourne (GB0SXW), they told us that conditions on HF had been so bad on the Saturday that they had decided to concentrate purely on 2m FM on the Sunday!*

*"We used the club's Icom IC-910 running 50 Watts into a collinear antenna on top of a very tall mast. This was held up by a homebrew roof rack mount attached to a club member's car".*

**Keith Watkins G8IXN** (Redruth) was able to open the Isle of Man repeater, GB3GD with one watt to his loft antenna on 30 May, with excellent tropo across the sea. Keith could see the narrow dark band over the horizon, indicating a temperature inversion and the promise of good tropo on VHF/UHF.

Roger EI8KN found tropo conditions excellent on 1 and 2 June. Highlights of the log include



SP3NYF (JO72), DH6DAO (JO41), DL10A (JO41), OK8QC (JN89), OK1CT (JN69), OK1NYD (JN69), DK1FG (JN59) and DL1FAR (JO40), all on FT8. Roger caught a brief Es opening on 1 June when he worked IT9GSF (JM67). There was a much better Es opening on 5 June when Roger worked YO, HA, YU, OE, EA6 and OK with around 25 QSOs logged on FT8 during around an hour's operating.

Jef ON8NT has been using the FT8CN Android app for FT8, running on his cheap Nokia smartphone and says that during the four-hour monthly FT8 contest the app used about 30% of battery capacity. Jef is very pleased with the performance of the app. Highlights of Jef's log include F4JDM (JN07), OV3T (JO46), G4KUX (IO94), GR0JCC (IO82), G4LOH (IO70) and MODSR (IO82).

**Stewart Wilkinson G0LGS** (Cheltenham) caught a brief Es opening to Poland on 4 June, working SQ8AQX. Next day, Stewart caught a much more lengthy opening, working OE4WHG, YU7MS and IZ0BPI on FT8, with HA8MV/P, HG8YKO, HA3KZ, HA6IHA, HA500 and HA8AR on SSB. Operating portable from the Cotswolds during the UK activity contest on 6 June, Stewart found the band good into Denmark, working OZ9KY, OZ1ALS, OZ1BEF and OV3T, all on SSB.

Simon G6AHX caught the Es opening on 5 June, working HA8MV/P (KN06) and YU1LA (KN04).

Roger G3XBM copied signals from Norway, Sweden and Germany on FT8, using his Big Wheel antenna during the tropo lift in early June.

Ian G4ELW caught some tropo, working F5LMG (IN88), GU4EON (IN89) and PA3BIY (JO22) – Ian was particularly pleased to work PA3BIY as it's a very difficult direction for him. On 5 June, Ian was on for the Es opening, which he describes as 'spectacular', enabling him to work YO5AVN (KN17) and OK2WD (JN89). Ian runs 15W to a 5-element Yagi, 4m above ground.

Tony G4NBS found the evening of 31 May good for tropo with the best contacts being DL1SUZ (JO53) and SM7K0J (JO66). Next evening, highlights were DL3DQL (JO61) and LA9AKA (JP20). On the morning of 2 June, Tony worked GM40DA/P (IO99) with just 5W. Tony also caught the Es opening on 5 June working OE6IWG (JN77), OE3EMC, OE3DSB (JN78), OE4HWG, HA1TVQ (JN87), HA3FOK (JN96), YU7ON (KN04), YU7MS and YO5LD (KN05). During the FT8 Activity contest on 7 June, Tony made 100 QSOs in 45 locators.

## The 70cm Band

During the lift on 1/2 June Roger EI8KN worked some good DX on the 70cm (432MHz) band, with the highlights being DL1VPL (JO61), DL2ALF (JO50), DL9DBF (JO40), OV3T (JO46),

DL5FDP (JN49), and DH2UAK (JO71).

Jef ON8NT took part in the monthly FT8 session on 10 May, with the notable stations worked being M0BUL (IO82), 2R0IEI (IO81), G8SEI (IO92), G4VPD (IO92) and GR0LGS (IO81).

Tony G4NBS found the band open on the evening of 31 May, working OZ4VW (JO45), OZ2ND (JO46), DL1SUZ (JO53), DJ8MS (JO54), DL7APV (JO62), DJ4TC (JO63), DM2CNE (JO73) with the next evening being good too, with EI3KD, GD0TEP, GM0HBK, DL5FDP (JN49), DH8BAO (JO43), OV3T (JO46), DL2ALF (JO50), DH2UAK (JO71) all in the log. Like several others, Tony found the band good into Denmark after the 2m FT8AC had finished on 7 June, working OV3T (JO46) and OZ4VW (JO45).

## FM DX

Following **Paul Logan's** interesting piece about transatlantic DX being heard on the FM broadcast band, I asked Paul what time of day was most common for the openings. Paul says that the majority of openings have been in the evenings although he says that there was a very short opening in July 2003 at 0230 local time.

**Larry Horlick VO1FOG** (Newfoundland) logged BBC Radio 2 and BBC Radio 3 from the Wrotham transmitter in Kent on the evening of 10 June. Interestingly at the time, Larry was on 6m SSB working M0IQD in Sittingbourne, only 30km from Wrotham. On 5 June, Larry logged 91.3 SNRT AI-Idaa AI-Watania from Morocco at a distance of 4434km. Other loggings recently have been Cadena 100 88.8MHz and Onda Cero 91.6MHz, the Azores RTP Antena 1 88.9MHz as well as AFN Island FM from the Azores, which is a 150W transmitter and France Musique on 89.4MHz from Brest. Amazing loggings!

Simon G6AHX sent details of his loggings, mostly by Sporadic E. On 18 May, Simon logged several stations in North Africa. On the 19th, the band was open to Portugal with North Africa being heard again on 24 May. On 26 May there was good tropo to Germany, Belgium and France with stations in Portugal being logged again on the 27th. On 1 June, Simon caught an opening on the OIRT band into the Czech Republic and Slovakia, with lots from North Africa on 4 June. Next day on 5 June there were signals from Iceland.

It was also a pleasure to hear from **Adam Wisner** (Cheltenham). Adam writes, *"I'm an FM and DAB DXer in Cheltenham, Gloucestershire. After a bit of a break from it, I've been interested in the hobby again in the last couple of years. I use a couple of SDR devices – an Airspy mini for FM and an RTL-SDR dongle for DAB. As well as that I now have a TEF6686 portable radio. For antennas, due to restrictions where I live I can only have them inside the loft, but I have a 5-element Band III DAB antenna, a 3-element FM*

*Yagi in horizontal polarisation pointing around south east, and a vertical FM dipole.*

*"After an OIRT band (65.9-74.0) opening to Belarus on the 7th, things started to get going a bit more interesting on the 18th with stations from Algeria received, then Italy and Portugal on the 19th. This was followed on the 26th by openings during the day to Portugal, Spain and North Africa and then a very intense opening to Italy, with the band up to 108MHz absolutely full of stations.*

*"The tropo conditions really picked up towards the end of the month, with Denmark being received on 99.9 (DR P4) and 102.1 (Radio 4) from the Rangstrup transmitter briefly in the morning of the 27th. Some of the more powerful services on the north coast of France are also received here at times. On the other hand, with the vertical dipole Ireland is very commonly received here, especially the signals from Mount Leinster and Kippure near Dublin. A highlight from there recently was a 1kW station on 106.4 from Three Rock Mountain near Dublin – Raidió na Life.*

*"A lot of FM (and DAB) DXers use FList, an excellent site kept up to date by volunteers who maintain frequency databases for each country. You can use it as an online logbook and it's just an excellent resource. For example, here are my catches from the last 30 days as logged there, plotted on a map, Fig. 2:*

<https://tinyurl.com/mr4y6zkj>

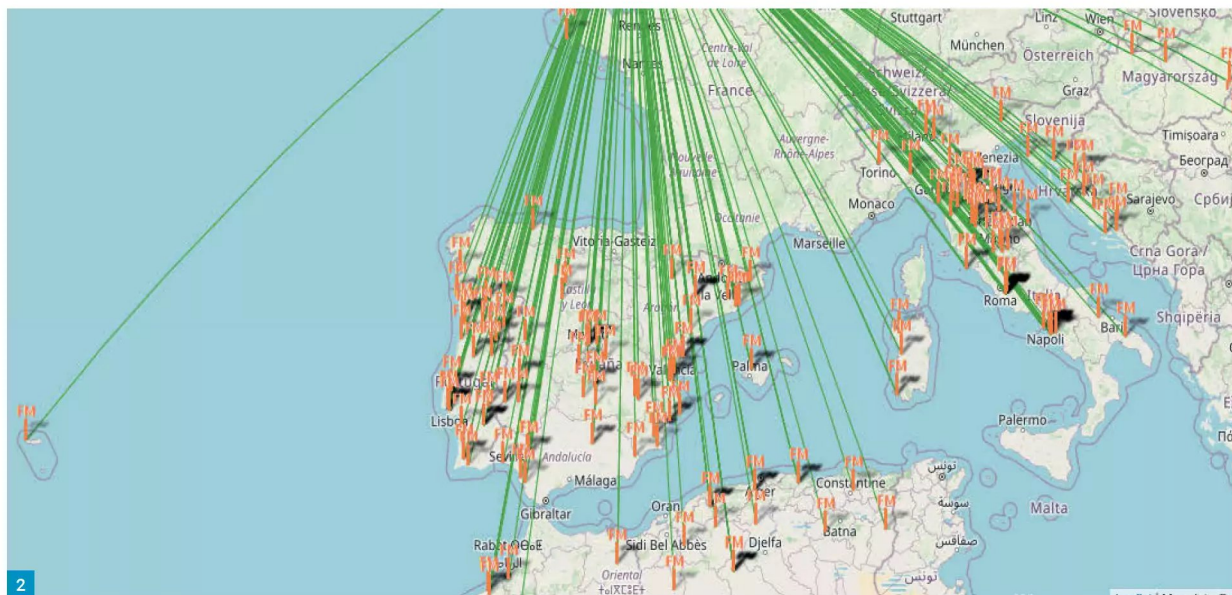
*"On Sunday, 4 June I received the Azores briefly on 89.5 (RTP Antena 1 Açores from the Pico das Éguas transmitter on São Miguel island at 2413km, carrying football commentary). Catching those elusive Atlantic islands is a highlight for me! It's where Cheltenham's geography actually helps, as BBC Radio 2 from Oxford also on 89.5 is nicely nulled out.*

*"On Monday (05/06) there were a few different openings, to central and SE Europe (Slovakia/Hungary/Romania), the Western Balkans (Croatia/Bosnia) and the more common Italy, and the also common Spain/Portugal/Algeria/Morocco. The highlight though was an opening in the evening to Iceland. Several stations were received here from along the south and west coast of the country, including a few RUV transmitters and FM957 from Reykjavik.*

*"Tropo-wise, I was surprised again on 1 and 2 June with a fair few stations received from Western and Central Germany, including MDR Kultur on 87.9 from Inselsberg in Thuringia (878km) and Dlf Kultur on 97.4 from Brocken in Saxony-Anhalt (872km).*

*"DAB has been more disappointing for me. I did receive a couple of the new small scale multiplexes that are springing up across the UK overnight from 31/05 into 01/06 though, which*





**Fig. 2:** A screenshot of FMDX stations received by Adam Wisher in Cheltenham over the last 30 days. **Fig. 3:** Patrick WD9EWK's station setup all ready to test using D-STAR through one of the TEVEL satellites.

was a bit of a surprise! 7D Crewe and Nantwich and 9A Congleton + Leek. The transmitters for these are 138 and 139km away from me respectively, and these are only licensed to run 100-200W ERP!"

## Satellites

Jef ON8NT monitored the ISS schools contact on 25 May.

The ZQ2HRH call proved very popular on QO-100 for Kev ZB2GI, making around 100 QSOs including GB3RS at Bletchley Park.

Many thanks to **Patrick Stoddard WD9EWK** (Phoenix) for another very interesting report, which I have had to edit more heavily than I'd have liked. Patrick writes, "During the last week of May, NA1SS started showing up on the ISS cross-band repeater. Two different crewmembers were making contacts: **John Shoffner KO4MJC** from the Axiom Space Ax-2 mission, and **Warren "Woody" Hoburg KB3HTZ** from the SpaceX Crew-6 mission. Both John and Woody worked stations across North America and Europe. On 29 May, the Memorial Day holiday in the USA (and the day before the Axiom mission, with John KO4MJC as the pilot, departed the ISS), Woody was on the microphone.

"Since that holiday weekend, NA1SS has made a few appearances on other passes, late in the ISS workday around 2100-2200 UTC. As there is no set schedule for NA1SS activity on the cross-band repeater, you have to get on and hope to



hear someone pick up the microphone on the ISS. Woody Hoburg is scheduled to be on the ISS until September or maybe October, so hopefully we may hear more from him as NA1SS.

"In the past few weeks, we have had FM repeaters activated on the TEVEL satellites. Initially, only one of those eight satellites would be active at a time, but now more are being activated. Recently, one or two would be on during the week, and two or even three on weekends. With AO-91's continuing battery issues, it is nice to have some FM satellites passing by in the mornings, and also available in the evenings. According to **David Greenberg**

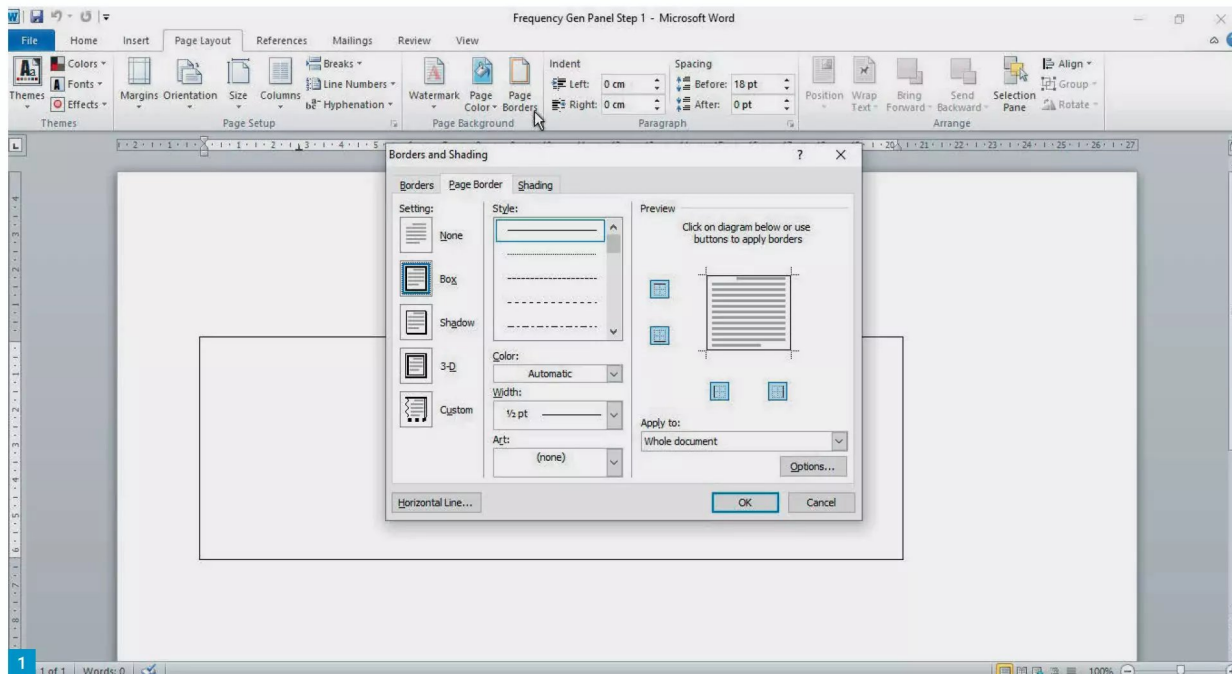
**4X1DG**, two of the eight satellites (TEVEL-1, TEVEL-8) are not available, but the other six are operational. 4X1DG has been sending TEVEL schedule updates to the AMSAT-BB mailing list, and also tweeting the updates from his @DavidGr06270644 Twitter account".

After some experimentation, Patrick has discovered the Tevel satellites can be used, like AO-27, to pass D-STAR transmissions, **Fig. 3**. Why not give it a go if the satellite is quiet?

Another packed column this month. Very many thanks to everyone who has contributed. Please keep your news, reports, pictures and screenshots coming. See you next time. **PW**

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David Hodgkinson BSc CEng FIET GI7TPO  
practicalwireless@warnersgroup.co.uk

**W**ould you like to add a professional looking front panel to your project? Good front panel graphics can really enhance a project. Would you like to use a system that has the following features?

- Graphic design can be completed on any PC.
- Ready to fit within minutes of design completion.
- Wide choice of colours for legends and background.
- Low cost. (10 to 20 pence per panel)
- Repeatable, so ideal for school, club or STEM projects.
- No messy or smelly glues, inks, varnishes or paints with long drying times.
- Easy to modify if requirements change or different versions are needed.
- Covers any existing panel markings or defects, allowing instrument cases to be re-used.

The system to be described is really straightforward and the only additional item of hardware required is a low-cost personal laminator, which is widely available for around £20. In outline the process steps are as follows:

### Plan the Layout

- Produce rough sketches of your proposed panel layout.
- Measure the panel size accurately.
- Make an actual size paper template of the panel.
- Make simple paper cut-outs of the various knobs, displays, switches etc. to be used.

# The Easy Way to Panel Labelling

**David Hodgkinson GI7TPO** describes an easy way to achieve a professional look for your projects.

- Lay these on the panel template and adjust the positions until you are happy with the layout.

### Create the Final Design

- Create an actual size layout of the panel on your computer.
- Measure the position of each control, graphic and caption from the paper template and add them to the computer image.
- Print a plain paper copy of the computer design and check it against the instrument panel, adjust the computer image as necessary until you are totally satisfied.
- Add any colours, graphics etc. to the image, print the final draft and recheck it against the panel.

### Produce the Graphic Panel

- Choose thin card in either white or a colour of your choice for your panel.
- Print your panel and then carefully cut out any display windows etc.
- Laminate the card to produce a durable, wear-resistant panel overlay.
- Trim the panel to size and fit to your project. Normally the fixings for the controls will be

sufficient to secure the overlay, however a few drops of instant adhesive will secure any difficult areas.

If any design changes or additional controls are required, then the design can easily be modified and the existing overlay replaced. Equally, alternative versions can be produced for various members of a group building multiple versions of the same design.

### Plan the Layout

- Produce rough sketches of the panel layout choosing the location of controls to minimise the lengths of internal wiring particularly for any wiring carrying radio frequency signals or power.
- Measure the panel size accurately including measuring the position of any fixing holes or any existing drillings that are to be used for component mountings. Then make an actual size template of the panel using heavy paper or thin card.
- Cut templates out of thin card or heavy paper for each control knob, switch, display, connector and anything else to be mounted on the panel. Ideally the templates should show

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Fig. 1: Setting the borders.

Fig. 2: Step 2 – ready to enter text.

Fig. 3: Setting paragraph spacing.

Fig. 4: Text and graphics entered as required.

Fig. 5: The finished project.

the visible size and the rear mounted size of each component.

- Arrange the control templates on the panel template as per the rough sketch, ensuring there is adequate room for the hidden parts of the controls (potentiometers, rotary switches display brackets etc.). This will be an iterative process until you achieve a combination that has the desired appearance and achieves adequate and safe internal clearances.

## Create the Final Design

The first step is to create a layout on your computer that will print out at the exact size of your panel. Any one of a number of software packages could be used for this. However, there is no need to obtain an elaborate or expensive graphics package. I use Microsoft Word and find that, with a little patience, it will produce an excellent result.

I recently constructed the HF Signal Generator designed by **Eric Edwards** [1]. I wanted to create a professional looking front panel for the generator. I will use examples from this project to illustrate some simple tools within Word that I used for the job.

Open Word and create a new blank document.

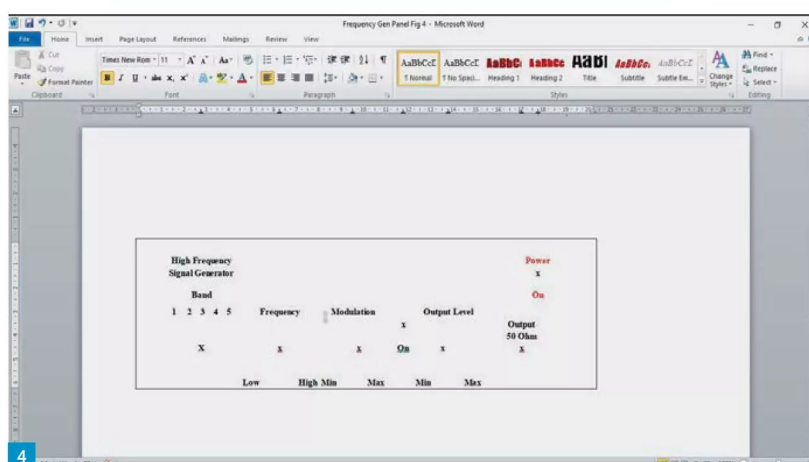
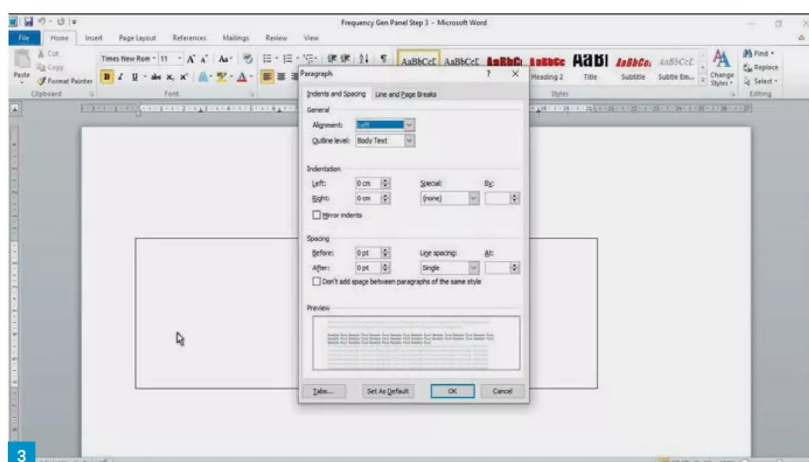
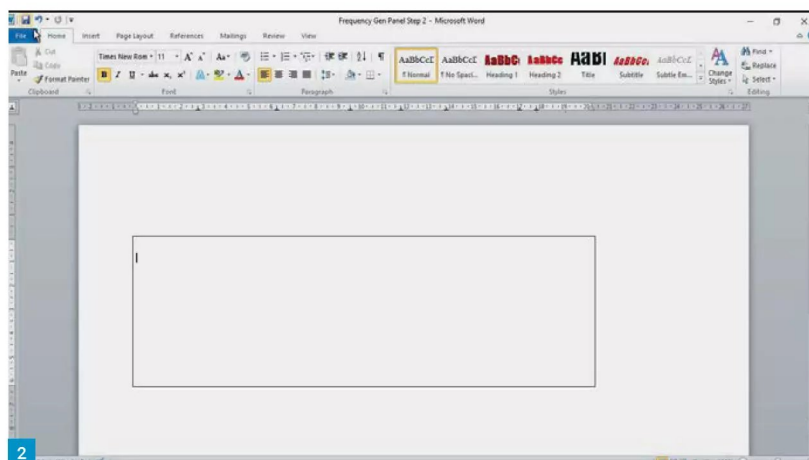
- In the **Page Layout** tab choose the document orientation that matches your panel shape; in this example Landscape is selected.
- In the **View** Tab make sure that the **Ruler** box is ticked.

Adjust the Left Margin in the Ruler to position the panel conveniently on the page and set the Right margin to the exact width of your panel as measured earlier.

- Similarly adjust the top and bottom margins to the exact height of your panel. The ruler and margin bars both are normally calibrated in centimetres.

- In the **Page Layout** tab click on Page Borders and in the **Page Border** sub-tab select **Box**. This will frame the working area and serve as a cutting guide for the final panel. (See screenshot **Fig. 1**)

- Print the page and check that the printed box exactly matches your project front panel. If there is a mismatch, then adjust the margins to achieve an exact match.
- Set **Centre Tab stops** for the horizontal position of each of the controls. This will enable text to be centred for each control.
- Set tab stops to the centre mode by pressing the Tab button at the top left corner of the pane until the centre tab (like an upside down T) appears.



- Click on the ruler line at the centre position of each control to set the tab stop. (Use your measurements from the panel to get the correct position.) (See screenshot **Fig. 2**)
- Set the **text font, style, size and spacing** required.
- In **Paragraph settings** set to single line spacing and **Nil before** and **Nil after** each line.

- Set paragraph spacing to **Nil** before and after. (See screenshot **Fig. 3**)
- With the cursor on the first line of text use the keyboard Tab key to step to the first tab and enter the first legend, use the keyboard Tab key to step to the second tab and enter the second legend and so on to complete the first row of the legend.

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5

- Measure the required vertical position of the text.
- Right-click the line of text, select the Paragraph setting and then adjust the **before** spacing to position the text exactly. (You can enter a numerical value into the box to achieve the exact spacing required.)
- Repeat for each line of text.
- Wherever controls are to be fitted put an X at the centre position of each hole needed.
- Select the colours required for each block of text and add any graphics as desired. (See screenshot **Fig. 4**)
- Print a paper copy of your graphics panel and check it against the project panel, make any small adjustments as required to either the tab positions or line spacing. (If you need to adjust the Tab spacing make sure that you have all the text selected not just one row.) This can be an iterative process as any adjustment to the first line affects the subsequent lines.

## Produce the Graphic Panel

Background colour(s) can be printed as part of the graphics. However, if only one colour is chosen, then the selection of suitable thin card of the appropriate colour usually gives a better result and saves printer ink.

- Print your graphics panel onto thin card and then make one final check against the project's panel.

- Carefully cut any windows (e.g. for the display) out of the graphics panel.
- Load the graphics panel into a Lamination pouch, add a coloured filter (if required) for any display area. (Alternatively, a coloured filter can be slid between the graphics panel and the instrument panel, I used a piece cut from an A4 blue coloured pocket).
- Feed the pouch into the laminator to laminate the panel.
- The panel outline will be printed. Use the outline as a guide to cut the panel to size, a small paper trimmer makes accurate cutting easier.
- Use the printed 'X' markings to centre punch the hole positions of your controls and fixings. Then cut matching holes in the graphics label.
- Put the graphic label onto the project's front plate, add a display filter if required; then assemble the controls to hold the graphics panel in place. If necessary, a small dab of instant adhesive will secure any difficult areas.

## Conclusion

Admire the beauty and professional appearance of your finished project. **Fig 5.**

Should you later decide upon further design enhancements then the artwork can easily be modified and a replacement graphic panel

created at minimal cost.

Now that the design is complete you can readily produce multiple copies for other club or group members, each of which can either be identical or personalised to taste.

## Initial Costs

A4 laminators can be purchased for less than £20 and combination packages that include a laminator and a paper trimmer start at around £30. Or a laminator and trimmer can be bought separately for a similar price.

## Running Costs

A4 Laminating pouches can be obtained for as little as £1.50 for a pack of 25 from discount stores; these are adequate for most applications. However, heavy duty pouches cost around £11.50 for a pack of 100, which is still less than 12p per graphics panel.

A4 Card in white costs around £1.00 for 30 sheets and coloured card is not much more expensive at £2.00 for 50 sheets.

Thus a completed A4 graphics panel will cost between 10p and 15p depending upon the pouch chosen. Multiple small panels could even be combined and produced from one A4 lamination.

## Reference

- [1] Edwards E. "An HF Signal Generator", *Practical Wireless*, November 2021, pp 63-66 **PW**

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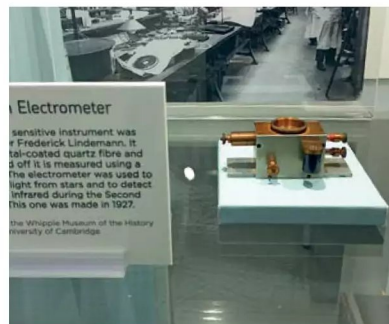
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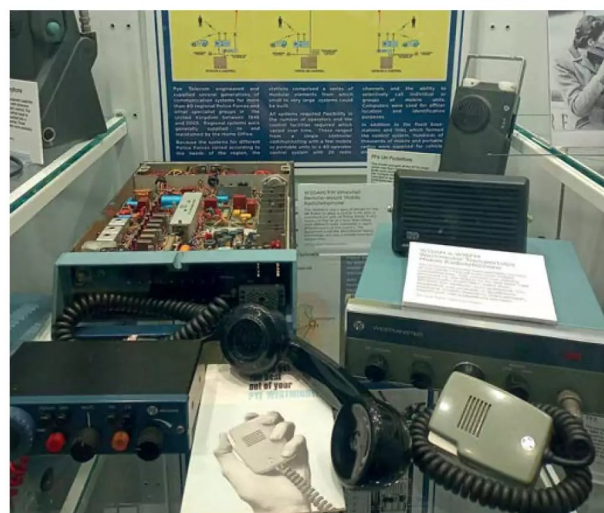
## An Historic Slice of Pye

PW Designer **Mike Edwards** recently visited the exhibition at Cambridge Museum of Technology, celebrating the centenary of the BBC and the first radios made by Cambridge Company Pye. Some 25 of the earliest Pye radios are included in the display. We feature here some of the photos that Mike took on his visit.



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Colin Redwood G6MXL

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**M**any newcomers to the hobby over the last few years have missed out on the construction aspects of the hobby.

The change of syllabus for the Foundation and Intermediate exams means that many newcomers have just a theoretical grasp of basic circuits and may never have carried out tasks such as measuring voltage and current in DC circuits, or be able to recognise common components etc.

No doubt some will debate whether these skills should or should not return to the exam syllabus. What is perhaps more important is that those who wish to can acquire the necessary knowledge and develop a better understanding that really is most easily gained from hands-on practical use.

Talking to members of my local club, many relative newcomers were expressing a desire for some practical construction incorporating component identification, measurement, soldering etc. If you find yourself introducing newcomers to construction, it is probably best to assume no knowledge until proved otherwise.

## First Project

Choosing a first project is important. It needs to be something that is easy to construct and doesn't rely on small or hard-to-get components. If it allows a variety of construction techniques, then so much the better. Above all, don't be too ambitious! If you are tempted by a transmitting project, it is worth remembering that constructors will need at least an Intermediate licence in order to operate it on the air, and won't necessarily be CW operators.

The project should also be something that has a practical use once built. My club chose a battery-powered audio oscillator. This can be used to help learn Morse code and it can also be used as a continuity tester. There are plenty of circuits around for audio oscillators, typically using no more than a dozen or so cheap components.

## Kits

A kit is a good choice for a first project. By buying a kit, all the components come from one source, with no worry about choosing the correct components, and there'll be no minimum order quantity for small components such as resistors – you don't want a pack of 10 or 100 of the same value! It will also minimise postage costs.

## Identifying Components

If you are constructing a project from a kit or have a pile of components in front of you, you'll need to identify what each component is, its type and value. I'm sticking here with traditional leaded components and not the modern surface mount components, as traditional leaded components are much easier to handle for beginners to home construction.

# Component Identification & Construction

Colin recommends some simple constructional techniques along with advice on component identification.



## Ceramic Capacitors

Ceramic Capacitors, **Fig. 1**, are non-polarised, so it doesn't matter which way round they are inserted into a circuit. Many ceramic capacitors are marked with three digits, such as 473, 225 or 104. The first two digits are a value (47, 22, 10 in the examples). The last digit is the multiplier power of 10. So, 3 means  $10^3$  (1,000), 2 means  $10^2$  (100) and 4 means  $10^4$  (10,000). So, 473 means 47,000pF, 222 means 2,200pF, and 104 means 100,000pF.

In many cases values over 1,000pF will be converted to nano Farads in the documentation so, for example, 1,000pF is the same as 1nF. The capacitor marked 222 will be 2,200pF or 2.2nF. Sometimes there will be a letter on the ceramic capacitor (**See Table 1**) to show the tolerance. Ceramic capacitors often have tolerances of between  $\pm 2\%$  and  $\pm 20\%$ . Low tolerance values are often used in tuned circuits.

## Electrolytic Capacitors

Electrolytic capacitors are polarised, so they must be inserted into the circuit the correct way round. They usually have far higher values of capacitance than ceramic capacitors, and their tolerance is often  $\pm 20\%$ ,  $\pm 50\%$  or even more. They rely on a DC supply to work, and are rated at a maximum DC



voltage. There is generally no problem using an electrolytic capacitor with a higher voltage rating than required in a circuit, providing it will physically fit. As a general rule of thumb, the size of electrolytic capacitors increases with capacitance and voltage rating. To determine the polarity, there is usually a black line showing the negative lead of the electrolytic capacitor, **Fig. 2**.

## Radial vs. Axial

There are two main physical configurations of electrolytic capacitors. The first is radial – where both leads are at the same end of the body of the capacitor. This is a good configuration where you want to mount the capacitor vertically on a printed circuit board (PCB) as it can save space on the PCB. The second is axial – where one lead leaves at one end of the body of the capacitor, and the other lead leaves from the other end of the body. The indentation at one end also shows the positive lead (see **Fig. 2** again). You'll encounter electrolytic capacitors with a variety of different coloured bodies.

## Tantalum Capacitors

Tantalum capacitors can be thought of as a special type of electrolytic capacitor. They are generally much smaller than their equivalent value in

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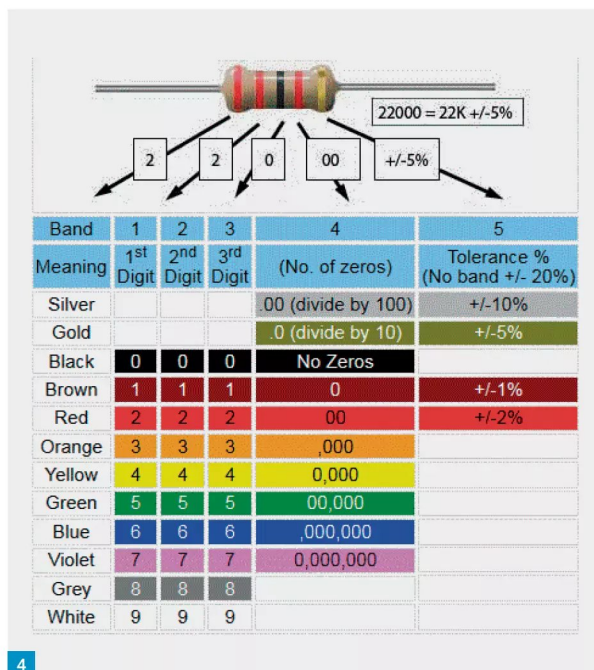
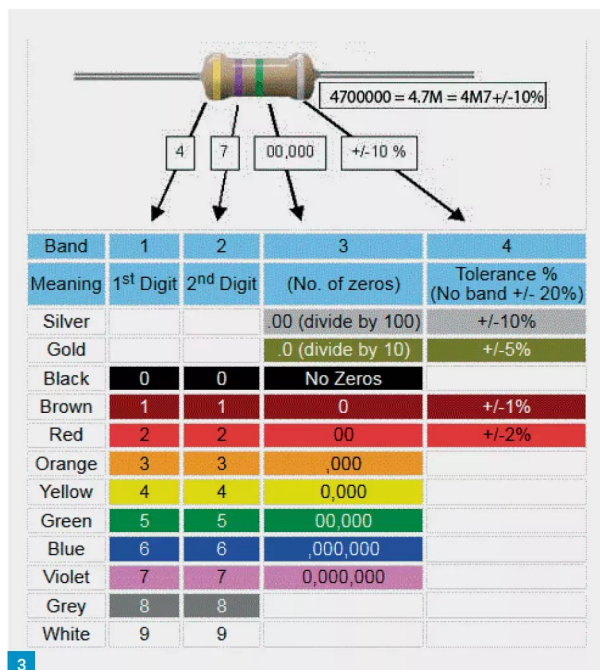


Fig. 1: A ceramic capacitor. Fig. 2: Two electrolytic capacitors – the green is radial and orange is axial in this example. Fig. 3: The resistor colour code for 4 banded resistors.

Fig. 4: The resistor colour code for 5 banded resistors. Fig. 5: A small rectifying diode rated at 1 Amp. Fig. 6: Transistors come in numerous shapes and sizes. Fig. 7: An integrated circuit showing the white mark (bottom left) marking pin 1.

traditional electrolytic capacitors, and usually have a tighter tolerance and a lower working voltage. They are usually found in the radial form only. Again, the colour of the body varies between manufacturers.

## Resistors

Most resistors likely to be encountered are colour coded. There are two variants of the same basic convention. One uses four bands with the first two for the value, the third for the multiplier and the fourth for the tolerance, Fig. 3. The other uses five bands, with the first three for the value, the fourth for the multiplier and the fifth for the tolerance, Fig. 4. In both cases, it is quite rare these days to encounter resistors without a tol-

erance band (meaning  $\pm 20\%$  tolerance). It was far more common 40 or more years ago. I tend to treat such resistors with caution, as they may be very old stock and have drifted in value over the decades since they were manufactured! They are also likely to be very large in comparison with modern resistors of the same wattage rating. While it is perfectly OK to mix resistors of the four and five-band varieties in the same circuit, I try to stick to one or the other for each project, to make identification and fault-finding easier. I try to orientate the resistors the same way round to make subsequent checks easier.

## Semiconductors

I'll briefly cover three types of semiconductors,

namely diodes, transistors and integrated circuits. In all cases correct orientation is imperative. Get this wrong and you risk permanently damaging the device in question. If you are soldering semiconductors, be particularly careful not to overheat the device.

## Diodes

Diodes are two-leaded components. The lead with the band on the end of the body is the cathode, Fig. 5.

## Transistors

Transistors come in numerous designs and sizes, Fig. 6. You'll need to find the model number from the body and look up in a reference guide to get the 'pinout' (the layout of the base, emitter and collector leads).

Note that pinout in reference guides is usually shown looking from the lead up at the underside of the transistor (where the leads go into the body of the transistor).



## Integrated Circuits

Like transistors, integrated circuits (ICs) come in a variety of shapes and sizes, with as few as eight and as many as hundreds of pins to be connected to the circuit. I'd certainly suggest using suitable integrated circuit sockets for your first project using ICs. For ICs with 8, 14 or 16 pins, there is usually a small dimple or mark in the top, **Fig. 7**, which marks pin 1, with the pin numbers increasing by one on the same side as the dimple. The pin numbering continues on the other side ending opposite the dimple.

## Soldering

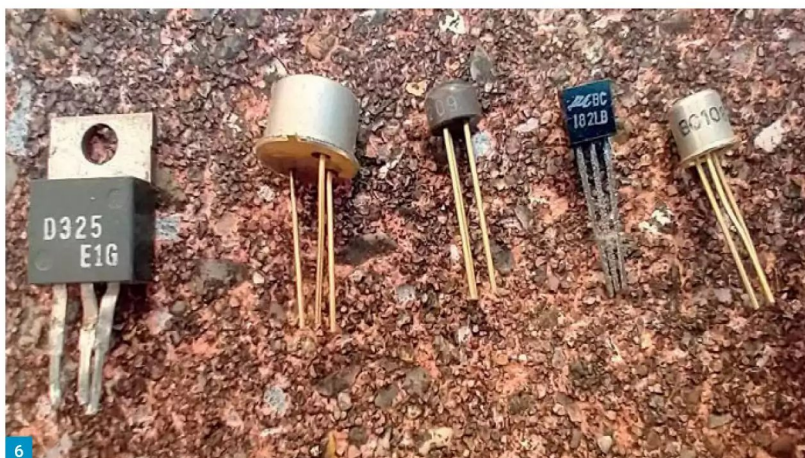
If you don't already own a suitable soldering iron, then you'll need to obtain one. There is a large range available. Those used by plumbers are not suitable. Look for one with a fine tip that is rated at about 25 Watts. Over the years I have found that 25-Watt irons from Antex are really excellent. 25 Watts is powerful enough to provide enough heat for nearly all purposes – don't be tempted with a more powerful iron, as you may overheat and damage temperature sensitive components. Antex also have a range of bit sizes to suit any solder joint you might wish to make, and they have stands and replacement bits available.

You'll also need a soldering iron stand and solder. If you opt for lead-free solder, make sure the iron is able to produce sufficient heat to make a good joint. You'll also need to consider safety precautions, including wearing eye-protecting goggles and providing adequate ventilation. If you are new to soldering or haven't soldered for a few years, I'd suggest practising with a few odd components and a bit of Veroboard or PCB.

Some fumes are produced when soldering. While the amounts are small, they can accumulate with time, so make sure to have adequate ventilation. Indoors with a window open is a good idea. Don't lean down closer than is absolutely necessary to see what you are doing. If you don't wear spectacles, then you should wear some eye protecting goggles. It is very rare for solder to splash up into the air, but it is not unknown. This is particularly likely to happen when you are removing components from a circuit, and when soldering a PCB where there is some moisture present (perhaps a new board that you have just washed).

Before soldering a joint, it is important that both items to be joined are clean. With a PCB, a quick scrub with some wire wool will do the job if the board is not really shiny. Wire wool can be obtained from your local DIY shop. Make sure that you don't leave any wisps of the wire wool around to short out tracks! Component leads probably won't need any preparation unless they have been lying around in a junk box for years. A gentle twist of wire wool will do the job if you have any doubts.

Before plugging in the soldering iron, check that the tip is clean. If not, you may need to lightly file



it. Plug your soldering iron in and wait for a few minutes for it to really warm up. After a few minutes, dab a bit of solder on the tip. If it doesn't melt immediately, then the iron isn't yet hot enough. If in doubt, wait a few minutes longer. Once it is good and hot, tin the tip. This is done by dabbing a little solder on to the tip and allowing it to flow around the surface of the tip. Don't overdo this – we just need a shiny surface on the tip itself. This process is very important as it helps transfer the heat of the soldering iron to the joint. Think of it as the equivalent of water or steam in a saucepan full

of vegetables. If at any time you feel that there is too much solder on the tip of the iron, wipe it off on a small sponge soaked in water.

Now to make the joint. Bring the soldering iron tip and some solder up to the joint simultaneously. Melt the solder and the joint, and wait while the solder flows around the joint. This will take perhaps five seconds or so. Don't just dab the soldering iron on to the joint. The solder needs to flow. Once the solder has flowed, remove the iron and return it to the stand. Now let the joint cool for at least 30 seconds. **PW**

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0.00001 $\mu\text{F}$	0.01nF	10pF
0.0001 $\mu\text{F}$	0.1nF	100pF
0.001 $\mu\text{F}$	1nF	1,000pF
0.01 $\mu\text{F}$	10nF	10,000pF
0.1 $\mu\text{F}$	100nF	100,000pF
1 $\mu\text{F}$	1,000nF	1,000,000pF
10 $\mu\text{F}$	10,000nF	10,000,000pF
100 $\mu\text{F}$	100,000nF	100,000,000pF

Table 1: Converting capacitor values between pF, nF and  $\mu\text{F}$ .

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**Steve Telenius-Lowe PJ4DX**  
teleniuslowe@gmail.com

**W**elcome to the August HF Highlights. The 28MHz beacon report was compiled by **Neil Clarke G0CAS**. During May, Sporadic E got off to a slow start. Small localised openings took place on most days to various areas within Europe, but it was not until the 26th when a widespread opening took place, and again on the 30th when 23 and 24 beacons were heard respectively. The most common beacons heard via Sporadic E during May were IW3FZQ 28228 on 12 days, ED4YBA 28263 on 17 days and DB0UM 28279 on 11 days. In the Middle East 4X6TU 28200 was heard on 28 days and in South Africa ZS6DN 28200 was logged on 13 days. As expected, South American beacons remained good all month: interestingly the farthest south, LU4AA 28200, was heard on 30 days. Further north, OA4B 28200 was heard on 23 days while the farthest north, YV5B on 28200, was only heard on nine days. Only two beacons were logged from North America: AA1SU 28243 on the 5th and VA3KAH 28168 on the 31st. No beacons were heard from the Pacific area but a new one, HS0ZEA on 28260, was heard for three consecutive days from the 7th, although not since then. Apparently, it is running 25W to a 3-element beaming towards Europe.

### The Month on the Air

Four Norwegian operators, LB0VG, LA1UW, LB5SH and LA3WAA, were active from Market Reef, **Fig. 1**, between 20 and 27 May, signing OJ0/own call signs. Market Reef (or Märket – literally ‘the mark’ in Swedish) is one of Europe’s oddest DXCC entities. Located about half-way between the Åland Islands and the Swedish coast, Märket’s sovereignty is divided between Sweden and Finland. Only a couple of metres above sea level and about 350m long, its only structures are a lighthouse, constructed in 1885 when the Grand Duchy of Finland was part of the Russian Empire, and a few associated outbuildings.

In May, **‘BJ’ Rollason WA7WJR** was sailing from Guam to the Solomon Islands when he lost his mainsail in a gale and then his yacht’s engine blew its head gasket. He diverted to the nearest island, Pohnpei, repaired the sail and, while waiting for a new head gasket to arrive, operated ashore from the marina’s bar and restaurant as V63WJR. BJ was mainly on FT8 with some CW and SSB on the 14 to 28MHz bands. His next scheduled stop will be Fiji.

Also in May **Vlad UA4WHX** was operating from Maralal in central Kenya as 5Z4/UA4WHX. Vlad used mostly CW with some SSB on all bands from 3.5 to 50MHz. He went QRT in the early hours of 2 June.

The **King Charles III** Coronation special event, **Fig. 2** (see *HF Highlights*, July 2023), continued until the end of June, with plenty of UK stations taking the opportunity of using the GR, MR or 2R



## Another Busy Month

Despite the usual summer downturn in HF conditions, **Steve Telenius-Lowe PJ4DX** reports another bumper month for activity.

prefix. In mid-May, the RSGB Operating Awards Manager, **Lindsay Pennell G8PMA/G3KME**, wrote that certificates for the RSGB Coronation award would be sent out at the end of the activity. He said “*It seems to be very popular only two weeks into the two-month operation period, with 50 successful applications already. Plenty of UK stations using the ‘R’ prefix, which is great to see, with most activity on FT8/FT4 but still some on SSB and CW, and I myself am operating as GR3KME in PSK31/63 and Olivia on HF too.*”

A real surprise on 28 May was the appearance of **David EZ/DL7ZM** from Turkmenistan. It was a surprise because for the last 17 years all amateur radio activity has been completely banned by the government of secretive Turkmenistan; at the time of going to press it is uncertain whether or not this activity would count for DXCC. This was an academic ‘radio propagation study’ rather than a DXpedition. On his QRZ.com page David wrote that he would be active until 3 June: “*The radio propagation investigation is right now only on CW in 10m... Do not expect a strong signal!... This is a propagation study, so I may just call test test and let the faculty and students observe on DX maps or reverse beacon or so.*” David was quite accurate in suggesting his signal would not be strong: at a time when he was being called by European stations his signal was totally inaudible here in Bonaire.

**Nobby GOVJG** and **Emil DL8JJ** started activity

as MM0UKI from Rockall, **Fig. 3**, on the night of 30/31 May, with Nobby on 7MHz SSB and Emil on 14MHz CW. Both operators were easy to work from here on Bonaire. Rockall, EU-189, is the rarest IOTA counter in Europe. They went QRT in the early hours of 2 June. [see also the report in this issue – ed.]

T31TT from Kanton Island in Central Kiribati also started operations on 31 May. According to the group’s QRZ.com page they had one CW, one SSB and seven FT8 stations on the go. Unfortunately, the DXpedition was cut short and ended on 9 June after one of the boat’s crew sustained an injury necessitating a return to Samoa for medical attention.

On 1 June, **Prince Al Hussein Bin Abdullah II**, the crown prince of Jordan, married **Rajwa Al Saif** in Amman. To celebrate the occasion, all Jordanian amateurs could use the special callsign JY7RW from 1 to 4 June. The crown prince holds the callsign JY2A: he is the grandson of the late **King Hussein bin Talal**, who was famously active as JY1.

### Coming Up...

Although this is the August *PW*, don’t forget that the RSGB Islands On The Air contest runs from 1200UTC on 29 July for 24 hours. Participants can operate on SSB or CW or use both modes. The full rules are at:

[www.rsgbcc.org/hf/rules/2023/riota.shtml](http://www.rsgbcc.org/hf/rules/2023/riota.shtml)

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Fig. 1: The lighthouse on Market Reef.

Fig. 2: UK stations continued to use the GR, MR and 2R prefixes celebration the Coronation until the end of June. Fig. 3: The forbidding vertical walls of Rockall (Photo: [www.geograph.org.uk/photo/1048775](http://www.geograph.org.uk/photo/1048775) copyright Andy Strangeway, Creative Commons Licence). Fig. 4: Eva PJ4EVA operating her favourite mode, FT8. Fig. 5: World Wide Digi DX Contest certificate.

**Vlad OK2WX**, who was active as 9U4WX from Burundi back in February-March, plans to operate as 9Q2WX from the Democratic Republic of the Congo from 20 August to 9 September. He will use CW, SSB and digital modes.

[mdxc.support@9q2wx](mailto:mdxc.support@9q2wx)

The 2023 World Wide Digi DX Contest runs from 1200UTC on Saturday, 26 August, and runs for 24 hours. Despite its name, this contest is for the FT4 and FT8 modes only (and not RTTY, PSK etc). **Eva PJ4EVA**, Fig. 4, participated for the first time last year with a very much part-time low power (less than 100W) entry on 14MHz only and was rewarded with the certificate shown in Fig. 5. The contest rules, and lots of useful tips for operating on FT4 and FT8, can be found at: <https://ww-digi.com>

## Readers' News

**Etienne Vrebo OS8D** wrote when he had "Just came back home from a castle activation in the south of the country (Fig. 6): 122 QSOs on 40m. I really like that new part of our hobby; I'm near to the 100 castles activated in four months." Later he wrote that he had just bought a new Icom IC-7610 as he wished to have "something a little bit 'more' than my Icom IC-7300 to use here inside the shack." During May Etienne made about 1200 QSOs, nearly all as OS8D/P while activating castles using a Yaesu FT-710 at 80W to a SOTAbeams dipole for 40 and 20m.

**Carl Mason GW0VSW** put in an entry to the CQ WPX CW contest at the end of May. He used 5W from a Xiegu G90 transceiver to an 'inverted' G5RV to make 272 QSOs with 49 countries. He wrote: "Band conditions were not so bad though most DX heard was on 15 and 10m. It was nice to work the lower bands for a change though topband was fairly quiet considering the contest was running."



Carl commented that working S56X on 1.8MHz was "hard work with just the G5RV". I'm not surprised: working across Europe on 1.8MHz with just 5 watts during the summer months would be a challenge with almost any antenna.

**Kevin Hewitt ZB2GI** wrote about the Gibraltar Amateur Radio Society's activation of special event station ZQ2HRH to celebrate the Coronation of King Charles III on 6 May. ZQ2HRH was on the air throughout May and made over 3000 QSOs on SSB, more than 1000 on FT8 and over 200 on CW. GARS members **John King ZB2JK** operated on SSB, **Ronnie Payas ZB2RR** operated FT8 and SSTV, **Ernest Stagnetto ZB2FK** operated CW while Kevin himself used SSB, FT8 and SSTV. One of the SSTV images transmitted by ZQ2HRH is shown in Fig. 7. Kevin wrote: "My ZQ2HRH FT8 log included 900+ QSOs operating from my home station and



the GARS station. Operating on 15m SSB with John, we had to operate split and by call numbers to control the pile-up. Operating early in the morning and late at night resulted in many stations working Gibraltar for the first time. The ZQ2HRH QRZ.com page had 19,444 look-ups at the end of May."

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Owen Williams G0PHY said "here's my latest report that I thought would be all about Rockall but looking through the log I see there is a little bit more activity than last month. A number of special event stations in Europe were worked during the month. These included ZQ2HRH, celebrating the coronation of King Charles III, DL17UBOOT, the transfer of U17 from Kiel to a museum in Speyer and F/ON6UN/P from the D-Day beaches. Two of the four Norwegians on Market Reef were worked on 14MHz. There were openings to the USA on 14MHz in the evenings and early mornings. N8QA in southern Ohio that was part of the Lewis and Clark Trail on the Air event was worked in the evening. There were early morning contacts with KB3WD in Washington DC and W6AFA in Studio City, California.

"The highlight of the month was undoubtedly MM0UKI from Rockall. The W6EL Prop showed that the best chance of a QSO was late night or early morning on 7MHz. I prepared for this by replacing the 'chocolate block' connector joining the radials to the quarter-wave inverted-L antenna. The plastic of the original block had been degraded over time to such an extent that only the rusty metal inserts remained. This was replaced and a few more radials added and then it was a question of waiting. Nobby G0VJG was strong on 21MHz during the afternoon of 31 May but I could not break the pile-up. I then decided to stay up late that night and my patience was rewarded with a 7MHz contact at 2327UTC.

"There was interesting propagation on the evening of 23 May. The UAE club station A62A as very strong on 14MHz and I heard PJ4KY work him. The operator at A62A told Bert that they were also on 18MHz and again I heard both sides of the QSO. The operator on 18MHz was Amir 4X6TT, who suggested that they try 24MHz. I could hear Bert but not Amir. Bert must have a really special station." [He has, see Fig. 8 – Ed.]

Tim Kirby GW4VXE found conditions much changed over the last month: "During the daytime, 20m has been very poor with very high absorption,



meaning that 15m and sometimes 17m have been much better bets for making contacts. In general, 10m has been poor too, although there have been a few European QSOs via Sporadic E. The weekly CWOps CWT sessions are always a good indicator of conditions and, for the last few weeks, it's been quite hard to raise North America during the 1300 event, especially on 20m, though 15m has been a better bet. During the 1900 event it's still been possible to work the west coast on 15m, but North American signals have faded much earlier.

"This weekend, Justin G4TSH came to stay and, with an extra pair of hands, we put up a small mast holding 20 and 10m dipoles sharing the same feeder. So far the results seem encouraging, but it's early days... With less DX around, I have been enjoying working SOTA portables on CW, mostly on 20 and 40m."

Don G3XTT reports working two new ones on the 12m band, T31TT on FT4 and VP6A on FT8. VP6A was running four streams using Fox and Hounds mode and achieving a high QSO rate. I expect to have more on the VP6A operation next month (and see A Revolutionary DXpedition in last month's column).

### Band Highlights

Etienne OS8D: 14MHz SSB: 4L7KA, F04AE, JY7RW, MM0UKI (Rockall), O4ADAG. 21MHz SSB: 5UA99WS, BA4TB.

Carl GW0VSW (all QRP): 1.8MHz CW: LN8W, S56X. 3.5MHz CW: CN3A, MJ0X, OL750HOL.

Fig. 6: OS8D/P handing out the castle contacts in May. Fig. 7: An SSTV image transmitted by special event station ZQ2HRH. Fig. 8: Bert PJ4KY working on his SteppIR 'MonstIR' beam.

7MHz CW: 9H6A, DL17UBOOT, K1ZZ, TF/DL1MGB. 14MHz CW: CT3KN, HB0A, EF8R. 21MHz CW: CN3A, EA9/EA5EL, EH8DDC, K1LZ, VY2TT, WP3X. 28MHz CW: CW5W, EA8BQM, FY5FY, LU8DPM, P3C, PY2FRQ.

Kevin ZB2GI: 14MHz SSB: K1A, V44KBP, VK4NBX, ZL1XS. 18MHz SSB: VK3HJ, ZL4SQ. 21MHz SSB: GU5XW, V01CAL. 21MHz FT4: 9K2GR, BG4TRN, BG8PC, JA0DAI, JR5XPG, KJ7TEA, YB3BGM.

GARS ZQ2HRH SES: 3.5MHz CW: WE5S. 14MHz SSB: 6Y5CB, 9Z4GKM, AB6BT, CE4PS, HC4CS, HI3SD, JA6GGD, KH6CT, KL7HRN, KP4NYC, LU5BX, PJ4KY, PY2DV, TI2SD, V44KBP, VK1IR, VK2CIA, VK3DU, VK4PDX, VK5KI, VK6WC, VK7RG, VK8GM, XQ6CF, YV4ABR, ZL1DK, ZL3NB. 14MHz CW: N7DR, PY1NP. 14MHz FT8: 4X5MZ, N6RW. 18MHz SSB: VK3TZ, ZL4SQ. 18MHz CW: K0TF, PY2DV. 18MHz FT8: C07IG, JA1QVR, VK3BY, W7AAD. 21MHz SSB: C07NL, JJ1LWA, N7NG, PT7ZT. 21MHz CW: HC5LM, PT9DX, WC6Y. 21MHz FT8: N0TZC, TA3BD, YB8QF. 24MHz FT8: 9Y4DG, BV7NR, E29TGW, PU2MST, WC2F, XE1KK. 28MHz SSB: HC1JG, LU7FIA, PJ7FM, PP5BT, W7SMW. 28MHz FT8: CA3HXY, CX3DAC, JJ1HMR, KP4OMR, LU5EPB, PY3TP, YV5JLQ.

Owen G0PHY: 7MHz SSB: MM0UKI. 14MHz SSB: K0C, OJ/LA3WAA, OJ/LB5SH, FM1HN, W6AFA.

Tim GW4VXE/GW4MM: 14MHz CW: KP4TF, V26GB, VK2GR, VK3DBD. 18MHz CW: FY5KE, TZ4AM. 21MHz CW: A61Q, A7/RN1B, BH7FFR, FR4KR, KP2M, KP4TF, LU7HN, PJ2/K5PI, PT7BI, V26GB, VP5M. 24MHz CW: ZS1ANF.

### Signing Off

Thanks to all contributors. Please send all input for this column to [teleniuslowe@gmail.com](mailto:teleniuslowe@gmail.com) by the 11th of each month. For the October issue the deadline is 11 August. 73, Steve PJ4DX. **PW**

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Roger Dowling G3NKH  
practicalwireless@warnersgroup.co.uk

**A** fantastic trip – and the results exceeded all our expectations”. That was the verdict of inveterate DXpeditioner **Nobby Styles G0VJG** on his return from the long-planned Rockall 2023 expedition (*The Face behind the Call, May PW*). The twin objectives of the trip to the lonely 17 metre high outcrop of rock in the North Atlantic, **Fig. 1**, over 300 nautical miles from the Outer Hebrides, were to activate EU-189, one of the world’s most-wanted Islands on the Air (IOTAs), and to raise funds for Royal Navy and British Army charities.

The adventure started from Inverkip Marina in the north of Scotland on Friday, 26 May as the 60ft racing yacht *Taeping* made its way up the Firth of Clyde towards the open sea. It had nine passengers: a crew of four, two cameramen shooting a video for a planned documentary *Rockall The Edge of Existence*, and the three-man team, **Fig. 2**, who planned to land on the rock itself. Leader was the Scottish marine biologist and oceanographer **Chris ‘Cam’ Cameron**, who planned to stay on the rock long enough to beat the previous record of 45 days. Nobby Styles was expedition radio operator, working alongside experienced climber **Emil Bergmann DL8JJ**.

A number of local radio amateurs came along to see them off, together with reporters from

## Destination: Rockall 2023

**Nobby Styles G0VJG** tells **Roger Dowling G3NKH** about the major MM0UKI Rockall expedition.

the national press. Fortunately, the weather was good, though the sea was somewhat choppy as *Taeping* left the shelter of the harbour. They sailed for about six hours before anchoring overnight to avoid an expected weather front, followed by a further nine hours the next day and an overnight stay at Campbeltown on the Kintyre peninsular for food, drink and last-minute provisions. Then, beyond the tip of the Mull of Kintyre, it was pretty well open sea for the rest of the voyage to Rockall.

*“And that where the sea became very choppy indeed,”* said Nobby. *“Five of the nine of us on board became really sea-sick. I took tablets, but they just made me feel even worse”*. There were strict safety rules when moving around the boat: lifejackets had to be worn at all times and the team had to be clipped to the boat when moving around.

### The Team reach Rockall

Travelling at 6-9 knots, *Taeping* finally reached Rockall early in the morning of Tuesday, 30 May. Weather conditions remained good, though there were occasional heavy mists, which made the rock quite wet and slippery. For obvious safety reasons,

*Taeping* remained well away from the rock, **Fig. 3**, but for landing purposes the team had a specially designed powered dinghy with a strong metal hull that could withstand any unintended impact with the rock.

The task of getting on to the rock was by no means simple, as the team was to discover the hard way. It was agreed that Emil, as the climber, would be the first; he could then fix lines in position to help his two colleagues who would follow. As the weather was quite warm, he decided not to wear his dry suit as it would be easier to climb in climbing clothes, but it was a decision he came to regret when he fell into the icy sea on his first attempt to jump across on to the rock. His life jacket inflated automatically and Emil was eventually ready for a second attempt – but that was also unsuccessful. Fortunately, it was a case of third time lucky!

Understandably, Nobby feared the worst when it was his turn to get on to the rock. *“I just crossed my fingers, took a giant leap, and hoped for the best,”* he said. *“And somehow, I managed it!”* Cam followed, a little while later.

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Fig. 1: In position on the rock (photo: Aaron Wheeler). Fig. 2: L to r: 'Cam' Cameron, Emil Bergmann, Nobby Styles. Fig. 3: Taeping kept a safe distance from Rockall throughout (photo: Aaron Wheeler). Fig. 4: One of the two operating positions. Fig. 5: Life on the ledge: the survival pod and storage barrels.

## Getting up to Hall's Ledge

But that was only the first challenge. The team then had to climb up to Hall's Ledge, the only flat occupiable area of Rockall about 14m above sea level where they would be setting up the station. As planned, Emil had set up lines from the landing point and in theory it should just have been a simple case of Nobby and Cam following on. But disaster nearly struck again. *"There was one section where I had to climb along ropes where the rock was overhanging the sea,"* said Nobby. *"But the rope between me and Emil somehow got stuck. I was hanging on to it for dear life, while Emil was shouting to me on the marine radio to release more rope so he could move forward. In the end he had to climb back down and free the rope!"* The climbing was much harder than any of them had expected. Cam took a slightly different route up the rock and at one stage even he almost had to give up – he had almost run out of energy.

Having got themselves on to Hall's Ledge, the next task, not completed until midnight, was to winch up the survival pod, radio gear and survival provisions from the dinghy below. The radio equipment included two tiny Yaesu FT-857D transceivers, an Icom IC-7300 and an Elecraft KX2 pocket-sized QRP rig. They also had an HX890 marine radio, and an Iridium GO system. **Rick Westerman DJ0IP** kindly supplied a specially designed doublet antenna with a very lightweight centre insulator and specially robust wire, and Emil himself provided a G5RV. Both were on Spiderbeam 10m-Mini fibreglass poles. A third antenna was a 10m wire vertical on a Spiderbeam attached to the rock. This pointed out to the sea at 45° and worked very well, particularly 40m and 20m. Power came from a Honda 1kW generator, plus solar panels and a battery to provide further back-up.

## Life on the Rock

*"The weather was quite kind so I preferred to operate in the open air while Emil operated in the pod,"* said Nobby, **Figs. 4 and 5**. *"Emil did all the CW work and notched up nearly 4,000 QSOs – he never seemed to need any sleep! I did the SSB work and shared the FT8 work with Emil, even managing 18 stations on 6m."*

Operating in the open air did have its drawbacks, however. *"The biggest problem was a very heavy dew, which made everything damp. But just as bad was being bombed by the large gannets flying overhead that deposited bird poo on us at regular intervals. On one occasion I had to terminate a QSO completely when a gannet did a bulls eye onto my laptop."*



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## Bands Worked

The charts show the breakdown of the 7,227 QSOs completed during the four days and three nights spent on the rock. The first chart, **Chart 1**, is interesting because it demonstrates the growing popularity of FT8, particularly in an IOTA situation where for obvious reasons there is more interest in 'making contact' than having a formal QSO. **Chart 2** shows the dominance of 20m, which accounted for about half of the QSOs while on the rock, and **Chart 3** shows the pre-eminence of European stations (84% of the 7,227 QSOs) and North America (13%).

"We were hoping to have around 5,000 QSOs while we were on the rock," said Nobby. "The 7,227 figure was far beyond our expectations and the pile-ups were the biggest I have ever heard. It was great to give so many stations the rare EU-189 IOTA locator." All stations worked will automatically receive a specially designed QSL card, thanks to QSL Manager **Charlie Wilmott MO0XO**.



## De-rigging

De-rigging was a fairly straightforward operation, which started at 6.00am on Friday, 2 June and was completed in about six hours, leaving on the rock only the equipment and facilities that would still be needed by Cam who was staying on the rock alone. The voyage home was fairly uneventful and the team arrived back at Inverkip on the morning of Sunday, 4 June.

## Thanks - and the Future

"We couldn't have made this trip without the generous support of all our many sponsors," said Nobby. "On the radio side, we'd particularly like to thank Yaesu, CDXC, RSGB, IREF, GMDX, Landpod,

James Burden, Spiderbeam, EIDX Group, LZ1JZ, Northern Ohio DX Group, GDXF, FEDXP, AGCW Group, SQ1K and DXWorld". The team would also like to thank everyone who has donated to their appeal, which has already provided thousands of pounds for the expedition's two designated charities. "Donations though the event website [RockallExped.com](http://RockallExped.com) will still be very welcome," said Nobby.

After the rigours of Rockall 2023, I rather expected that Nobby would want to put his feet up for a while. But no – he told me he was already planning his next major outing. He wouldn't be drawn on the destination but would only say mysteriously that it would be "very, very interesting!" Watch this space... **PW**

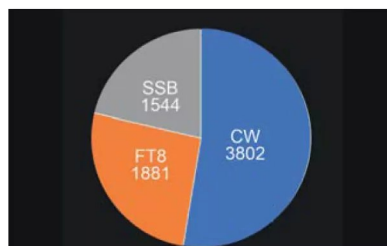


Chart 1: Mode breakdown.

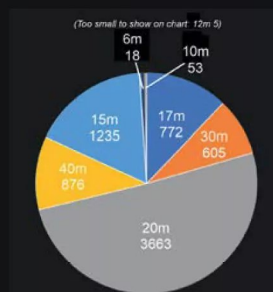


Chart 2: Band breakdown.

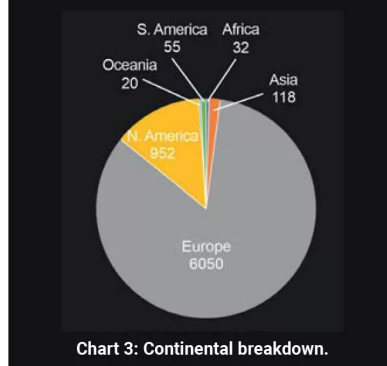


Chart 3: Continental breakdown.

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Keith Rawlings G4MIU  
keith.g4miu@gmail.com

**H**ello again! In last month's column I described my TinySA-Ultra purchased from UK authorised dealer Mirfield Electronics. I discussed how it could be used to trace sources of unwanted noise and described a shielded loop antenna for use in hunting down these noise sources using any suitable receiving device, including the TinySA, which can be most useful for this being portable and having a generous internal battery life.

The TinySA itself is also entirely suitable for use in individually pinpointing offending devices once the location of the source has been found. Then, where appropriate, it is also possible to trace the actual point on a circuit board where the noise is radiating from by using suitable probes. Therefore, it may be feasible to use the device to take action and modify the circuit to eliminate the noise.

This month I will describe how to make a couple of simple probes to do this but as we may be dealing with mains powered devices I would be remiss if I didn't add some words of caution.

Let's say we suspect that noise is being radiated from a 'Wall Wart' PSU. We can use the TinySA connected to a probe to run over the outside of the case where we should be able to confirm that this is indeed the offending item, **Fig. 1**. This is safe enough.

If, however, the case of that PSU is removed with a view of identifying down to component level where the noise may be radiating from, then there exists an extreme hazard due to possible contact with the mains voltage.

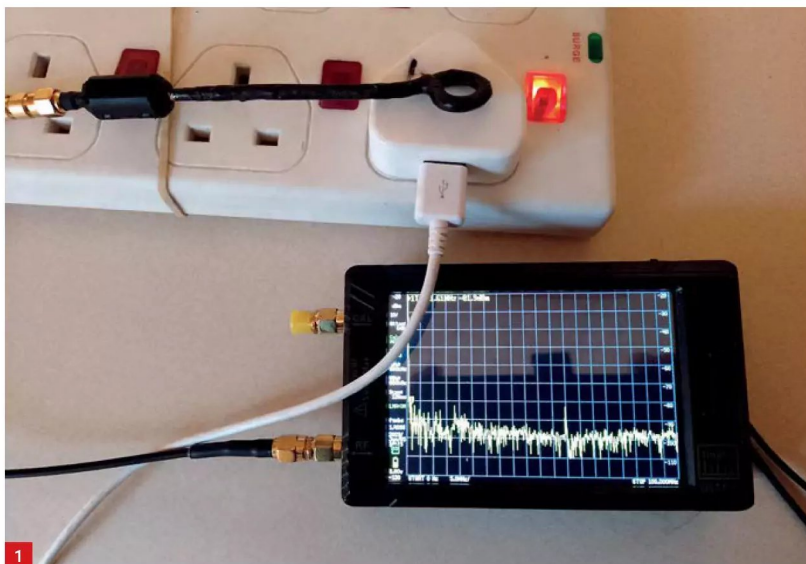
I know there are plenty of *PW* readers who will be comfortable and more than competent to do this, which is fine but, for those that are not, by all means identify a noise source but then leave it at that, keep the covers on and please go and find a non-noisy replacement!

### Using the TinySA Ultra with Probes

To identify a specific area of a circuit board that has an issue while using a TinySA, or in fact, any other SA, we need to connect an antenna with a suitably small capture area.

As we will very likely need to be able to differentiate between E-Field and H-Field radiation we will need the use of both Near Field E and H (sniffer) probes, which are, on the face of it, still antennas.

E-Field probes will respond primarily to the Electric Field, which is generally produced by voltage changes in the circuit. A simple homemade E field probe can be seen in top of **Fig. 2** where the small stub at the end of the probe is the 'antenna'. E field measurements with this type of probe are insensitive to the orientation of the probe.



## TinySA-Ultra, Probes and QRM Continued

Keith Rawlings G4MIU looks at further uses of the TinySA-Ultra.

H-Field probes respond primarily to the Magnetic Field, which is produced by current changes. See **Fig. 2** bottom. Here you can see the probe looks like a loop, which is shielded to minimise E-Field pick-up.

It is, in fact, another form of shielded loop as described last month and this type of probe is sensitive to orientation, as it will respond to currents that are flowing in the same plane as the loop, i.e. are parallel to it.

Incidentally it is possible to use an unshielded loop, which will respond to both the E and H Fields.

The beauty of using probes such as this is that they are not directly connected to the circuit but held close to it so there is minimal, if any, loading on the circuit. Probes of this sort should enable you to find the location of a problem component, board trace, or part of a circuit, as well as identifying RF leakage from connectors, cables and even enclosures.

Shielded loops may be orientated for maximum and/or minimum pick-up to further help isolate noise paths.

Probe sets, often called EMC probes, can be bought at prices from the very expensive with accompanying pre-amps, which might be used in scenarios such as compliance testing, all the way down to the very cheap Chinese offerings on eBay for around the £12-20 mark. I have not

tried the latter but if construction is not your thing and you fancy sniffing around appliances looking for radiated noise, then these may be a bargain.

If you don't mind a bit of wire snipping and soldering, then it is a simple matter to make your own. There are quite a few ways that to configure homemade probes but they will all basically fall into two categories, E Field Stub or H Field Loop often in the form as seen in **Fig. 3**.

There are a number of resources on the internet that describe probe construction and the probes I am detailing here are copies of those from an EEVblog YouTube video:

[www.youtube.com/watch?v=2xy3Hm1\\_Zql](http://www.youtube.com/watch?v=2xy3Hm1_Zql)

Here both E and H field probe construction is described and then compared with a \$300 commercial set made by Tekbox.

### Construction

As per the video I bought off eBay a 30cm length of RG401 semi-rigid coaxial cable terminated with male SMA plugs on each end. This cost me £4.78 delivered from the Far East. In addition I ordered a couple of clip-on EMI ferrites to fit over the RG402 (see links below and the photo, **Fig. 4**):

[www.ebay.co.uk/itm/184375875989](http://www.ebay.co.uk/itm/184375875989)

[www.ebay.co.uk/itm/125776754085](http://www.ebay.co.uk/itm/125776754085)

Also needed was some heatshrink sleeving

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Fig. 1: TinySA-Ultra displaying noise from a Wall Wart PSU. Fig. 2: Completed E-Field probe (top), H-Field probe (bottom). Fig. 3: Cable and clip-on ferrites. Fig. 4: Completed probes before applying insulation. Fig. 5: Close up view of loop before soldering. Fig. 6: Close in view of the H-Field loop. Fig. 7: TinySA-Ultra measuring noise from the sockets of a Racal RA6790GM Serial Interface.

to go over the RG402 and some liquid rubber, both of which I had on the shelf. I already had the same wideband amplifier used in the video.

I started by cutting the RG402 130mm from one end to make the E field probe. Next, I trimmed back the outer braid and also the insulation from the inner conductor to leave a 5mm 'stub' of copper protruding from the end. See Fig. 3 bottom. And that was the E field probe made, well, almost! For the sake of safety I covered the outer screen with heatshrink to insulate both it and the exposed 'tip' from accidental contact with a live part of the circuit and I then clipped the ferrite over the probe with the intention of reducing currents being picked up on the shield.

The H Field probe requires a bit more work to produce.

I used the remaining end of the RG402 and cut back the end in a similar way to the E-Field probe although I left only about 2mm of the inner protruding. I then bent this end round back on itself to form a circle of about 20mm, Fig. 5.

Next, I soldered both the inner conductor and outer screen onto the outer braid where the loop touched and then a small cut was then made in the shield at the top of the loop, which can be seen in Fig. 6.

On this probe insulation was provided by applying a couple of coats of liquid rubber and when dry the second ferrite was clipped into place and job done.

## In Use

The wall wart PSU in Fig. 1 was known to cause hash over a wide frequency range, which was enough to disrupt reception from up to around 20 feet away on a Sangean ATA909X2 when using the internal ferrite antenna.

Fig. 1 shows the extent of this interference. The TinySA-Ultra was set to span 0-100MHz with 'Peak Hold' set to capture what were essentially rapid broadband switching spikes radiating from the PSU.

The H Field Loop was used in this demonstration and while in this case the device was a known noise culprit the TinySA/Probe combination would be a good tool to identify a noise source in an unknown environment.

Another Issue I have with QRM is home based and is being caused by one of my own receivers! The offending device is a Racal RA6790GM, which is fitted with an A6A1 RS232 interface card, which in turn connects to the receiver's A6A2 CPU card.

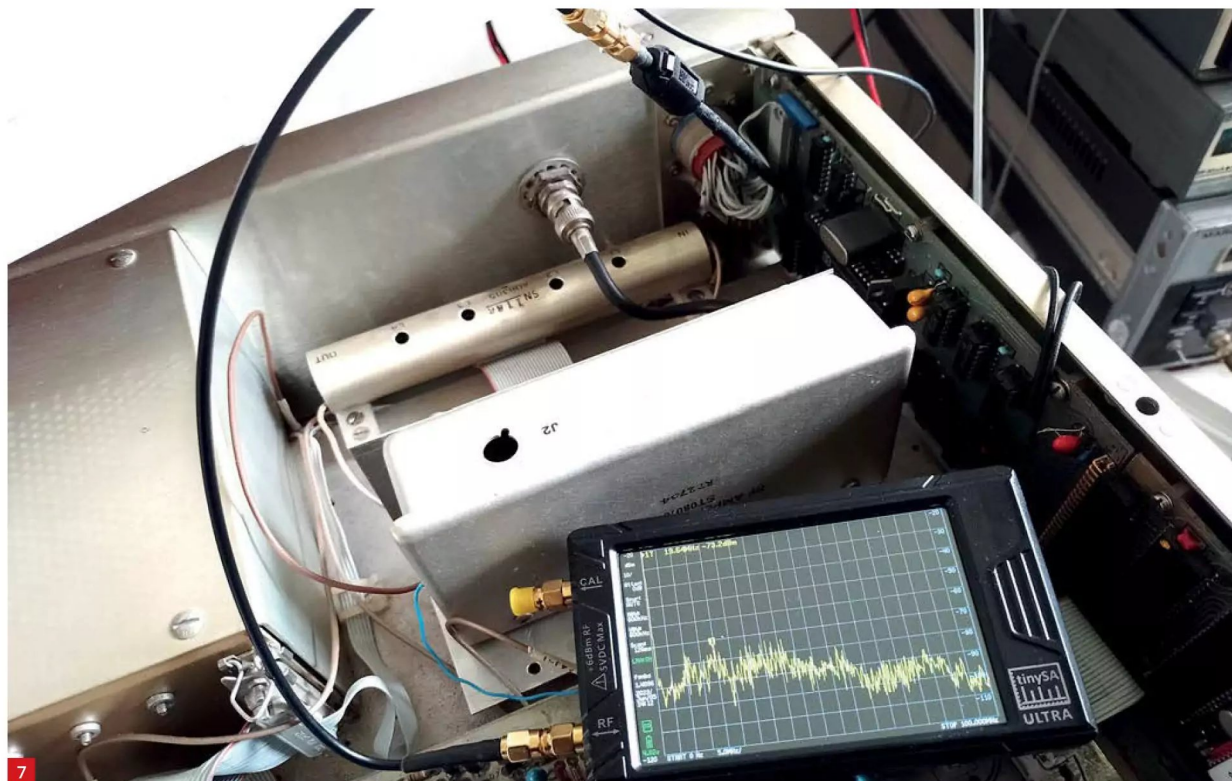


The noise manifests itself when the RS232 lead is connected to the rear panel connector with a slight rise in the noise floor but, more noticeably, 'birdies' throughout the upper HF spectrum and beyond. With the lead disconnected the levels are quite low and can be ignored, but with it connected the levels are problematic.

Using the TinySA-Ultra in free running mode and using the loop probe noise levels can be measured all along the 8ft cable. Fig. 7 demonstrates the Ultra displaying levels measured directly at the connector on the A6A1 board (top right-hand corner of the photo).

The RA6790GM can address multiple receivers, selecting different baud rates and parity via the pins on the connector. There are many wires that need to connect to an external configuration interface and then back





to the board so there is ample opportunity for unwanted processor noise!

With levels of some  $-70\text{dBm}$  it may well be tricky to fix but I will eventually get round to fitting some ferrite over either the main lead or even the individual wires on the RS232 line to try to reduce the noise radiating from this receiver. The TinySA and probe combination will be able to provide instant visual confirmation of my modifications and display whether they have worked or not.

I did note that in my tests the TinySA-Ultra seemed sensitive enough with the internal LNA selected not to need the external amplifier in most cases.

This YouTube video demonstrates how this type of probe may be utilised on a modern oscilloscope:

[www.youtube.com/watch?v=nImoQcoqkuQ](https://www.youtube.com/watch?v=nImoQcoqkuQ)

The TinySA-Ultra has plenty of other uses than just hunting down QRM but hopefully I have demonstrated that with this cheap little device, and some simple homemade 'antennas', it is possible to track down sources of noise thereby giving at least some chance of resolving noise issues.

Just to labour the point once again, if working inside devices that are live to mains voltages be very, very cautious and if you are in any doubt do not do it!

Also, my advice would be to avoid trying to remedy or modify anything belonging to a third

party; try to come to some other arrangement such as a replacement device.

### AN-SOF Antenna Simulator News

AN-SOF are running a Blog dedicated to exploring the fascinating world of Antenna Design and Simulation. They say that:

*"Whether you're a beginner or an experienced engineer, you'll find valuable insights into antenna modelling, theory, numerical methods, and practical examples of antenna models using AN-SOF Antenna Simulation Software."*

Latest Topics are:

- Linear Antenna Theory: Historical Approximations and Numerical Validation,
- Wave Matching Coefficient: Defining the Practical Near-Far Field Boundary and Modeling a J-Fed 5-Element Collinear Antenna for the 2m Band.

<https://antennasimulator.com/index.php/blog>

- Also reported is that the latest version of the AN-SOF calculation engine, 8.20, has successfully completed validation for accuracy in accordance with the IEC FDIS 62232 standard.

*"This standard outlines guidelines for calculating radio-frequency field strength and specific absorption rate (SAR) in the vicinity of radio-communication base stations (RBS) to assess the potential human exposure. Specifically, the validation of the AN-SOF calculation engine was conducted for the*

*'Antenna with Dipole Radiators' defined in this standard. This significant achievement enhances the reliability of the AN-SOF Antenna Simulator."*

Within the AN-SOF application models may be set up to measure both E and H Near Field data with the Start, Stop and Step distance parameters for the X, Y, Z axes being programmable. Results may be listed in tabular format for both E and H fields. These results may be saved for analysis in something like MS Excel for further processing, printing, charting etc. Also, AN-SOF will itself display results in either 2D or 3D format.

While this is not something I have investigated, AN-SOF should be accurate enough to model Electro Magnetic Field compliance for antennas or antenna configurations that are not in the RSGB EM-Field calculator, thus being able to determine whether they are likely to comply with OFCOM's EM-Field requirements.

Clearly, where possible, the RSGB calculator should be used but if an antenna is not in the calculator an AN-SOF model is likely to be accurate enough to give some idea if it will be compliant or not, certainly in cases of HF antennas that have ground radials or are close the ground, something NEC-2 can struggle with.

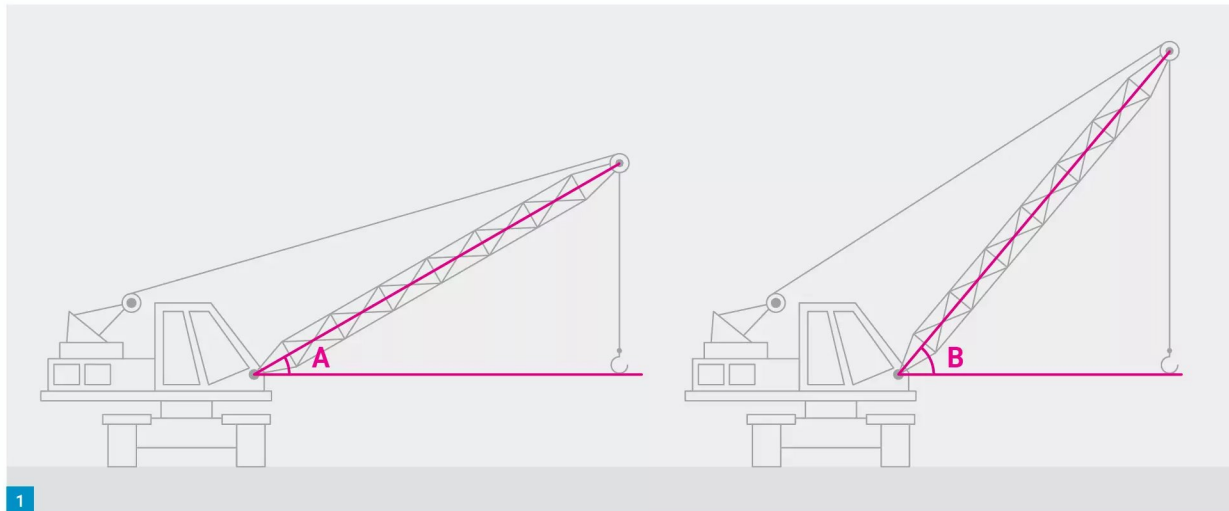
Further information may be found here:

<https://tinyurl.com/bdhdyje6>

That's it, see you all next time around! **PW**

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Godfrey Manning G4GLM  
cgmm2@btinternet.com

**C**urvy. Sinuous. What are you thinking? Well, it reminds me of the curl of artificial smoke emanating from an OO-gauge model steam locomotive.

The crane, **Fig. 1**, is far from curvy. To start with, the jib is at angle A degrees to the magenta horizontal line. In the next picture, the jib has been raised to angle B. This causes the hook to be brought nearer to the driving cab, but it also means that a greater height of cable is needed in order that the hook still touches the ground. The reach of the crane (horizontally, cab-to-hook) and the height to which the hook can travel (ground upwards) are fixed according to the selected angle. Changing the angle changes both reach and height, the driver has no choice.

This fixed relationship is important in maths, geometry and – wait for it – radio. Starting with the jib horizontal, the hook touches the ground and its maximum height is zero. Raising the jib up a degree at a time and measuring the height of the hook's cable shows that the height increases, but not steadily. I've plotted this, **Fig. 2**, with jib angle along the horizontal axis. The length of cable for the hook to touch the ground, that's also the maximum height the hook could reach when wound in, is shown on the vertical axis as a fraction of the length of the jib and starts at zero. When the jib is vertical (90 degrees) that's as far as it goes. The cable length to reach the ground is the same as the length of the jib, I've plotted it as 1.0 jib-lengths. I've also marked out where the cable length is half of its possible maximum. Don't guess – it's not at 45°, it's 30°.

Only, it doesn't say 'Jib-lengths', it's got a curvy sinuous name: sine (abbreviated sin). This is an aspect of trigonometry, meaning triangle-measuring (abbreviated trig). If trig leaves you cold, it might not matter if you can't drive a crane, but neither will you understand the waveforms that make up our

## Trigger Warning: It's Trigonometry

Godfrey Manning G4GLM shows why trig matters.

radio and audio signals. The shape made by the jib, the horizontal ground and the hook's cable makes a triangle which includes a right-angle. The plot gives a curve, a sine wave.

While the height of the hook-cable gets longer when the jib swings up, the horizontal reach reduces according to a curve that looks like a mirror image of the plotted sine wave. The reach can also be calculated from a sine function, but it's fiddly, so there's a shortcut called cosine (abbreviation  $\cos$  – not 'cos I say so). A modest schooldays scientific calculator will have buttons for these functions (sin and cos).

### CW Takes a Crane to Explain

The voltage amplitude of a transmitter's continuous wave varies in time as a sine wave. I've displayed this on an oscilloscope, **Fig. 3**, with the signal at 145MHz. See for yourself. The wave enters the graticule's zero (midline) at the left and traces a complete wave shape in about 3.5cm. At this point, the wave repeats ad infinitum. With a time-base of 2 nanoseconds per centimetre, this gives one wave pattern as lasting 7ns. Calculate  $1/7\text{ns}$  to get 145MHz.

This wave is the same as in **Fig. 2** except repeated. The first quarter of the wave goes upwards (positive direction) as in the **Fig. 2** plot, followed by a mirror image on the way back down. Then the wave gets inverted to go down further, below the midline and hence negative. Another mirror image '...brings us back to Doh' as they sing, or zero on the graph. The four quarters of one complete

sine wavelength are all the same shape as the **Fig. 2** plot, just mirror images one way or another. The  $\cos$  function mentioned above starts out as the second quarter of the sine wave.

That signals can be described as sine waves gives a means for a wide-ranging analysis of circuit behaviour. This leads to the necessary maths that enables, for example, the design of filters or the analysis of the spectrum of a radio signal. All from plotting the changing geometry of a crane jib.

### Not Pirate Radio

Knowing about the sine waves that make up signals is helpful for we radio enthusiasts, justifying the need for us to pay attention to the subject. The sine function also occurs in many other natural phenomena, such as the swing of a pendulum or the longitudinal vibration of air molecules when conducting sound.

There are also more practical examples of calculating sizes of physical triangles. **WS Gilbert** knew "...many cheerful facts about the square of the hypotenuse" in *The Pirates of Penzance* Act 1. Which is fine unless you don't know what a hypotenuse is. For a triangle with a right-angle, it's the longest side, the one that hasn't got the right-angle at either of its ends. Another triangle calculation, Pythagoras' Theorem, allows working out problems such as the length of guy rope needed

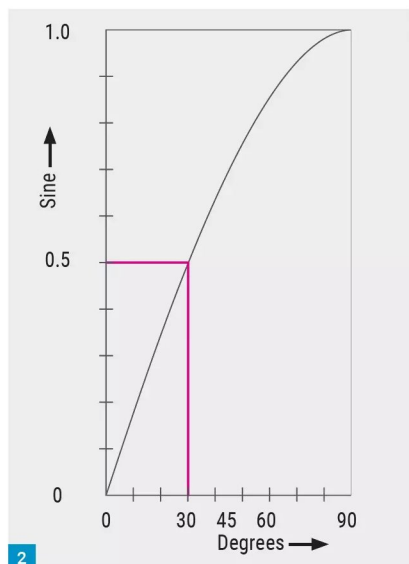
**Fig. 1:** The effect of raising a crane jib.

**Fig. 2:** A plot of jib angle versus height.

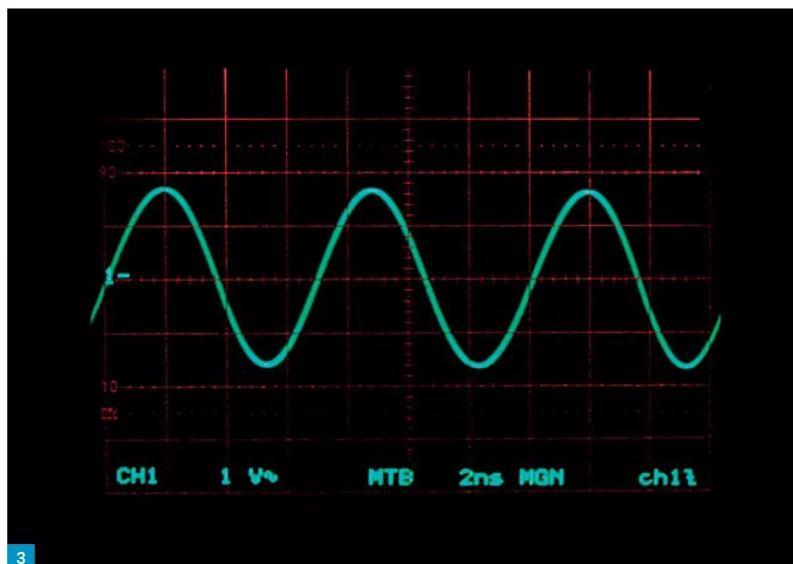
**Fig. 3:** A 145MHz sine wave.

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to stabilise a mast of known height in a garden of limited surface dimensions. The straight-line distance, between the antenna atop its mast and the nearest neighbour in an adjoining garden, can be calculated to check it's the minimum required for

EMF compliance.

Where the hypotenuse guy rope is inaccessible and the mast is of unknown height and can't be measured, another trig function, tangent (abbreviation tan) comes to the rescue.

Triangle geometry is a wide subject with helpful applications. That's all I've room for, but, having shown the value of these methods, you might consider finding out more rather than dismissing the subject as being too academic. **PW**

## Commemorating this famous chapter of WWII



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**Mike Richards G4WNC**

practicalwireless@warnersgroup.co.uk

**V**arAC continues to develop with more features added in the previous couple of releases. Now at version 7.3.0, the latest addition is an image compression tool. This takes a lead from the SSTV world and includes the option to add callsigns and signal reports to the transmitted image, very neat. The tool becomes available when you start a file transfer and includes sliders for resolution and quality so you can optimise the file size for the prevailing conditions.

Also recently released is an update to the Auto QSY feature. By way of a reminder, the Auto QSY provides a managed QSY from the calling frequency, while keeping the two stations locked together. It is also possible to remotely QSY the distant station.

This is useful if you want to leave a lengthy email, file transfer or if you're making contact with a newcomer who may need some guidance. The latest addition is an automated QSY recovery for occasions when the QSY fails. This could be due to interference, propagation or other technical problems with the frequency change. The new system automatically returns both stations to the previous frequency if 'I'm alive' signals are not received within 20-25 seconds of the QSY starting.

Another useful add-on is the new Start command. This can automatically send a CAT command when VarAC starts, e.g., switch your rig into the correct digital mode.

The final headline addition is the Alert indicator. This will turn red when a new alert is received and you can click on the indicator to be taken directly to the Alert Centre where you can examine the alert.

For those getting started with VarAC, it's worth tuning in to the weekly broadcast Chatroom/net. This occurs every Sunday afternoon between 1400 and 1600UTC on 20m slot 15, which is 14108.750kHz.

## SDR—IQ Signals

In-phase (I) and Quadrature (Q) signals are used extensively in software-defined radio, so we need to understand why they are so important. Plenty of technical articles contain mathematical analysis of these signals, and they are fine if you're comfortable with high-level maths. However, many of us didn't cover maths to that level or have forgotten the details! In this section, I'll provide an alternative explanation that avoids maths but will hopefully convey the essential points. Inevitably, I will make some simplifications that the experts may criticise, but I think the compromises are worth it.



# More on VarAC and SDR

This month sees another update to VarAC, plus Mike's continuing delve into SDR technology. This time he is tackling IQ signals and digital down conversion – all with no maths!

## Rotary Encoder

An interesting place to start our look at this topic is the popular rotary or shaft encoder often found on modern equipment. Used extensively for volume and tone controls in audio equipment, many controls on your rig will use them instead of traditional potentiometers or rotary switches. Rotary encoders use quadrature signals just like those in an SDR, so are a good place to start. I've shown an internal photo of a rotary encoder in **Fig. 1**. Most everyday rotary encoders have three contacts, common plus A and B. The wiper rests on a circular PCB with a precise track pattern. If we plot the output from the A and B contacts on an oscilloscope while rotating the shaft, you should see the result shown in **Fig. 2**. If we consider the movement from A first making contact to the next occurrence of A making

contact as a 360° cycle, you will see that the output from contact B lags 90° behind A. However, if we rotate the shaft in the opposite direction, **Fig. 3**, you will see that output A now lags B. This simple relationship between the A and B signals tells us the direction of rotation and thus makes the control so versatile. In addition to knowing the direction of rotation, the pulse frequency tells us the rotation speed. From this example, you can see that the quadrature output from a device allows us to see direction and speed of movement.

## IQ and Radio Signals

Returning to our SDR principles, I have explained how our radio signal is digitised with an analogue-to-digital converter (ADC), and we have a stream of samples flowing to the next stage of the receiver. I've also shown

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Fig. 1: Internal view of a rotary encoder.  
 Fig. 2: Encoder output with clockwise rotation.  
 Fig. 3: Encoder output with anti-clockwise rotation. Fig. 4: Sinewave showing its 3D representation. Fig. 5: Generating IQ signals with a pair of mixers. Fig. 6: Polar diagram of IQ values. Fig. 7: Transmitting with an IQ modulator. Fig. 8: DDC Frequency shifts the desired frequency (14MHz) to 0Hz. It is then low-pass filtered and decimated to give the narrow-band output.

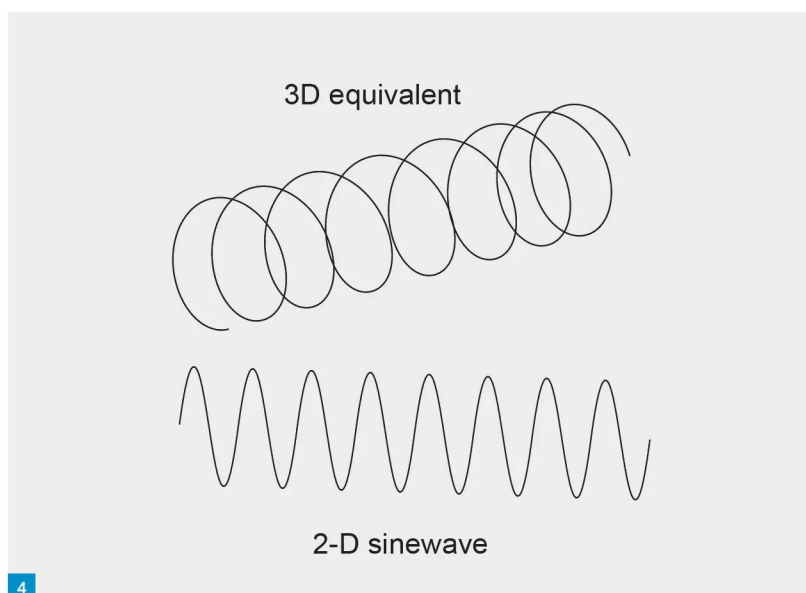
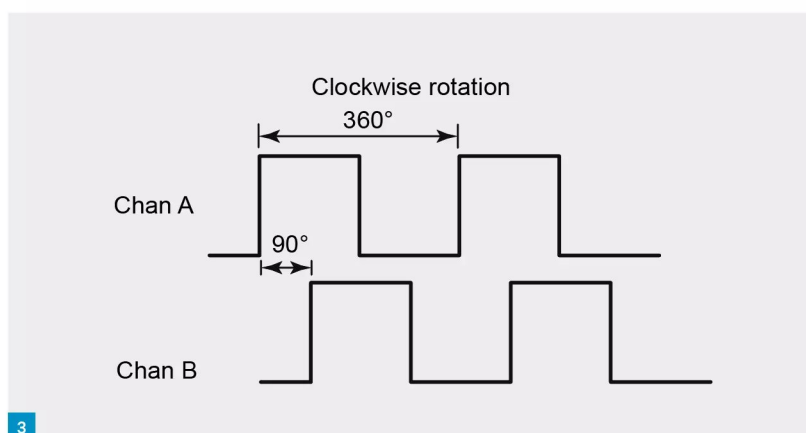
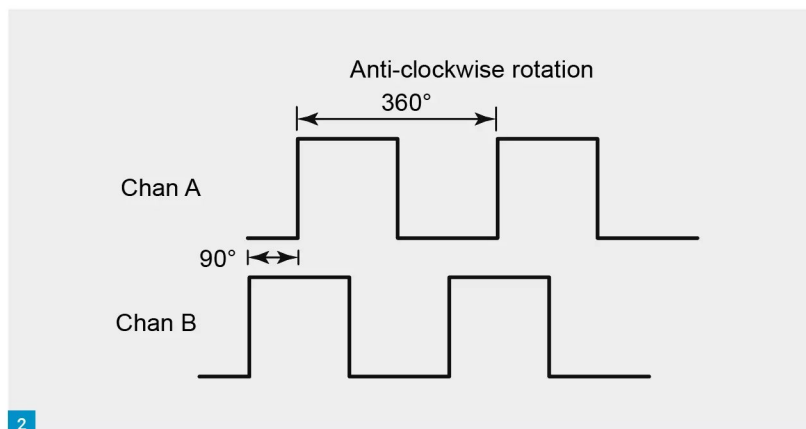
how to process that data to provide spectrum displays using Fast Fourier Transforms (FFTs). The ADC output from our high-end receiver is loaded with information covering a very wide frequency range, so we need to process this data to extract and demodulate individual signals. We need to know a little more about the signal to do that successfully.

Let's begin by looking at a simple sinewave. At this stage in the process, each measurement sample from the ADC is a single value that tells us the amplitude of the signal at a specific instance, which is a one-dimensional view. This comes to light when you realise that the familiar sinewave signal we see on a scope is a side-on view of a rotating signal, **Fig. 4**. Because our signal is rotating, we need to know where our signal sits on that rotational cycle. The solution is to use the same technique as the rotary encoder and employ two versions of each measurement, one offset by  $90^\circ$ . So, how do we do that? The answer is simple and shown in **Fig. 5**. Our incoming sample is passed to two identical mixers, one supplied with the local oscillator and the other fed by the same local oscillator, but the phase shifted by  $90^\circ$ . The output is the I and Q signals. The amplitude and phase of each sample is captured in those two values.

A simple way to plot the result is to use a polar or vector display where the I value is on the horizontal axis and the Q uses the vertical axis, as in **Fig. 6**. These axes are often called real and imaginary, respectively. By joining the resulting plots, we can see the signal's amplitude and phase and plot its exact position on the rotational cycle. The quadrature conversion process can be done in the analogue or digital worlds with the same effect. The earliest examples of amateur SDR receivers were probably the Softrock series. They used Tayloe mixers to directly convert the incoming RF signal into audio IQ signals that were processed by the computer soundcard.

## Transmission and IQ

Before we continue with the receive chain, it's worth looking at how IQ signals simplify the generation of a modulated RF signal. **Fig. 7** shows an example of an IQ modulator, and



you'll notice that it's simply the reverse of our receive mixer. The two mixers use a common carrier oscillator, but one feed is shifted by  $90^\circ$ . The combiner simply adds the output from each mixer. The I and Q signals control how

much carrier passes through to the combiner. Let's begin with the I mixer input value at maximum and the Q mixer input at 0. In this case, the full  $90^\circ$  shifted carrier will appear in the output. If we reverse the situation, the



unshifted carrier will make it to the output. This shows that, by changing the value of the I and Q inputs, we can shift the transmitted signal's phase – that's phase modulation sorted! So, what happens if I and Q are at a mid-value? In that case both I and Q carriers will reach the combiner where they will be added together to produce a signal with an intermediate phase. The net result will be a signal output where the amplitude and phase depend on the relative I and Q values. The ability to alter the amplitude and phase of an RF signal by applying I and Q values means that we can create any modulation system. This dramatically simplifies transmitter design and makes IQ modulation an incredibly versatile system that can mimic any modulation system.

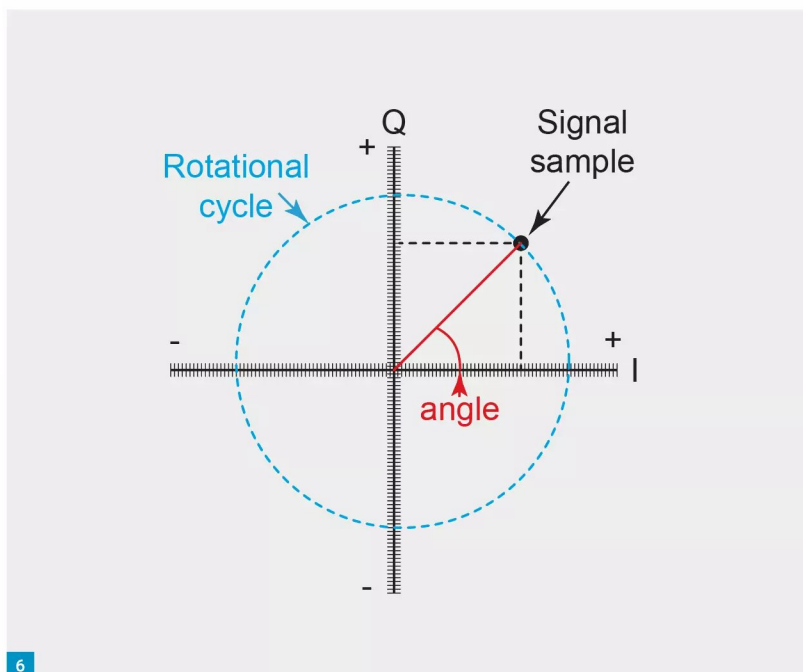
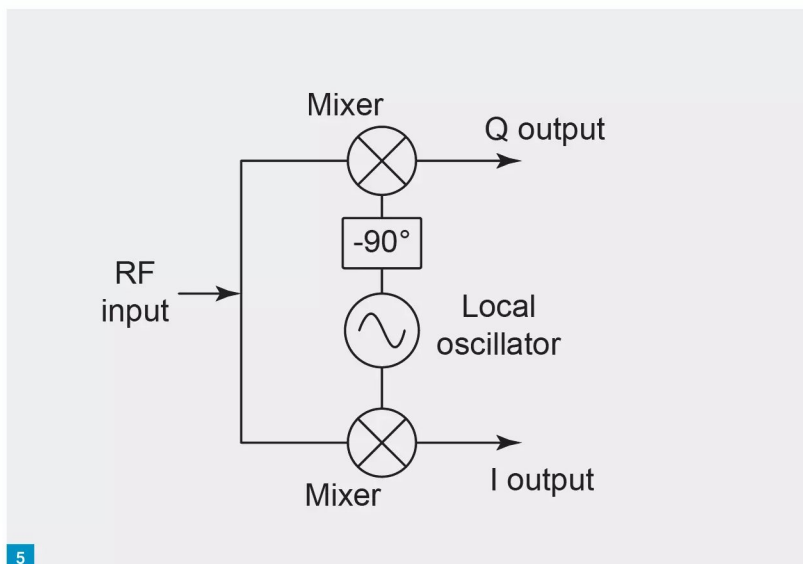
## Receiver IQ

Turning back to our SDR receiver, the receive IQ mixer reverses the transmit modulator and extracts the IQ values so we can calculate the amplitude and phase of the incoming signal as shown in **Fig. 5**. This vital information is all we need to process and demodulate any signal. In addition to showing these IQ values on a phasor diagram, you will also see them written as a complex number like so:  $0.8 - 0.5j$ . Although this might seem confusing, it is simply the values of the I and Q signals. Referring to our polar chart, the first number would come from the X-axis and the second from the Y-axis.

## Digital Downsampling

Having briefly examined the rationale behind IQ signals, we need to return to our high-end SDR receiver with its sample rate of 122MHz and digitised frequency range of 100kHz to 55MHz. While seeing the entire spectrum in one view is very impressive, we need access to narrow-band segments, i.e. amateur bands within that spectrum. So how do we manage that? A modern SDR handles this entirely in the digital domain, usually with a Field Programmable Gate Array (FPGA). The FPGA is a large, expensive chip containing thousands of configurable logic blocks. These can be software configured to carry out many of the critical processing steps of the SDR. In addition to being versatile, FPGAs are extremely fast and can operate with parallel processes, making them ideal for handling the high data rates found in SDRs.

Most of today's SDRs use receiver slices to provide access to selected amateur bands. A slice is appropriate because we want to extract a narrow portion of the spectrum that contains our chosen band. Technically this process is known as Digital Down Conversion (DDC). As you might expect, there are many ways to achieve this, but I will describe one common

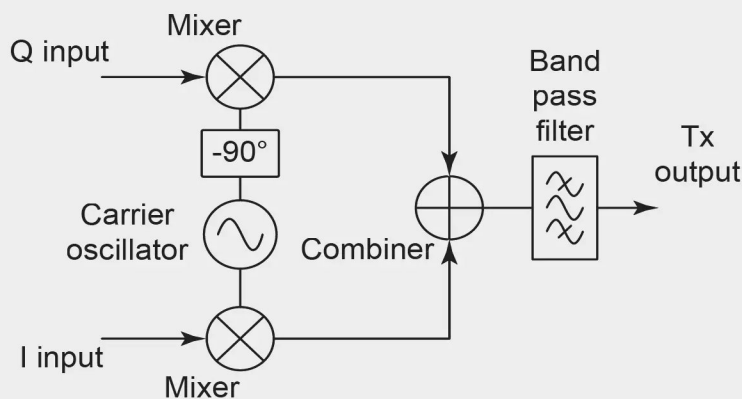


method here.

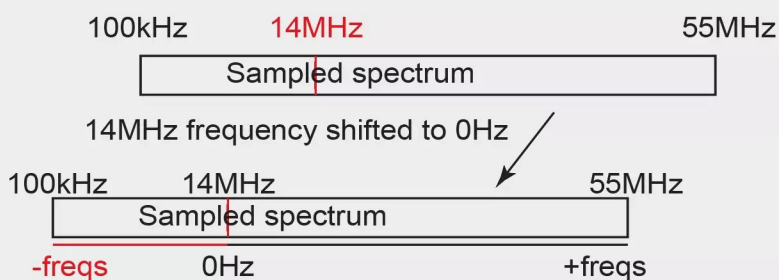
The first step in the DDC is to frequency shift the entire spectrum so that the lowest frequency, for example, 14MHz, is moved to 0Hz, **Fig. 8**. We do this using the digital equivalent of a local oscillator and a pair of mixers. This equates to a numerically controlled oscillator and a pair of multipliers in the digital world. In addition to shifting the spectrum, this stage converts our ADC output stream to the I and Q values that are necessary for the following stages. By moving the spectrum, everything below 14MHz will become negative frequencies. Due to Nyquist

effects, these will fold back over the remaining positive frequencies as inverted signals. These can introduce harmful effects, but problems can be avoided by careful frequency management within the DDC process. The output from the frequency shifting process is a pair of I and Q signals that still cover too broad a bandwidth and running at the original high sampling rate. To correct this, we add a special digital lowpass filter that reduces the sample rate by discarding unnecessary samples. In practical designs, there are often several stages of lowpass filter. At the end of this process, we get a pair of low sample rate





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IQ signals carrying information for the desired band. In the case of the 20m band, that could be a 500kHz bandwidth from 14MHz to 14.5MHz. As this is just 500kHz wide, the sample rate can be as low as 1MHz, which is relatively easy to manage and process. Many popular rigs offer several receiver slices so you can monitor multiple bands. The size of the FPGA usually limits the number of available receiver slices.

### DDCFuture

While most popular amateur radio rigs and receivers use FPGAs to process the data stream from the ADC, this is likely to change as technology progresses. One alternative that's been with us for a while is used in the RX-666/888 receivers. These receivers avoid using FPGAs by employing a high-speed USB3 interface to transfer the raw ADC data stream directly to the PC. Once in the PC, the powerful processor and GPU (Graphics Processing Unit) can do the heavy lifting and down-convert the data into more manageable formats.

Having studied some of the leading chip manufacturers, I can see a growing trend to combine the ADC and DDC conversion processes into a single configurable chip. The AD9680 and AD9625 families are good examples of this trend. These ADCs feature Gigabit per second sample rates, have built-in DDC converters, and feature in many of today's commercial designs.

### Useful References

If you want to learn more about digital receiver technology, I've found the following resources very helpful:

Analog Devices:

What's up with Digital Downconverters:

<https://tinyurl.com/yfuajjwb>

Not your grandfather's ADC:

<https://tinyurl.com/ynvca9ym>

Frequency Folding Tool:

<https://tinyurl.com/3t3w5jd9>

PySDR:

<https://pysdr.org>

## NEWS EXTRA

### SCREEN SUCCESS FOR ABERDEEN AMATEURS:

A short film produced by members of Aberdeen Amateur Radio Society (AARS) has won a top award at the 2023 Doric Film Festival. The film was joint winner in the 'Groups' category of the prestigious festival that showcases the distinctive Doric language and culture, most closely associated with North-East Scotland.

The winning five-minute production, with all commentary in Doric, was written and filmed by AARS member **Mike Lowson MM7MWL**, and narrated by the club's secretary, **Fred Gordon GM3ALZ**. Other members to take part in the filming included **George Anderson GM0VGI**, **David Wilson MM0MVX**, **Nigel Paterson GM4JOJ** and **Pete Weller GM3XOQ**. It also had a specially written fiddle-music theme, based on Morse code, which was composed and played by **Graeme Henderson** of Aberdeen Strathspey and Reel Society.

Mike said: "To quote some Doric words, I was stammygastered (astonished) and dumfooned (stunned) that we won the award, but fair tricket (delighted) for the radio club. We filmed extensively across the north-east over a ten-month period, which included footage of club nights, field days, special events, SOTA and in members' own shacks, too."

Fred added: "It was a great example of teamwork from club members and I hope the successful film will be not only a snapshot of our activities in 2023 but also spread the word about the club."

The festival, which is supported by the Scottish Government, has an enviable reputation for attracting a diverse field of work from individuals, groups and schools. It culminated in a splendid showcase awards ceremony at Aberdeen's Robert Gordon University, hosted by award-winning broadcaster **Frieda Morrison** who created the platform to celebrate the Doric language and its cultural identity. She said: "We are pleased that the Doric Film Festival continues to grow its reputation as an important platform for north-east filmmakers to share their work and we are indebted to all those who support the event in so many ways".

**Peter Reid** from RGU's School of Creative and Cultural Business, added: "Doric is such a vibrant part of life here and the university is pleased to be able to celebrate it through the film festival."

In addition to a wooden trophy, which now hangs in the AARS shack in Aberdeen, the winning entry also won a cash prize, which will go towards a new item of club equipment. AARS is now in its 77th year and in addition to weekly club nights on Thursdays it runs two 80m and two 2m nets every week, plus nets on 4m and 6m. The club is also active on field days and contests and offers a range of training, including for CW and for new licensees.

For further information: Fred Gordon, AARS Secretary, 01975 651365.

Read more radio news and reviews at [www.radioenthusiast.co.uk/news](http://www.radioenthusiast.co.uk/news)





David Smith  
dj.daviator@btinternet.com

**T**he VHF Low Level (LL) Common Frequency, 130.490MHz, trialled from June 2021, has been permanently introduced in the UK. With an ever-increasing trend of military versus civil aviation AIRPROX (Air Proximity – near misses) below 2000ft above ground level, the aim of the LL Common Frequency is to reduce the chances of mid-air collisions in the UK Low Flying System (UKFLS).

The desired effect is to improve situational awareness among civilian and military aircraft operating in the UKFLS when not in receipt of an air traffic service. Getting a Lower Airspace Radar Service or an ATC service should take priority over the use of LL Common Frequency. In areas where this cannot be achieved, then the LL Common Frequency should be used.

The channel should be monitored whenever possible and pilots should use it to broadcast their intentions in order to help improve situational awareness between all aircrew operating in the same area. Among the conditions of use are that pilots should report when entering or leaving the UKFLS, at turning points of significant heading changes and approaching well-known and recognisable physical features. The blind call should include callsign, aircraft type, altitude, heading and next significant reference point. It is emphasised that it is not to be used as a 'chat' frequency.

## A Common Frequency for Low Level Traffic

**David Smith** brings news of recent developments in the world of air traffic management.

### Increasing the Departure Rate at Heathrow

Recently, NATS has been working with European partners, including London Heathrow Airport, on research that could pave the way for more frequent single-runway departures. This is achieved by modifying the current practice of widely separating two departing aircraft of significantly differing weight and size to protect the follower from the vortex wake created by the preceding departure. There has long been a view that smaller aircraft, which generally take off earlier and climb more steeply than heavy aircraft, may not need such large separations as they tend to remain above the downward deflecting vortices.

Building on this principle, research focused on actively suspending these wake turbulence separations for smaller aircraft. The work has established the feasibility of such a concept, which could potentially cut separation times in half for some aircraft pairs. Because aircraft performance varies significantly, even within one aircraft type,

predictions of departure trajectories based on historical performance and real-time flight performance are needed.

Once a departing leader-follower pair has been identified, automated systems run comparisons to establish whether the predicted take-off positions and climb profiles would be sufficiently separated in the prevailing wind conditions. Finally, a dynamic tool notifies the controller of any potential to suspend wake turbulence separation and instead apply spacing procedures that are more typically adopted when wake turbulence is not a concern.

This concept has been proved through a series of exercises that simulated dynamic separation and showed that it could lead to a significant increase in departure runway capacity. However, further work is needed to identify what actions might be required to account for emergency procedures, for example if the following aircraft suffered an engine failure and failed to climb through the vortices. At today's busy airports, every second counts. When punctuality is key and the value of departure

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**Photo 1: F-16 Royal Netherlands Air Force at Fairford. Photo 2: AgustaWestland AW149 at Fairford.**

slots is counted in millions of pounds, a little delay can add up to a large economic and environmental cost for airport operators and airlines, as well as passenger inconvenience.

## Improving the Accuracy of Satellite Navigation

The International Civil Aviation Organisation (ICAO) has now adopted multi-constellation standards for the Global Navigation Satellite System (GNSS). This allows for the combination of dual-frequency signals from up to four GNSS constellations simultaneously, including the American GPS system and the European Galileo. By processing signals received from the satellites, a GPS receiver can determine its own position with an uncertainty of less than 10m. All GPS satellites broadcast on at least two carrier frequencies: L1 band, at 1575.42MHz, and L2 band, at 1227.6MHz (newer satellites also broadcast on L5 at 1176MHz).

Formerly, global aviation GNSS capabilities have relied mainly on just one constellation and one frequency via GPS L1 band. Dual-frequency or 'Multi-Band' systems use multiple frequency bands, meaning that the receiver tracks more than one radio signal from each satellite on different frequencies. This produces greater system accuracy and filters out inaccurate signals reflecting off buildings, trees or mountains.

While GPS is the most established GNSS, other nations have set up their own systems to provide complementary, independent PNT (position, navigation and timing) capability. The main ones are as follows:

**Galileo:** a global GNSS owned and operated by the European Union.

**BeiDou, or BDS:** a global GNSS owned and operated by the People's Republic of China. BDS was formally commissioned in 2020. The operational system consists of 35 satellites.

**GLONASS:** global GNSS owned and operated by the Russian Federation. The fully operational system consists of 24+ satellites.

**NavIC Navigation Indian Constellation:** an Indian Government autonomous system designed to cover the Indian region and 1500km around the Indian mainland.

GLONASS is still available for use in Ukraine, but it seems likely there are not enough compatible receivers for these systems to equip all Russian forces so they are forced to use GPS. Evidence for this comes from shot down Russian fighters found to have GPS receivers taped to their instrument panels. As the world's first global navigation satellite system, GPS receivers have become both plentiful and inexpensive so, allied with duct tape, they are a good solution to lack of equipment.



Russian forces are known to be expert at jamming and spoofing GNSS, but the problem with this is that high-power, persistent GPS jammers are easily targeted. Any strong and consistent radio frequency transmission can easily be located and attacked. Many militaries have missiles specially designed to home in on and destroy jamming transmitters. Even without such weapons, direction-finding technology can pinpoint a transmitter, enabling an artillery attack or an air or ground assault. Russian commanders may be limiting transmission power and time on air to avoid attracting hostile fire.

GPS signals support a wide variety of infrastructure. Telecommunications, the internet, electrical grids and machine-control systems all rely on GPS for timing. Russian forces may wish to protect Ukraine's infrastructure for their own benefit and use, if they ever make any further gains. Another theory is that deploying Russia's most sophisticated and powerful electronic weapons in Ukraine would enable adversaries to study technologies and tactics. This would lead to the development of countermeasures and make the weapons less effective in any future conflict.

American military analysts have said that Russian military doctrine assumes that signals from space, including its own GLONASS and other GNSS, will not be available once a battle begins. They will instead turn to a version of the obsolete American Loran-C for navigation. Known as Chayka, this terrestrial system is maintained to protect their homeland with navigation and timing services when signals from space are not available. Fixed Chayka transmission sites operate between 90kHz and 110kHz. Power output is typically between 200 and 800kW with effective ranges over land of about 800 miles and over water of 1,000 miles.

Three of Russia's Chayka stations have Ukraine surrounded, one of the three transmission sites being in the Crimea. Regaining control of this one in the 2014 invasion has assured them sovereign terrestrial PNT (Positioning, Navigation and Timing) for the entire region, including the Black Sea.

## Five-Letter Name Codes for Waypoints

ADOLA, KODAP, KUXEM, EKLAD are examples of Five-Letter Name Codes (5LNC) computer-generated by ICAO (the International Civil Aviation Organisation). They are assigned when a significant point is required for a position not marked by the site of a radio navigation aid and is used for air traffic control purposes. The location is determined by self-contained airborne navigation aids, such as the intersection of radials from two VOR beacons.

The objective is to provide a unique pronounceable name code free of ambiguity with those for other significant points in the same general area. It also has to be unique worldwide. The system was devised originally by the US Federal Aviation Administration and ICAO in the 1970s, the list being distributed to the various ICAO regional offices throughout the world.

The first internet application of the ICAO International Codes and Routes Designators (ICARD) database was deployed in 1998. It was developed to support the allocation process of 5LNC within the ICAO EUR/NAT region (Europe and the North Atlantic).

The application was gradually extended to other ICAO Regions from 2005 onwards, with ICARD becoming accessible to all ICAO Regions at the end of 2010.

Originally, names could be chosen by an air traffic unit and coordinated with the ICAO regional office for approval. This resulted in some imaginative names, KEGUN for example, derived from footballer Kevin Keegan and still used for Liverpool Airport inbound. Long-standing codes in the UK relating to geographical positions include REXAM (Wrexham), STAFA (Stafford), NANTI (Nantwich) and WOBUN (Woburn). It seems that any new allocations have to be chosen from a list of available random words offered by ICAO. There are stringent checks to ensure that the name does not sound similar to other codes in the vicinity. **PW**

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**Roger J Cooke G3LDI**  
roger@g3ldi.co.uk

I had a major G3 thing this last month. I lost the Library machine to disk read errors and could not do anything with it. I could see the icons on the screen and in the taskbar but nothing worked. I tried to fix it by reinstalling W10, but that only made it worse. As I type this, on Monday I have to submit the article to Don on Wednesday. Phew, I don't wish to see this problem again. I lost all emails, files saved and my address book, Skype included, so it's a bit discombobulated this month. Sorry about that! Luckily, I had a very good friend sort it for me. I now have a new 1TB SSD drive, so hopefully it will be fine now.

## The CW Way

Recently I received via snail mail an unexpected book. It was *The CW Way of Life* by **Chris Rutkowski NW6V**. We had exchanged emails regarding authoring CW books earlier, and he kindly included me on his 'author's' list for a free copy. I did mention that the RSGB did not intend to print my book again, for some strange reason. However, that did not deter him from sending me a copy.

Chris goes through all the usual methods of learning Morse Code, even spending time on the ergonomics of correct posture and approach to keying practices. Looking at a basic straight key, for example, I was pleased to see he mentioned the knob and the skirt. A lot of straight keys do not have a skirt and this does not help when hold-

# The CW Way and a Reply from ChatGPT

**Roger Cooke G3LDI** has the latest from the world of Morse Code.

ing the key correctly. Interestingly the skirt was a guard to protect the operator when using a spark transmitter, so it could be called a 'guard'. I described this in a previous article. However, keys made with a skirt became known as a key with a Navy Knob.

Chris also has an interesting way of writing Morse. For example, vocalising Morse using the conventional method would result in the following:

Dah-di-di-dit dit di-di-dit Dah for Best

Chris shortens the above to Dddd d ddd D.

This method uses a Capital D for Dah and lower-case d for dits, where the LAST d is dit.

He enlarges on this a lot and then goes on to discuss procedures and practice, covering all the usual routines and QSO format together with abbreviations and Q-codes, plus the need for regularly using Morse Code. It is very lengthy, 217 pages, but well worth the investment if you are considering learning the Code. It is available from Amazon in paperback at £22.44, or you can purchase a Kindle edition for just £7.18, or just about two cups of coffee these days!

The book is shown in **Fig. 2**.

## AI

Artificial Intelligence (AI) has been in the news a lot just lately with some dire warnings too. I would hope that humans have sufficient control over such things to not let the situation get out of hand. Just as an experiment I used ChatGPT to test it out. So, I asked it a question: "Why should any radio amateur bother to learn CW in this day and age?"

I thought this quite a valid question in view of the facts that exist now; No Morse test needed for a licence. Morse could be considered as an outdated mode. Too much practice needed (usual excuse, too lazy). The response was comprehensive, very persuasive and quite amazing in that it could have been me that wrote it. I do use all those arguments! This is the reply: "While it is true that many modern communication technologies have made Morse code (CW) less essential for everyday communication, there are still several reasons why radio amateurs might choose to learn and use CW:

- *Tradition and History:* Morse code has a rich heritage in the field of radio communication. It was the original mode of communication used

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Fig. 1: An Essex CW Boot Camp. Fig. 2: The CW Way of Life. Fig. 3: The CWops logo.

in early radio systems and played a vital role in maritime and military communication. Learning CW can help radio amateurs connect with the history of their hobby and appreciate the roots of modern radio technology.

- **Emergency Communication:** In certain emergency situations, such as natural disasters or when other forms of communication infrastructure fail, Morse code can still be a reliable means of communication. Being proficient in CW can enable radio amateurs to provide assistance and coordinate emergency efforts when other communication methods are unavailable or overloaded.
  - **Long-Distance Communication:** Morse code can be transmitted and received over long distances with minimal equipment. It is less prone to interference and can often be heard when other voice or digital modes may struggle due to poor propagation conditions. Learning CW allows radio amateurs to reach out to other operators across the globe, even in challenging conditions.
  - **Low Power and Simple Equipment:** CW is an efficient mode that can be transmitted using low power and simple equipment. This makes it an attractive option for radio amateurs who enjoy the challenge of building their own radios, operating portable or QRP (low power), or experimenting with minimalistic setups.
  - **Personal Achievement and Challenge:** For many radio amateurs, learning CW is a personal goal and a significant achievement. Mastering Morse code requires dedication, practice, and perseverance. It can be a fulfilling journey of self-improvement and can enhance overall skills in radio operation and understanding.
  - **Contesting and Awards:** CW remains a popular mode in amateur radio contests and awards programs. Participating in CW contests can be exciting and competitive, providing opportunities to test one's operating skills, improve efficiency, and potentially win awards.
  - **International Communication:** Morse code is a universal mode of communication in amateur radio. Even if two operators do not speak the same language, they can still communicate effectively using CW. This opens up the possibility of connecting with fellow radio enthusiasts from around the world.
- In summary, while Morse code is not as widely used as it once was, there are still valid reasons for radio amateurs to learn and use CW. It offers historical and traditional value, can be valuable in emergency situations, enables long-distance communication, works well with low power and simple equipment, provides a personal challenge, and allows participation in contests and international communication."

## NARC Activity

Locally here in Norfolk we are taking our summer vacation and classes will commence again at the beginning of October. We now conduct our classes on GB3NB, so the range is extended. We find that helps a lot. Unfortunately, **Chris G4CCX** is ill in hospital at present so we are hoping he makes a good recovery. Chris is very keen on his CW and has been missed on classes lately.

Volunteers for the GB2CW tutoring scheme are always wanted so if you would like to take on the role of a tutor for your club, please ask me for more details. It is simple and straightforward and will provide a lot of help to students. As the RSGB GB2CW Coordinator I do have to issue a letter of authorisation and then get the information onto the GB2CW page of the RSGB website.

Essex CW club run at least two Bootcamps per year, always very well attended, **Fig. 1**.

## CWops

If you are interested in joining CWops, **Fig. 3**, take part in a few of the hourly events on a Wednesday and see how you get on. If you are not quite up to that hectic speed, try the slower speed events. Go to:

<https://cwops.org>

There is plenty here to read. You might like to join the CWops Academy and do an online CW course. It's a great way to improve your CW or even start from scratch. Numerous awards are available, and you will be joining like-minded people from around the world.

You could join in with the SLOW SPEED contests. Go to this page and have a read:

[www.k1usn.com/sst.html](http://www.k1usn.com/sst.html)

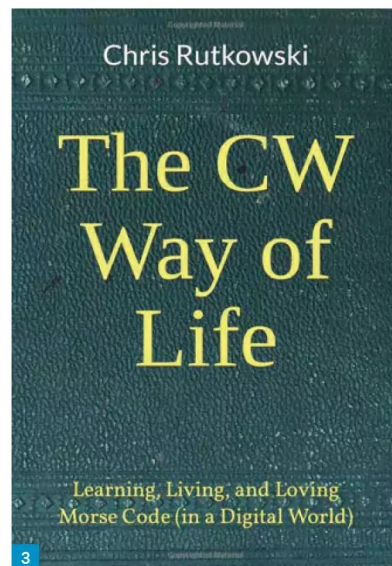
Plenty here to keep you busy too! You might now be into CW contesting, having been nervous about jumping in at the deep end with the QRQ (high speed) gang. This provides great practice to become familiar with the whole thing, contest protocol, contest programs and so on. Be careful though, you might catch the bug and I don't mean Covid! You can join in the fun without being a member of CWops and it is great practice for the RSGB CC series too. It will hone your operating skills and it is a lot of fun. Once you get known and can operate at around 25+ wpm you might even be nominated for membership.

## Announcing the 2023 CWops CW Open Contest

And while on the subject of CWops, in less than two months the annual running of the CW Open will occur. The dates and times for the 2023 sessions are:

- Session 1: Sept 2 (00:00 – 03:59 UTC)
- Session 2: Sept 2 (12:00 – 15:59 UTC)
- Session 3: Sept 2 (20:00 – 23:59 UTC)

It is also an excellent time to start to organise your team and get it registered. Last year there were 25 registered teams with members from all



three ITU regions. The team rosters ranged from a full 10 member team down to three members. They do not need to be CWops members to be on a team. It is always more fun being part of a team.

If you have not yet participated in the CW Open, you should give it a try! Each session is a standalone event and is only four hours long. With that flexibility you can operate as little or as much as you want. You can even win an award by only participating in one session. Unlike the weekly CWTs, the CW Open is more of a contest and less of a sprint. Low power and dipoles work just fine for this event. Plaques and Trophies are awarded for all power classes.

For additional information please refer to the CW Open website at the following URL:

<https://cwops.org/cwops-tests/cw-open>

Look down the web page for the team sign-up link. It is lots of fun as a single op but even more fun to be part of a team. The team membership has no geographic restrictions. It can be local, national, or international.

Please send all your comments, offerings, information and especially pictures to: [roger@g3ldi.co.uk](mailto:roger@g3ldi.co.uk)

73 and may the Morse be with you! Roger G3LDI. **PW**



# BBC Coronations (Pt IV)

This month, **Keith Hamer** and **Garry Smith** continue the special series looking back at the BBC's coverage of Coronations since 1937. There is also a Coronation vintage radio advertisement from the archives. The continuing sagas of the BBC Cymru-Wales Centenary and 100 years of BBC Scotland-Alba are also featured. The series about the development of Swiss Radio and Television since 1933 also continues.

**Keith Hamer**

Keith405625.kh1@gmail.com

**Garry Smith**

Garry405625.gs@gmail.com

In countless homes throughout the world during the Coronation of **King George VI** and his wife, **Queen Elizabeth**, on 6 May 1937, practically all wireless receivers were tuned-in to the BBC's coverage from 10.15am until 11.0pm on Coronation Day. One of the special programmes was the *Empire's Homage*. The climax of the day's programmes was the speech given by the new King, which was broadcast from Buckingham Palace at night, only a few hours after his Coronation. The Royal message came at the end of a 40-minute 'microphone tour' of the Empire, during which listeners were taken by radio westwards around the world. This was George VI's first broadcast as *King-Emperor*. A special 'Royal' microphone was used. This consisted of a standard microphone, but housed in a special ornamental case!

In order to ensure worldwide reception of the Coronation broadcasts, extensions to the *BBC Empire Station* at Daventry were hastened, resulting in six short-wave transmitters being used. They were then linked with the *National* and *Regional Home* transmitters and for most of the day, simultaneously radiated the same programme. In addition, the day's programmes were electrically recorded and re-broadcast from Daventry throughout the night until 8.20 the next morning. As far as it was possible, the BBC ensured that listeners in any part of the world could hear the broadcasts, either 'live' or recorded, at some convenient time during their particular day.

The Coronation ceremony itself was broadcast by a relay of either British Home or Empire transmissions, in more than 20 foreign countries. The USA and most European countries also joined British listeners in hearing the Empire's Homage programme and the King's speech on Coronation Night. The broadcast of the Coronation ceremony was heard by a greater number of people throughout the world than any other programme hitherto in the history of

radio. While it was in progress, the streets of many villages and provincial towns in the UK were practically deserted, the inhabitants being indoors listening intently to their wireless sets. In other places, people gathered in the open air to hear the programme relayed by public address systems.

The BBC wireless commentators were **John Snagge** (at Buckingham Palace), **George Blake** (Middlesex Guildhall), **A W Dobbin** (overlooking the inner courtyard at the Palace where the King and Queen entered the State Coach), **Howard Marshall** (stationed in the *Triforium* inside Westminster Abbey), **Harold Abrahams** (from his vantage point at the *Ministry of Labour* building in Whitehall), **Michael Standing** (overlooking the *Hall of Assembly* in the Abbey), and **Thomas Woodroffe** (at Constitution Hill).

## Vintage Coronation Wireless Equipment

This month's scour through vintage copies of dishevelled newspapers and magazines has garnered an advertisement for no fewer than four Bush radios produced in time for the Coronation, **Fig. 1**. The text has been left in its original format to reflect the spelling, grammar and punctuation of the time.

This is the full description of the *Bush All-Wave and Four-Band Radios* originally featured in an advertisement, dated 16 April 1937:

### "A FRONT SEAT all along the CORONATION ROUTE says Christopher Stone

*Sounds impossible I know, but the B.B.C. Commentary promises to be the next best thing and, if you can't come to town or haven't a seat I am sure you'll be listening. So now's the time to get that new set. I suggest you make it a Bush even if only because you know that it won't let you down just as the cheering begins.*

*Then apart from the B.B.C. Coronation relays the Dominion programmes will be full of interest, so your new Bush should be one of their wonderful shortwave superhets. They make a model for every listener whether A.C., D.C. or Battery user. Ask your local Bush dealer for details.*

*Above is the Bush D.C./A.C. All-Wave superhet*

*model D.A.C.43 PRICE 12 ½ GNS. CASH*

*Also, in the same cabinet, the Battery All-Wave superhet model B.A.43 PRICE £12 GNS. CASH*

*For A.C. users there is the very popular All-Wave superhet model S.S.W.33 at 11 ½ GNS. CASH*

*Then there is the S.S.W.37, a four band receiver of exceptional performance with a triode output valve giving superlative quality of reproduction at 15 GNS. CASH*

*All-Wave receivers are also available in Console cabinets and as radiograms - details will be sent in response to the coupon below.*

*BUSH ALL-WAVE RADIO MODELS FROM 3/6 A WEEK*

*POST THIS COUPON*

*To Bush Radio Ltd. (Dept. R.T. 120), Power Road, Chiswick, London, W.4.*

*Please send me full details of Bush All-Wave table models, consoles and radiograms, also name of nearest Appointed Dealer.*

*Post in ½d. unsealed envelope."*

The Bush company certainly seemed to have a radio suitable for all listeners, even those tuning-in to the BBC's short-wave broadcasts to the British 'Dominions' throughout the Empire.

Although it is interesting to read in the 1937 Coronation advertisement that Bush produced several 'superhet' models, just how many 'average' readers would understand what that term actually meant? How many would be impressed that one radio featured a 'triode output valve'? However, even more intriguing is the mystery surrounding Christopher Stone. Who was he, exactly?

**Major Christopher Reynolds Stone** D.S.O., M.C. was born in 1882. 50 years later, in 1932, he became the BBC's first 'disc jockey', although this term hadn't actually been coined until 1935 when it was used for the first time by the American radio commentator, **Walter Winchell**.

Christopher Stone was an enthusiastic collector of gramophone records and had presented a music programme on the BBC's *2LO Station* back in 1924. His style of presentation didn't suit the BBC at that particular time and he wasn't invited to return until 1932 when he was offered a weekly radio programme. He always wore a dinner jacket and tie while presenting his programmes. He was also the editor of *The Gramophone* magazine, founded by his brother-in-law, **Compton Mackenzie**.

He left the BBC and joined the commercial radio station, *Radio Luxembourg*, in 1934. The station was a serious rival to the BBC. The English-language service of Radio Luxembourg began in 1933 as one of the earliest commercial radio stations broadcasting to the UK and Éire. The station provided a way to circumvent British legislation which, until 1973, gave the BBC a monopoly of radio broadcasting on UK territory and prohibited all forms of advertising over the domestic radio airwaves.

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# A FRONT SEAT all along the CORONATION ROUTE



*says Christopher Stone*

SOUNDS impossible I know, but the B.B.C. Commentary promises to be the next best thing and, if you can't come to town or haven't a seat I am sure you'll be listening. So now's the time to get that new set. I suggest you make it a Bush even if only because you know that it won't let you down just as the cheering begins.

Then apart from the B.B.C. Coronation relays the Dominion programmes will be full of interest, so your new Bush should be one of their wonderful shortwave superhets. They make a model for every listener whether A.C., D.C. or Battery user. Ask your local Bush dealer for details.

## POST THIS COUPON

To Bush Radio Ltd. (Dept. R.T. 120), Power Road, Chislewick, London, W.4.

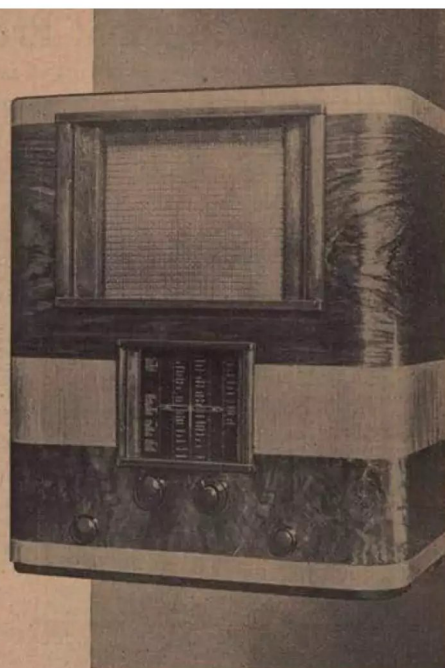
Please send me full details of Bush All-Wave table models, consoles and radiograms, also name of nearest Appointed Dealer.

Name

Address

Post in 4d. unsealed envelope.

1



Above is the Bush D.C./A.C. All-Wave superhet model D.A.C.43 . . . . . PRICE 12<sup>1</sup>/<sub>2</sub> GNS. 12<sup>1</sup>/<sub>2</sub> CASH

Also, in the same cabinet, the Battery All-Wave superhet model B.A.43 . . . . . PRICE 12 GNS. CASH

For A.C. users there is the very popular All-Wave superhet model S.S.W.33 at . . . . . 11<sup>1</sup>/<sub>2</sub> GNS. 11<sup>1</sup>/<sub>2</sub> CASH

Then there is the S.S.W.37, a four band receiver of exceptional performance with a triode output valve giving superlative quality of reproduction at . . . . . 15 GNS. CASH

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# BUSH

## ALL-WAVE RADIO

MODELS FROM 3/6 A WEEK

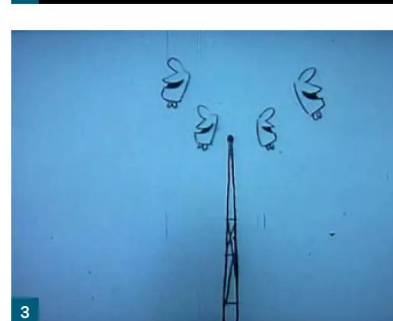
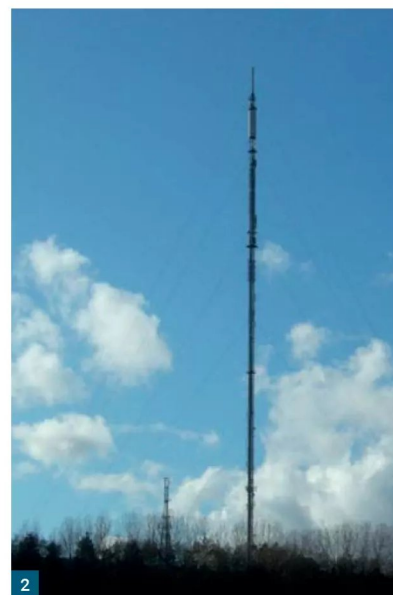


Fig. 1: A Coronation advertisement for *Bush All-Wave and Four-Band Radios*, published on 16 April 1937. Fig. 2: The Wenvoe transmitter in October 2011. Fig. 3: A promotional film was radiated by the BBC shortly before the official opening of the Welsh television service on 15 August 1952.

When the BBC began broadcasting in 1922, the British government awarded a monopoly broadcasting licence to the *British Broadcasting Company*, whose shares were owned by British and American electrical companies. Although in theory the BBC could have sold sponsored airtime, instead their income came from the royalties generated every time a radio receiver was sold by the various manufacturers. This arrangement lasted until 1927, when the broadcasting licence of the original BBC was allowed to expire. The assets of the former commercial company were then sold to the new non-commercial *British Broadcasting Corporation*, which operated under a Royal Charter.

Meanwhile, Radio Luxembourg boasted that they operated the most powerful privately owned medium-wave transmitter in Europe (200kW). In

the late 1930s, and again in the 1950s and 1960s, it had large audiences in the UK and Éire with its programmes featuring the latest pop songs as well as general light entertainment shows. The station was an important forerunner of pirate radio and modern commercial radio in the United Kingdom.

Christopher Stone was reportedly paid £5,000 a year by his new employer. Not surprisingly, the BBC temporarily barred him from working on any of their own music programmes!

*Bush Radio* invited him to appear in several of their advertisements, such as the one featured this month. He was a very popular character and became known as 'Uncle Chris' in 1937 when he presented the first daily programme for children on *Radio Lyons*. The programme was called *Kiddies Quarter Hour*.

The BBC eventually relented on banning

the presenter and he was offered a regular programme slot. Unfortunately, the BBC soon wished they hadn't invited him back. He caused a major furore on 11 November 1941, when he wished **King Victor Emmanuel III** of Italy a happy birthday 'live' on-air, adding: "I don't think any of us wish him anything but good, poor soul." Many *PW* readers will recall that the United Kingdom happened to be at war with Italy at the time. The misplaced good wishes to the warring Italian head of state resulted in the sacking of the BBC's *Senior Controller of Programmes* and tighter government controls were imposed over all broadcasts!

## BBC Cymru-Wales Centenary, Part IV

Television came to Wales on 15 August 1952, from the 750ft (230m) Wenvoe transmitter

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mast in the Vale of Glamorgan. It operated in Band I on channel B5 (66.75MHz) with 100kW ERP. On 8 February 1964, the Wenvoe Band III transmitter opened on Channel B13 (214.75MHz) with 200kW, employing vertical polarisation. The authors visited the transmitter in October 2011, **Fig. 2**.

A promotional film was radiated by the BBC shortly before the official opening of the Welsh service, **Fig. 3**. Intense anticipation was felt by those who could not only receive a television signal, but also afford a set. New technology required fresh terminology and Welsh speakers had no desire to lag behind. In May 1953, the BBC ran a competition to find a Welsh word for *television* that surpassed the rather unimaginative *teletisiwn*. About 500 entries were received. Among the suggestions were *radlunio* ('radio picturing') and *radiolygad* ('radio eye'), and *teledu* (combining 'television' and *darlledu*, the Welsh for 'broadcasting'). After much deliberation, the latter suggestion was eventually announced as the clear winner.

Welsh and English news and current affairs broadcasts, such as *Cefndir*, proliferated, and up until the introduction of the teleprompter in 1957 roving news reporters faced the difficult task of memorising or improvising their pieces to camera. Unpredictability was often the byword of early Welsh regional news bulletins, the first of which, called *News From Wales*, was read by **Michael Aspel** in September 1957. The authors were delighted to be Michael's special guests of honour for an edition of the *Antiques Roadshow* in September, 2006, where they were interviewed on-stage in front of a large audience to discuss their extensive collection of BBC archives. The programme was recorded at the *De Montfort Hall* in Leicester. This particular programme was one of the first to be produced in HDTV. Michael began his career in 1954 as a radio actor with the BBC in Cardiff.

The successor to the short *News From Wales* bulletin was called *Wales Today*. Originally presented by **Brian Hoey**, the news programme went on-air at 6.10pm on Monday 17 September 1962. It shared a 25-minute timeslot for regional news with *Points West* from Bristol. Both programmes were broadcast to Wales and the West of England from the Wenvoe transmitter near Cardiff.

Two new television regions, *BBC Wales* and *BBC West*, were created in February, 1964, with the addition of a new frequency, Channel 13, for Wales from Wenvoe. *BBC Wales Today* became a 25-minute programme broadcast only to Wales while *Points West* was transmitted solely to the West of England. In 1969, the opening of separate UHF transmitters at Wenvoe (Wales) and Mendip (West) led to a complete separation, except for overlap areas in South Wales.



During the Sixties, several new television transmitters were constructed throughout Wales with a consequent rise in the number of viewers. The BBC Wales Band III transmitter at *Moel-y-Parc* was brought into service on 28 October 1965. By 1967, the year in which the BBC's first purpose-built Broadcasting House opened in Llandaff (1 March), BBC Wales was available to more than 70% of the population.

21 October 1966 was one of the darkest days in Welsh history when, after weeks of torrential rain, a coal tip slid down onto *Aberfan* in the South Wales valleys. The community lost 144 people in the disaster. The lively light music accompanying *Test Card 'D'* on BBC-1 was hurriedly replaced by sombre classical pieces until being interrupted for a 'live' news report from the village.

Television in Wales was at the forefront of innovation with programmes such as *Doctor Who* with his deadly adversaries, the *Daleks*, transferring production to the Principality. Radio continued to develop rapidly with the formation of *BBC Radio Cymru* on 3 January 1977, and *BBC Radio Wales* on 13 November 1978. Since then, both stations have become full, national services.

One of the earliest colour television broadcasts in Wales was on 7 April 1968, with a programme called *Music In Midsummer*, which was performed ahead of the 1968 *Llangollen International Eisteddfod*. On 1 July 1969, an historic Outside Broadcast was mounted by the BBC to broadcast the formal investiture of the 20-year-old **Prince Charles** as the *Prince of Wales* at a lavish event at Caernarfon Castle. The six-hour broadcast was watched by a television audience of 500 million people around the world.

## BBC Scotland-Alba Centenary, Part IV

The *BBC 5SC Station* began broadcasting on Tuesday 6 March 1923, from an attic in Rex House, located at 202 Bath Street in Glasgow. The first radio station in Scotland was operated by the British Broadcasting Company. The station's first Director was **Herbert Carruthers**.

In 1935, BBC Scotland moved their headquarters from West George Street to North Park House in Queen Margaret Drive, Glasgow. The site was chosen partly due to the attraction of the nearby tennis courts, gardens and bowling greens. As the various services increased, more space was required, resulting in the demolition of all those facilities which the staff had hitherto enjoyed!

When BBC Scotland ultimately vacated their studios at Queen Margaret Drive and moved to a new home in Pacific Quay in 2007, most of the former facilities were restored to their former glory. An art consultant was engaged to create a piece of public artwork in Queen Margaret Drive as a legacy to BBC Scotland's time there.

## Service Information: Switzerland, Part VI

Switzerland's first experimental television transmission was broadcast in 1939 at the *Landesausstellung* (Swiss National Exhibition) in Zürich. The demonstration was organised by the *Eidgenössische Technische Hochschule* (ETH, the Swiss Federal Institute of Technology). SRG-SSR hired a company of actors whose performance in front of the camera was shown on a television receiver and viewed by onlookers through a glass screen, **Fig. 4**. The ETH was founded in 1855.



**Fig. 4: Onlookers at the Swiss Landesausstellung (National Exhibition) in 1939 watched the first experimental television programme through a glass panel. Fig. 5: SRG officially began their experimental television service in 1953 from the Bellerive studios in Zürich.**

**Fig. 6: The first French-language news programme in Switzerland.**

**Albert Einstein** studied there and later taught as a professor of theoretical physics.

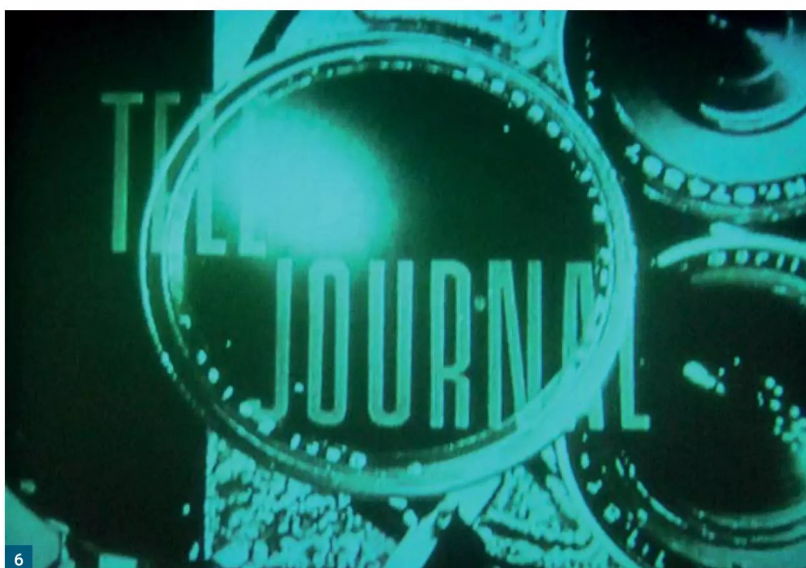
The next major development in television was the release by the SRG-SSR Directorate-General of a report detailing the exact requirements for the introduction of a television service.

The first official experimental programmes were broadcast in 1951. The broadcasts were only intended for viewers in French and German-speaking areas of Switzerland. Unfortunately, the new technology was met with fierce opposition in German-speaking parts of the country amid fears that television would destroy family life. Indeed, in 1957, the Swiss held a referendum and rejected the initial proposals for a national television service. New agreements had to be implemented. Meanwhile, viewers in the Italian-speaking Ticino had to rely on test programmes broadcast by the Italian national broadcaster, known until 1954 as *Radio Audizioni Italiane (RAI)*. After 1954, the service was renamed *Radiotelevisione Italiana*, but is still known today as *RAI*.

In 1953, SRG officially began their television service, but only as a series of test transmissions, **Fig. 5**. The Bellerive studios, located on Kreuzstrasse in Zürich, broadcast for approximately one hour, five nights a week, with a daily news bulletin called *Tagesschau*. Studios in Geneva, located on Boulevard Carl Vogt, received their own licence to broadcast test transmissions at around the same time. The French-language news programme was called *Tele Journal*, **Fig. 6**. These archive off-screen photographs were captured by the authors during a visit to the *Verkehrshaus der Schweiz (Luzern)* in 2006. This amazing transport and technology museum was opened in 1959.

In 1957, the *Schweizerischer Bundesrat* (Swiss Federal Council) granted SRG and SSR licences to broadcast television programmes from Zürich and Geneva, respectively. The licences officially came into force on 1 January 1958. Viewers in the Ticino had to watch SRG or SSR programmes with Italian subtitles. A microwave link was used across the Alps. It ran in a chain from Gempen, near Basel, to Frobürg, then Bantiger, the Jungfrau (12,000ft), and finally on to Monte Generoso in the Ticino. This link connected the German-language service to the inhabitants of the Italian-speaking Ticino.

A second microwave link ran from Uetliberg (Zürich) to Frobürg, then Bantiger to Romont, and



finally the transmitter at La Dôle. This link was subsequently extended to Cuiseaux to provide facilities for the exchange of programmes with France via the Eurovision network.

By 1959, television transmitters were in service at Uetliberg, Bantiger, Sankt Chrischona, Säntis, and La Dôle.

According to the authors' copy of the EBU's *List Of Television Stations No. 5*, published on 1 March 1960, programmes in the Ticino could be received from the transmitters at Monte Ceneri on Channel E5 (175.25MHz, 10kW vision and 2kW sound ERP with horizontal polarisation) and from Monte San Salvatore on Channel E10 (210.25MHz, 10kW vision, 2kW sound, horizontal).

The transmission characteristics were: 625

lines; FM sound modulation  $\pm 50\text{kHz}$  50 $\mu\text{s}$ ; negative vision modulation; offsets of  $\pm 10.5\text{kHz}$  for vision and  $\pm 10.5\text{kHz}$ , sound.

### DX-TV & FM News

The latest DX news, plus details of changes to broadcast television and radio services, is available on-line via the *Radio Enthusiast* website by searching for the *Latest Articles* section.

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

### Stay Tuned!

All photographs this month are by the authors or from our archive collection. Please send archive photographs, information or suggestions for future topics via the email addresses shown at the top of this column. **PW**

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# Your Letters

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## ★ Star Letter ★

The Star Letter will receive a voucher worth £20 to spend on items from our Book Store, or other services offered by Practical Wireless

### Kent Rigs, a Thank You

Dear Don,

In 1997, as a newcomer to the world of short-wave radio listening, I bought an AOR AR7030 desktop receiver, which gave many years of enjoyment until, in 2020, while running a filter calibration sequence, the radio suddenly stopped functioning as expected and displayed a fixed message of CPU ??? No amount of button pushing had any effect.

Suitably baffled, I tried to find any information on the internet as to what might be the cause of the problem and even called the supplier, Waters & Stanton, but since this was during the Covid-19 lockdown period, they were not taking in any repair orders and were equally unable to offer any options over the phone. Moreover, I could not induce the LOAD DEFAULT option as the device was unresponsive.

The following year, with a renewed urge to get the problem sorted out, I wrote a letter outlining the problem to **Georg Wiessala**, Editor of *RadioUser* magazine knowing that he too owned the same radio as me. He was unable to replicate the message I had shared, but he

kindly mentioned it in his Editorial column in the May 2021 issue, and also placed a Help request on the Home page of the radioenthusiast.co.uk website in the hope that someone might be able to offer assistance. Sadly, these generous appeals yielded no response.

Resigned to not seeing any way forward to getting the radio operational again, I searched around on the internet and through the magazine for similar units, but with the advent of SDR and so many desktop units being transceivers, nothing seemed to be available as a direct replacement.

It was thus with some renewed hope that I then came across a possible solution in the Classified Adverts section of the June 2023 edition of *Practical Wireless* (which I had not realised had joined up with *RadioUser* and hence my earlier inability to find issues of it). A small ad under Repairs from a company called Kent-Rigs caught my attention, particularly as I live in Kent and, as it turned out, not too far away as they were a Chatham location.

Prompted by a good review from Twitter from another enthusiast who had had radios

repaired to a high standard, I had a look around the website and called the number. The conversation sounded promising, so I boxed up the unit in its original packaging with the power supply and manual and posted it off.

About 10 days later I had a phone call from Kent-Rigs to say the radio had been completely restored to full working condition with the installation of several replacement components, which was particularly impressive seeing as AOR had been out of business for many years.

Long story but I wanted to take this opportunity in your *Letters* section to call out Kent-Rigs, and in particular **Mick Baldwin**, for not only providing such a brilliant service but also at an incredible price, saving me many wasted pounds on a new radio by restoring my treasured receiver.

So, if your readers are in need of repairs to a radio device (valve or transistor), please do not hesitate to call the number – I can wholeheartedly recommend them and you will not be disappointed.

**Simon Bagg**  
**Ashford, Kent**

### Don't try this at Home and Whither AM?

Dear Don,

I recently bought a copy of the book by **Gilbert Davey** *Fun with Short Waves* on eBay and built the radio with a DF96 and DL96. It didn't work.

Something to do with parasitic oscillations, but no matter what I did, it wouldn't work. Then it hit me, I built the same radio in the late 70s and that never worked either. This is from an author that could never get the negative grid bias circuit to work as it should. The weird thing is that high tension batteries were expensive in the late 70s and had a high internal resistance. You could put a couple of paper clips in the connectors and go into a darkened room and draw small sparks off them.

In order to try the old circuit above, I bought ten PP3 batteries and wired them in series for an HT battery, but what a difference to the old HT batteries. They were practically lethal, drawing big yellow sparks off them, if you accidentally shorted the contacts. I even got a bit of an electric shock off them when I got a bit sweaty and accidentally shorted the terminals against me. Don't try this at home!

On another topic, 50 years ago, I bought a load of back copies of *Practical Wireless* from a jumble sale at my local school. I have read them avidly ever since, and have learned a lot about radio and radio servicing. I have spent the last 40 years or so restoring old radios from the knowledge learned in those back copies.

However, here is my problem, given that AM

radio stations are being switched off at an alarming rate, what is the point in restoring old AM radios any more? The local oldies station plays the same old 80's hits in a loop and the only other stations on air are sports radio stations, not my bag. FM has always been patchy and I can never get a reliable digital signal when listening in the bath. What am I to do?

**Andrew Redding**  
**Rotherham**

### Near Field Measurements

Dear Don,

With reference to the letter from **John Fitch G8EWG**, I have built the E-Field meter designed by **John Hawes G8CQX**. I calibrated it with my

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Racal 9301A RF millivoltmeter and use it to get an indication of field strength in my shack and around the garden. However, I doubt that OFCOM would accept this as a means of proving compliance with the ICNIRP limits.

As I had to buy the components in bulk I have some left over. If any reader would like to build and experiment with this device, I can supply the PCB and a number of the components (free of charge) to the first three readers to contact me via the email address on my qrz.com web page.

Surface mount soldering skills will be required, and one of the ICs is VERY small

**Mike Dunstan G8GYW**  
Woodley, Berkshire

**Dear Don,**

Re: 'Thoughts on the Near Fields' letter from **John Fitch G8EWG** in the July issue. I totally agree that we need a usable option for reliable EM field measurements.

The electric field from a transmitting antenna induces a significant currents in nearby conductors. These are then re-radiated and contribute to the overall radiated electromagnetic field. This is particularly troublesome with pole-mounted vertical antennas.

Using EZNEC, I modelled a groundplane antenna with four droopy radials at 50MHz with a half wavelength sampling rod 10cm vertically below its feedpoint. The results were surprising. The currents picked up in the rod were about 82% of the current in the radiator element. Plus, the major lobe was deflected downwards by about 30°, which has serious ICNIRP implications. With four horizontal radials the sampling rod picked up 31% of the radiator current, resulting in a major downward lobe at 45°.

Even if we resort to fibreglass poles, the pick-up will manifest on the outer of the coax despite ferrite chokes at the antenna feedpoint.

The effects on the direction of the main lobe were significant up to a gap of one wavelength. There are some remedies but these are single band. Increasing the length of the pole to a non-resonant length proved not to be a usable solution.

I am happy to share details of the modelling as I think that a robust analysis of this phenomenon is needed – particularly as the radiation patterns claimed by manufacturers of VHF/UHF 'white stick' antennas seem to be immune from these problems.

**Keith Lockstone M0KIL**  
Pevensey Bay

## Trigonometry... "Your Letters"

**Dear Don,**

I noticed that in the next upcoming issue of *PW* that trigonometry is set to be exposed, courtesy of G4GLM. I can't wait. To be honest, I've not had

the occasion to use this indispensable mathematical tool, not since my brother and I were entranced with astronomy (we had a small homebrewed observatory in the back garden that housed a 14in Celestron Cassegrain telescope) and the darker arts of cosmology. We'd use trig to formulate and confirm the distance of nearby stellar objects, which sometimes didn't correlate with the then known and accepted co-ordinates. Initially, it was great fun trying to get our collective heads around all the basic functions: sine, cosine, tangent and so on. And of course, without the seeming magic of trig, the LEO (Low Earth Orbit) adventures of the Space Shuttle and the effort of putting satellites aloft might not have happened. And I read somewhere that trig is now used in the gaming industry. Who'd of thought that would be the case several decades ago?

Anyway, I'm sure that G4GLM will gently fill us in on all the other finer points of trig.

Lastly, if I may, I just can't help myself commenting again regarding 'pages coming loose' in *PW*. This time, EI5CD. Never ever happened to any of my issues of *PW*. 50 years plus of thumbing through *PWs*, and never an errant page coming loose. Maybe I've been lucky? Or too careful?

**Ray Howes G4OWY/G6AUW**  
Weymouth

## Licensing

**Dear Don,**

As an avid reader of your magazine in my very early teens I had always hoped for a foray into amateur radio. Opportunity and finance prevented this at such an early age and I left school and experienced the rush of growing up in heavy industry.

Maintaining the interest I went into electrical engineering in the Royal Navy and enjoyed all the radio communications that came with the RN role in such a diverse operating environment.

In the final years of my non-technical Government career, post RN, I have finally managed, in preparation for retirement, to achieve an M6 callsign. Why did I not do this before? Well sometimes life gets in the way and while I have not one regret, I do take some amount of satisfaction that the spark that ignited the flame back in the mid-70s still burns to this very day.

Operating is enjoyable from home on my FT-991A, mobile using my FT-7800 and when my wife and I are away touring the UK, my 991A accompanies us (sometimes the FT-897 but I do enjoy the visual capabilities of the new radios), packed carefully in a plastic box with a few wire antennas, a homebrew 2m dipole, all of which can be erected on my 7m telescopic fibreglass

mast. FT8 and voice, Wires-X and SW listening are all within my reach.

To be an effective operator, a good understanding of the radio environment is essential. As a Foundation licence holder my technical knowledge is far in advance of such a lowly station and accreditation, but it has to be if you want to be successful in your hobby. I do believe an additional qualification is unnecessary for that status.

Intermediate (licence) operation is not something that I long for but I do wait with anticipation for the outcome of the Ofcom review. I do hope those who will participate in the review consider very carefully, and with some acceptance and understanding, that the safe and effective operation of modern radios and associated antennas does negate some of the more complex learning necessary, that is currently mandated in the Full Licence.

It is absolutely essential that we need to understand how our radios operate in tune with Ofcom and the Operational Band Plans alongside the obligatory etiquette etc, and if it can be further acknowledged, in licence terms, that there is a difference between the skills required for the safe operation of a modern Yaesu/Icom et al, and the additional technical ability required in the construction of an equivalent and/or increasing the power output over that of which the modern radio is capable. If the licence conditions reflect this then I am sure the hobby will positively flourish and grow in a way not yet considered. That is if such growth is the outcome Ofcom would wish for!

I am not an amateur radio purist. I am but a safe operator. There is, absolutely, a place for the thousands like me in this marvellous hobby.

**John Harts M6GOV**  
Barnsley

*(Editor's comment: Thanks John, great to hear from you. One of the problems is that, in order for the UK Full Licence to be accepted in other countries, certain technical and other requirements need to be met. Perhaps we need an 'operator only' licence, limited technical knowledge required, that we accept limits the licensee to operation from the UK. But, sadly, to pick up on one of your other points, Ofcom seem to have little or no interest in amateur radio nowadays – since their remit was expanded some years ago, they have much bigger fish to fry, not least the current issues with the BBC, ITV, etc.)*

## The Decline of Amateur Radio

**Dear Don,**

I am stimulated to write to you following your editorial in the July edition of *PW*.

I have been licensed since 1979. I have not been 'on the air' for decades, but still enjoy lis-



tening to anything that piques my interest – sadly the amateur bands do not form a part of my regular listening habits anymore.

I have gradually come to the conclusion that the digital revolution has led to the 'industrialisation' of amateur radio, which in turn has made the hobby unattractive to both potential new, and old followers alike, and thus contributes to its continuing decline.

I believe the hobby has been reduced to the level of 'target chasing' (which does make it attractive for some!). These targets have become the 'de-facto purpose' for many, with the resulting mindset that leads to (bizarre) behaviours and the exploitation of digital technology in support of it. A side effect is the so called 'spirit' of the hobby falling by the wayside.

This has led to the situation where amateur radio is all about 'hitting the target, and missing the point'.

The '145 Alive' event was a great attempt to resurrect the 'spirit' of the hobby, but was it just one event in the death throes of Amateur Radio?

**Martin Swan**  
Ipswich

*(Editor's comment: Sorry you feel that way Martin. There is, of course, a lot of truth in what you say. Many amateurs nevertheless fall back on Zoom, Skype, WhatsApp and the like for actual chatting nowadays, whereas back when these facilities didn't exist and even long-distance phone calls were expensive, amateur radio was an attractive alternative. But I see lots of interest in building and operating QRP equipment in particular and what I also discern in those shacks where PC and radio are inextricably connected, is an opportunity for 'self-training' in systems integration – for some enthusiasts this is at a very high level of expertise. So, yes, the hobby has certainly changed – hardly surprising I guess for many of us. I was licensed in 1968, some 55 years ago, so I have witnessed roughly half the time that humans have been using 'wireless' technology. For those who have come into the hobby much more recently, I suspect they simply accept it for what it is. But, as always, I'd welcome reader views.)*

## Simple Pleasures

**Dear Don,**

It is sometimes all too easy to forget how to enjoy the simple pleasures of amateur radio, which is how I got started, like so many others, with a cheap 2m FM rig back in the early 80s. I distinctly recall jumping up and down with excitement when I managed my first 'DX' using a low powered Trio TR-2200G on the beach at Great Yarmouth, Norfolk, in the summer of 1984. My first 'DX' contact? A Dutch amateur!

Then just last week I climbed one of our hills within a sensible distance from home with my

son. This is Breidden Hill, Powys, Wales, or just shortened to 'Rodney's Pillar', between Oswestry and Welshpool, off the A483. I took my venerable and trustworthy 1985 Icom IC-2E with me, and from the top of the climb at approximately 367m, I switched it on.

The results reminded me that with VHF and above, that old saying 'height is might' is so true. With an 'antique' Icom handheld radio, a quarter-wave whip and approximately 2.5 watts, I had good 5+9 contacts with **Peter M1BZJ** in Wigan (around 70 to 80 miles away), and **Tom M1EYP** around 60 miles away.

Imagine – no built-in GPS, no digital modes, no APRS, just plain old analogue FM. A new definition of SDR?

Sometimes we all need to leave the shack and get outdoors to remember the real pleasures of playing radio!

**Richard White G6NFE**  
Shrewsbury

## Bush EU15

**Dear Don,**

I was a one-time member of BVWS and am trying to locate a schematic for the Bush EU15 radio. Any help would be appreciated.

**Richard Brewster** (gransue7@gmail.com)

*(Editor's comment: Can any reader help Richard? The EU15 appears to have been an export model but the Bush collector's website now seems to be defunct.)*

## Downloading +/- Printing

**Dear Don,**

I finally got my licence some 40 years after I first discovered amateur radio. I think my first exposure to it was reading through some old PWs a school friend had. No idea where he got them. Anyway, when I found PW was still around I had to subscribe and have enjoyed many of the articles.

One problem I find is downloading articles and I think the same problem occurs with RadCom. Keeping relevant articles as PDFs in my own filing system allows much easier searching and finding of same.

Your software (*Pocketmags* – ed.) seems to allow downloads of only one page at a time. I use Windows 11 and Chrome and keep them updated. I have tried many times to select two or more pages of an article and download them as one PDF and it seems impossible. Using CTRL or SHIFT keys while clicking on more than one page seems totally forbidden – I get the spinning wheel for a few seconds and then right back to the main reader.

Some readers may have PDF editing software, which costs some pounds last time I checked,

and use that to combine downloaded pages into one PDF but that is cumbersome and should be unnecessary if your website allows downloads the way it says.

Could someone advise me on this in due course please? Many thanks.

**Declan Fox M17DEC**  
Northern Ireland

*(Editor's comment: I have asked Warners to comment on this as they use Pocketmags for their whole range of publications. I suspect the answer is that the intention is for subscribers to be able to read the magazine online but not to be able to download it, because then they could share it with others who would then have access at no cost, which isn't a good business model, of course!)*

## Using Old HiFi Speakers

**Dear Don,**

In response to the article by **Steve Ireland** regarding using old surround sound speakers in place of the rig's own speaker, I could not agree more.

Years ago I purchased a JBL soundbar for use on my TV. I was having problems getting the correct sync. As a result, I plugged it into my PC for a bit of an experiment. This was the same PC that was attached to my Winradio SDR card. Needless to say, I immediately ditched the cheap PC speakers and continued to use the soundbar. The clarity was greatly improved and since then every radio device I have has been improved by this method.

You have to make sure the receiver has a line-out (mine all do) and the soundbar has an analogue input as well as the optical and Bluetooth options that are standard now. Also, the output socket will probably be mono, and the soundbar will be stereo. An adapter may be needed.

The PC that runs my Winradio card has built-in Bluetooth, so I can connect without using the analogue method.

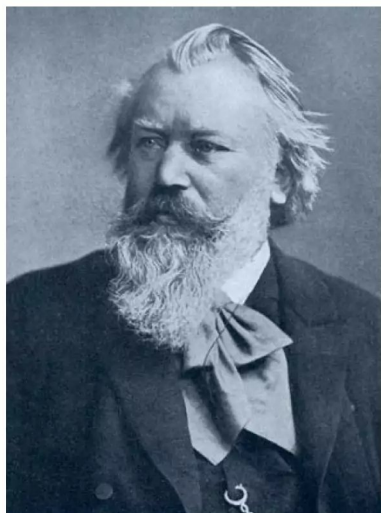
I have just moved into a flat so most of my system is in pieces at the moment. However, as I pen this letter, I have cobbled together an impromptu system. It comprises a Tecsun S2000 Radio (much maligned, but it does quite well) connected through my old AMC 3025a amplifier, then through some cheap JVC music centre speakers from my late father's study. I take pleasure in listening to BBC Radio Scotland on 810kHz in the evening sitting on the sofa in the kitchen. Subject to conditions, the fidelity can be surprising.

My main receiver is an Icom R75, which I think I will connect to the JBL soundbar, but aerials in a flat will be challenging.

I have just taken a subscription to your magazine and am considering joining the local

Read more radio news and reviews at [www.radioenthusiast.co.uk/news](http://www.radioenthusiast.co.uk/news)





Why Johannes Brahms...

NADARS. I don't have the technical knowledge of most of your readers, but trying to reinvent an old hobby, and yes, I have sofa, PC, Radio, Music in my kitchen...and am single, Lol.

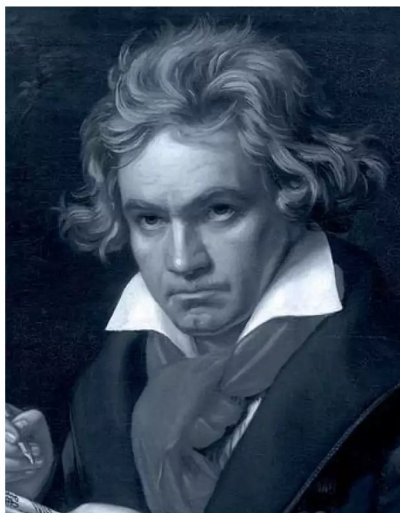
I conclusion, I really enjoyed the article.

**Simon Corbet**  
Near Newbury

## Various

Dear Don,

My letter last month should have included contact details for **Jake Rothman**. For conven-



...and not Ludwig van Beethoven...

ience, his email and phone number (which he has asked me to include in print) are:

**jrothman1962@gmail.com, 01597 829102**

On a completely different subject, the music at the close of the Joan-Eleanor SSTR-1 training film (last month's *Valve & Vintage* and tinyurl 4h4ydx3w) is the very end of Brahms Symphony No 1 Op 68 in C minor. It's a triumphant ending, but a few bars before the part we hear is an allusion to Beethoven's style, the perceived shackles of which the composer appears to be casting off. The very opening of the work has a similar idea and we know that Brahms, despite his habitual



...or Pyotr Ilyich Tchaikovsky?

confidence and successful career, felt so much in awe of his predecessor that he began writing symphonies only late in life and was limited to just the four.

My musical interest happens to peak in the Romantic period, which includes Brahms (Tchaikovsky and Dvorak as well, but – I have to warn you – Gilbert & Sullivan operetti for light relief!).

Do any readers have an idea why this piece might have been chosen?

**Godfrey Manning G4GLM**  
Edgware

# Next Month

in the UK's best & only independent amateur radio magazine...



**THE FACE BEHIND THE CALL:** Roger Dowling G3NKH takes an enjoyable trip down memory lane to meet Lynda Jopson, the second G6QA.

**THE 2023 PW 70MHz CONTEST:** Colin Redwood G6MXL has the rules and advice on taking part.

**PREPPERS:** Joe Chester M1MWD goes digital in the second part of this series, sorting out various software issues.

**VINTAGE TELEVISION & RADIO:** Keith Hamer and Garry Smith continue the special series looking back at the BBC's coverage of Coronations since 1937. There is also a Coronation vintage wireless advertisement from the archives, including a profile of Murphy Radio. And lots more.

**BUILD YOUR OWN GEAR:** Tim Walford G3PCJ discusses the pros and cons of building from scratch and from kits.

There are all your other regular columns too, including HF Highlights, World of VHF, Valve & Vintage, Antennas, Book Reviews and Data Modes as well as your Letters, the latest News and more.

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# LOOK WHAT A UK HAM WORKED IN JUST A SINGLE MONTH USING A YAESU FTDx10. ALL ON A HALF SIZE G5RV!

Thanks for the FTDx10, purchased from you a few weeks ago. The radio is superb with the receiver being especially good for CW, my only mode. Shown are the QSOs I had in May 2023. I decided to plot the CW contacts



with very casual operating at <40 Watts (many at 5W) to a half size G5RV antenna. 263,538 miles, or around 11 times around the earth, amazing! As they say, "a picture paints a thousand words."  
73 de Chris G4UDG



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\* Microphone M-1: Optional

\* Photo shows the FTDX101MP

\*1 3DSS: 3-Dimensional Spectrum Stream

\*2 ABI: Active Band Indicator

\*3 MPVD: Multi-Purpose VFO Outer Dial

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# The Battle of Britain

IN COLOUR



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**Publisher**  
Rob McDonnell  
[robm@warnersgroup.co.uk](mailto:robm@warnersgroup.co.uk)

**Editor**  
Andy Saunders  
[andy.saunders@warnersgroup.co.uk](mailto:andy.saunders@warnersgroup.co.uk)  
Tel: 01753 770712

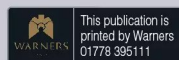
**Colourisation Artist**  
Richard J Molloy  
[@colourbyRJM](mailto:@colourbyRJM)  
**Aircraft Profile Artwork**  
Andy Godfrey  
[teaselstudio@yahoo.co.uk](mailto:teaselstudio@yahoo.co.uk)

**DESIGN**  
**Head of Design and Production**  
Lynn Wright  
**Designer**  
Mike Edwards

**MARKETING**  
**Marketing Manager**  
Katherine Brown  
[katherine.brown@warnersgroup.co.uk](mailto:katherine.brown@warnersgroup.co.uk)  
Tel: 01778 395092  
**Marketing Executive**  
Luke Hider  
[luke.hider@warnersgroup.co.uk](mailto:luke.hider@warnersgroup.co.uk)  
Tel: 01778 395085

**ADVERTISING**  
**Sales Executive**  
Kristina Green  
[kristina.green@warnersgroup.co.uk](mailto:kristina.green@warnersgroup.co.uk)  
Tel: 01778 392096  
**Production Manager**  
Nicola Lock  
[nicola.lock@warnersgroup.co.uk](mailto:nicola.lock@warnersgroup.co.uk)  
Tel: 01778 392420  
**Production Assistant**  
Charlotte Bamford  
[charlotte.bamford@warnersgroup.co.uk](mailto:charlotte.bamford@warnersgroup.co.uk)  
Tel: 01778 395081

**DISTRIBUTION**  
Warners Distribution  
Andy Perry  
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# Welcome

The Battle of Britain will forever hold a special place in the collective memory of the peoples of Great Britain and her Commonwealth and was also a battle which saw the participation of airmen from no less than 15 nations, including the occupied countries of Europe. It was also a battle on which national survival depended if Germany was to be held at bay and prevented from launching any invasion and occupation of the British Isles. Indeed, such was its significance that it is unique in being the only battle of either of the world wars which has its special commemorative date set in the British calendar: Battle of Britain Day, the event marked on the nearest Sunday to 15 September each year with commemorative events and church services.

As a battle, it was perhaps caught up in the national psyche more than any other because it was fought out in the skies above Britain – and principally over the south east and London – and in full view of the British public. Certainly, the population had been exposed to relatively limited attacks by Zeppelin airships and aircraft during the First World War, although this was the very first occasion on which the British public were so much on the front line, bystanders to the greatest aerial assault that the world had yet seen. From their grandstand view of the battles which unfolded above their heads, so the public's admiration of the RAF's fighter pilots grew and was nurtured. In fact, it would be true to say that this admiration grew to adulation and hero worship as the battle progressed. This was, perhaps, increasingly the case as a realisation dawned that these young fighter pilots were seemingly all that stood between potential defeat and the catastrophe of invasion. Not only that, but as bombs began to fall on Britain in an increasing tonnage, so the RAF's fighter pilots were pretty much the only effective defence to counter the assault by the Luftwaffe's bombers. Thus, they were rightly perceived as the saviours of the nation and defenders of the people.



Eighty years on, and there is every reason to still remember with gratitude the sacrifices and the endeavours of the pilots of RAF Fighter Command during that momentous summer of 1940 and to honour their memory. Of course, the Battle of Britain has been remembered by a grateful nation across the decades and through all manner of commemorations, memorials, books, films and TV programmes. Frequently, photographs from the Battle of Britain will have been seen across many years and will be widely familiar. However, for the most part at least, these images will have been in black and white and it has often been said that our perception is almost that both world wars were fought in black and white. Now, in this unique publication, we bring you an entirely fresh view of that battle as its narrative is told through digitally colourised photographs from 1940. These colourisations have been professionally created by using references to known colours and markings of the period and by scientific evaluation of shades and tones on the original images.

I hope you enjoy this unique look at the Battle of Britain in its 80<sup>th</sup> anniversary year through a publication which is presented as a tribute to the young men of RAF Fighter Command, Churchill's revered 'Few'.

**Andy Saunders**  
*Editor, Battle of Britain in Colour*



# The Battle of Britain

## IN COLOUR

### INSIDE THIS COMMEMORATIVE PUBLICATION

#### 6 THE BATTLE LOOMS

We take a look at the lead-up to the Battle of Britain, including the Battle of France and the Dunkirk evacuations, and how those events impacted on the battles to come during the summer and autumn of 1940, as they were played out in the skies over the British Isles.

#### 12 THE LEADERS

Two very different leaders were in charge of Britain's air defence and the Luftwaffe assault: the slightly dour and reserved Air Chief Marshal Hugh Dowding, leading RAF Fighter Command, and the flamboyantly extravagant and grandiose Reichsmarschall Herman Göring, the supreme commander of the Luftwaffe.

#### 16 A DAY IN THE LIFE

What it meant to be a pilot in RAF Fighter Command during the Battle of Britain is examined in detail, including the mental and physical strain, the exhaustion, the nervous tension in waiting for the order to 'Scramble' and the adrenalin charged fear and excitement of combat.

#### 30 ATTACKERS AND DEFENDERS

The equipment employed by both sides, including the quality and effectiveness of the aircraft and weaponry, were as much the deciding factors in the outcome of the Battle of Britain as was the calibre and the numbers of the men who operated that hardware.

#### 48 THE SPITFIRE FUND

An innovative 'crowd funding' campaign, 1940 style, gave rise to a remarkable nationwide initiative for communities, organisations and businesses to raise funds for the purchase of Spitfire fighters to be gifted to the Royal Air Force.

#### 52 A WEAPON FOR VICTORY

The unique command and control system operated by the RAF in 1940 was the first integrated air defence system in the world. Centred around radar and an observer-based reporting system, it was the key to ensuring that the Luftwaffe did not gain mastery of the air.



#### 58 FIERCE DAYS OF FIGHTING

Although the Battle of Britain lasted from 10 July through to 31 October 1940, some days were much harder fought days than others. Three days in particular are singled out for a closer examination of the dramatic events that unfolded in the air war over the British Isles.

#### 80 FAILED TO RETURN

When German aircraft were downed over the UK, both airframes and crews were a total loss to the Luftwaffe; the crews were either dead or prisoners and the aircraft they had flown were re-processed as scrap metal to feed the British aviation industry. We look at the stories behind some of the downed enemy aircraft during the Battle of Britain.

#### 100 DOGFIGHTS TO BLITZ NIGHTS

When the Luftwaffe changed tactics, from attempting to destroy the RAF in the air and on the ground to its round-the-clock attacks on London, it relieved pressure on RAF Fighter Command. That, though, was of little consolation to those civilians on the receiving end. It was, however, a significant point in the Battle of Britain.



#### 106 THE ITALIAN JOB

Briefly, and rather ingloriously, the Italian Air Force played a small part in the latter stages of the Battle of Britain, flying fighter and bomber sorties from bases in occupied Belgium. Things did not go well, however, and Italian participation in the Luftwaffe's air campaign against the British Isles was gradually drawn down.

#### 110 THE FEARSOME CHANNEL

German fighter pilots and bomber crews not only faced the RAF after crossing the English Channel or North Sea, but then had to endure return flights, over water, possibly wounded, perhaps with damaged aircraft and sometimes running low on fuel. The Luftwaffe airman's day was just as dangerous and demanding as for their opponents.





## 118 URSULA'S DEMISE

The Battle of Britain captured in what was then the relatively new technology of colour photography by a Messerschmitt 110 pilot using a Leica camera and Agfa film, providing us with unique insights into the air campaign which was largely photographed, by both sides, in monochrome.

## 126 MEN OF THE BATTLE

The stories of those who served in the air, the 'Few', and the men and women who served and often gave all on the ground, the unsung 'many', are central to the RAF's narrative of the Battle of Britain. We pay tribute to all who served, their role in securing victory and spotlight gallantry in the air, along with the Battle of Britain's Victoria Cross action.



## CONTRIBUTORS



### Richard J Molloy

The colourisation artist for this project was Richard J Molloy who specialises in the digital colourisation of historic images. His particular interest is with military subjects and he is a regular art contributor to Iron Cross magazine, also

published by Warners Group Publications Plc.

Using research based on known colours, and sometimes using period colour charts, Richard constructs accurate representations of period images. His evaluation of those images is often carried out through forensic research, requiring background investigation to properly represent the image being coloured.

This piece of work on the Battle of Britain is Richard's largest single project to date, and is work of which he is justifiably proud.

Samples of Richard J Molloy's work may be viewed by searching:- @colourbyRJM



### Andy Godfrey

The aircraft colour profile artwork for this publication was by Andy Godfrey of the Teasel Studio.

Andy specialises in bespoke profile artworks for publication and commission.

Working from his studio near Hastings, East Sussex, his work draws on an extensive reference collection, gathered over five decades, a deep fascination with aircraft and specialist knowledge of colours and markings. For enquiries:- teaselstudio@yahoo.co.uk

## Acknowledgements

A number of individuals have helped in the production of this commemorative publication. In no particular order of merit, they are: Chris Goss, Rob Pritchard, Col Pope, Simon Parry, Winston Ramsey, Sarah Warren, Kate Pierce, Nicholas Pierce, Mark Fisher, Mike Fisher and Richard Paver.

## 156 THEIR FINEST HOUR

Prime Minister Winston Churchill was the nation's inspirational and 'bulldog' leader during the Battle of Britain, spurring on both the people and the combatants with words and rhetoric in what was a battle to the death for survival, as well as a fight for the greater good of humanity and civilisation.

## 159 THE BALANCE SHEET

Air fighting during the Battle of Britain exacted a grievous toll on friend and foe alike, both in terms of men and of machinery. Tallying up the casualties, and the losses suffered by both sides in 1940, presents us with sobering figures. The stark numbers of the bottom line reveal the true cost to the Luftwaffe and the RAF and the scale of loss suffered by friend and foe.





# The Battle Looms

The Battle of Britain was one of the most iconic battles of the Second World War, embedding itself indelibly into the nation's consciousness. Earlier, the Battle of France could easily have spelled defeat before the air battles got underway in July 1940.

**A**fter the outbreak of war in September 1939, there followed eight months of what became known as the 'Phoney War'. However, it was clear that large-scale fighting would ultimately follow, and a British Expeditionary Force was sent to France before the end of that year. As part of that BEF, a large Air Component was supplemented by an Advanced Air Striking Force. In total, these air forces amounted to 25 squadrons, six of which were Hawker Hurricane-equipped fighter squadrons. The remainder of the RAF force in France comprised largely light bombers and Army Co-Operation squadrons. Eventually, however, the 'Sitzkrieg' became the 'Blitzkrieg'.

On 10 May 1940, German forces launched their all-out assault on France and the Low Countries and what followed in Belgium, the Netherlands etc. was the complete collapse of those countries under the overwhelming might of German military power. Across France, German forces rolled inexorably onwards towards the English Channel and while the French and British tried desperately to stem the advance, so the situation became ever more hopeless.

### **Predicted Catastrophe**

When the fighting had broken out in earnest on 10 May 1940, aircraft of the Air Component were in almost constant combat, and losses had to continually

be made good from squadrons based in Britain. The Commander-in-Chief of RAF Fighter Command, Air Chief Marshal Hugh Dowding, had already stated as early as September 1939, that if he was expected to defend Britain's skies, then he would need 52 fighter squadrons. At that time, he had only 32 under his command and was told it would be impossible to produce the number he required. However, efforts would be made to provide him with a further eight.

During the fighting in France, increasing numbers of fighter squadrons were sent across the Channel, urged on by desperate appeals from the French Prime Minister, Paul Reynaud. Dowding saw his resources 'slipping away like



## BACKGROUND TO BATTLE

**Left** A Hurricane of 501 Squadron starts-up for an operational sortie at Betheniville, France, May 1940. Air Chief Marshal Hugh Dowding argued successfully against further wastage of the home-based RAF fighter force by sending yet more fighters to France to bolster a futile defence.

**Right** As the unstoppable juggernaut of German military might advanced across Europe, the deadly Junkers 87 Stuka dive-bomber came into its own. However, the RAF quickly learned how to deal with the aircraft, and this stood them in good stead when facing the Stuka during the Battle of Britain.

**Below right** Panzer IV tanks roll across France in May 1940. The German advance was rapid and overwhelming, and within six weeks France had collapsed and the BEF were evacuating from Dunkirk.

sand in an hour-glass' and he predicted catastrophe if Churchill continued to help the failing ally. Thus, he sent a letter to the Air Minister on 16 May 1940, which may well have saved Fighter Command, and ultimately Britain, in the nation's darkest hour. He wrote:

*"I have the honour to refer to the very serious calls which have recently been made upon the Home Defence Fighter Units in an attempt to stem the German invasion on the Continent ... I would remind the Air Council that ... my strength has now been reduced to the equivalent of 36 Squadrons ... I must therefore request that as a matter of paramount urgency the Air Ministry will consider and decide what level of strength is to be left to the Fighter Command for the defence of this country, and will assure me that when this level has been reached, not one fighter will be sent across the Channel however insistent the appeals for help may be.*

*"I believe that, if an adequate fighter force is kept in this country, if the fleet remains in being, and if the Home Forces are suitably organised to resist invasion, we should be able to carry on the war single handed for some time, if not indefinitely. But, if the Home Defence Force is drained away in desperate attempts to remedy the situation in France, defeat in France will involve the complete and irremediable defeat of this country."*

It was a hard-hitting letter, but Dowding's words had their effect and while the French still asked for more fighter squadrons to be sent to France, such appeals were rejected. However, further squadrons of Hurricanes were deployed over France, but they remained based in the UK.



### Losses Mounted

At around the same time, another momentous decision was undertaken by making Lord Beaverbrook Minister of Aircraft Production. Aircraft production had in fact kept pace with fighter losses incurred during the Battle of France. Soon, production would outstrip losses. Thus, the availability of fighters would not become a limiting factor in the air defence of Britain.

However, by 1 June 1940, the RAF had lost 436 fighter aircraft and almost all its light bomber force of Fairey Battles, along with a considerable number of its Bristol Blenheims. However, RAF Fighter Command at home continued to operate over France as the situation worsened.

In a matter of six weeks, France collapsed entirely. Now, it only remained for British forces, and some units of the French army, to evacuate via Dunkirk in what was Operation 'Dynamo'. RAF Fighter Command at home continued

to be called into action, covering the evacuation from Dunkirk and other French ports. Inevitably, their losses mounted. Meanwhile, the battered and depleted RAF units that had been based in France were withdrawn to Britain. Here, they were re-equipped where necessary, and manpower shortages made good so far as possible. Meanwhile, RAF Fighter Command readied for what was to come. Certainly, the Battle of France was over. The Battle of Britain was about to begin.

### Immensely Powerful

Dowding had mentioned the possibility of invasion as early as the middle of May 1940, but by the end of that month the possibility had been turned into what appeared to be probability. If Hitler was to impose his will on the British people, then he could apparently only do so by crossing the English Channel and dictating his terms from Westminster. To



## THE BATTLE OF BRITAIN IN COLOUR



### BATTLE OF BARKING CREEK

On 6 September 1939, RAF Fighter Command suffered its first air battle fatality. However, the tragedy was that it was a 'friendly fire' incident, with Spitfires attacking the Hurricanes.

With Britain's defences at high readiness, and hordes of German bombers expected any time, the RAF's response to perceived threats was on a hair trigger.

With aircraft reported over Essex by anti-aircraft batteries at 06.15, RAF North Weald were notified and duly 'scrambled' eighteen Hurricanes of 56 and 151 Squadrons. Meanwhile, air raid sirens wailed across Essex and Kent and Spitfires of 54, 65 and 74 Squadron were 'scrambled' from Hornchurch.

Exactly what happened next is confused, but suffice to say that both groups of fighters were expecting to meet enemy aircraft. Ultimately, the Spitfires of 74 Squadron attacked the Hurricanes of 56 Squadron before the mistake was realised. Two of the Hurricanes were shot down.

Pilot Officer Montagu Hulton-Harrop was killed while Pilot officer Frank Rose made a safe force-landing in his damaged fighter. Meanwhile, anti-aircraft guns opened fire on the Spitfires of 65 and 74 Squadron, damaging one of the 65 Squadron aircraft.

It was a debacle with tragic consequences which became known as 'The Battle of Barking Creek'. Although Pilot Officer Hulton-Harrop was the only pilot killed in the incident, his fighter was shot down.

**Above** The air war in France prompted huge public interest in the RAF's fighter pilots who were perceived as 'glamour boys' and already earning a kudos that only strengthened during the Battle of Britain. On the left is Flying Officer Newell 'Fanny' Orton, on the right, Flying Officer Edgar 'Cobber' Kain DFC, of New Zealand. Kain became the first Allied 'ace' of the war and was awarded the DFC in January 1940. He was killed in a flying accident on 6 June 1940. Orton was shot down on 15 May 1940 and baled out with burns. He was then shot at and wounded by French soldiers and took no part in the Battle of Britain but returned to operations in 1941, being killed in action on 17 September 1941.

**Below** This photograph of 'B' Flight, 56 Squadron, was taken on 3 September 1939 - the day war was declared. Within three days, two of these men had been shot down by friendly fighters. Seated at front left is Pilot Officer Hulton-Harrop, who was killed. Standing, back right, is Pilot Officer Rose who was unhurt. He was killed in action over France in May 1940.





# Leader of the 'Few'

Air Chief Marshal Hugh Dowding is rightly given credit for not only preparing Britain's air defence system which ultimately brought success in the Battle of Britain, but also in his brilliant leadership of RAF Fighter Command during that battle.

**A**ir Chief Marshal Hugh Caswall Tremenheere Dowding was born in Moffat on 24 April 1882, and educated at St Ninian's School and Winchester College. He trained at the Royal Military Academy before being commissioned in the Royal Garrison Artillery in 1900.

Promoted to lieutenant on 8 May 1902, he served with the RGA before becoming interested in aviation. Gaining his Aviator's Certificate in 1913, he attended the Central Flying School, where he was awarded his wings. Although added to the Reserve List of the Royal Flying Corps, Dowding resumed his RGA duties.

In August 1914, he joined the RFC as a pilot on 7 Squadron and was promoted to Major in 1915. In 1916, having been promoted to temporary lieutenant colonel in 1916, he was given command of 7 Wing at Farnborough, transferring to command 9 Wing in France in June. Returning to England, he was promoted to temporary colonel on 1 January 1917, as commander of Southern Group Command, and became temporary brigadier-general in June 1917, before commanding Southern Training Brigade in August. Sent to York as chief staff officer in April 1918, he was made Companion of the Order of St Michael and St George in January 1919.

Dowding was given a permanent commission in the RAF in August 1919, with the rank of group captain, commanding 16 Group from October 1919 and 1 Group from February 1920. Promoted to air commodore on 1 January 1922, he was appointed Chief Staff Officer for RAF Iraq Command in August 1924.

In May 1926, Dowding was director of training at the Air Ministry and made a Companion of the Order of the Bath on 2 January 1928, being promoted to air vice marshal on 1 January 1929.

He became Air Officer Commanding Fighting Area, Air Defence of Great Britain, in December 1929, joining the Air Council as Air Member for Supply and Research in September 1930. He



was promoted to air marshal on 1 January 1933, and advanced to Knight Commander of the Order of the Bath on 3 June 1933.

## The 'Dowding System'

In July 1936, Dowding was the first commander of the new RAF Fighter Command, conceiving the 'Dowding System' of integrated air defence. He also introduced modern aircraft into service during the pre-war period, including the Spitfire and Hurricane. He was promoted to air chief marshal on 1 January 1937, and became Knight Grand Cross of the Royal Victorian Order in January 1937. Due to retire in June 1939, Dowding was asked to stay on until March 1940 because of the international situation, and was again permitted to continue through the Battle of Britain until November 1940.

In 1940, Dowding, nicknamed "Stuff", was unwilling to sacrifice aircraft and pilots in the Battle of France, resisting requests to weaken home defence by sending precious squadrons to France.

Beyond the system of integrated air defence, his major contribution was to marshal resources (including replacement aircraft and aircrew) and maintain significant reserves while leaving subordinate commanders' hands free to run the battle in detail.

Dowding was known for humility and

**Above** Removed from command in November 1940, Dowding maintained an interest in his 'dear fighter boys'. Here, in bowler hat, he is flanked by participants in the Battle of Britain outside the Air Ministry on the 1942 anniversary of the battle.

great sincerity, and was characterised as caring for his men, with their best interests at heart. He referred to his fighter pilots as his "chicks": indeed, his son Derek was one of the 'Few', a Spitfire pilot with 74 Squadron.

Because of his brilliant preparation of air defences, and prudent management of resources, Dowding is given large credit for victory in the Battle of Britain.

Dowding was made Knight Grand Cross of the Order of the Bath in October 1940. He unwillingly relinquished command on 24 November 1940, but was elevated to the peerage in June 1943.

Post war, he developed interests in spiritualism and was a leading anti-vivisectionist. In 1969, in the film *Battle of Britain*, he was played by Laurence Olivier.

He died in Tunbridge Wells on 15 February 1970. His cremated remains were buried beneath the Battle of Britain window in Westminster Abbey, recognising the unique place he held in ensuring Britain's survival during the Second World War. ■



## THE COMMANDERS

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Air Chief Marshal Hugh Caswall  
Tremeneere Dowding, C-in-C,  
RAF Fighter Command, 1940.



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