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Incorporating **RadioUser**

September 2023 Vol. 99 No 9

On sale: 10th August 2023

Next issue on sale: 14th September 2023

ISSN 0141-0857

Practical Wireless

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This publication is printed by Warners Midlands PLC Telephone: 01778 391000

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Keylines

My highlight in the past month was a week in Italy for the World Radiosport Team Championship (WRTC). You can read about it elsewhere in this issue. Other than that my operating has largely been confined to 6 and 4m, as there are few DXpeditions to chase on the HF bands over the summer period. But hopefully many of you have been enjoying taking to the hill-tops, helping with communications for community events or generally enjoying the hobby in other ways. There are so many facets, several of which we report on this month's *News* pages. It's always good to hear what clubs and individuals have been up to and, space permitting, we are always happy to report these activities to the wider audience.

Ofcom Consultation

The deadline for responding to the Ofcom consultation is drawing near (4 September), so do submit your feedback in good time. While I'm not proposing to tell you all how to respond, I have, in answer to a couple of this month's *Letters*, set out some of my thoughts on the topic. I suspect our answers will depend on the type of operating each of us does, and obviously Ofcom are looking for replies from as wide a spectrum of the amateur radio community as possible.

Rockall

Further to what I said last month, at the time of writing **Nobby**, **Emil** and **Cam** have failed to get back onto Rockall to recover the various equipment that had to be left when Cam was airlifted off the rock. The most recent news was on 19 July, when weather prevented a landing, with nothing since (I am writing this on 25 July).

Systems Integration?

At the CDXC Convention back in May we were treated to an excellent presentation about the 21st century shack. A lot of it was about using Node-RED software for knitting together the various equipment in the shack. Node-RED is becoming more prevalent as people become familiar with it and I see that our own **Mike Richards G4WNC** has recently given a talk about its use.

But I wanted to make a more general point, which is that a lot of what I see happening in the hobby nowadays is about systems integration in a wider sense. If you read my report this month on the WRTC event in Italy, it will be obvious that the teams had to integrate two transceivers in way that allowed them to share antennas without being on the same band at the same time. This required using band decoders, switchable bandpass filters and a triplexor, among other items. So some clever hardware but also some serious software to take



account of everything. Modern 'logging' programs take care of a lot of this in our shacks – I put 'logging' in parentheses because such programs nowadays are actually station management programs in a wider sense, taking in data from the internet (Cluster spots and the like), turning the antenna towards the selected DX, handling data modes such as WSJT, automatically uploading logs to LoTW and much more.

Much of this is perhaps anathema to many of you who have been licensed for several decades – maybe you even continue to log on paper. But for the newer generation of radio amateurs, it's actually much more relevant than the RF aspects of the station, which are pretty much solved by buying a transceiver, an antenna and maybe an amplifier.

And, dare I say it, the skills that this sort of systems integration require and help to develop are highly relevant in the big wide world today. Definitely, I would suggest, a very significant part of our 'self training' as radio amateurs and, indeed, almost certainly something that should receive more attention in the various levels of amateur radio examination.

What do readers think?

This Month

Once again I've had to carry some promised articles over, for which I apologise. I never seem to have enough space but that reflects the good news, that I have a steady stream of excellent articles coming my way. I am forever grateful to all who contribute but am always ready and willing to have more articles, especially related to home construction – but not built from the junk box please, as such projects tend not to be reproduceable!

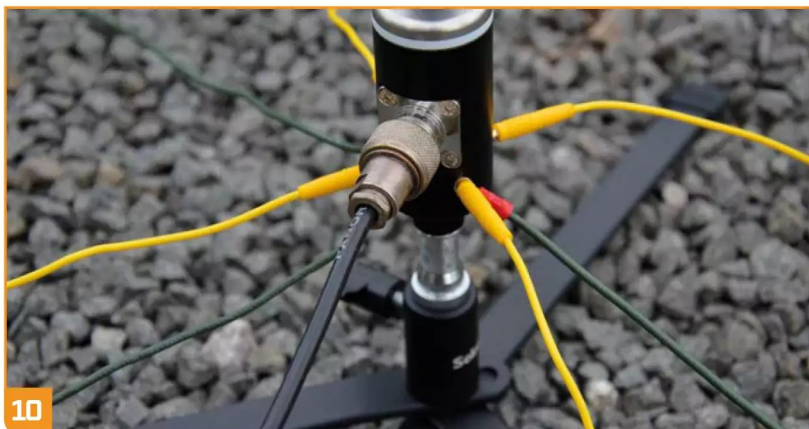
Anyway, I do hope you enjoy another packed and varied issue of *PW*.

Don Field G3XTT

Editor, *Practical Wireless Magazine*

Read more radio news and reviews at www.radioenthusiast.co.uk/news

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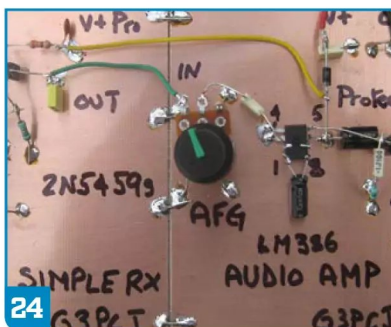
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This month's *Letters* cover the Ofcom proposals, Mr Pye, Kent Rigs and Out and About with Radio.

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Newsdesk

Have you got something to tell our readers about? If so, then email practicalwireless@warnersgroup.co.uk



New from Martin Lynch & Sons

Fresh from Friedrichshafen show comes a new 1.5kW HF Linear amplifier with internal Auto Tuner, the RF Kit B26-PA. Dual LDMOS devices rated at 3400 Watts ensure a safe operating margin, even at full power. Lightweight at only 16kg, large 7in colour display and <1mS for very fast QSK CW. In stock and on show at their London showroom. £5799.00, including VAT. For more information see:

HamRadio.co.uk/RFKit

JNC Radio SV6301A 1Mz-6.3GHz VNA: One of the largest for screen size (7in IPS LCD capacitive) Vector Network Analyser covering 1MHz-6.3GHz.

This really is a beautifully built instrument supplied in a nice carry case. A full video presentation is available on the MLandS.tv YouTube Channel. For more information see:

HamRadio.co.uk/SV6301A

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QMX from QRP Labs

QRP Labs have recently introduced the QMX five-band (*0, 60, 40, 30, 20), 5W multi-mode transceiver, including embedded SDR, 24-bit 48kps USB sound card, CAT control, and synthesised VFO with TCXO reference. The specification is extremely extensive, especially given its small size. More information from the QRP Labs website but, in any case, we hope to run a review in the next couple of months. Watch this space!

<https://qrp-labs.com/qmx.html>



TX Factor is back on the air with a brand new episode. **Bob McCreadie G0FGX**, along with friends **Noel Matthews G8GTZ** and **Dave Crump G8GKQ**, head out into the Wiltshire countryside to put the new Icom IC-905 all-mode microwave transceiver through its paces.

Not content with a few Watts of microwave power, Bob treks off to the heart of England to visit the UK's last remaining shortwave transmission station. Woofferton, near Ludlow is a former BBC station and now in private ownership, but still busy sending out daily transmissions across the world with up to 250kW of HF power. Bob has a guided tour of the antenna arrays and the gleaming transmission hall, which still contains some of the original Marconi senders installed back in the 1960s.

TX Factor is sponsored by the RSGB.

txfactor.co.uk

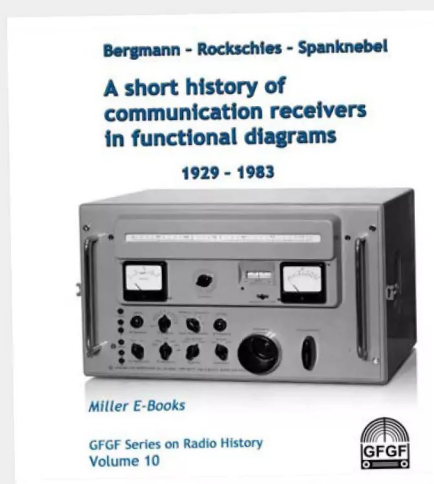
COMMERCIAL INTERESTS PETITION FCC FOR HIGH POWER ALLOCATION ON SHORT-WAVE SPECTRUM: The ad hoc group Shortwave Modernization Coalition have petitioned the Federal Communications Commission (FCC) in the USA to allow data communications on

multiple bands within the HF 2-25MHz range with up to 20kW, including on bands immediately adjacent to spectrum allocated to the Amateur Radio Service.

This group appears to represent high-speed stock trading interests. The FCC has assigned

the public notice as docket number RM-11953. While the petitioners exclude the amateur bands, high-power operations on immediately adjacent bands are proposed. ARRL is reviewing the petition. A PDF of the petition is available at:

www.fcc.gov/ecfs/document/1042840187330/1



RadioTechnology

Wolf DL2MCD writes, "I am a German amateur radio operator, Member of DARC (German amateur radio club) and GFGF. The latter is a society for the history of radio technology:

www.gfgf.org

"The GFGF has a members' magazine like the amateur radio club and also technical books about historical radio technology. One is about communications receiver technology from 1929 till 1983, written by three German engineers and radio amateurs. The GFGF translated it into English and relaunched it as an e-book":

www.miller-e-books.de/2022/12/short

There also is an English factsheet available:

<https://tinyurl.com/4r65evx7>

ATV display installed at RSGB National Radio Centre

A new amateur TV display has just been installed at the RSGB National Radio Centre, with signals received via the wide-band segment of the geostationary satellite QO-100. The Society is delighted to be able to demonstrate amateur TV as a permanent display at the NRC, helping to highlight yet another exciting aspect of our technical hobby. A special configuration, developed in conjunction with the British Amateur Television Club, incorporates a touchscreen from which visitors can select a signal to be tuned, decoded and displayed on the large monitor. The RSGB would like to thank **Justin G8YTZ** for designing the display and working with the BATC for the specially adapted configuration.

Read more radio news and reviews at www.radioenthusiast.co.uk/news

RSGB RELEASES NEW MOCK EXAM PAPERS:

The RSGB's Examinations and Syllabus Review Group (ESRG) has provided an additional set of four mock exam papers. These cover Foundation, Intermediate, Full and Direct to Full exams. You can find the papers on the RSGB website at:

rsgb.org/mock-exams

QSO TODAY ACADEMY: The QSO Today Virtual Ham Expo was introduced during the height of the Covid-19 pandemic. After six successful events, it is evolving into the QSO Today Academy. The inaugural event will take place on 9-10 September. See the website below for more information:

www.qsotodayhamexpo.com

FROM ASPIRATION TO AFFILIATION – SOUTH-EAST BUILDERS CLUB UPDATE:

In July 2022 it was reported that **Eric MOREQ** and **Graham G4NMD** were proposing a regional hub for makers and home brewers of radio related projects. The first meeting was held in September 2022 and was attended by ten people with a further ten expressing interest by email. After sharing their vision about a co-operative approach to making, and learning, in radio related activity, including pooling of knowledge, test equipment and books, the assembled group were asked what they would like out of such a group.

Out of that discussion came a variety of topics from construction techniques including kits and 'from scratch' builds through understanding test equipment, microcontrollers in the shack and on to specialist modes and wider-than-amateur related topics such as LoRa.

The overriding factor was that the group was to be practice based.

The group met again in October with more members and because of the discussions around construction and SMD at the first meeting, and to test the venue as a place for hot soldering irons, we offered the opportunity to undertake construction of a 20W SMD dummy load as sold by KANGA UK. This proved a great success as the novices were supported by the 'old-hands' and completed dummy loads were produced.

Testing dummy loads and questions of impedance and network analysis led to November's meeting being about VNAs and nano VNAs and their usefulness in terms of understanding what is measured and what limitations they may have. After a short talk by **Andy G4XYW** the group engaged in practical 'shack related' experiments with a number of VNAs brought along on the evening. This reinforced our intended format of very short talks and a highly practical element to the meetings.

As there seems to be a core of around 15-20 'members' the November meeting agreed with the small steering group that the club was viable and that it would be known as Surrey Electronic



Maker and Radio Club (SEMARC) and to that end have adopted a constitution and agreed subs for the coming year. Further to this the club intends to apply to be an affiliate of the RSGB.

The club callsign is G8KVU and the relevance of this callsign is outlined on the G8KVU QRZ page. The club e-mail is hamradiobuilders@gmail.com. From January 2023 the club will meet on the third Wednesday of the month 1930-2130 at Grafham Room, Horsham Road, Grafham GU5 0LJ. The what3words address for the club is ///hiring.hedgehog.prayers

<https://w3w.co/hiring.hedgehog.prayers>

BRARS NEWS: The British Railways Amateur Radio Society (BRARS) is delighted to announce the publication of the July 2023 issue of its *Rails and Radio* magazine.

In this issue are reports of visits to several model railway exhibitions and to a splendid amateur radio rally. There is also a welcome to several new members and an update to the stormproof Slim Jim described in the previous issue. We launch a new column entitled *Meet the Club*, in which our members can tell us about other clubs that may be of interest to BRARS members. The club featured in this launch column is the Model Electronic Railway Group.

This issue also includes notice of our AGM which will be held online using Zoom on 24 October. Membership of BRARS is open to anyone interested in any aspect of railways (including trams, miniature railways, model railways and suchlike) and in any aspect of amateur radio (whether licensed or listener).

For more information about BRARS please visit www.BRARS.info or contact the membership secretary **Richard Waterman G4KRW**, 170 Station Road, Mickleover, Derby DE3 9FJ.

membership@brars.info



EXERCISE BLUE HAM - HERMIA 23: Hermia 23 took place during Cadet Parade timings over the week of 19 – 23 June 23 with some 20 UK Cadet radio stations coming together to take part in the radio communications exercise on the 5MHz (Shared) Band. The date and timings for exercise were changed from the usual weekend operating to provide more access and exposure to Cadets and Volunteers using the available HF radio equipment that Units hold.

During the exercise, Cadet Forces Adult Volunteers (CFAV) and Cadets operated HF radio equipped stations to make contact with radio amateurs for the purpose of exchanging specific information during their QSOs. As usual the exercise brief was sent out to CFAV radio staff and was also published on the internet so that planning could begin as this would give enough time to test equipment and antennas for the band and train cadets in what is to be expected when operating. On checking on the Monday morning after the exercise the online log page reported some 450 QSOs made by the Cadet stations during the period of operation. The breakdown for the RAF Air Cadets was 373, Army cadets/CCF 46 and the Sea Cadets 31. The top three amateur contacts logged were G4KUR - 50, M0PLT - 45, G0TNF/P up a Mountain in Cumbria operating his Clansman PRC-320 at 30 Watts also noted was many different amateurs who joined in but not showing on previous exercise logbooks which show how popular the exercise is. We had four Cadet Data capable stations on air using mainly OLIVIA 16/500 or PSK31. This again brought quite a few different amateurs willing to have a try these modes for the first or second time; there were periods where up to three stations managed to operate simultaneously with Olivia on the frequency to exchange messages. Our thanks go to G4HPE, G6NLZ, G0GSA, G4ICP/P and G4ATX for their data exchanges.

The organisers would like to thank all of the CFAV's and amateurs for the time and effort which they put into exercise weekend. There are more planned for 2022; the best place to find out is to check:

<https://alphacharlie/blueham>

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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



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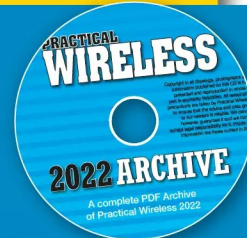


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Richard Constantine G3UGF
practicalwireless@warnersgroup.co.uk

Portable operation has never been more practical or popular. When it comes to compact, lightweight transceivers with all-mode outputs from 5 to 100 watts there's a wealth of new and pre-owned radios to suit just about every pocket. Homebrew QRP is alive and well and many operators are out and about all year round.

Lithium Iron, gel cells, deep cycle leisure batteries and solar panels have revolutionised portable operation. Staggering up hill, lugging lead acid car batteries and generators is a thing of the past – Newbies take note, you've never had it so good!

While the equipment situation has never been better, the laws of physics don't really change. Every radio needs an effective portable antenna.

MC-750vJPC-12

Regular readers will know that portable antennas seem to find me these days, so it was little surprise when the latest offering from China the MC-750, turned up for me to cast an eye over with a view to /P activity.

Similarly priced, it was obvious that comparison to the JPC-12 vertical that I reviewed in PW February 23 issue was going to be unavoidable.

Weighing in at just 1.8kg it's weatherproof outer Gore-Tex™ type padded bag, complete with carry handle and shoulder strap, possibly of photo-

Practical Portable

Richard Constantine G3UGF takes a trip 'Up North' with the MC-750 from JNC Radio.

graphic or perhaps snooker cue origin, makes it an instantly appealing package.

What's Inside?

The kit on arrival can be seen in **Fig. 1**. Inside the bag there's a base connector with SO239 socket, attached to a very substantial 10mm diameter stainless earth spike. Unlike the JPC-12 this one isn't hollow, weighs in at 180g and is 4.5cm longer. At first it appeared to be locked on to the base connector. A quick turn to release the locking nut with a 15mm spanner proved otherwise.

Unfortunately, the review package contained no assembly instructions in either Chinese or English. I'm reliably informed that they are normally included. No matter, how hard could it be for an experienced reviewer like me? Answer – more confusing than expected and I'll explain why as we go.

The base connector assembly has different sized threaded holes at either end. I anticipated wrongly that either the whip section or the 40m coil unit would fit directly on to the base connector. Checking proved otherwise as they only con-

nected to the same port as the ground spike, i.e. the wrong end.

Assembling the Hard Way

A process of baffling elimination (I'm easily baffled these days) revealed that the insulated top part of the base connector has a 12mm diameter hole and a coarser thread that only mates to the studded end of the solid metal, 50cm black, anodised metal rod section but, what on earth (no pun intended) was the large red grooved, metal bit, secured by Allen screws in the middle of it for? (find out later).

Once I had sorted out what connected to what at the base it became obvious that the top of the black rod was threaded to accept either the 40m coil or the whip section. Slowly, it was starting to make sense that the substantial 337g black rod section is designed to always be in line, when the antenna is assembled.

The 40m band inductor comes in its own little soft jewellery bag, for safe keeping. The resonator is very nicely made. It consists of a 10.55µh coil wound on a 35mm diameter former with approxi-

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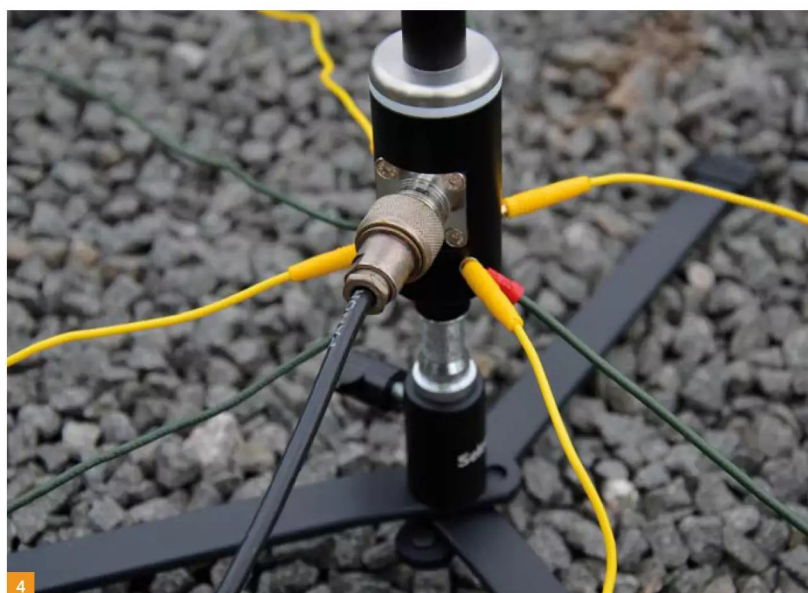
Fig. 1: MC-750 complete kit plus tripod.

Fig. 2: Band marker on telescopic whip.

Fig. 3: Essential parts, closer up.

Fig. 4: Antenna base with additional radials, on hard standing.

Fig. 5: Antenna in strong wind (see treetops).



mately 24 turns of 1.219mm enamelled wire (18 swg in plain English to you and me). It's a decent diameter and covered in a rubberised clear shrink plastic for weather protection. For my money it's the nicest engineered piece in the whole package.

The penultimate part of the kit is the 13-section whip. It's longer, has a larger base section diameter at 15mm and is overall heavier and more substantial than that included in the JPC-12 kit.

Fully extended it's 4.82m (15ft 10in) in length and as such isn't quite long enough for a full-size quarter wavelength on 20m. It's around 20cm (8in) too short, hence the need to always have the base rod in line. This arrangement not only keeps the centre of gravity low for better stability but also ensures that the vertical is a true quarter wavelength on 20m.

Previously, I commented that the JPC-12 has a number of different metals in use in its various interconnecting parts and the MC-750 is no different. To avoid poor contact over time due to oxidation, it must always be stored clean and dry. This offering is similar with no more critical point than that at the base of the whip, where brass insert meets steel, at both ends.

The last item in the package is a convenient wire winder, with 4 x 3.5m flexible counterpoise wires. Each one has a very small diameter spring-loaded plug, of a type I'm not familiar with. My first attempt to push them into the four mating holes on the earth side of the base connector was a struggle. The plastic shrouds sometimes slid back

along the wire exposing the metal pin, when being pulling out of the earth socket. With care and repeated use, they became easier to connect and remove but I do wonder where I would get replacements from were the wires to break – research needed.

The only significant thing missing is the coax to connect the antenna to a radio. Also, without an instruction sheet how was I going to resonate it on the various bands?

Tape measure in one hand and portable Vector Network Analyser (VNA) in the other, I extended the telescopic whip only to find the job had been done for me as, each of the various amateur band dimensions is marked along its length, **Fig. 2**. Who needs instructions?

Tripod Mounting

Before moving on to testing, it's worth mentioning that the kit also arrived with a Selens tripod mount included in the package price. Selens is definitely a photographic kit supplier. The 300mm (12in) diameter, stoved steel, tripod has some nice features, including stops to ensure the legs each open to 120°.

Only the longest leg has a hole part way along it that can be used to anchor it on hard standing. I used a camping 'rock peg' and with experience learned to face this longest of the three legs into the prevailing wind. The aim being to stop the tripod being lifted off the ground in the wind, when the antenna is fully extended. Additional holes and pegs would be better but I refrained from attacking it with a drill.

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That said, it is an additional and weighty 735g if you're considering yomping up any one of the UK's 282 Munro summits – I might suggest leaving it at home in favour of a rubber faced camping mallet.

The tripod kit, **Fig. 3**, also contains a commonly used photographic adapter. One end has the familiar threaded studding that fits the base of just about every camera ever made and known as a 'quarter inch' but not used in this application.

The other end is something of an enigma. It has a 3/8ths threaded stud, but it's not as expected a UNF, CB type thread. Initially it appeared to connect to the base of the antenna assembly but felt slack until screwed up tight.

A mating black thread adapter with a slightly finer pitch that screws on to this end of the camera adapter ensures the device attaches more firmly to the base connector. Its use gave rise to another head scratcher when it came to testing. The adapter simply fits into the tripod centre. Once locked in by a thumb screw it's ready to accept the antenna base unit.

Ready to Go!

Wanting to pass on to the authentic experience, I took the MC-750 with me on a four-day excursion to Barnard Castle in Co Durham. A fabulous and historic area of open country with much to see and do that I've long meant to visit post Covid... eye test jokes aside.

Having finally learned which thread fitted what and no longer a brain teaser, the antenna became quicker and easier to deploy. The longer ground spike is sharp and pierces softer ground with little problem. Here I learned what the lumpy red bit in the middle of the black tube is for. It acts as a hand grip for pushing the base into the ground or for pulling it out.

Pausing only to unroll and position the four radials and close down the fully extended whip to the relevant band marker, you can easily be in business in less than five minutes.

Being full sized on every band between 20 and 10m you simply don't need a VNA. Yes, it saves time walking back to the radio to check the VSWR at three points across the band before making fine adjustments but it's quite easy to do without the VNA. I need the exercise.

Inserting the 40m coil into the mix is a different matter. The antenna becomes smaller than the real thing. Bandwidth is tighter and adjustment more critical. It's almost a spot frequency antenna, particularly when tripod mounted.

I checked out the band markers on the whip against a tape measure and in general they are a reasonably good guide.

The principal differences when matching are mainly down to location, earth conductivity and counterpoise deployment. Yes, achieving a reasonable match is one thing but the too often overlooked and hidden issue is ground loss. An inefficient earthing setup may not be quite so im-



mediately noticeable with a 100 watt transceiver but at 5 watts mitigating ground loss becomes really important.

I wanted to add more radials to see the effect and to create not only the illusion of a better earth mat around the vertical but also to lower the take-off angle and improve range.

It looked a no-brainer to crimp some 15mm ring terminals on to additional radials and fit them between the little thread adapter and the connector base, when using the tripod – wrong! The black anodising on both the base and the adapter act as insulators. The solution was to re-visit a famous high street motoring emporium and purchase a pack of 6mm red crimp connectors. These fit nicely between the original radial pins and the base unit. Now extra radials can be attached when either the spike or tripod is in use.

Laying four more semi-random, lightweight Kevlar wire radials on the ground of 3.5, 5, 7.5 and 10m instantly improved reception by around 5dB on the S-meter. Resonating became easier as expected and the bandwidth on 40m improved most significantly when on the hard standing. This told me not to waste my time transmitting on 40m without at least 1 x 10m radial, plus a manual or auto-tuner unit to move and fine tune across the band.

Considering 20 through 10m: VSWR's of between 1.2:1 and 1.15:1 were readily achievable using the earth spike on grass. On gravel/hardstanding as per **Fig. 4**, 1.3:1 was the best I could get on 20m even with eight radials, whereas 15m was better and 10m was an apparent 1:1. Proof if needed that ground loss is perhaps the most significant part of the antenna equation.

Accepting that soft ground and grass is better, a convenient multiband contest (not another one!)

made it easy to make brief contacts into Europe and Scandinavia on the HF bands with 10 watts and just a quick CW contact with a KC6 on 15m with just 5 watts. Being a contest, signal reports are no measure of reality but a contact is a contact!

Ups and Downs

Take a closer look at **Fig. 5** and especially the treetops. You'll note that regardless of brand this type of antenna doesn't do well in windy conditions. and it's almost always windy on a hilltop!

They are extremely compact and convenient for temporary use, holidays, parks and gardens etc. However, unlike fibreglass they may easily distort, making telescoping difficult. You have been warned!

I would strongly advise a regular spray and wipe with that blue and yellow can, light fish oil-based spray that everyone has in the workshop cupboard and to think twice before venturing on to a SOTA summit in a moderate to high wind.

Both the JPC-12 and MC-750 definitely require more radials than are initially included in order to be more effective. Neither device is supplied with coaxial cable and so far, it's honours even.

The JPC-12 version has ferrite in its longer, thinner base connector. The MC-750 does not. I think this is something of an omission as the SO-239 is straight through to the top insulated centre. When accurately matched the coax is docile but RF on the coax outer could be a potential problem, particularly on hard standing at band edges.

Placing a few ferrite tubes over the coax, taped close to the antenna connector end, may be a worthwhile investment.

I get the impression that like similar devices, the MC-750 has been made with items from different sources. It's no detriment to understand that it's not the product of one factory. I believe that reasonably available components have come together, to make up a very practical, grab-and-go package. Having spent more than a little time with it out and about, I've come to like it for what it is and what it offers. It's convenient, compact and easy to transport. Its limitations and performance are no greater or lesser than similar devices.

On the downside, I really would have liked some ferrite in the base unit but it's not a deal breaker and I haven't made my mind up about the confusing threads.

On the upside... Band lengths marked on the MC-750 whip is an excellent idea, tape measure not required. Tripod included is another plus and I love the bag. It has spare space for more radials and the tripod.

My impression is a likely 4 out of 5. As always, now you decide. My thanks to Martin Lynch and Sons for extended time to really get to know this device. Cost at time of press £229.99, including tripod (value £34.99). **PW**

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Michael Jones GW7BBY/GB2MOP
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I'm sure that at some point in our radio careers most of us will have come across an AC/DC radio, also referred to as a universal set. As the term suggests, an AC/DC radio will run happily from either an AC or a DC mains supply.

History

DC mains power is unheard of these days, but when electricity started to be supplied to industry in the late 19th century and subsequently to our homes at the start of the 20th century the supply could be AC or DC and a variety of voltages from 100 to 240. The reasons for choosing AC over DC vary. The battle of the currents raged in America with **Thomas Edison** supporting DC distribution while **Nicola Tesla** and Westinghouse supported an AC system. In the UK, **Dr John Hopkinson** and **Sir William Thomson** (later **Lord Kelvin**) supported DC while **Sebastian de Ferranti** and **Professor Sylvanus Thompson** supported AC. In both countries AC won principally because AC could easily be transformed to different voltages and was thus much more flexible than DC which, in those days, could only be changed by wasteful potential dividers or voltage dropper resistors.

Standardisation

Between the 1880s and 1920s some 600 local electricity generating companies had been established in the UK as well as many other smaller suppliers. In an attempt to standardise supplies, the Electricity Supply Act was passed in 1925. This resulted in the establishment of the Central Electricity Board, which bought the output from selected generating companies and distributed electricity through what was to become the National Grid. From this time the standard voltage for domestic use became 240V AC at 50Hz. This still left some smaller suppliers generating DC supplies as well as other larger companies who had perpetual contracts to supply DC such as the Bankside Power Station on the River Thames in London as late as 1981. Although part of the Central Electricity Generating Board, it supplied DC printing presses in Fleet Street. It was not decommissioned until 1981 when the newspaper industry moved to the Docklands area and adopted AC powered presses. Other DC supplies continued into the 1970s for things such as trams, major welding supplies and pit head mining equipment.

Domestic DC supplies persisted in some areas at least until the mid-1950s. There is even some anecdotal evidence of DC being available until the 1960s.

In the early days there was a demand for AC/DC sets, but despite the demise of DC supplies in the 1950s, AC/DC sets continued to be sold well into the 1970s. Radios such as the Philips, **Fig. 1**, would have adorned many a mid-20th Century sideboard.



AC/DC Radios: Eddystone 840A

Michael Jones GW7BBY/GB2MOP discusses the issues involved in working with AC/DC sets, using the Eddystone 840A as an example.

There was one big advantage as far as manufacturers were concerned: AC/DC sets were cheaper to make than AC only ones.

So What's the Difference?

Remember we are talking about valve radios, which required 200 – 250V DC High Tension (HT) for their anode supplies and a lower voltage for the valve heaters or filaments. The traditional power supply for a valve radio would require a transformer running off the AC mains to produce an HT voltage of the order of 250V AC and a heater supply of usually 6.3V AC. A rectifier valve, choke and smoothing capacitor(s) would be needed to change the AC HT voltage to DC. Importantly the transformer also provides isolation between the chassis and the mains supply. An AC/DC set would employ a dropper resistor in place of the mains transformer. This is essentially a voltage divider connected across the incoming mains to produce the required voltages. If the set is used on an AC supply, then the resulting voltages from the dropper resistor will still be AC so the choke and smoothing capacitors will still be needed. However, a dropper resistor is substantially cheaper than a mains transformer with its high steel and copper content. For DC operation, the rectifier valve behaves as a passive conductor and effectively the DC output from the dropper resistor is used.

For AC operation one simply plugs the set into the mains supply. Hopefully live and neutral wires

are correctly connected in the plug. If they are reversed, the set will still work and as the chassis and all the metalwork is mounted in the plastic case, while the control knobs are plastic so the user is insulated from the risk of electric shock. For DC operation the supply wires need to be connected the right way round for the set to work. If they are reversed, the dial lights will still come on, the set will not work, but will come to no harm. Simply change the connections in the plug and it will work.

Fig. 2 Shows the inside of the Philips radio illustrated in **Fig. 1**. You can see that the chassis is attached to the plastic case, effectively isolating the user from contact with the metalwork. Notice the brown two-core mains cable. There is no coding to identify live or neutral, so the chassis could equally be at live or neutral potential. There is also no provision for earth, understandable in this instance as there would be no viable point to connect it to.

What's the Problem?

As many a service technician and unwary amateur can testify (hopefully!), the issue lies with that potentially live chassis. Live and Neutral may be incorrectly connected in the plug, or past repair work may have been incorrectly executed (as with the Eddystone 840A later). Even if you are familiar with working on high voltage valve equipment, a moment's inattention can result in at best a nasty belt from the chassis, at worst one we try not to think about!

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Fig. 1: Typical Philips AC/DC Radio of late 50s/early 60s. Fig. 2: Inside the back of the Philips AC/DC Radio. Fig. 3: Eddystone dropper resistor in parlous condition. Fig. 4: Eddystone 840A Power supply. Fig. 5: Barretter.

Other issues with the dropper resistor are mainly down to heat. Because they are lossy devices, they generate heat. The heat affects adjacent components, thermal cycling causes cracking of the ceramic insulation on the dropper resistor itself. Poor storage often in unheated garages or lofts allows damp into the cracks. If it's cold enough, the insulation will crack further and pieces fall off. Next time the set is plugged in, the dropper resistor will be in a dangerous state. Earth leakage issues at least may be a problem.

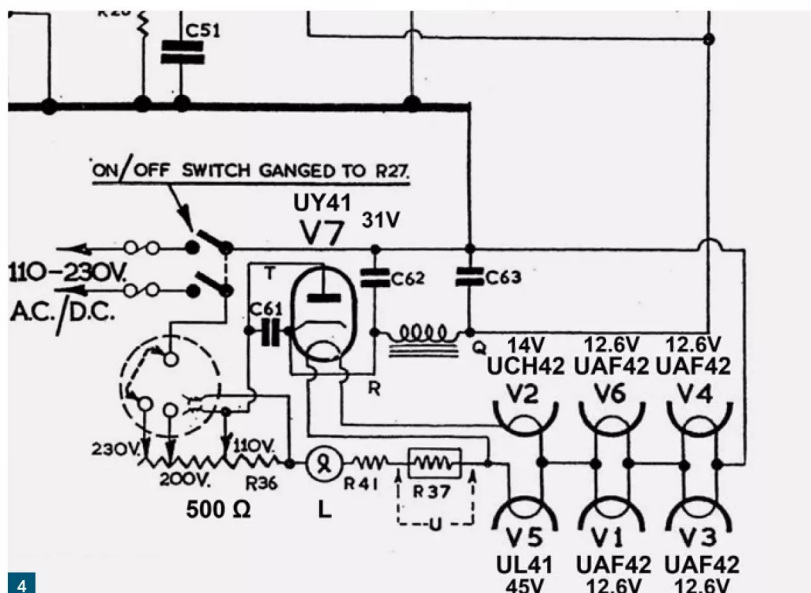
See Fig. 3: If this was my personal radio with this dropper resistor, I would disconnect the dropper resistor and associated components and build a transformer-based power supply in a separate enclosure. If originality was not an issue, I might even remove the dropper resistor and build the power supply on the vacated real estate.

In addition to the primary health concerns, care needs to be taken when testing an AC/DC radio to avoid grounding problems when mains-powered test equipment such as signal generators, oscilloscopes etc are being used. An isolating transformer should be used to protect your test equipment and for your own safety. Incidentally, a Variac is not an isolating transformer.

When first turning on a valve radio a simple preliminary check to see if all the heaters are alight can often save a lot of time. You need to be aware that with an AC/DC set the heaters are connected in series or series/parallel chains (Fig. 4: Eddystone 840A) so that if one fails all the others in that chain stop working.

Resistive Power Cords

Instead of a dropper resistor some sets, notably American, had a resistive mains lead, which was all very well. As Harry Leeming G3LLL warned in his *In the Shop* series in *PW*, more than one person has fallen foul of these by either replacing the mains lead with a conventional copper-cored lead, or shortening the lead. Either way the performance



is compromised and the set suffers the consequences. Resistive mains cable is specified as so much resistance per foot, commonly 60Ω per foot. It can be expected to get quite warm in use. Such cable is probably hard to find now, but probably best substituted with a suitable dropper resistor in the set itself, or perhaps an external enclosure. Herein lies another danger signal: if the cord is in good condition and working, leave it alone. If it is at all damaged, beware, it probably contains asbestos insulation.

Precautions

If you're not sure, don't do it! Otherwise before working on an AC/DC set, leave it unplugged, but turn the power switch to the on position. Get your multimeter and check for continuity from the neutral pin on the plug to chassis, it should be close to 0Ω. There should be no continuity from live to chassis (Open Circuit). Even so, take great care not to touch the chassis while poking around looking for faults. It's easy to get too engrossed in checking a voltage and absently brush against the chassis or some other live component.

If you have the chassis removed from the cabinet,



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make sure that all the control knobs are replaced on their spindles. It's all too easy while engrossed in the innards of the set to just get hold of a bare spindle to see a switch operate, for instance.

While the AC/DC set carries its own set of safety risks, I must emphasise that working on any mains powered valve radio, AC/DC, AC/Battery or AC only, requires constant attention to the risk of electric shock.

ATypicalAC/DC Circuit

The circuit shown on Fig. 4 is the power supply section of the Eddystone 840A. The layout is not as intuitive as might be desired.

Power enters from the left via fuses in each line to the two-pole switch incorporated in the tone control. From here the neutral, or negative line goes to the chassis. The live, or positive side goes to the top of the 500Ω dropper resistor, which offers 230V, 200V or 110V operation. The 110V tapping goes to the anode of the rectifier valve. You can see then that the HT voltage is an unusually low 110V DC. Indeed, on the 110V tapping the dropper resistor is effectively out of circuit and the 110V mains is rectified directly. The rest of the HT circuit is quite normal, with the half-wave rectified output taken from the cathode of V7 via a pi-section smoothing circuit comprising a choke, C62 and C63.

Heaters(Filaments)

If you are used to AC-only radios, you will know that the valves, aside from the rectifier, have 6.3V heaters. They are connected in parallel to a suitably rated 6.3V tapping on the mains transformer. With this arrangement each valve has the same heater voltage and can draw the current it needs from the transformer.

The arrangement for AC/DC sets may seem to be quite simply one of connecting all the valves in series. The problem is that their current requirements will vary, causing unequal voltage drops along the series chain. This could be mitigated to an extent by using shunt resistors across some of the filaments. Furthermore, it would need a lot of 6.3V valves (17) to add up to 110V.

Valve manufacturers addressed this problem by developing a range of valves with various, higher, heater voltages, but all with the same specified current. A 'U' prefix (UAF42, UL41 etc) valve consumes 100mA, but has different heater voltages, UAF42, a small signal valve, has a 12.6V heater while UL41, an output pentode, has a 45V heater. Similarly, a 'P' prefix indicates a 300mA range of valves commonly found in TV sets; a 'C' prefix denotes a 200mA heater usually in a pre-war design; an 'H' prefix is for a 150mA heater commonly in American sets.

In the Eddystone 840A circuit (Fig. 4 again) the valves are all in the 'U' series and therefore have 100mA heaters. The heaters are connected in series/parallel. You will see that V4 and V3, both UAF42s, are in parallel and they have 12.6V heat-



ers. Similarly, V6 and V1 are also UAF42s. V5, UL41, an output pentode, has a 45V heater. The series combination of V2, UCH42 with a 14V heater and V7, UY41, with a 31V heater gives a total of 45V in parallel with V5. Adding up the parallel pairs we get $45 + 12.6 + 12.6 = 70V$. The resistance of the additional dropper resistor R41, the dial light 'L' and thermistor R37 bring the total voltage requirement to 110V. Other sets will have similar arrangements, some more imaginative than others!

Thermistor or Barretter

R37 is a thermistor: a negative temperature coefficient device. In other words it has a high resistance when cold, but as it warms up its resistance drops rapidly. Its purpose is to control the inrush current that occurs at switch-on. The valve heaters have a lower resistance when cold so the inrush current can shorten the life of the valves. In older sets, mainly pre-war, a barretter [1] performs this function. A barretter (Fig. 5, [2]) is a constant current device consisting of an iron filament in a hydrogen atmosphere. As well as controlling inrush, it will maintain a constant current of, say, 150mA over a moderately wide range of input voltage. This used to be more important when the mains supply voltage could vary quite considerably, especially on the remaining DC supplies. (I'm afraid I can't explain the physics involved!)

Remember the Dial Light

'L' is the dial light. In this circuit as in many others, failure of the dial light will interrupt the supply to the heaters and will thus stop the set working – remember this!

Other sets may have a shunt resistor across the dial light, this will slightly reduce the brilliance of the light, but prolong its life. Crucially, if the dial lamp does fail, current will continue to flow through the shunt resistor and keep the set working.

The Eddystone 840A

So, to the focus of this month's story: the Eddystone 840A is an AC/DC set produced from about 1955 to 1958. One wonders why a quality manufacturer like Eddystone continued with this practice. The reason is that Eddystone supplied equipment for maritime use and the voltages available on board ship were either 110V DC or 240V DC.

At *Internal Fire, Museum of Power* we have two Eddystone 840As as part of a new display depicting the BBC's Tatsfield Receiving station as it was in the early 1960s. They are both clean and visually in good condition, Fig. 6. I knew that they were AC/DC sets and decided that as they were expected to be working in a public area, it would be prudent to do some checks. I needed to ensure that

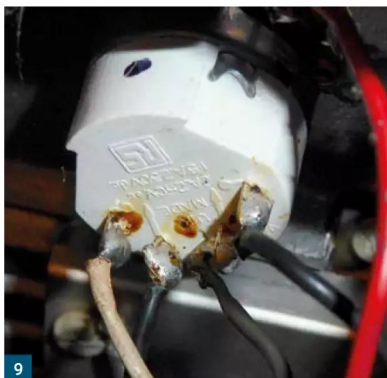
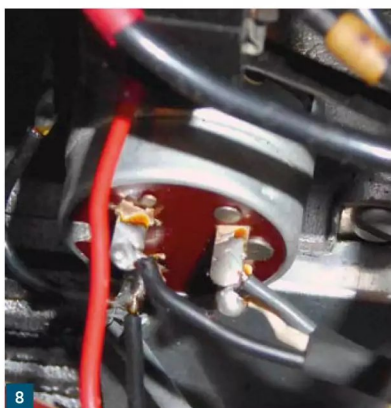
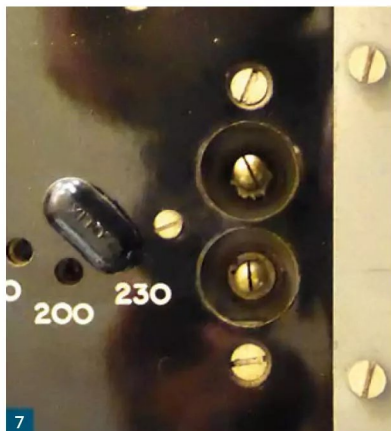


Fig. 6: The two Eddystone 840As. Fig. 7: Non-polarised power inlet on the 840A.

Figs 8 & 9: The two different power switch connections.

Fig. 10: Rubber power connector. Fig. 11: IEC C6 connector fitted.

Fig. 12: IEC connector offered up to rear panel.

mains neutral, not live, was connected to chassis and that all the insulation between the aluminium casework and the chassis was intact.

Mains Inlet

One of the first things to notice is that the mains inlet is a two-pin non-polarised connector, Fig. 7. It can be plugged in either way round so irrespective of how the three-pin mains plug is wired, there is only a 50% chance of actually having a neutral chassis. I believe some Eddystone sets had one pin larger than the other, but on the 840A they are both the same size. Indeed the 840A Instruction manual states, "On AC mains the receiver will work with the plug either way round.....On DC mains.....(if) the valve heaters and the pilot lamp glow but if after the normal 30 seconds.....the set remains lifeless, the power plug should be reversed."

I decided to determine which of the two pins was connected to the chassis and thus should be the mains neutral. On the first 840A the top pin went to chassis, on the other one the bottom pin went to chassis. Odd! Upon following the wiring it became apparent that the tone control, which incorporates the two-pole on/off switch, had been replaced at some point in one set and the wiring had become reversed at that time, Figs 8 & 9. Here is a classic example of how the unwary repair man can be caught out even though the mains plug is correctly

wired and the two-pin plug at the back of the radio is correctly oriented.

The Eddystone power plug, Fig. 10, is a rubber covered affair. Even if you have an original one, it is likely to be perished and unsafe to use.

Replacement

I decided to replace the two pin mains inlet with an IEC C6 or cloverleaf chassis connector, Fig. 11. This would be non-reversible thus ensuring that neutral was always in the right place. It would also allow me to connect the front panel and case to earth so that in the event of any insulation issue between chassis and case the RCB in the consumer unit will trip very rapidly.

Fig. 12 shows the Cloverleaf socket offered up to the 840A rear panel over the two-pin mains inlet. You can see that the fixing holes do not line up with the old two-pin socket holes, in fact they fall right on the edge of the existing apertures for the two-pin plug. My original plan was to make up a small plate from Perspex or stripped PCB material to carry the IEC socket and utilise the original fixing holes. In the end I simply used two large washers to spread the fixing force, Fig. 15.

You will have to remove the bridge, Fig. 13. I used a router, Fig. 14, as it is quick and easy and the vibration transmitted to the radio is minimal. The IEC C6 Cloverleaf socket will then drop nicely into the

space created and can be fixed with 3mm countersunk screws with large washers on the inside to spread the load, Fig. 15.

The bar shown in Fig. 16 will have to be removed; it will break off cleanly by bending it back and forth a few times.

I am pleased with the end result, Fig. 11 again. It works well ensuring that the chassis is at neutral potential and that the exterior metalwork is earthed.

An equally valid solution would be to install a captive mains lead. In Fig. 17 I have just shown the cable passing through one of the two pin plug holes. You will have to incorporate a cable grip and strain relief.

If you decide to carry out this modification, do not earth the chassis. Neutral is grounded, earthed at the substation, not in your home. As a consequence there can be considerable circulating earth loop currents. At the very least an RCB will trip, if you have one.

While I have focused on the Eddystone 840A the IEC connector is a good solution for other radios, including domestic radios with plastic or Bakelite cases. For the latter, the earth connection will not in general be used, but as the connector is polarised you can ensure that neutral is always connected to chassis thus reducing the risk to future service personnel.

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Fig. 13: This bridge to be removed.

Fig. 14: Using router to remove material.

Fig. 15: Internal view of completed installation.

Fig. 16: This bar to be removed.

Fig. 17: Captive mains cable an option.

Fig. 18: Note C13 to be in good condition.

Check the Metal Casework

The next thing to notice is that the Eddystone 840A has an aluminium front panel and steel case, rather than the plastic, wood or Bakelite case found on domestic sets. The chassis is insulated with Paxolin washers from the enclosure metalwork in numerous places. Great care is needed when re-assembling these sets to ensure that all the insulation is correctly fitted and not damaged in any way. Eddystone specify that the insulation resistance chassis to case/front panel should be >100MΩ measured at 500V with a Megger.

It may be worth noting that these sets will run cooler and more efficiently on 110VAC if you have a suitable 240/110V transformer, as the dropper resistor will be largely by-passed.

One final observation on the Eddystone concerns C3, Fig. 18. This needs to be in good condition. If it becomes leaky, one half of a dipole antenna could become live. Alternatively, if the earth plug is fitted, the cabinet could potentially become live.

Conclusion

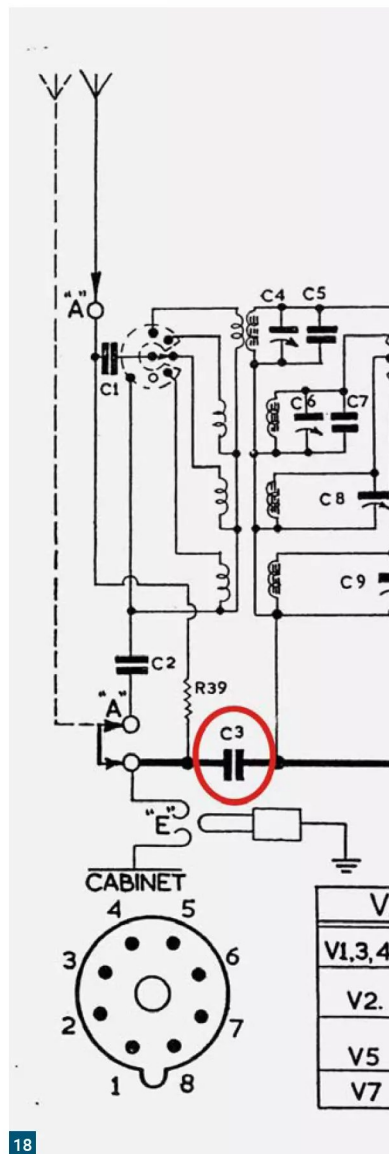
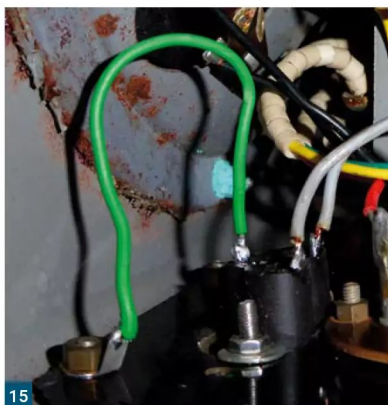
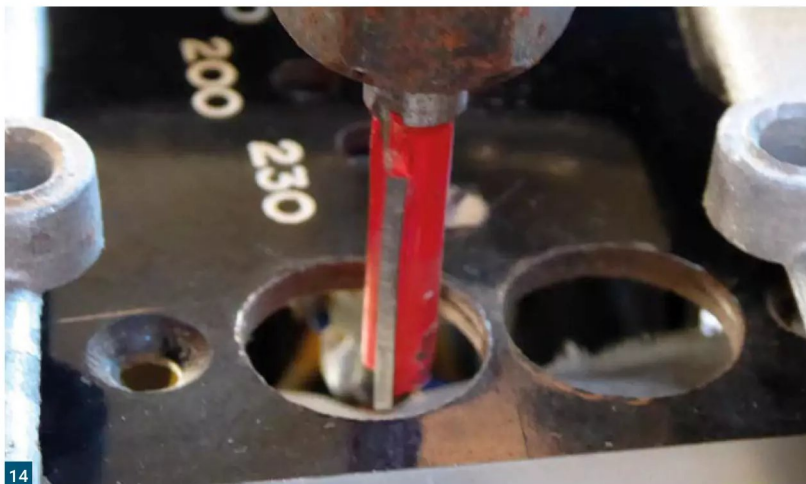
An AC/DC set in good working order, correctly installed in its enclosure, will give good service, but if the time comes to carry out repairs, take care. Whenever we work on mains operated equipment we must be aware of the risk of electric shock and take precautions. These precautions are largely common sense and keep us safe when working on 'conventional' AC mains powered units. Working on AC/DC universal radios requires just a bit more vigilance as there are a few non-intuitive traps to catch us out – take care!

Notes

[1] In the early days of radio a barretter was used as a detector as the low thermal mass of the filament could respond to changes in audio frequency, but could not respond to RF frequency, thus the change in resistance demodulated the signal.

[2] Barretter © 2005 - 2012 by **Andy Cowley M1EBV**, image is licensed under a Creative Commons License. See:

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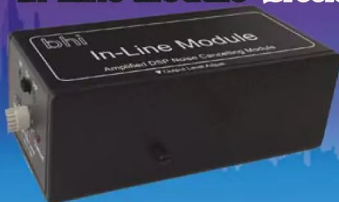
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E & O.E.



James Stevens M0JCQ

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I know what you're thinking, FM is for the VHF and UHF bands right? Well usually yes, but there is an exception on the 10m band and again typically only at certain points in the sunspot cycle. The 10m band is an interesting band, exhibiting qualities of an HF and a VHF band. Sometimes you'll only be able to work local stations, other times it will support worldwide contacts. 10m FM offers a world of fun, which you can enjoy, especially now as sunspot cycle 25 is starting to warm up.

10m is the only HF band that has a FM allocation in the band plan [1]. It certainly wouldn't be welcomed much elsewhere, due to the comparatively large amount of bandwidth needed for a single QSO! 10m is unique as a result on HF. Fortunately, the 10m band has a sufficiently large bandwidth to support FM as well as all the other usual modes, including AM.

There are other more pressing reasons FM isn't typically used on HF, as you the readers will no doubt know. It's not a great mode for DXing or for use under marginal propagation conditions. In fact, it's one of the least efficient modes we have! In terms of voice modes available to us we'd consider it in order, with the most efficient being SSB, then AM and finally FM. The reason? A single FM contact takes up a whopping 12kHz of bandwidth, AM is wide using 6kHz, while SSB takes up only 3kHz. But during the upswing in each sunspot cycle and especially near the top, FM becomes a viable mode for making worldwide contacts – just ask a CB enthusiast and they'll confirm it.

This article will outline the fun you can have

Getting Started on 10m FM

James Stevens M0JCQ advocates trying FM on the 10m band, now that propagation is improving.

with 10m FM during the more favourable conditions we're starting to see with the current sunspot cycle – we'll be able to do things we couldn't even dream about during sunspot minima!

10m Equipment to Use

The great news here is that if you have an HF rig already, it will allow you to use 10m FM, as long as your rig supports FM, which most do. If you wish to operate 10m FM mobile or portable, then there are specific rigs which will do this. Moonraker, for example, offer the Anytone AT-5555N 10m Transceiver [2] and Anytone AT-6666 10m Transceiver [3], both of which cover FM, AM and SSB modes.

If you wish to work 10m FM repeaters, then it's worth checking your transceiver is CTCSS capable. Some are out of the box, while some require optional boards. Often, dedicated 10m FM transceivers are converted CB transceivers, so you'll get a CB transceiver thrown in for free. If you already have a CB transceiver, then this may well be convertible for use on 10m FM.

Personally, I have the Yaesu FT-8900 FM transceiver, **Fig. 1** [4], which covers four bands, including 10m, 6m, 2m and 70cm. This is particularly useful as an all-in-one FM only transceiver for your vehicle or portable use. You can work locally on 2m and 70cm, while also having the option to catch some DX on 10m and

6m from the comfort of your own vehicle.

The 10m antenna is up to you. A simple vertical will work well, **Fig. 2**, or even a horizontal dipole. Antenna dimensions are kinder than the lower HF bands, so a Moxon or Yagi are a bit more feasible. Polarisation is less of a concern on 10m than the VHF/UHF bands when using FM. If Sporadic-E or F-layer propagation is at play, then there's no predicting which polarisation the signal will arrive in and therefore there's no convention on 10m for horizontal or vertical polarisation, unlike FM on the VHF/UHF bands. If you are also wanting to work via groundwave with local stations, then vertical polarisation is probably the best choice.

Mobile Operation

10m FM is good for mobile operation due to the relatively small antennas and transceiver available. I'd also err on the side of caution and pull up before operating. Driving to a hilltop location would benefit you two-fold, it would give you an unimpeded take off to the horizon to maximise contact range, and it may also be a lower noise environment, meaning you'll hear more than from your home QTH.

The Yaesu FT-8900 and other dedicated 10m transceivers use a mobile form factor, making them suitable for mobile installation. The FT-8900 even has a detachable faceplate, allowing you to mount this somewhere suitable and stash the transceiver out of the way.

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Fig. 1: Yaesu FT-8900 is a quad-band FM transceiver covering 10m. Here it's monitoring the 10m FM calling frequency.

Fig. 2: Making a vertical 10m antenna is cheap, quick and effective – this was my quick effort at the home QTH.

Fig. 3: By leaving the squelch open I could copy N2ZN calling on the FM calling frequency. His signal wasn't huge and had QSB.

10m FM Frequencies

The 10m FM allocation is at the top end of the band, just above the satellite allocation, and covers 29.520 through to 29.700MHz:

- 29,520-29,590 6kHz All modes – FM repeater inputs
- 29,600 6kHz All modes – FM calling channel
- 29,610 6kHz All modes – FM simplex repeater (parrot), input and output
- 29,620-29,700 6kHz All modes – FM repeater outputs

29.600MHz is the FM calling frequency and a good place to monitor activity; it can certainly be lively during good F2 propagation. During summertime Sporadic E openings, it would be worth putting out a call to see what comes back, the propagation paths can be very localised during these openings. Working summertime Es on 10m from Mallorca a few years back, I seemed to have a direct line into Germany, but not much elsewhere! Once you establish contact with a station on the FM calling channel, QSY to another frequency to complete the contact, the same as you would on the VHF/UHF calling frequencies.

10m FMDXing

Based on what I've outlined so far, the term '10m FM DXing' sounds like an oxymoron. But it really does become feasible when conditions are very good. If the sunspot count is high enough, then the 10m band will support worldwide F2 layer propagation and even at very low power levels. This is a far cry from the conditions on the band over the last few years during the sunspot minimum, where you were lucky to get SSB and FT8 contacts outside of the summer Sporadic E season! If you wish to try for worldwide contacts, then the time of day really plays a part, with the strongest openings being around midday. Certainly, daylight hours are better, but during really good conditions the band can open before sunrise and stay open into the night. DX opportunities on 10m via F2 propagation often follow the sun across the globe. This is worth thinking about when DXing. For the path to be viable you'll need the path from you to the DX to be in daylight, unless the sunspots are really active which will extend the opening into the darkness either side.

If you want to try 10m FM DXing, then you'll want to know how to assess if conditions are good enough. We need a strong opening. Under marginal openings you'd be much better off using SSB, CW



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or FT8. To monitor for strong openings, you can use several techniques:

Monitor the FM calling channel on 29.600MHz.

Monitor the 10m repeaters to see when simplex might be supported.

The 11m CB band is just below the 10m band, so a lot of DX contacts here will mean 10m is feasible (or will be soon).

Monitor the 10m CW beacons. These will give you an indication of the paths that are feasible at any given time. A compiled list of the 10m beacons can be found here [5].

Of course, this is not foolproof and often there's nothing like putting out a few calls at likely times on the FM calling frequency, you just never know who might respond!

A few things to watch out for when operating 10m FM, which might catch you off guard if you're not used to using FM. First of all, disable your transceiver's squelch, you'll want to hear everything and not miss someone that's down in the noise. Depending on the conditions, the path between you and the other station may be marginal or fading on FM and you really don't need the signal to cut in and out due to your squelch. This caught me off guard while operating from a SOTA summit on EA8, just after the peak of the last sunspot cycle 24. The conditions fluctuated quickly during my FM QSOs back to the UK, meaning I would miss 50% of what was said, **Fig. 3**. Having used my Elecraft KX3 mostly on SSB, I'd forgotten all about the squelch when enabling the FM mode!

The 'capture effect' on FM is also something to be aware of. Say you call CQ on the FM calling frequency and more than one station responds at the same time, the capture effect will mean you won't hear all stations simultaneously (as you would using SSB). The signals combine and turn into an indecipherable mess, unless one station is

particularly stronger than the other. You may well have encountered this while operating using FM on the VHF/UHF bands. In this situation, there'll often be a partial callsign which you can copy in the overall mess, especially if one person calls for a longer time than the other. Using this partial callsign you can then ask for only that station to respond.

The editor, **Don G3XTT**, mentioned to me working many JA stations using 10m FM when he was on the D68C Comoros DXpedition (IOTA AF-007) back in 2001, saying the mode seemed very popular in Japan! It makes sense for a nation where mobile and portable operation are very popular.

During good conditions you may also hear the infamous Russian taxis, which seem to use the 11m and 10m bands for local communication, clearly not realising they can be heard worldwide sometimes.

10m FM Repeaters

FM repeaters on HF? Well, yes, 10m has these too. Under flat conditions and especially during sunspot minima these support local contacts, limited to 'line of sight' groundwave propagation, similar to how you reach and use 2m/70cm repeaters. However, when the band is supporting F layer propagation, you'll find you can suddenly work through repeaters around the world. Have you ever worked through a repeater located in New York? Well, you can during a sufficiently good F layer opening and many amateurs do during sunspot maxima. You might want to call into the downtown Manhattan 10m repeater KQ2H. Of course, if you can open the repeater from here in the UK, who knows who else you will work through the repeater, it could be anywhere. It might surprise you that there are also a number of 10m repeaters within the UK [6].

DL6XB compiled a list of the 10m repeaters worldwide, which you can find here [7]. I wasn't able to verify how old this list is, but it will give you an idea of just how many 10m repeaters there are worldwide. There are plenty located in mainland Europe, which will be accessible even during SpE openings in the summer. Program in a few in different places and you'll be able to make worldwide repeater contacts.

Conclusion

If you've never used FM on the 10m band, now is a good time to try something new. The improving propagation conditions will increasingly make this viable. It's an exciting mode and band combination, which can throw up absolutely anything. While writing this article I had a nice groundwave QSO with **Tim G4DBL/P** in Oxford. We had a good chat, leaving breaks for other callers. The QSO had a nice feeling about it, like a 2m FM contact, with armchair copy, but with the real possibility of some DX calling in. Straight afterwards I copied **Kenneth N2ZN** on the FM calling frequency!

Web Links

- [1] RSGB 10m Band Plan:
<https://tinyurl.com/4udyvnh3>
- [2] Anytone AT5555N 10m Transceiver:
<https://tinyurl.com/bdf8shf2>
- [3] Anytone AT-6666 10m Transceiver:
<https://tinyurl.com/yr266a5n>
- [4] Yaesu FT-8900 Quad Band FM Transceiver:
<https://tinyurl.com/yckyjdfc>
- [5] 10m Beacon List by WJ50:
www.qsl.net/wj50/bcn.htm
- [6] UK 10m Repeater List:
<https://tinyurl.com/2p985bdx>
- [7] DL6XB 10m Worldwide Repeater List:
<https://tinyurl.com/3taczdne>

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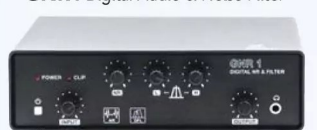
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Tim Walford G3PCJ

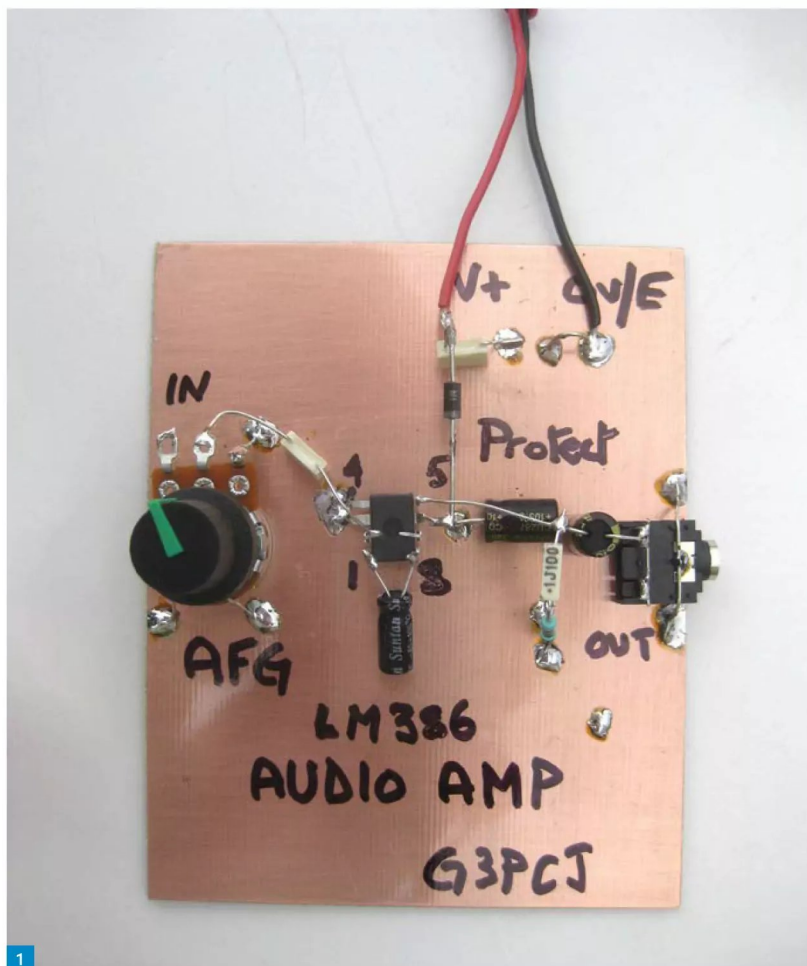
Tim@walfords.net

Why not build your own – it has *never been easier* – so start now! My aim in a couple of articles is to show how easy it is to build simple radio equipment. Until you have done it, you won't experience the satisfaction this brings, whether you are showing it to grandparents, local radio club members, or even using the item on air! In my case, it also led to an early career in electronics!

I often get asked by Club Secretaries about construction projects for their members; usually they hope to encourage home construction among those who have done very little previously. I normally advise a simple receiver project because the likely builders may not yet have the necessary tickets to operate their own transmitters without supervision. Group projects with a leader in a 'Buildathon' session are another approach, which is particularly good for younger participants. Another point that often arises early on, is whether the project can be something 'digital'? This can range from a winking LED to a complex Software Defined Radio (SDR), which will comprise a powerful computer, with a very fast analogue-to-digital converter, display drivers etc, and some very special software. Except for those of primary school age, I always advise an analogue project, especially if it is to be a radio! Even the digital SDR will perform the same fundamental signal processing as the analogue one, first selecting the wanted signal, then demodulating it to extract the wanted information, and probably more filtering to enhance its nature. There will also be amplification in one or more of those stages as well. Sadly, the days of viable simple crystal sets have passed, but as noted by **Eric Edwards GW8LJJ** in his letter to the Editor in the June 2023 *PW*, there are modern ways to overcome the snags. You may lack a pair of High Impedance SG Brown headphones but you can easily build the simple audio amplifier described below. The other drawbacks of huge inductances (lots of turns), the need for multiple windings to improve selectivity, and lack of galena/cat's whiskers (or germanium diodes), can all be overcome in a simple analogue radio using just two transistors and one integrated circuit (IC) that will drive a loudspeaker or modern earphones.

Audio Amplifier

With a bit of care, you can make excellent items without undue cost, or an etched/drilled printed circuit board (PCB). Parts and tools can be accommodated on a large tray moved to the kitchen table as opportunity allows! The simplest physical layout uses upside-down parts and is hence known as 'dead bug construction'. The photo, **Fig. 1**, shows a basic audio amplifier with the integrated circuit lying on its back with



Build your Own Gear? (Pt.1)

In Part 1 of a two-part feature, **Tim Walford G3PCJ** encourages readers to take up their soldering irons and build something useful for the shack.

its pins pointing upwards. This unit can be used in many projects! The circuit is shown in **Fig. 2** but at this stage you do not need to worry about any theory – that comes a lot later – just build it for now! All you need to do is join the parts together electrically as shown in the circuit! It is arranged to have a voltage gain of x400 for audio signals and can drive modern phones/earbuds, or even a small loudspeaker. It includes an Audio Frequency Gain (AFG) or volume control to cater for strong signals. The base material is a piece of printed circuit board where the copper has ideally been left mostly intact to form an earthy ground plane, which is also the negative supply line. (Even scrap drilled PCBs are suitable provided the copper ground plane is present without

any solder 'resist' coating.) Mounting the parts 'in the air' with the component earthy leads soldered directly to the ground plane can make a remarkably rigid assembly! The earthy pins of the chip are bent sideways and soldered directly to the ground plane. If you really want to anchor the non-earthly joints, you can use stick-down 'me-squares' or even off-cuts of the ground plane! For some circuits, there will be points such as the in/out/supply leads where extra physical strength may be sensible; this can be provided with small capacitors across supply lines or 1MΩ resistors across signal leads. The amplifier circuit does not need these extra items because it should have parts at these points already.

You can obtain most parts and the copper clad

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Fig. 1: Audio Amplifier.

Fig. 2: Circuit of audio amplifier.

Fig. 3: Circuit of Simple RX.

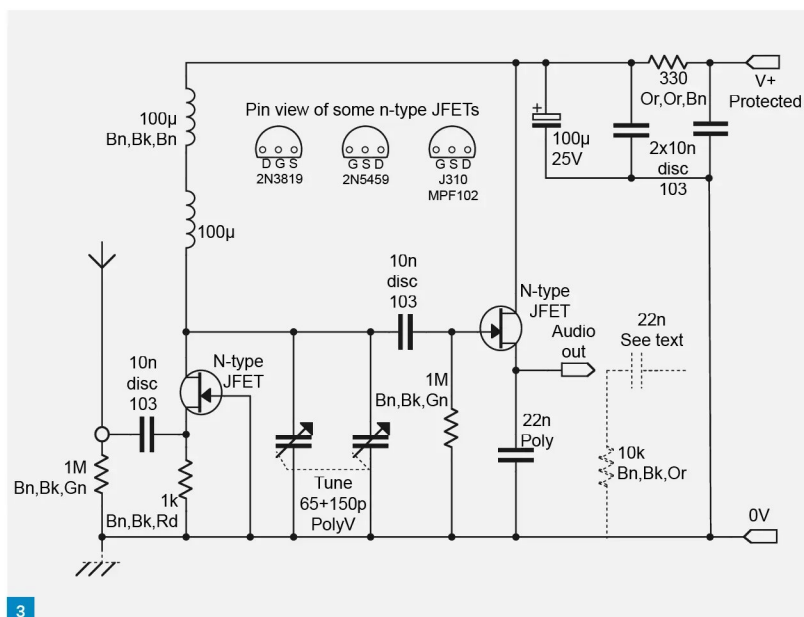
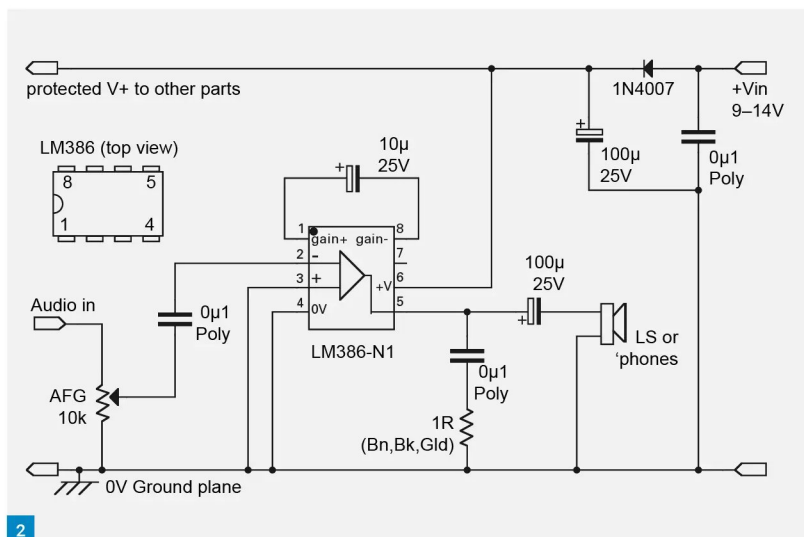
Fig. 4: Simple RX.

Fig. 5: Simple RX with Audio amp.

PCB from stalls at rallies. Web based suppliers such as Rapid Electronics or CPC/Farnell do sell to anybody but they will be expensive for things costing a few pence each. If you are also a member of the G-QRP Club (and if doing these sorts of things, you should be!), they have an excellent range of more commonly used parts. If you have not done it before, practice soldering on an offcut of the copper clad board with a 25W iron and flux cored solder – use 60:40 tin:lead if you can get it – it melts at slightly lower temperature than lead free solder so it is easier to make strong bright smooth rounded joints. Modern components are not troubled by the higher soldering temperatures needed for lead free solder. Do not breathe the fumes. Start laying it out with the larger parts and secure them with wire straps to the copper ground plane. Write the pin numbers of the chip on the PCB not forgetting the effect on them of turning it over! I have included the pin-out labelling for it (and the transistors of the next block) in the circuit diagrams. My version in Fig. 1 takes up more space than is really necessary so you can see better how I did it! Connect your loudspeaker or phones and make certain that the amplifier's mono output signal is connected to both sides of earbuds that use stereo plugs (do not use a mono plug in a stereo socket!). Check the layout again, especially if not using the optional supply protection diode (any of the 1N4001-7 series), before connecting your power source (9 to 12V battery or redundant 'wallwart') and turning on. You may hear a faint click as you turn on, or even a faint hiss when it's working; then try the finger hum test! Gingerly apply your finger to the shaft of a metallic tool touched to the input point with the AFG control turned right up! If it hums or makes other noises, it is likely to be working fine!

Radio RX Section

This part is not that hard either because there are still broadcasting stations in the Medium Wave band (about 750kHz to 1500kHz) that use Amplitude Modulation – these were what crystal sets used to hear mostly! There is still the need for large values of inductance (200µH or more) to decide what it hears, but luckily there are modern ready wound inductors that look like oversized resistors. With two 100µH inductors in series resonated by both sections of a modern PolyVaricon variable tuning capacitor, the tuning range will usually include at least three of the more powerful MW stations. The need for extra windings to connect to an unknown impedance antenna is best done by a very simple grounded-



gate RF amplifier using practically any N type Junction Field Effect Transistor (JFET) – but beware pin-outs do vary with type and remember that turning them upside down will 'reflect' the order! The last functional block needed is the detector – this is an infinite impedance detector with another JFET that acts like a perfect diode/buffer when connected across the tuned circuit. The complete Simple RX circuit is in Fig. 3. When coupled to the Fig. 1 amplifier, you do not need the extra parts shown dotted – they are only required if some other amplifier (HiFi etc.) is to be used. The antenna point has an extra 1MΩ resistor, and the supply line an extra 10nF disc capacitor, for better rigidity. This simple receiver can be built using the same approach (see photo, Fig. 4) and can share the protected supply of the ampli-

fier. As before, check the layout carefully before switching on. With luck a few metres of insulated wire outside your building for the antenna, with an RF earth connection to radiator pipework or the metallic case of a mains powered appliance, there should be enough signal for easy listening. Fig. 5 shows the receiver and amplifier joined together.

Advantages of Kits

Some builders may prefer to buy kits, which often look better and save the hassle of buying individual parts. They are often a bit easier to use and usually come with good instructions and some explanation of how they work! Irrespective of the source of parts, they will all need to be checked (especially to distinguish between

ready wound inductors and much higher value resistors) prior to building. Do build only one section at a time and then test/correct any errors, before going on to the next stage – this will give instant pleasure and much increase the chances of overall success!

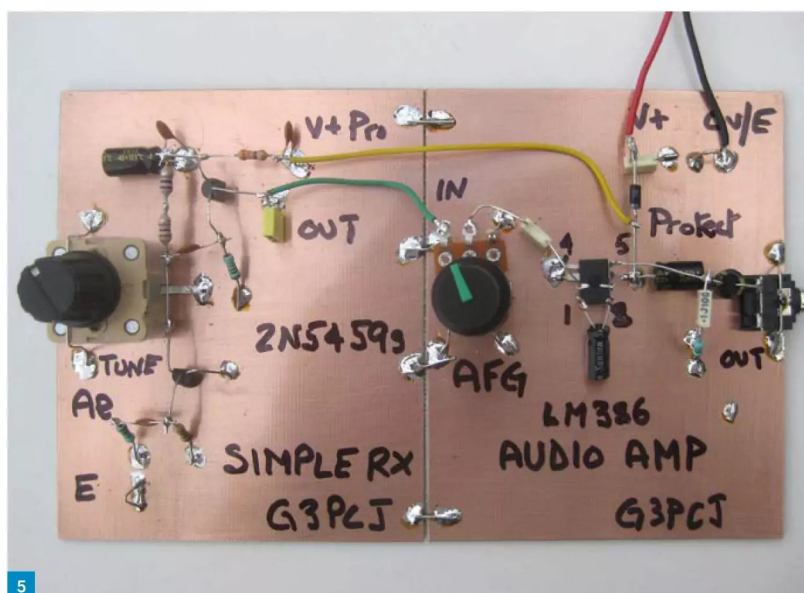
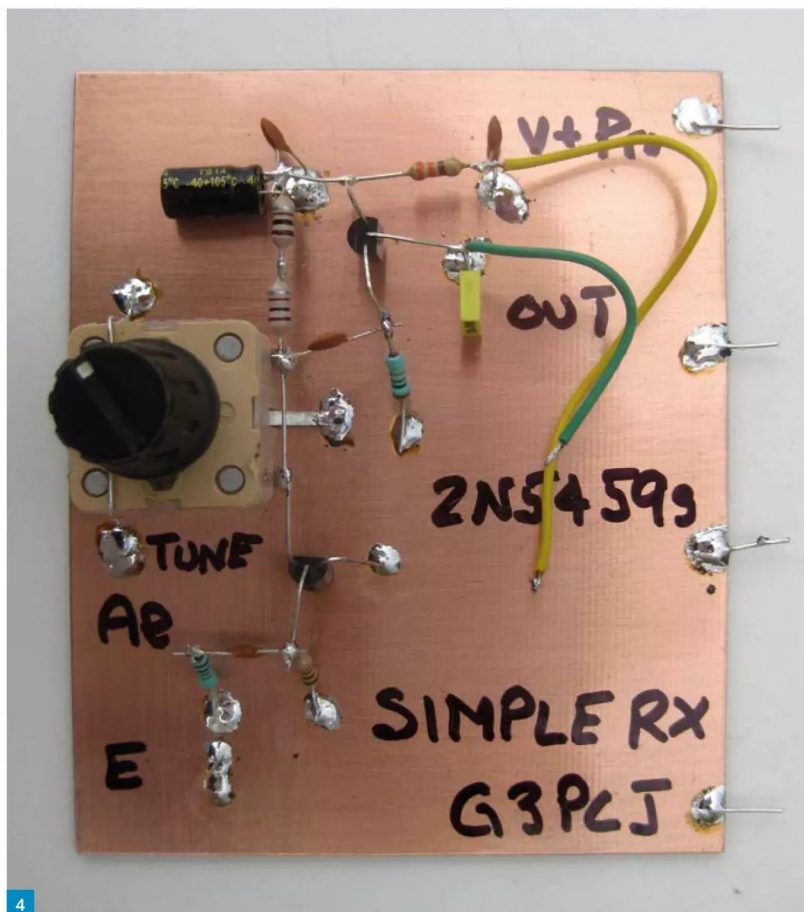
The simple radio described above is an excellent introduction to home building but does not cover any of the common amateur radio bands. My own very similar kit (The Shipham Mk2) also includes parts for the popular 40 or 80m amateur bands with a regenerative stage that greatly enhances the sensitivity and selectivity, as well as making it possible to hear Morse (CW) and the common single sideband (SSB) voice or phone stations, in addition to the AM ones. The instructions, being both text and pictorial, are best viewed on a computer. Adjusting the regen stage for the optimum point is much easier than it was when valves were used but it does need practice and a little patience!

Many operators will prefer a product detector (instead of the infinite impedance detector and regen stage) because they are much easier to use for CW/SSB, but they cannot do AM. Such rigs have the same type of RF filtering but the tuning is done by altering the frequency of a separate Variable Frequency Oscillator (VFO). This makes them more frequency stable and easier to tune up and down the band searching for stations of interest. My own simple kit using a product detector is called The Stathe; its reception bandwidth can be altered for CW or phone and, more importantly, it can be built for any of the main amateur bands 20, 40 or 80m; so you can try one of them without breaking the bank! Both the Shipham and Stathe RXs are detailed on my website:

www.walfords.wordpress.com

The next step up in complexity is to add a transmitter; and beyond that, eliminating the unwanted sideband usually needs the superhet format which is beyond the Editor's current space allowance!

Adding a separate transmitter to the above receivers is certainly possible but making certain they are working on the same frequency is awkward – especially for CW because there are two alternative tuning spots that provide the desired beat note, with the need to change by a few hundred Hertz in the correct direction to transmit on the other station's actual frequency. Adding the circuitry for 'single knob' tuning in such Transceivers (TCVR) makes them much easier to use. Those designed for CW will often include audio sidetone so you hear your own key depressions, with semi-automatic change-over of the antenna relay when the key is first pressed for a new transmission. Transceivers for phone need a speech amplifier and linear transmitter stages, with different transmit/receive control circuits. Apart from being easier to use, a TCVR



will involve less parts (hence lower cost) than a separate receiver plus transmitter; but the scale becomes uncomfortably large and the layout more critical/risky – hence the attraction of

proven kits with etched and drilled PCBs etc. In the second article, I will describe my 'Simplest' TCVR designs, called The Sheppy for CW, and The Quantock for phone.

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BBC Radiophonic Workshop

David Harris reviews a book that, among other topics, is a history of the BBC's well-known radiophonic workshop.

This book is an appraisal of a double CD, *BBC Radiophonic Workshop: A Retrospective* by Various Artists, which was released by Mute Records in 2008 and sells for £36.53 on Amazon. This collection has 107 short tracks featuring sound effects, TV and radio themes, incidental music and interval signals produced by staff who worked at the BBC Radiophonic Workshop from its opening in 1958 until it closed in 1998. This CD is not available on Spotify but one can find most of the tracks on other BBC Radiophonic Workshop compilation albums, which are available on this streaming platform.

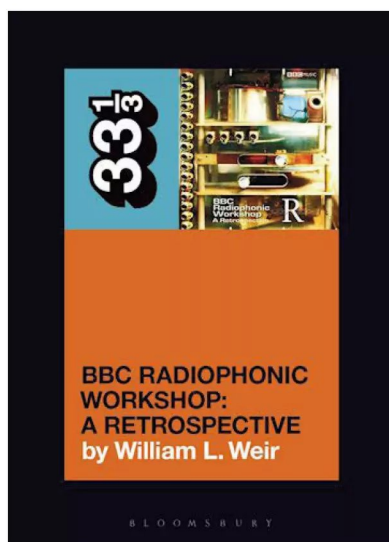
The book is also a concise history of the Radiophonic Workshop and to some extent a history of electronic music. The book is part of a series of over 170 books that are all dedicated to classic or influential LPs by artists including, The Beatles, Pink Floyd and Jimi Hendrix:

www.333sound.com

The Workshop was founded in 1958 and based at the BBC's Maida Vale studios. The initial investment was £2,000, which was used to purchase tape machines, oscillators and other pieces of electronic equipment. What the early pioneers at the Workshop produced was a form of *Musique concrete* (music composition that utilises recorded sounds as raw material as opposed to using conventional musical instruments) developed in France and Germany in the early 1950s.

Daphne Oram (1925 – 2003) joined the BBC in 1942 and worked in the music department as a studio manager. She became very interested in making music using tape machines, oscillators and other devices. She was one of the original staff of the Radiophonic Workshop where many of the employees only served for three months before they were moved to other departments. Oram wanted to develop experimental music that would be performed on the radio but most of the work of the Workshop was with the drama department who wanted sound effects. An early collaboration was on the radio play, *After the Fall* by **Samuel Beckett**. The offbeat humour of *The Goons* led by **Spike Milligan** was also a customer of the workshop. The 12 second clip 'Bloodnok's Stomach' (available on Spotify) gives an impression of the types of sounds they created. Oram left the BBC in 1959.

In 1962 **Delia Derbyshire** (1937 – 2001) joined the Workshop and is best known as the joint creator (along with **Ron Grainger**) of the *Dr Who* theme. She graduated from Cambridge with a degree in both mathematics and music. The author is interested in the history of electronic music and cites **Maddalena Fagadini's** (1929 - 2012) *Time Beat*, which was originally commissioned as an interval signal as being one of the first examples of electronic percussion. This piece of music was then re-



BBC Radiophonic Workshop: A Retrospective by William L. Weir.

Bloomsbury. 2023. £9.99.

153 pp. Pbk.

ISBN 9781501389153

www.bloomsbury.com

corded by Beatles producer **George Martin** who released it as a single under the name 'Ray Cathode' in 1962. Fagadini joined the Workshop having originally worked for the BBC's Italian Service.

In the pre-digital era the Workshop made sounds by manipulating tape machines and by cutting up tape, often into individual notes and splicing it back together, which was a very labour intensive task. Magnetic recording tape had been developed in Germany back in 1928 by AEG. The Magnetophon tape recorder was built in Germany during World War Two and used extensively to record **Hitler's** speeches, which were then broadcast. After the war the tape recorder and magnetic tape became the main format for recording sound and music.

The Workshop was open 24 hours a day to accommodate the creative staff and never had more than a dozen employees, including composers, engineers, secretaries and a director. The author makes the point that several women held prominent roles in the Workshop. This was unusual in the UK in the 1960s but the BBC had employed women from the very beginning and several had risen to senior positions. This was because broad-

casting was a completely new industry with no preconceived notions about the role of women.

The author makes the point that television theme tunes and jingles are not topics usually brought up when people discuss music. However, the pioneering work of BBC Workshop influenced The Beatles who used tape loops for the first time on *Tomorrow Never Knows*, which was featured on their 1966 LP, *Revolver*. In 1967 they released *Sgt Pepper*, which was recorded using a lot of special effects.

In 1970 the Workshop acquired their first EMS VCS3 synthesiser, which was a portable analogue device that soon became the standard way in which short pieces of electronic music could be created. The author attributes **Delia Derbyshire's** *Dance from Noah* (1971) as being one of the first pieces of electronic dance music created using a synthesiser:

www.youtube.com/watch?v=Hw7VNHbxtU8

As the 1970s progressed the analogue synthesiser, which could only produce one note at a time, was replaced by the polyphonic synthesiser. The 1980s saw the introduction of samplers and by the 1990s we had Apple Mac computers with MIDI interface. A criticism of synthesisers was that they all sounded the same whereas early experimenters recorded and manipulated sounds from any source that they thought might be interesting.

The BBC Radiophonic Workshop was closed down in 1998 as part of cuts to BBC costs. Synthesisers and digital recording equipment were now much more affordable and there were many freelance musicians and producers around who were willing to take on commissions for the BBC.

Further Reading

- *BBC at 100 – BBC Radiophonic Workshop (Pt 1 & 2)* by **Chrissy Brand**. RadioUser Sept & Oct 2022.
- *Special Sound: The Creation and Legacy of the BBC Radiophonic Workshop (Oxford Music/Media Series)* by **Louis Niebur**. OUP. 2010.
- *First Twenty-five Years: BBC. Radiophonic Workshop* by **Desmond Briscoe & Roy Curtis-Bramwell**. BBC. 1983. (Out of print)
- *An Electric Storm: Delia, Daphne and the BBC Radiophonic Workshop*, by **Ned Netherwood**. Obverse Books. 2014
- *40 Years with the Radiophonic Workshop, in the studio and on the road* by **Peter Howell**. Obverse Books. 2021.
- The Obverse books are only available direct from the publisher:

<https://obversebooks.co.uk>

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The World Radiosport Team Championship started in 1990 in Seattle, in conjunction with the Goodwill Games organised by media mogul **Ted Turner** to bring together sports people from both sides of the Iron Curtain. The idea behind the first WRTC was to do the same with amateur radio, bringing together radio enthusiasts from Russia, the USA and elsewhere to meet socially and to compete on something close to a level playing field, with host stations being relatively close together in the Seattle area and therefore experiencing much the same propagation.

Subsequent WRTCs have taken place every four years, hosted in Finland, Serbia, Brazil, Los Angeles, Moscow, New England and Germany. I was privileged to be a referee in Brazil and a Judge in Moscow and New England. Referee, Judge? Yes, typically the events host 50 or so two-person teams. Each team can bring their own equipment (100 watts maximum) but are allocated an operating site with pre-installed antennas, all the same, and each team has an on-site referee for the duration of the contest (24 hours, coincident with the IARU Radiosport Contest, which runs over the second weekend of July) to ensure adherence to the rules.

Italy successfully bid to host the 2022 event but have had to deal with three major obstacles, Covid (setting the event back to 2023), the Russia/Ukraine war and, most recently, terrible flooding in the Emilia-Romagna area of Italy which, among other effects, made some of the proposed operating sites inaccessible.

As well as the competition itself, which takes place from 1200UTC on the Saturday for 24 hours, the event is also very much a social affair, with the opportunity to meet and mix with fellow testers from around the world, people who many of us will have worked time and again in contests but perhaps never met. Most of us, competitors, referees, judges, visitors and, in a number of cases, spouses, arrived on the Tuesday, with the chance to register, check into our hotels and collect not only the event 'magazine' (a timetable of events plus full contest rules) but the obligatory T-shirts for official photos, etc. The opening event, welcome, and a first chance to meet everyone, including the Italian organisers, took place on the Wednesday evening but during the day there was the opportunity for a tour to Villa Marconi and Museum Pelagalli – see my report following.

Thursday was assigned for Team and Referee assignment (i.e. referees being assigned to teams – I was pleased to end up with **Alberto VR2XAN** (an Italian living and working in Hong Kong) and teammate **Luca IK2PFL**. There



WRTC 2022

Don G3XTT was a referee at the recent World Radiosport Team Championship in the Bologna area of Italy. He reports on the experience.



was then a Referee and Team meeting, giving an opportunity for questions about the rules and logistics, followed by a similar meeting specifically for Referees.

Friday saw the drawing for sites and callsigns. The sites were chosen to be as equal as possible and based around bed and breakfast facilities within striking distance of Bologna. Each had a triband Yagi on a mast of about 10m, with a 40 and 80m dipole also hanging from the mast. These had been installed prior to the event by a large team of Italian volunteers. The callsign allocations were unique, all in the I4xx series, where the 'xx' consisted of a number and a letter. My team, for example, ended up with I41N, although the envelope with the callsign wasn't opened until 15 minutes before the contest start to prevent details of callsigns and teams being promulgated to the wider amateur



radio community – the whole idea of the event is to keep teams 'incognito' to avoid any cheerleading.

Our site was about 30km from the event headquarters, and actually owned by an Italian radio amateur and his wife, albeit one who is a casual operator with no English. But their hospitality was second to none. We travelled

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Photo 1: Getting ready for the opening – referees in orange, competitors in yellow!

Photo 2: The WRTC 2022 'Magazine'.

Photo 3: The I41N team by their antennas: Host Ilario I4IPX, Alberto VR2XAN, Don G3XTT, Luca IK2PFL and station manager Marco I4YMN.

Photo 4: The I41N team at the station: Station manager Marco I4YMN, Don G3XTT, Luca IK2PFL, Host Ilario I4IPX and Alberto VR2XAN.

Photo 5: Luca IK2PFL and Alberto VR2XAN operating the contest.

there on the Friday afternoon, allowing the teams to get their equipment set up.

Setting up for WRTC teams is by no means trivial because two 100W stations are allowed, and can operate simultaneously through the contest (the contest is on 80 through 10m, SSB and CW). So most if not all teams use band decoders and triplexors, the former to switch antennas and bandpass filters (and ensure both operators don't end up on the same band at the same time) and the latter to permit both operators to use the triband Yagi at the same time, albeit on different bands.

Saturday morning was used for fine-tuning the

station, before the contest started at 2pm local. My job as referee was to ensure the station build was in accordance with the plans previously approved by the organisers while, during the contest itself, I sat with headphones listening to both operators and keeping an eye on the power meter to ensure compliance with the 100W limit. In my case one operator was using an IC-7610 while the other had a Yaesu FTdx101.

The contest itself tends to pass by in something of a blur with the top teams making over 4000 contacts in the 24 hours. My job at the end, as referee, was to take a memory stick from the team with the log and an audio recording of the contest, and ensure it got back to the adjudicators as quickly as possible. Their job was to score the contest (overnight if necessary) ready for the final banquet on the Monday night.

On the Monday there were further tours available, including one to some of the car factories in the Bologna area (there is a strip along which you can find Ferrari and several other well-known marques) although I decided to chill and catch up on my sleep. Then, in the evening, the prize giving and closing ceremony.



The winners this year were UW7LL and teammate VE3DZ. A highlight of the evening was a short address by **Princess Elettra**, Marconi's daughter by his second wife (and after whom the ship was named from which he conducted many of his experiments). She is 93 now so was not with us in person but to hear her voice was to remind us that radio, despite its amazing advances, is a relatively recent innovation.

And the next one in three years' time, to get back onto the original schedule? **Mark Haynes MODXR** was there at the closing banquet to announce that the next WRTC will be hosted in the UK, with stations located in the Norfolk/Suffolk/Essex/Cambridgeshire area. The UK volunteers have a challenge to make this happen but we can only wish them all the best. Meanwhile, my thanks to the Italians for pulling off a very enjoyable event, albeit hot (temperatures reached 39C during my time in Bologna).

More information on the Italian and UK websites:

www.wrtc2022.it
www.wrtc2026.org

Read more radio news and reviews at www.radioenthusiast.co.uk/news



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While in Italy for the recent World Radiosport Team Championship (see previous report), I signed up for a day of visiting to Villa Griffone and the Bologna Museum of Communications.

Villa Griffone lies quite close to Bologna but in the countryside. It houses the official Marconi Museum. It's quite a substantial building, as can be seen from the photographs, and was bought by the Marconi family in the mid-1800s.

Guglielmo was the youngest son of the family, his father being Italian and his mother Irish from the Jameson family (as in the whisky empire).

As a young lad Guglielmo became interested in things electrical and by his mid-teens was already undertaking what for the time were quite innovative experiments. His parents allowed him to use one of the attic rooms as a laboratory. There has always been some dispute as to who actually discovered wireless communications, with the Russians arguing for **Popov**, but our guide at the Villa was adamant that while, as with many major 'discoveries', many people contributed, Marconi was the first to bring the various elements together (batteries, spark gap, coherer detector) along with some unique developments in terms of aerials. And, of course, he also turned out to be a true entrepreneur, commercialising his developments very successfully well into the 20th century.

Villa Marconi and the Bologna Museum of Communications

PW editor **Don G3XTT** reports a recent visit to Villa Marconi and to the Bologna Museum of Communications.

Nowadays the Villa is a recognised museum site, with many examples of Marconi's early equipment, from spark gaps and early coherers to later developments right through, for example, to a typical ship's radio room as used on the *Republic*, the first example of wireless being used successfully to save lives at sea, three years before the *Titanic*. In fact, the first convincing demonstration of wireless communication was from the Villa to the other side of the Celestini hill, just a couple of kilometres but, crucially, well beyond line of sight. After that achievement Marconi took his ideas to England where, as we all know, he managed to secure support and funding to take his experiments further, eventually leading to the successful bridging of the Atlantic and the culmination of Marconi's dream to be able to communicate successfully with ships at sea, something impossible with wired communication systems.

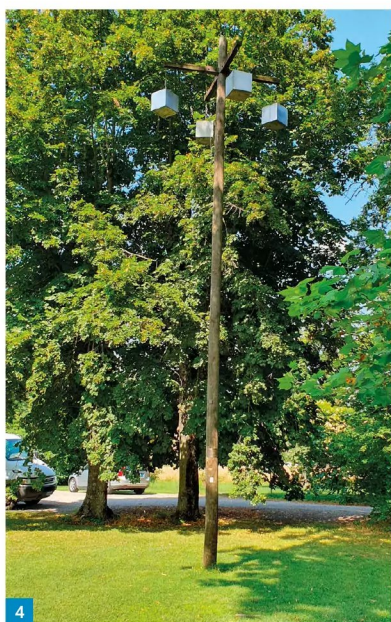
We were also able to see Marconi's tomb, set into the hillside, where he is entombed with his second wife. The Villa Marconi is also home to the permanent Marconi Memorial Amateur Radio Station, IY4FGM. Understandably the Bologna area is very proud of its most famous son, with a statue in the centre of the city and the railway from the airport into town known as the Marconi Express.

The charge for visiting Villa Marconi is 7 Euros for adults. For amateur radio enthusiasts it really is a trip back in time to the origins of our hobby. More information on the website:

www.museomarconi.it/welcome

Indeed, there is so much to learn about Marconi that a visit to Wikipedia, at the very least, is well worthwhile. I asked our Guide whether there was a book in English she could recommend but although there are a couple about the man and his business activities, there

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seems to be very little about the technological developments for which he was responsible.

Museo Pelagalli

The Museo Pelagalli (Bologna Museum of Communications) represents the life's work of a single enthusiast. The website describes the exhibition as covering the history of communication by radio, TV, cinema and musical from 1760 to 2000. While there is small display of Marconi-related equipment, the packed displays cover just about every aspect of communications technology, from early cylinder recorders, through early gramophones right through to tape recorders of various sorts and CD players. Telephones are represented from early models through to modern smartphones. Similarly, TVs of all vintages with some real curios – ideas that must have seemed revolutionary at the time

but which never caught on. Broadcast wireless receivers, of course. Even juke boxes. TV and cinematic equipment from cameras to cinema projectors. And, of course, personal computers from the earliest days to examples of much more recent devices. And perhaps the most remarkable aspect of all this gear is that all, or least most of it, is fully restored and in working condition.

The museum is close to the centre of Bologna. More information on its website:

www.museopelagalli.com/index_UK.htm

Well worth a visit if you ever find yourself in Bologna! **PW**

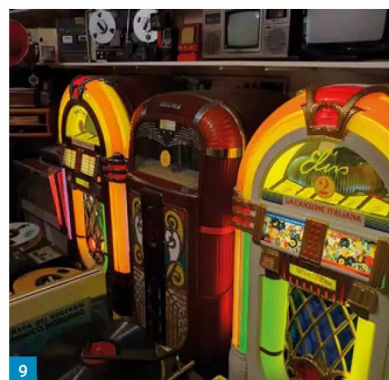


Photo 1: Villa Griffone, with Marconi's mausoleum set into the hillside. Photo 2: I4YCE explains an early experiment.

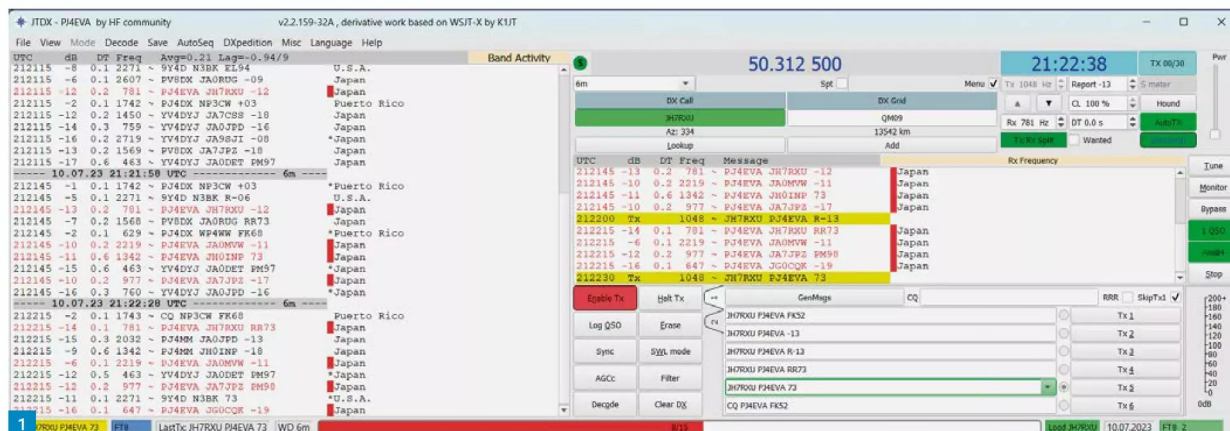
Photo 3: Part of the attic room where Marconi undertook his early experiments.

Photo 4: A replica of one of Marconi's earliest outdoor aers. Photo 5: An early ship's radio (wireless!) position.

Photo 6: Part of the extensive collection at the Museo Pegalli. Photo 7: Some early gramophones.

Photo 8: This will bring back some memories! Photo 9: A display of juke boxes.

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OFCOM Consultation

Tim Kirby GW4VXE discusses the Ofcom consultation and its impact on VHF/UHF operators.

I'm sure many readers will have seen the details of OFCOM's amateur licence consultation. From my perspective, it looked mainly positive. I know a few people have expressed concerns about gateways, repeaters and beacons being deployed all 'over the place' without being co-ordinated. Co-ordination will be the key, as well as following the bandplans. Clearly this is something that will need to be worked through in practice to avoid interference. I like the ability to create low power beacons and I can see that others will enjoy the ability to experiment more widely with repeaters and gateways.

Increased power levels will be positive for those with Full licences who enjoy experimenting with scatter modes or EME – or simply winking out weak DX. Intermediate and Foundation licensees benefit from increased power levels too, with Intermediate licensees seeing an increase to 100W which is, after all, a very useful power level and Foundation licensees seeing an increase to 20W.

Although in practice, it doesn't make that much difference, I would have liked to have seen Foundation licensees with a power level of 25W. After all, PMR and Marine users can use 25W with no technical training, so why not the same for Foundation licensees? Pragmatically too, more radios have 25W power settings than 20W settings.

If you are reading this, you will just have time to reply to OFCOM's consultation which has a deadline of 4 September.

DAB in Ireland

After an enjoyable 2m SOTA contact with **David Gardiner EI3IXB**, David emailed me to say "you are probably aware that RTE closed down the DAB network here last year & reverted to VHF FM as DAB didn't really take off over here as the commercial stations did not sign up for the network". This might be of interest to some readers, wondering why they don't see DAB signals from Ireland.

Fusion Mode—Simplex

Readers are probably aware that the 146 – 147MHz band is available by Notice of Variation to Full Licence holders. The RSGB website states that the facility ended in October 2022, but I think this is an error and know that NoVs have been issued this year. **Stu Hammonds G4KUR** writes, "The 146MHz bandplan shows there are up to eight channels at the top end of the band set aside for DV use. As there are now at least half a dozen Yaesu rigs capable of working on 146, I have taken it upon myself to try and drum up some activity and hopefully should soon make what might just be the first ever C4FM simplex contact on the band. Rigs such as the FT-3D, FT-5D, FTM-200D, FTM-300D, FTM-400D and FTM-500D will all work on 146 after undertaking the MARS-CAP mod. Yaesu's latest baby, the FTM-500D, is currently selling like hot cakes so it's a good opportunity to get this done by the dealership upon first purchase. Also, the FT-991A can be persuaded to operate on 146 without any modification by simply following a sequence of button pressing.

"Obviously the band is only available to Full Licensees having obtained the necessary NoV but those are the only two hoops we have to jump through to get on the band and get a few contacts logged on 146 whilst we still have access to this unique extension to the 2m band, though surprisingly very few seem to know of this. I've set up a Facebook group to help bring together anyone interested in establishing some simplex C4FM on or around 146.900, and if you are interested, I will keep you posted of our progress".

C4FM does work well simplex, so I wish Stu and the group well and look forward to hearing about how it goes.

Talking to a Robot?

I am sure many readers will have read about AI and perhaps even made some experiments themselves. If you are a D-STAR user, **Jef Van Raepenbusch ON8NT** says that you can connect to XLX140X where a Chat GPT Voice Bot has been installed. You can ask questions and should get a reply. The Voice Bot can respond in multiple languages, although Jef says it seems to work better in English, probably because it has had more practice. If you try other languages, it seems to work better if you use slightly longer sentences and questions.

The 8m Band

Kevin Hewitt ZB2GI (Gibraltar) has been monitoring FT8 and has seen the following stations on the 8m band: G8JNJ (I080), G9PUV (J000), ON5QRP (JN29), S50B (JN65) and S57A (JN65).

Roger Laphorn G3XBM (Cambridge) says that his coax and antenna have a high SWR currently, so he is off air. However, prior to the fault, he had a number of European spots of his 2.5W of FT8.

The 6m Band

Keith Watkins G8IXN (Redruth) saw EY8MM coming through early on the morning of 11 June, having seen OA1F the previous evening.

Roger Greengrass EI8KN (Co Waterford) worked EA6SA/P (JN20) in the IARU Region 1 contest on 18 June. JN20 is quite rare as it's mostly water. On 21 June, Roger caught a good opening to the Caribbean, which was unusual because it started early around 1000UTC, working FG80J (FK90), NP3YL (FK68) and WP4JCF (FK68). A little later the band opened into Florida, Dominican Republic and Cuba.

Jef ON8NT (Aalter) says that this year it seems to be quite difficult and rare to work into the USA – certainly I would agree that there have been fewer extended openings to North America. Some of the highlights from Jef's log include EA8/DF4UE, 7X2RF (JM16), 7X2KF (JM06), EA8AT (IL17), CU2DX (HM77), CN8YZ (IM63), CN8AM (IM63), 7X4CZ (IM95), 4L7ZS (LN21), EK/RX3DPK, OY9JD (IP62) and TF3VG (HP94).

Kevin Hewitt ZB2GI has worked over 250 stations from home on FT8 this month. Highlights of his log include AC4TO (EM70), AC50 (EL49), KI4DLS (EM90), N4RWG (EM80) and NF4A (EM70).

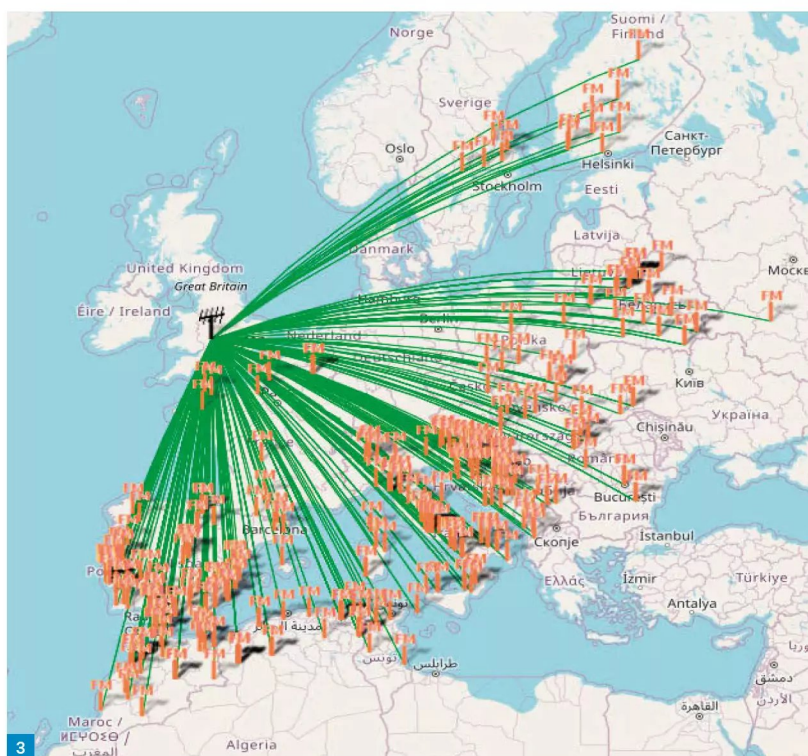
Steve Telenius-Lowe PJ4DX was on holiday in Europe for the whole of June, so missed whatever Sporadic E events took place on 6m during the month. Back on the air on 1 July, he worked several European stations then on 6m FT8 but did not think propagation was too good. However, the 3rd, 4th and 5th were much better, with C31CT (Andorra) a 6m new one on the 3rd, and 7X2RF (Algeria) another new one the following day. Best DX was 9K2GR at 11,750km, again on the 4th, although Kuwait was not a new one for Steve. "I worked a few UK stations on 3 and 4 July", Steve said, "including G3SVL, G3SED, M0CTP, M0NKR, M0AGP and G0VUH. Last year July was good for Sporadic E on 6m, so let's hope the openings continue for a while yet. On 10 July there was an opening from the Caribbean to Japan. I worked JH7RXU, JR5JQA and JA7QVI, while **Eva PJ4EVA** worked several other Japanese stations (see Fig. 1). Japan was a 'new one' for both of us on 6m."

Andy Adams GW0KZG (Letterston) writes, "Best DX for me over the last month was the opening to the west coast of the USA and Canada on 12 June. I was fortunate to be in the shack at the time on the computer and managed to work K0TPP ((EN54) at 1500, followed by NE9U (EN54), K1KD (EN34), N0ODK (EN35), N3QQ (CN87), VE7DAY (CO70), W7FI (CN87), N4WW (EL98), N2NL (EL88), N6AR (EL98) and K8NK (EL88), before finishing for tea!"

Ian Bontoft G4ELW (Bridgwater) feels the Es season has been a bit disappointing so far this year. Ian says the only contact of note this month was HI3T (FK49).

Phil Oakley G0BVD (Great Torrington) has had a busy month, dealing with a new PC, software and hunting antenna/coax issues. Fortunately, they've all been sorted and Phil's delighted with the results and has made a number of European QSOs on the band.

Tony Collett G4NBS (Cambridge) says that there hasn't been a huge quantity of DX but he has found a few good days. Tony worked his first North Americans of the season on 10 June. 9Y4ND and 9Z4Y were audible for long periods too. Tony also worked YV4DYJ and HK3W. On 11 June Tony saw his first JA of the season, JA3EGE (PM74), and immediately had a pileup



and worked 10 stations in PM74, plus JH4MGU (PM75) and JG2BRI (PM84) before it faded out. A nice one on 13 June was EK/RX3DPK along with 9K2GS, A61R, A65CW, A92HK (on SSB), Z62NS and 9H1SV.

The 4m Band

Roger EI8KN caught a good Es opening on the 4m (70MHz) band on 29 June working SV2JAO (KN10), SV1OH (KM18), S50B (JN65), EA3FN (JN11), 9A6R (JN83), HB0/DL2EAD, SV2TX (KN10), YT1Q (KN04), SV2SKU (KN10), HA3PV (JN96), OM2DX (JN88), S57TW (JN75), ZA/IW2JOP (KM09), EA3ERE (JN11), HB9TIH (JN36), EA3DHR (JN01), EA3RO (JN11), E77AR (JN94),

Fig. 1: PJ4EVA working Japan on 50MHz.

Fig. 2: Ed M0MNG used this handy portable 70cm setup during the RSGB Beaconnect event

Fig. 3: A map of the FM DX loggings made by Simon Evans during the June/July 2023 period.

S57A (JN65), 9A5CW (JN65) and ON4IQ (JO20).

Jef ON8NT has once again been using his IC-7300 at 10W and V-2000 tribander on the band. Highlights (all on FT8) include YO9IE (KN34), SP5QWB (K002), EA6SX (JM19), LZ1AG (KN22), 9H1CG (JM75), 9H1TX (JM75), SV2AEL (KN10) and SV2JAO (KN10).

Kev ZB2GI has worked over 50 stations on FT8 during the month, including G4BAO (JO02),

G8BXC (JO01), GM4CXM (IO75) and LX1JX (JO30).

Don G3XTT (Wells) says that he's up to 38 countries now on the band, although he's still missing some easy ones such as 5B and HB9. In mid-June, Don worked two Israeli stations and four Maltese stations. He's using a 4-element Yagi on a hand rotated pole.

Roger G3XBM has gone back to an IC-705 and has tried some FT8 on the band, getting some spots of his signal from around Europe although he feels activity is lower than he had expected.

Roger Daniel G4RUW (Newbury) says that he recently worked HB9 for a new country, but he's also worked EA, EA6, S5 and OK on the band.

The 2m Band

Jon Stow G4MCU caught some Sporadic E on 2m in early June. On 5 June Jon worked HA8AR (KN06), LZ2LY (KN13) and HA3KZ (JN97). There was another opening on 13 June when he worked LZ1ZP (KN22) and LZ2ZY (KN13) and then on 15 June, Jon caught another opening, working I7CSB (JN71), IK7RWE (JN80), IK7JNM (JN80), IK7BZY (JN61), IK8HJC (JN70), LZ1RDD (KN12) and E730 (JN95). Jon caught some tropo too, early in the month, working OZ, DL and SM. Jon caught another Es opening to Italy on 9 July which lasted around 40 minutes. All Jon's QSOs were on SSB.

Roger EI8KN enjoyed the 2m Es opening on 15 June, working IK7RWE (JN80), CN8LI (IM63), IU8MHG (JM78), IW7DIE (JN80), IB1EM (JM89), IK8BIZ (JN70), IK0SMG (JN61), IO0SI (JN61), 9A2WB (JN74), IK00ZK (JN52), IK6DTB (JN72), IZ7UMS (JN81), I7CSB (JN71), IW4EGP (JN64), IZ4AIK (JN63), IW4ARD (JN64), E77AR (JN94), IW9ABZ (JM68), IW9CTR (JM77), IU8JTA (JN70), IZ8FQO (JN70) and I8TWK (JN70). In another opening on 29 June, Roger worked 9A4MZ (JN85), HA7EG (JN97), SV8PEX (JM99), T77GO (JN63), IK7XLW (JN80), IK7FPV (JN80), IU4FKR (JN63) and IW0RNA (JN62).

Jef ON8NT was also active in the Es opening on 15 June and saw stations from TA, SV9, LZ and Z3 but unfortunately was not able to make any QSOs.

Keith Nolan EI5IN writes, "Shannon Basin Radio Club was active as EI3Z/P as part of the IRTS VHF/UHF Field Day weekend. Conditions weren't ideal on the day but we had a good height advantage operating from Cairn Hill in Co. Longford, Ireland. We pointed towards the SE and hoped some stations could hear us off the back of their beams. We were delighted to make some 600km+ 2m SSB contacts with G4ZAP/P, G6IPU/P, G8BGV/P and TM5R (over 800km)".

It was good to hear from **Dave Ackrill G0DJA** (Wakefield) who said that he was out and about in the Peak District during the recent '145 Alive' event from a site nearly 416m above sea level. Dave said he managed to call into a couple of the nets, which he enjoyed, using an Anytone AT-

778UV, which he feels has a good receiver. Dave is looking forward to the next 145 Alive! event and plans to try and use a larger antenna.

Roger G3XBM heard a station in Corfu during one of the recent Es openings and was spotted by a station in Italy.

Ian G4ELW caught the Es on 29 June and worked IU4FKR (JN63), SV8PEX (JM99) and IK7UXY (JN90). On 9 July, Ian worked 9A7CY (JN74) and E73CV (JN84). All Ian's contacts were on FT8, using 15W to a 5-element beam.

Roger G4RUW was very pleased to work EI8HH (IO53) for a new square recently. He says that by keeping a close eye on the DXMaps website, he has managed to catch 11 Es openings on the band this year. Most of them, he says, were short openings, but there were some 'classic' openings too. Roger worked the following countries; HA, EA, I, LZ, E7, 9A and YU. He missed ER, T7, HV and TA. Roger is on 49 countries worked on 2m, using only 10W. He says it's taken nearly 40 years but it keeps his interest going! Fingers crossed for #50!

Tony G4NBS did well in the opening on 13 June working plenty of stations, including 9H1CG (JM75) for a new DXCC. The opening on 15 June was longer and Tony worked I, 9H, SV, Z3, TA (new country), E7, YU and LZ.

The 70cm Band

Jon G4MCU worked OV3T (JO46) on SSB during the contest on 13 June. OV3T had a very strong signal, but Jon had to go QRT so wasn't able to see if there was any more DX around.

Jef ON8NT was active in the contest on 13 June and was very pleased to work GM4JTT (IO86) as it was Jef's first GM on the band, at a distance of 730km. Other stations worked included G7RQI (IO93), G8XVJ/P (IO93) and M1MLM/P (IO93). Jef runs 25W from his IC-9700 to a 5-element LPDA.

Ed Spicer M0MNG operated GB23BLH as part of the RSGB's Beaconnect project, **Fig. 2**, and was active in late June from Littlehampton Beacon in West Sussex. On the evening of 22 June there was some activity from Ditchling Beacon in East Sussex on 2m/70cm only. Ed was keen to get them in the log and particularly on 70cm. Ed writes, "I first heard Rich calling on 145.500MHz while sitting in my car with a 7/8ths whip on top. We could just about hear each other but the signals were extremely scratchy and a QSO would have been virtually impossible.

"We agreed to QSY to 70cm after I'd walked the very short distance to the beach and set up the Yagi on a small camera tripod. We proceeded to have a proper 'ragchew' QSO on 433.550MHz that lasted a good ten minutes. Signals were a steady 54 each way and were very readable. My Yaesu FT5D produces 5 Watts on 70cm.

"I think this is a good example of an advantage that 70cm can have over 2m. Although the loss is higher over any given path, higher gain from physi-

cally smaller antennas makes up for it. I would have struggled to fit an equivalent 2m Yagi on the same flimsy tripod!"

Tony G4NBS found conditions good towards Scandinavia on 13 June during the UK Activity Contest, making 103 QSOs in 27 locators. During the FT8 Activity contest on 14 June, conditions were good but there was less activity than usual, Tony worked 84 QSOs in 32 locators. During the July FT8 Activity Contest, Tony made 60 QSOs in 24 locators, with much less worked from the continent.

FM and DAB

Simon Evans (Twynning, Glos) says that he is currently concentrating on broadcast DX, **Fig. 3**. For FM he mostly uses a horizontal, rotatable 4-element Blake antenna. During the Es season he has now received 30 ITU countries. On the weekend of 9 July, the Es was so intense it was hard to resolve any particular stations, which Simon says is very unusual. For DAB DX, Simon uses an RTL-SDR and a program called QIRX.

Adam Wisher (Cheltenham) logged Iceland on FM on the afternoon of 30 June, hearing two different stations. The same day, **Paul Logan**, in Ireland, logged Greenland on 91MHz. Paul also heard Iceland's RUV RAS 2 accidentally relaying Classic FM from the UK, with the Icelandic station presumably a relay, fed off air. Paul logged Albania on 4 July, 92.0 Radio Shqip from Tirana.

Larry Horlick from Newfoundland caught a good transatlantic opening on 6 July, logging 91.7 SNRT Quran from Marrakech over a distance of 4229km. Larry also logged KNR Nuuk, Greenland on 90.5MHz on 14 July.

Satellites

Patrick Stoddard WD9EWK (Phoenix) reports that ARRL Field Day was busy on the satellites, with nine different satellites available. The ARRL Field Day rules give a 100-point bonus for a satellite contact, but only allow for one contact per FM satellite. Patrick made contacts on all nine different satellites during the event. Patrick says that as Field Day was ending, KN6UWK popped up on a couple of the TEVEL satellite passes. KN6UWK is a radio club on San Clemente Island off the southern California coast in a rare grid, DM02. The island is a US Navy base, but the radio club had some civilian visitors for Field Day. Patrick writes that the EO-88 satellite is getting lower and lower and will shortly 'de-orbit'. He also says that IO-117 was off for a little while at the start of July but has been back in operation for longer distance QSOs. 4W6RU from East Timor has been active as was KH6KK/KH2 on Guam, along with RU9GH/MM in the South Atlantic.

Thanks to everyone who's been in touch this month, it's always appreciated. Please keep your news coming. **PW**

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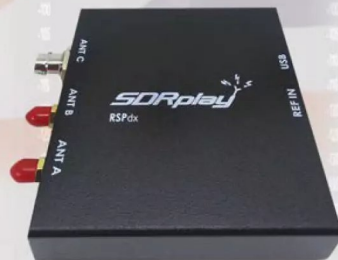
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- Uses a single USB connection to computer minimizing the cables mess
- Serial computer aided transceiver (CAT) port can be configured for logic levels, RS-232, C-I-V or TX-500
- Works with all major OS flavours: Windows, MacOS and Linux
- Permanently available independently from CAT port an open-collector PTT switch controlled by RTS signal of the COM port to interface Handies/Mobiles etc.
- Auxiliary connection points to CM108 codec
- Uses widely supported CP2102 serial interface & CM108 audio codec



For more details see HamRadio.co.uk/DigiRig

CG Antenna BL-49:1 Un-Un 600W

Tested by our own Richard 2E0SXX Hi Power Matching Transformer suitable for Multi Band End Fed Half Wave antennas. Ideal for home or field use. All you need to do is add 10, 20 or 40m of antenna wire - the Messi & Paoloni Dipole wire is ideal.£74.99



JNCRadio SV6301A

6G VNA with 7" Capacitive Touchscreen
Handheld Vector Network Analyser (VNA) with frequency range of 1MHz-6.3Ghz. £789.95



LM-V2 Straight Key

This heavy duty morse key is beautifully made and has an elliptical double electroplated base. Weighing 1100g and fitted with rubber pads on the base, this key is as solid as a rock. £160.00



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It's NEW! The M&P UltraFlex 7 "Sahara" in white

Ultraflex 7 and 10 sahara (white). £2.00 per metre. Purchase 100m+ and get 10% off!



Deals on Yaesu Speakers & Microphones!

These speakers reproduce the high quality output sound these receivers generate and thereby providing clear and crisp audio for reliable communications on all HF and V/UHF.



Yaesu SP-10. £109.96
External Speaker for FT-991A/FT-991.



Yaesu SP-30. £94.96
Desktop loudspeaker, optically and electrically matching to the FTdx10 transceiver.



Yaesu SP-20. £129.95
External Speaker for FTdx3000D/FTdx1200.



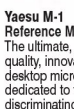
Yaesu SP-101. £139.96
Desktop External Speaker. Maximum input: 7W. Impedance: 8 Ohm.



Yaesu M-70 Desktop Microphone. £129.95
Desktop Microphone for the family of Yaesu HF transceivers. The M-70 utilizes a directional condenser microphone element which is specially tuned the frequency response to create clear and crisp audio for radio communication.



Yaesu M-100 Dual Element Microphone. £329.95
Features a hybrid design integrating both a high-quality Condenser and Dynamic element.



Yaesu M-1 Reference Microphone. £599.95
The ultimate, high-quality, innovative desktop microphone, dedicated to the most discriminating Ham Radio Operators. It features combined Condenser and Dynamic microphone elements.



Yaesu M-90D Desktop Microphone. £179.95
Equipped with both a round 8-pin jack and an 8-pin modular jack. Supplied microphone cable (round 8-pin to 8-pin modular) can be connected to either jack of the M-90D. The M-90D does not require the SCU-53.



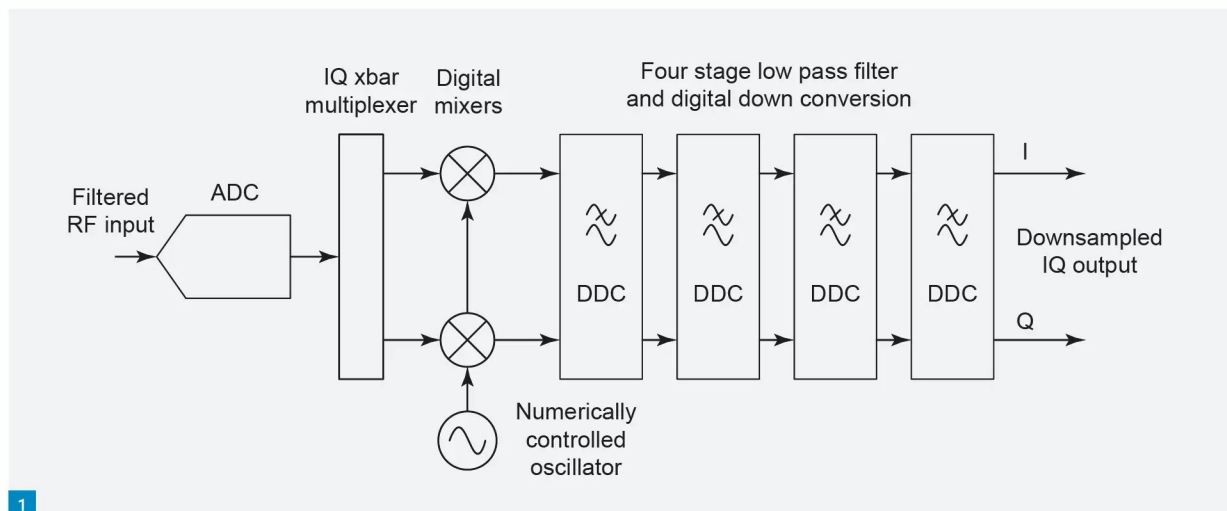
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Mike Richards G4WNC
practicalwireless@warnersgroup.co.uk

During the past few *Data Modes*, I've looked at many of the technologies behind the SDR transceivers that have come to dominate amateur radio equipment. While the details can get complex, the overall principles are relatively straightforward, as I hope I've shown you. However, SDR technology is evolving rapidly, and the mobile device market is driving exciting new developments.

The most likely outcome for us is more integrated devices. When you look at the SDR technology in today's amateur kit, most high-end units employ a fast ADC (Analogue-to-Digital Converter) followed by an FPGA (Field Programmable Gate Array). The FPGA is problematic because they are expensive to purchase and require specialist programming skills to configure.

The main purpose of the FPGA is to run the high-speed processing required to extract a narrow-band slice from a full spectrum sample, e.g. to access a single amateur band from a 50kHz to 55MHz sample. The latest SDR chips can handle this process in a single chip, thus saving the hardware and programming costs of using an FPGA. In addition to simplifying the component count, this type of integration often provides significant power and cost savings, critical factors for mobile devices.

One such device is the Analog Devices AD9680, a 1.25GSPS (Giga Samples Per Second) 14-bit dual-channel ADC with an integrated DDC (Digital Down Converter).

The DDC includes the digital quadrature mixer, NCO (Numerically Controlled Oscillator) and the decimating filters. **Fig. 1.** Combining these functions into a single chip dramatically

SDR Summary

Mike Richards G4WNC wraps up his explanation of SDRs before turning to the latest news regarding WSJT-X.

reduces costs. I checked the DigiKey price for the AD9680, and the 1.25GHz version is available for just £1.30 each in bulk quantities. That's a tiny fraction of the cost of creating the same functionality using traditional ADCs and FPGAs.

WSJT-X 2.7.0

The new WSJT-X v 2.7.0 release candidate has been launched and is available for free download from the WSJT-X site at:

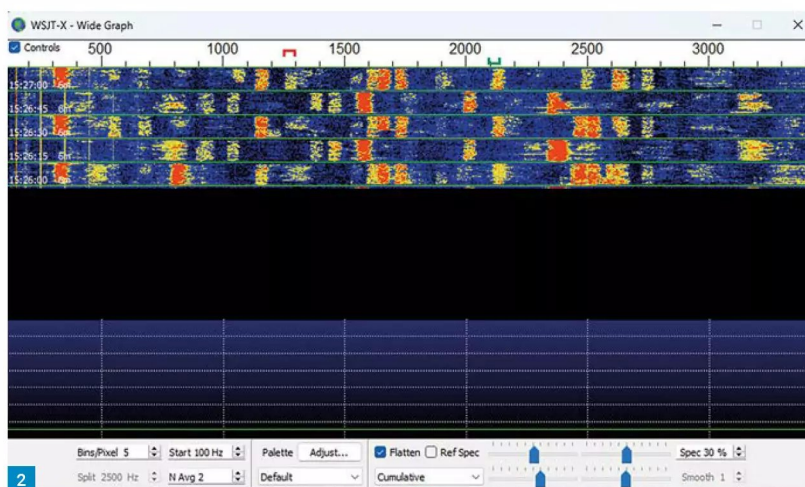
<https://wsjt.sourceforge.io/wsjt.html>

Most of the new features focus on the Q65 mode primarily used for EME (Earth-Moon-Earth) operations, but you will also find

Q65 used on 50MHz and some other bands for terrestrial communications. The most important change is the launch of a new Q65 companion program called QMAP. This standalone program enables parallel decoding of all Q65 60-second submodes within a 90kHz bandwidth. I'll look at this in a bit more detail next time.

Working 50MHz Sporadic E

On Saturday 8 July, I spent an enjoyable afternoon working sporadic E (known as Es) propagation on 50MHz. This was a useful opening with a good path into southern Europe, so I thought it might be helpful for



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those new to this mode if I describe my setup and operating technique. The first thing to note is that the name sporadic is appropriate because the propagation mode will be available randomly for random durations. However, the summer months are the most active time and there will still be activity when this issue lands.

The station setup for the Es session was a Yaesu FT-897 running about 15 watts into a Butternut HF9V multiband vertical antenna. The latest WSJT-X 2.7.0 rc2 was installed on my Windows PC, and I used my SB2000 interface for the CAT and audio link between the radio and PC. Logging was handled by Log4OM.

Given the random nature of Es openings, you need to stay in the shack for a while, so I usually occupy myself with a construction project. To keep watch for Es, I leave the rig running in the background and tuned to 50.313MHz with the volume set so I can hear the background noise. While monitoring, I'm listening out for FT8 signals.

The openings usually begin with a few weak signals, but a good event will bring strong signals that will be easy to work with a low power station, **Fig. 2**. While waiting, I also send CQ calls every 15 minutes. Sending occasional CQs is essential because if everyone just listens, an opening could come and go and we'd be none the wiser! While waiting for an opening, you will probably hear the occasional burst of signal that sounds like a ping.

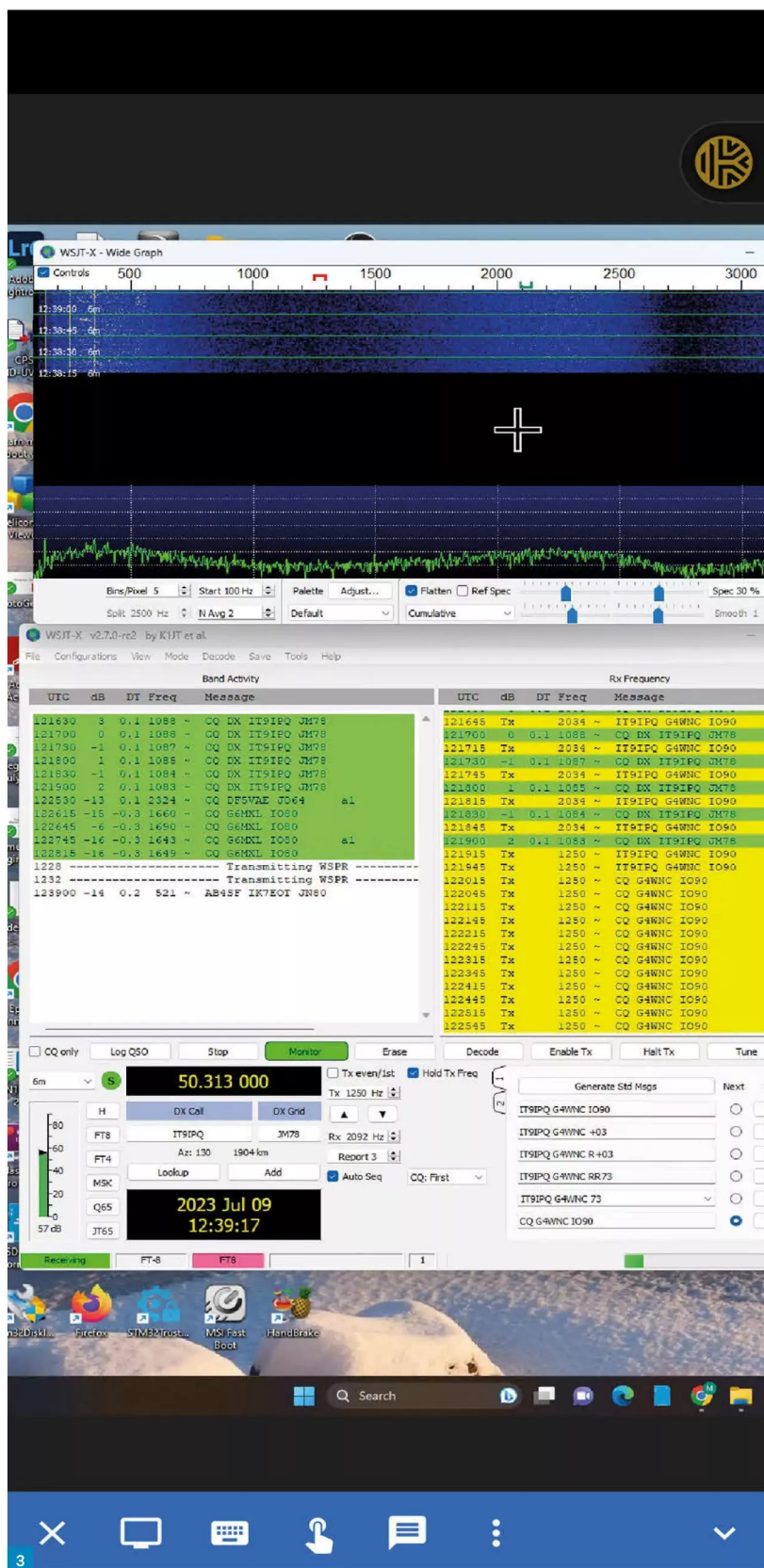
This is a brief opening known as meteor scatter and is caused by signals reflecting from the ionised trail of a meteor as it burns up in our atmosphere.

If there are many pings, it can be worth abandoning FT8 and switching to MFSK144 on 50.360MHz to see if you can grab a few contacts. As with Es, patience is required for success with meteor scatter.

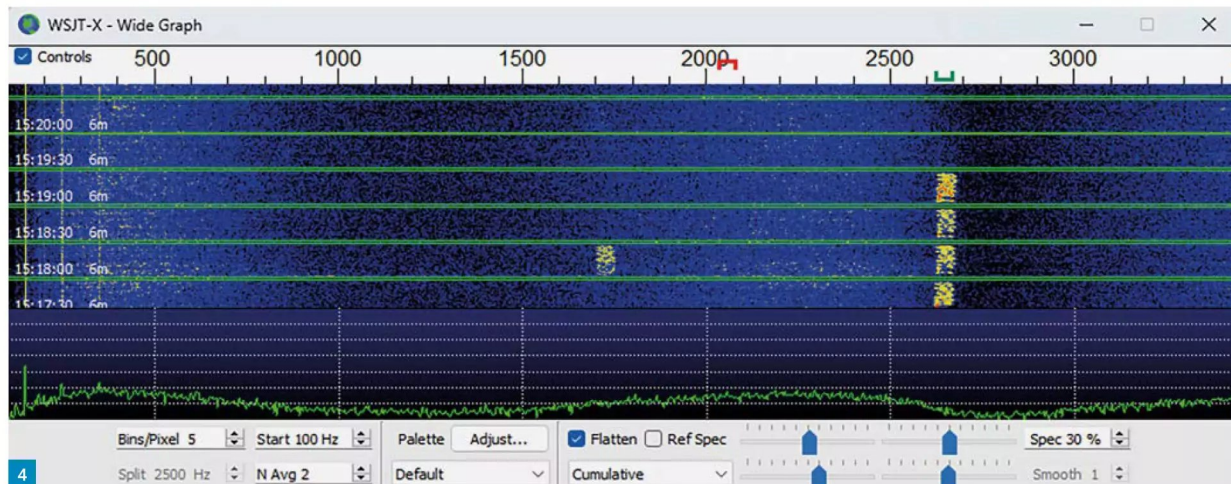
For occasions when I'm doing other jobs around the house but still want to keep an eye out for Es, I use the RustDesk remote access. I covered this software back in my March 2023 *Data Modes* column. RustDesk is an open-source remote access package that is particularly easy to install and use. You need first to install it on your shack computer. If you're using Windows, once installed, RustDesk runs as a background service so you can access your PC remotely without further action.

One of the many reasons I like RustDesk is its excellent Android App, which means I can monitor and operate my shack computer from my phone, **Fig. 3**. For more information on RustDesk and to get the download, go to:

<https://rustdesk.com>



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Frequency Calibration

Slope: -0.3375 ppm Intercept: -0.02 Hz

Working Frequencies

ISRU Region	Mode	Frequency	Ref	Description	Start Date/Time	End Date/Time
All	FT8	24.915 000 MHz (13m)				
All	FT8	28.074 000 MHz (30m)				
All	FT8	50.313 000 MHz (8m)				
All	FT8	50.323 000 MHz (8m)				
Region 1	FT8	70.154 000 MHz (4m)				
All	FT8	144.174 000 MHz (2m)				
All	FreqCal	0.198 000 MHz (DOB)				
All	FreqCal	0.690 000 MHz (DOB)				
All	FreqCal	0.690 000 MHz (DOB)				
All	FreqCal	9.996 000 MHz (DOB)				
All	FreqCal	14.996 000 MHz (DOB)				
All	JT4	2,301.065 000 MHz (13m)				
All	JT4	2,304.065 000 MHz (13m)				
All	JT4	2,320.065 000 MHz (13m)				
All	JT4	3,400.065 000 MHz (5m)				
All	JT4	5,760.065 000 MHz (5m)				

Fig. 1: AD9680 simplified block diagram.

Fig. 2: WSJT-X Wide graph showing the strong signals of a good Es opening.

Fig. 3: RustDesk Android App screenshot.

Fig. 4: Doppler shifting on Es signals.

Fig. 5: WSJT-X FreqCal entries.

Fig. 6: WSJT-X running in FreqCal mode.

Fig. 7: FreqCal good calibration pop-up.

Fig. 8: Using Ref Spec to flatten the audio response.

You can run your own private RustDesk server for the fastest connection speeds, but I find the free Web server to be fine for light usage such as shack monitoring.

When you catch a 50MHz band opening, you can operate FT8 as usual, though you may notice some Doppler shift skewing of the trace on the WSJT-X wide graph, Fig. 4. The duration of the opening is highly variable and can range from a few minutes to several hours.

However, a good opening will often provide strong signals to southern Europe; occasionally, a transatlantic path will also open. Although openings can occur anytime during the summer, activity is usually easier to spot at weekends when more people are on the air.

Although I haven't covered them here, there are many ways to look out for 50MHz openings, and I suggest you visit the UK Six

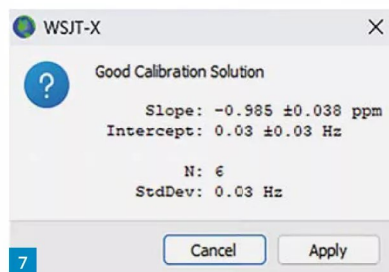
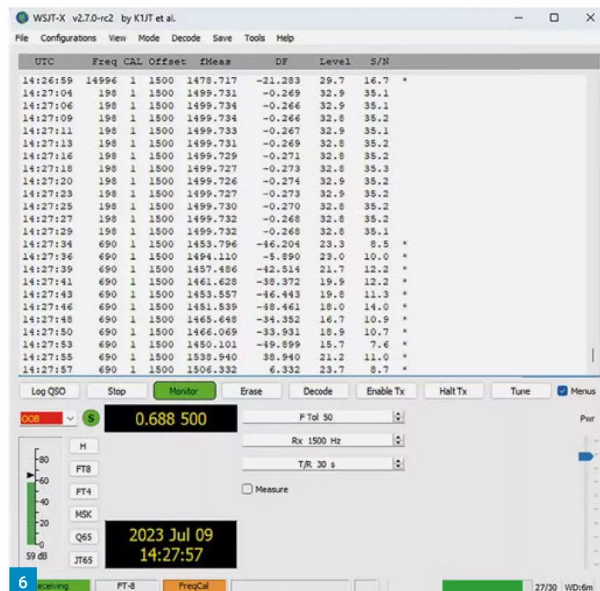
Metres Group (UKSMG) for more info:
www.uksmg.org/content/sporade.htm

WSJT-X Measurement Tools

In addition to the core decoding program, WSJT-X features several tools that can expand the usefulness of the software and add some refinements to your monitoring station. The first is the frequency calibration tool.

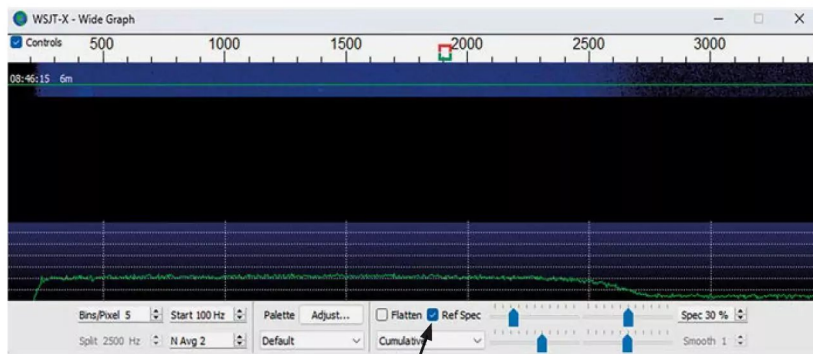
This builds an accurate calibration profile for your rig and lets you make precise frequency measurements. It also helps ensure that you are operating on precisely the correct frequency.

The process has three stages. The first stage is to tune to a selection of commercial standard frequency transmissions and record the frequency error in a text file. It does this by tuning 1.5kHz below the published carrier frequency and measuring the resultant



1500Hz audio tone. Next, the text file with the error information must be edited to remove outliers. Finally, the software calculates the correction profile and applies it to the software.

Let's run through the practical use of the software. The first task is to identify standard frequency signals that can be reliably received at your location. A station list is included with



Reference spectrum to flatten audio passband

8

WSJT-X, but you will need to edit this. You can see and edit the list from the File – Settings – Frequencies menu. When the list opens, click on the Mode column to sort by Mode, **Fig. 5**. Now scroll down the list to the FreqCal entries. You can now edit or delete the entries so the list only includes stations receivable at your location.

The next task is to go to the File menu, open the log directory and look for a file named fmt.all. It may not exist, but if it does, delete it, as the software will create a new file when we run the calibration.

That completes the preparation, so go to the Mode menu, choose FreqCal, then move to the Tools menu and select 'Execute frequency calibration cycle'. The main screen will change to something similar to **Fig. 6**, and the rig will begin trawling through the standard frequency stations from the list you've just created. The rig will pause for 30 seconds on each station and display the frequency error information on the screen.

If you're happy that the selected stations are receivable, you can tick the Measure box to build the calibration data file. You should let the software run through all the stations several times before stopping the process by un-ticking the Measure box.

The next task is to view the data stored in the fmt.all file (in the logs folder). You can do this with any text editor, but I normally use the excellent Notepad++ because it's fast, free and can handle a wide range of formats. You can download it here:

<https://notepad-plus-plus.org>

If you find Notepad++ useful, please donate to encourage further development. When editing the fmt.all file, you're looking to delete any measurement results that are out of alignment with the rest. This means scanning the 1500Hz readings (fMeas) and looking for out-of-sequence results. When you find an outlier, delete the entire line. Typically, errors are caused by interference or a signal that's too

weak. Once you have a clean fmt.all file, save it to the log file folder and move on to the next stage.

For this final stage, we must examine the recorded drift over a wide frequency range and build the calibration data. WSJT-X includes a tool to do this, so all you have to do is go to the Tools menu and select Solve for calibration parameters. If all is well, you will see a pop-up panel reporting a 'Good Calibration Solution', **Fig. 7**, where you can hit Apply to apply this correction to the software. If this fails, it means the variations in the file cannot be corrected, so you need to revisit the file to see if you've missed some outliers. When you've completed this calibration process, you can be confident of the accuracy of your frequency measurements in WSJT-X.

Reference Spectrum

This WSJT-X tool measures the frequency response or shape of your receiver's audio passband and uses that information to equalise the response in the Wide Graph. The tool is straightforward to use, and you begin by either tuning to a quiet part of the spectrum or disconnecting your antenna. The next step is to choose one of the WSJT-X slow modes, i.e. Q65-60.

When you're ready, go to the tools menu, select Measure reference spectrum, and let it run for at least a minute. When the time is up, hit the Stop button on WSJT-X to finish the measurement. This action will also save a new file called refspect.dat in the logs folder. This contains a detailed analysis of the frequency response from 1Hz to 6000Hz. You can view it, but there's no need because WSJT-X can process it automatically. Looking at Wide Graph, **Fig. 8**, you will see a Ref Spec box on the bottom toolbar. If you tick 'Ref Spec' your measured response will be used to correct and flatten the passband.

More tools are available in WSJT-X, but I'll cover those next time. **PW**

NEWS EXTRA

SPECIAL EVENT STATIONS, AND HOW TO ORGANISE

Many of you may have seen in June *PW* that the North and South Bristol Amateur Radio Clubs ran a special event to commemorate the loss of Flight 777, on route from Lisbon to Whitchurch Airport in Bristol on 1 June 1943. You may say, "so what, it happened all the time in war time." On this flight happened to be **Leslie Howard**, famous Hollywood actor. Also **Wilfrid Israel** one of the founders of the Kinder Transport that saved over 10,000 children from almost certain death in the concentration camps. Leslie Howard had his aide with him, **Alfred Chenhalls**, portly, round faced and smoked a cigar. Just like **Churchill**. Howard, was tall and thin, just like Churchill's bodyguard. Also on board were known SOE members.

We now had the basis for the event. Permissions were sought from the relevant authority. In this case Bristol City Council. Having been given the go ahead, we went to the next step, a survey as to where to put the gazebo, obtain power and more to the point, where to put the antenna. We were lucky, power was supplied by the nearby cafe and the gazebo to be placed on the lawn.

The more important point often missed by organisers of public events is RF separation. The antenna chosen was a trap dipole for 20 and 40m. 8m aluminium poles were strapped with ratchet straps to the steel fence posts, and the distance between them measured. The RSGB EMF Calculator was consulted, and with our antenna system, power and feedline the recommended separation was 3.4m. Add 1.8m for the average height for an adult gave us a magic figure of 5.2m. At the centre, the droopy lowest bit we had a spare 1.5 to 2m when underneath. Phew, we made it! We also completed risk assessments for all scenarios. If you work with local authorities or trusts, this is a must, along with insurance. We are lucky, as our clubs are affiliated to the RSGB so we have adequate third-party insurance. Now all the paperwork is out of the way and printed, let us get some publicity.

Apply for a relevant callsign. In our case GB80, that is 80 years after the event. AGBB the registration of the Aircraft that was shot down. Hence GB80AGBB. Put as much information on QRZ.com as you can.

Rabbi Monique Mayer was invited to say a few words and hold a minute's silence, along with a Pastor from the local Church. All of this added to the event and came to the attention of the BBC. BBC Points West fell over themselves to cover the event. They first said they were going to fill a two-minute slot, that very quickly turned to a three-minute slot.

Our event lasted for five days, visited by many members of the public and we worked over 400 stations. Many were old hams reminiscing of the times they worked at Whitchurch or flew into the Airport. Thanks go out to **Andy G7KNA** Secretary of the South Bristol ARC and his helpers and **Mat G7FBD** for putting in so much hard work to make this happen.

Steve Telenius-Lowe PJ4DX
teleniuslowe@gmail.com

We start this month with news of the World Radiosport Team Championship (WRTC), which takes place every four years (although this year's event, rather like the Olympic Games on which it is modelled, was postponed by a year due to the Covid pandemic). WRTC runs concurrently with the IARU HF Championship contest, which is held on the second full weekend of July each year (8/9 July in 2023).

This year WRTC took place around Bologna in Italy. 58 two-person teams from all over the world travelled there to compete on what was as close as possible to a 'level playing field', using the same antennas and power levels. All competing stations had callsigns beginning I4, followed by a single digit and a single letter. The UK was represented by **Martin Platt GD4XUM** and **David Sharred G3NKC** operating as I49R, while **Jamie Williams M0SDV** and **Philipp Springer DK6SP**, **Fig. 1**, were I47B and formed one of three 'Youth' teams.

The winning station was I44W, operated by UW7LL and VE3DZ. The full results and a video of the closing ceremony can be found at: www.wrtc2022.it

The WRTC format means that people at home can also join in the fun, for example by working all the WRTC competitors, a feat accomplished by **Tim Kirby GW4VXE**. Operating as **GW4MM**, Tim believes he was the first in Europe to work all 58 stations on CW, and was rewarded with the certificate shown in **Fig. 2**.

For UK amateurs the big news is that the next WRTC is to be held in the UK between 7 and 13 July 2026. While the planning is still in its early stages, a provisional programme has already been released by the organising committee. Volunteers are needed so if your interest has been whetted, please email the committee at info@wrtc2026.org. Take a look at the website for further information: www.wrtc2026.org

The Month on the Air

Although the June-July period is usually a quiet one for HF operators this year there is a lot to report!

The VP6A Ducie Island DXpedition (see *HF Highlights*, July 2023), was on the air for a fortnight in June, making nearly 62,000 QSOs. According to a report from the team and posted on the *DX-World* website, VP6A had four stations on the island, one of which was operated 'locally' by AA7JV, W6IZT and KN4EEI. The other three stations were operated remotely by 34 operators from Singapore, USA, Portugal, Germany, France,



WRTC, Ofcom Consultation and More

Despite the usual HF 'summer doldrums' **Steve Telenius-Lowe PJ4DX** has plenty of news once again.

Japan, Finland, the Netherlands, Brazil, Canada and Australia.

This was a DXpedition I missed entirely as I was in Europe during the whole of June (luckily I worked VP6D on all the HF bands in 2018, although VP6A would have been a new one on digi modes). More details and photos at: dx-world.net/vp6a-ducie-island

On 28 June 4W6RU came on the air from Timor-Leste. This was a small group from the Russian DXpedition Team which, according to their QRZ.com page, was "a suitcase DXpedition with modest setup". Nevertheless, they were easy and quick to work from here on various bands.

Every year for the last 15 years, the 'Thirteen Colonies' special event takes place during the first week of July. Special event stations using the callsigns K2A to K2M were on the air from New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, and Georgia, the original 13 British colonies that went on to become States of the USA. There were also three 'bonus' stations: WM3PEN from Pennsylvania, TM13COL from France,

and GB13COL, operated by members of the Durham and District ARS. Awards are available for working some or all of the stations, see:

www.13colonies.us

The Italian DXpedition Team was on its travels once again, this time to the Democratic Republic of Congo. Originally scheduled for September, the operation was brought forward to July, with 9Q1ZZ active on FT8 and 9Q1AA on other modes.

Although 'Cam' Cameron had to abandon his world-record attempt of staying on Rockall after 32 days due to a life-threatening storm, on 2 July **Nobby G0VJG** said "I am in the process of planning [a] return trip to collect all the equipment. Possibly a short period of QRV time around 19/20 July [as MM0UKI] subject to weather." At the time of going to press, it is not known whether or not he was able to get back on the air from Rockall. Nobby and **Emil DL8JJ** activated MM0UKI on SSB and CW from 31 May to 2 June (see *Destination: Rockall 2023*, PW, August 2023).

Most activity from American Samoa takes place from close to sea level on the island of Tutuila and signals are often blocked by the mountainous terrain of the island. The

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KH8RRC DXpedition was different: in early July they set up a station on a mountaintop in the American Samoa National Park. Several UK operators reported that their signals were strong, yet difficult to decode on FT8. I suspect this was due to distortion to their signals caused by the path from American Samoa to the UK passing through the auroral zone. From Bonaire the path avoids the auroral zone altogether, being virtually east-west, and KH8RRC was worked first call on FT8 on 14MHz and on 14MHz SSB in the IARU HF Championship.

Ofcom Licensing Consultation

As reported in last month's *PW*, Ofcom has released a consultation document with numerous proposals for changes to amateur radio licensing in the UK. While the proposals cover the whole gamut of UK amateur radio licensing, I believe the following, *if agreed and implemented*, will be of most interest to HF operators, both in the UK and overseas (comments in *italics* are my own and not necessarily those of the *PW* editor or management):

Higher permitted power for all licence classes: Foundation licensees' maximum allowed power will be doubled from 10 watts to 20W; Intermediate licensees' maximum power will go up from 50W to 100W, while Full licensees will be able to use up to 1kW, up from 400W at present.

The use of the Regional Secondary Indicator (RSL) – the 'M' in Scottish callsigns, 'W' in Wales etc – would no longer be mandatory but licensees could choose whether or not to use the RSL. *In my opinion this is a bad idea: although the RSL is not necessary from Ofcom's spectrum management point of view, it is recognised (including by Ofcom) that radio amateurs outside the UK wish to know whether a station they are contacting is in England, Scotland, Wales, Northern Ireland, the Isle of Man, Jersey, or the Bailiwick of Guernsey. Without the RSL it would be impossible to determine where in the British Isles any station is located.*

Ofcom proposes to phase out the use of callsigns beginning with the digit '2', i.e. those issued to Intermediate licensees. Current 2E0



(and 2M0, 2W0 etc) callsigns would become M8 while present 2E1 (2M1, 2W1 etc) calls would become M9 calls (with or without the appropriate RSLs as their use would no longer be mandatory). *Many Intermediate licensees may well approve of this recommendation as some consider the 2E0 and 2E1 etc callsigns rather 'cumbersome'. However, from an international regulatory point of view there seems to be little point to this proposal, as numerous countries use ITU allocations that start with a digit, e.g. 5B in Cyprus and 9A in Croatia to name but two.*

There is a proposal to allow licensees to append any suffix they like to their callsign. *While low-power operators may be pleased to be allowed to add /QRP after their call, I think this proposal opens up a can of worms as there does not appear to be any restriction on the length of suffixes.*

The consultation is open until 4 September and, as **Don G3XTT** stated last month, it's recommended that you read the document in full before making any response. It can be downloaded from:

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

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Fig. 1: Philipp DK6SP (background) and Jamie M0SDV operating in an earlier contest.
Fig. 2: 'WRTC Sprint' certificate awarded to Tim GW4MM. **Fig. 3:** Etienne OS8D/P activating another Belgian castle on 23 June. **Fig. 4:** The OS8D home station, with new Icom IC-7610 in pride of place.
Fig. 5: John ZB2JK at the Great Siege Tunnels using a 10m backpack. **Fig. 6:** Justin G4TSH operating the GB2MOP station in Ceredigion.
Fig. 7: A reconstruction of the former BBC Tatsfield Receiving Station at the Internal Fire Museum of Power.

Readers' News

Etienne Vrebos OS8D has been continuing his quest to activate all of Belgium's castles for the Belgian Castles & Fortresses Award. "Today I reached 133 castles activated within six months and more than 11,000 QSOs, mostly Europeans (**Fig. 3**). I'm still addicted to those pile-ups for some hours and giving points to the chasers... When I will have activated all Belgian castles (2700), I'll start with France... I'm lucky to be that free and drive all around here. Most activities are within 150km (one way) and I usually start very early (today at 0400UTC), avoiding traffic and catch the real chasers getting up early. That's a problem for the UK, but eastern Europe is awake.

"The Icom IC-7610 is still OK, but doesn't give the feeling of 'worth more' than the 7300 – but it's really nice to see on my desk." (**Fig. 4**.)

Jim Bovill PA3FDR wrote "This has been a good month for DX contacts, although what was interesting was the lack of activity in the 10m band, with only one repeat QSO with Angola (D2UY) on FT8. In contrast, 12m managed quite a good catch, and as usual 15m and 17m provided the majority of QSOs with, as usual, a considerable number of contacts with Asia, especially from Japan, Indonesia and mainland China, and, from the west, Brazil was prominent but there were fewer than usual from the USA, with most coming from states along the eastern seaboard or mid-west... I did get a couple from the far west of the US, Oregon (AG7TH) and California (AF6O) and from Ecuador on the west coast of South America. My only new DXCC was the Cayman Islands (ZF200) on 20m FT8. On the last day of the month I managed two contacts with Uruguay within less than 10 minutes of each other (CX1VH and CX1AAX). Although not new contacts, QSOs with this country have for me been uncommon. I had a few days before raised my long wire antenna up to just over 7m above ground with the help of two 4m-long fishing rods and this may have helped to obtain these QSOs."

Reg Williams G000F wrote that his HF Highlight was working Ducie Island. "VP6A had only started operations on the 13th... The



alert came up that they were working 20m FT8 F/H mode at 0530UTC. Within two tries of calling they responded and the QSO was completed in a short space of time. When checking for confirmation later, I was in their log. Next morning, repeat process but this time it was 30m FT8, again F/H, at 0523UTC. Within five minutes the QSO was complete and once again in their log. I could not believe how easy it was. Compliments to the operators. It was straightforward WSJT-X with F/H mode, no complications from them operating above 1000Hz and possibly using other FT8 software. The DXpedition has been a big topic of

conversation with a new approach to activating rare islands wanted for DXCC. Nonetheless I was pleased to work them.

"Recently I was introduced to POTA, Parks On The Air, by a local amateur, G0SDD, who has been activating a couple of local parks and hopes to activate more. I am not set up to do that, so I have become a 'Hunter' from home. Within a couple of months I have worked almost 75 parks, mostly on SSB with a few FT8 contacts. Quite a challenge to work SSB as the 'Activator' stations are working QRP, being either mobile or portable. All of these have been European stations. There are a good number

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of park activations from North America but it is very difficult to work at the moment other than a few on FT8. Maybe it will improve as seasonal HF conditions improve."

Kev Hewitt ZB2GI sent in a long list of stations worked, the best of which are shown in the 'Band Highlights' section, and said "I operated from my home station and the GARS club station. I also operated portable up the Rock with **John King [ZB2JK]**, twice at the top of the Rock and twice from the Great Siege Tunnels" (Fig. 5).

Owen Williams G0PHY said "there have been early morning openings to west coast Canada and USA and **Jim E51JD** in the South Cooks has been audible on 14MHz for the past few days. Something rare happened this month: I worked an all-time new one, AP5ARS [Pakistan], on 14MHz. Thanks to Logbook of The World the QSO was confirmed within a matter of days. During the Canada Day contest contacts were made with stations in British Columbia, California and Manitoba as well as east coast provinces."

At **GW4MM**, **Tim Kirby GW4VXE** found the bands in the summer doldrums! He wrote, "although solar flux has continued to be quite high, the daytime absorption has affected 14, 18 and sometimes 21MHz quite badly. Some days, I have contented myself with working SOTA portables on the HF bands. There are often many low-power portables out on the mountains and hills around Europe and sometimes further afield. It's fun to swap reports with them and find out where they are. I use SOTAWATCH to keep an eye on the activity. The SOTLAS site is very good for seeing where people are."

sotawatch.sota.org.uk/en/sotl.as/map

Tim mentioned that **Justin G4TSH** and he recently visited the Internal Fire Museum of



Power near Cardigan. "Visiting radio amateurs may operate GB2MOP and Justin was happy to make a few QSOs using a hand key on 40m on one of the stations" (Fig. 6). The museum also includes an impressive replica of the former BBC receiving station at Tatsfield in Surrey, Fig. 7, which was closed down in 1974.

<https://internalfire.com>

28MHz Beacon Report

The 28MHz beacon report for June was compiled by **Neil Clarke G0CAS**. As expected, Sporadic E was much improved during the month. Most of the regular beacons were heard via Es, but were heard on fewer days compared with last year: the average number of beacons heard each day was 19, compared with 21 each day during June last year. IZ8RVA was heard every day, followed by IW3FZQ 28228 and ED4YBA 28263, which were both logged on 27 days.

Looking towards Scandinavia, LA5TEN 28237 was logged on 24 days while SK7GH 28298 on 15 days and OH9TEN 28267, the furthest north and the greatest distance from the UK, was logged on nine days. Looking at the world-wide beacon network on 28200, 4X6TU was heard on 28 days, OH2B 20 days and CS3B 21 days. Further afield, VK6RBP and VR2B were only heard on the 8th. The three beacons in South America LU4AA, OA4B and YV5B, were logged on 21, 24 and 14 days respectively. LU2DT 28193 and PY4MAB 28270 were logged on 28 and 25 days respectively.

Band Highlights

Jim PA3FDR: 10MHz FT4: VK2WN. **10MHz FT8:** UK8UA. **14MHz FT4:** CK3AT, KI6DY, WP3R, YB1TDL, YF7NFB. **14MHz FT8:** BOCRA,

HC2GRC, UA9AAE, V31MA, VK3JLM, VK2LAW, ZF200. **18MHz FT4:** B7CRA, CU2AP, JH7KAG, PY40Y, W9RF. **18MHz FT8:** AG7TH, JA3XGE, UA0QNE. **21MHz FT4:** A41ZZ, AF60, BA3KY, BU2FF, BV2NF, CX1VH, HL2IFR, JA0FIL, PY2DPM, RK9UM, TR8CA, YB7WW. **21MHz FT8:** 4J100HA, 4L4DX, B4CRA, BD4STG, JA4FKX, PU2RTO, PY1TG, W5XO. **24MHz FT8:** 4JF1EU, CX1VH, JH8SGR, LU3HTS, PU2KNM, PY5XT, UA9YK, UN7LEW. **28MHz FT8:** D2UY.

Reg G00OF: 7MHz FT8: LU5FF, VK2LX, VK5PO. **10MHz FT8:** VP6A. **14MHz FT8:** JT1CO, VP6A.

Etienne OS8D: 21MHz SSB: FH4VVK, YB0AR, YB1EAO.

Kev ZB2GI: 14MHz SSB: VK2ON, VK3KJ, VK5PAS, WB6QEX. **21MHz SSB:** WS7X.

21MHz FT8: 4L7T, 7L2UXX, 7M4AOE, BG4QNE, BG6VBM, HC5F, HL2ZN, JA0DIN, JA1ILA, JA7AUM, JA9AVA, JG3TRB, JH6ETS, K6MKF, KK7DLC, KL7TC, VE6BMX, VK1HMS, VK2BY, VK3VM, VK5AIB, VK7CMV, YB4LFP, YV5TX. **28MHz SSB:** PY2UD. **28MHz FT8:** YB1VHC, YD2UIW.

Owen G0PHY: 14MHz SSB: AP5ARS, CJ7RR, K2L, TZ4AM, VO2RAC, W6AFA.

Tim GW4MM (GW4VXE) 14MHz CW: 4L8A, VK2GR, VK3QB. **18MHz CW:** TF/OE5FSM/P. **21MHz CW:** I4/G3XTT (Don on referee duty at WRTC), K7QA, PJ2ND, TR8CR, V31XX, YB7XO, ZS1ANF. **24MHz CW:** OY1CT. **28MHz CW:** CA40MQ, LU5FC.

Signing Off

Thanks to all contributors. Please send all input for this column to teleniuslowe@gmail.com by the 11th of each month. For the November issue the deadline is 11 September. 73, Steve PJ4DX. **PW**

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Roger Dowling G3NKH
practicalwireless@warnersgroup.co.uk

NO – it's not a misprint. Although the call G6QA was originally issued nearly a century ago, the first picture, **Fig. 1**, really is G6QA and I think you'll agree that it still looks a remarkably up-to-date operation. But G6QA is also the station in the next picture, **Fig. 2**, in the days when being a radio amateur still meant impressive 6ft racks of equipment – a far cry from the table-top transceivers found in most shacks today.

The explanation, of course, is that the call is a re-issue, and I was keen to meet the present-day **G6QA Lynda Jopson** located in the Greater Manchester town of Kearsley, near Bolton, to learn more about her introduction to amateur radio and how she came to acquire such a coveted callsign.

"Like many other radio amateurs, I started off with Citizens' Band and really enjoyed it," she told me. "But my husband didn't really approve of it as he thought it attracted undesirable elements!" So, observing that several CB friends had gone

Lynda Jopson G6QA

Roger Dowling G3NKH takes an enjoyable trip down memory lane to meet Lynda Jopson, the second G6QA.

on to take their RAEs and become fully-fledged amateurs she decided to go down the same path. "So, in 1992 I started studying for the RAE during the day and each evening I would tune into a lady in nearby Bury who transmitted slow Morse lessons."

She took the RAE and Morse test together at home as she was suffering from severe agoraphobia (fear of open spaces). In 1993 an invigilator from Birmingham came up to conduct the RAE and the RSGB conducted the CW test – and she was through!

The Quest to Become G6QA

So why and how did the Rochdale-born Lynda become G6QA? It's a long and fascinating story. She knew that it was possible to apply for the re-issue of old callsigns with family connections

and her family believed anecdotally that her grandfather **John William Shaw** had once been a licensed amateur back in the 1920s. At that time Inspector Shaw had been in charge of the Rochdale Corporation Fire Brigade. Regarded as 'a wizard in anything electrical' he was an enthusiastic experimenter in wireless, and earned his promotion to Inspector for his design of pioneering apparatus for use at fires to enable firefighters to keep in touch with the new Rochdale Fire Station that had opened in 1932.

But sadly – and despite many enquiries – Lynda was unable to confirm that Inspector Shaw had ever held a transmitting licence. (Nor was I in my research for this article, despite the generous assistance of **Ian Brothwell G4EAN** at the Radio Amateur Old Timers' Association). However, Lynda had a friend and distant family member

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Fig. 1: Lynda Jopson G6QA today.

Fig. 2: The 'original' G6QA, Arnold Whiteley.

Fig. 3: Present-day G6QA antennas: a G5RV for HF and a tri-band collinear for VHF.

Fig. 4: Giving a CW demonstration and talk to Bury Radio Society. Fig. 5: G5RV QSL card in April 1994 (front and rear). Fig. 6: Lynda operating /P at 'Owd Betts'. Fig. 7: The original G6QA's QSL card to Barbara Dunn, G6YL in November 1928. Fig. 8: Barbara Dunn: the UK's first licensed YL operator.

Pat Barnes, who was a daughter of **Arnold Whiteley**, a close friend of Inspector Shaw, who had held the callsign G6QA. With Pat's help and encouragement, Lynda determined to become the new G6QA.

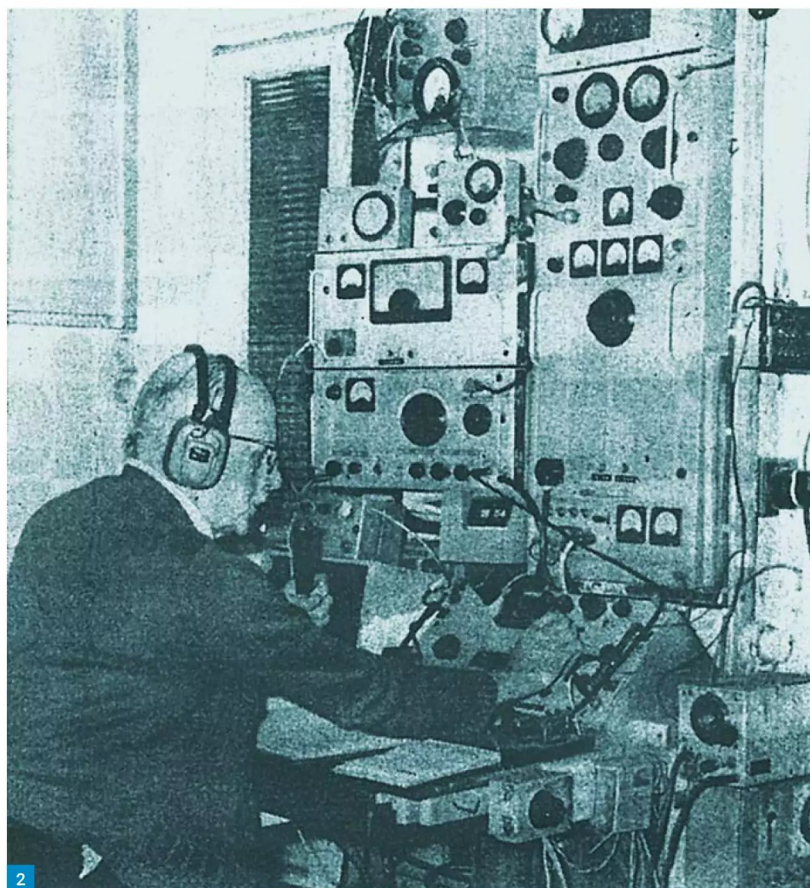
Arnold Whiteley: the Original G6QA

Arnold Whiteley received his licence in 1928. At the time he lived in a tiny terraced house, still standing today, at 82 Molyneux Street, Rochdale. There, as a nine-year-old in 1913, he would help his father, who was a keen experimenter in the new magic of 'wireless' – these were real pioneering days even before the Marconi Company began experimental broadcasts from its research station in Chelmsford, Essex, in 1920.

Having taught himself Morse Arnold obtained his transmitting licence and retained a deep and active interest in amateur radio throughout the rest of his life. During World War 2 he became a 'secret listener' – one of a national band of volunteers set up in 1939 to eavesdrop on enemy secret service communications and pass on their findings to the Radio Security Service (RSS). RSS was established in September 1939, following an investigation and report by **Lord Hankey**, then a member of the War Cabinet, with the responsibility for detection of illicit wireless communications within the UK and surrounding sea. Initially using physical facilities provided by the Post Office, RSS supplied the Security Service with details of intercepted communications.

In May 1940 RSS was made responsible for interception of German overseas illicit transmissions, and by the end of 1940 for the global interception of enemy secret service communications. In January 1941 RSS passed to the control of the Secret Intelligence Service (SIS). As well as targeting known enemy radio-communications networks, RSS undertook systematic searches and analysis of the radio spectrum looking for illicit broadcasts, which could then be targeted. These searches utilised home-based volunteer interceptors, who reported their findings by post to RSS.

For about three hours each day Arnold would tune in to his home-built receiver, noting down



random five-letter groups such as YXTCL or CJQKW, which he would post off to a secret box number for decoding. He was group leader of eight other interceptors, none of whom ever learnt the secrets of the many thousands of

messages they passed on.

"Arnold's daytime job was manager/projectionist of the Rialto cinema in Rochdale, where he apparently also had another secret receiver," said Lynda. "Of course, he could not

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divulge details of his work as a secret listener and inevitably he was sent a few white feathers for apparently not doing his bit for the country. They eventually gave him a Royal Observer Corps uniform and the white feathers stopped!"

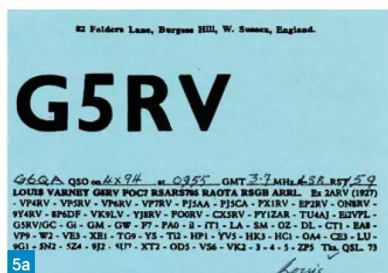
Lynda takes to the Air

Having decided to apply for the re-issue of G6QA, Lynda soon realised that it was a procedure that would take time. As a holding operation, she applied for G0VAL, Valerie being her second name, but as this was some months from becoming available, she temporarily became the cat-loving owner of the Class B call G7PUS.

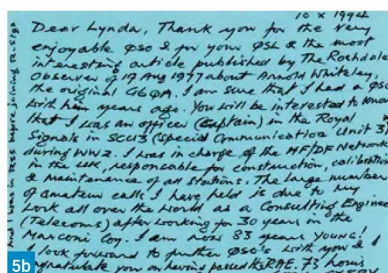
But in due course came a welcome response from the Radiocommunications Agency. "I received a telephone call from a very posh-sounding man in London," smiled Lynda. "I thought it was a leg-pull from one of the locals, but he was actually ringing to confirm that they had received an application from the daughter of the former G6QA and were very happy to re-issue the call to me." Since that day, Lynda has become well known on the air as "G6 Queen Anne", operating from the suitably regal "Kearsley Towers" near Bolton.

Lynda's main rig today is a Kenwood TS-590SG and she can be heard on most bands using a G5RV antenna or a tri-band collinear, Fig. 3. She also has a couple of Yaesu FT-857Ds, one of which she uses for mobile or portable operation. CW is one of Lynda's big loves, tapping out a comfortable 18 wpm, and for many years she has run slow Morse sessions four times a week on 2m for budding radio amateurs. She is also kept busy as Chairlady ("not Charlady", she jokingly reminds members) of the lively Bury Radio Society, which meets every Tuesday evening at Hollins Social Club, Fig. 4.

"It's appropriate that my HF antenna is a G5RV," said Lynda. "Louis Varney G5RV was one of the first stations I worked in 1994, and I treasure the QSL card he sent me," Fig. 5, said Lynda. "On the back he mentioned that he himself was a Captain



5a



5b

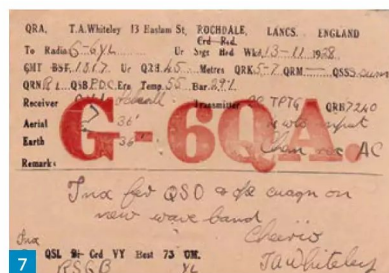
in the Royal Signals during the war, working in the Special Communications Unit."

Lynda also enjoys regular /P operations, using a Yaesu ATAS-120A HF/VHF antenna mounted on the back of her car, Fig. 6. A favourite location is 'Owd Betts', on Ashworth Moor a few miles north-west of Bury, which has stunning views across Rochdale, Manchester and Oldham.

The G6YL Connection

Lynda Jopson is proud to hold the callsign G6QA – and there is also a less-obvious reason why it is so dear. Among her treasured possessions is a print of a very early QSL card sent out by the original G6QA in 1928, Fig. 7. Its recipient: none other than the very first licensed YL operator in this country, Barbara Dunn G6YL, Fig. 8 (and see Valve & Vintage, December 2020).

Barbara Dunn, then operating from her home in Northumberland, had received her licence in 1927, having demonstrated her ability to copy Morse at what was thought to be the



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'sensational' speed of 20 wpm. In the absence of a mains supply, her original transmitter used a Hartley oscillator, powered from a 350V rotary converter running off a 6V car battery. She was an early member of the radio amateur 'Society' (later to become the RSGB) and was awarded the new Committee Cup in 1930 for her outstanding work in the first series of 1.7MHz tests. Coincidentally, Barbara also became an interceptor for the RSS during World War 2.

"Barbara Dunn worked the world despite the primitive technology all those years ago," said Lynda. "She is a real inspiration to me today." **PW**

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Keith Rawlings G4MIU
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In the June edition of *PW* Georg Wiessala evaluated the XHDATA D-109 'Multi-band Radio' and with an eye to improving reception during his review he used it with an externally connected random length of wire, which was fed to the receiver via a 'balun'. This raised a question from reader Paul Capewell on how he could connect one of these baluns to the similar XDATA D808.

The type of balun used by Georg is a receiving type, often called a Magnetic Long Wire Balun (MLB). However, it should be more correctly termed an Unun.

The reason why it is not a balun is because the output to the radio is via a coaxial feeder, which is classed as unbalanced as the screen of the cable is grounded to the receiver's chassis and in addition, the antenna connection is a single terminal to take a wire and as such is also unbalanced, hence it is an unun (UNbalanced to UNbalanced as against BALANCED to UNbalanced).

The term Magnetic Long Wire Balun seems to have been coined in the dark and distant past by MLB Manufacturer RF Systems who state: "The Magnetic Longwire Balun makes it possible to use a coaxial lead-in cable with all forms of longwire, windom or other types of wire antenna. The MLB contains a special impedance matching transformer, which converts any piece of wire between 6 and 20 metres long into a wide-band receiving antenna, without the need for an antenna tuner".

(I assume that when they say Windom they are referring to the traditional single wire variety and not the Off Centre Fed Dipole (OCFD)/Carolina Windom type fed by coax.)

The type of radio reviewed by Georg is often termed a World Band Radio (see Fig. 1 for a selection) and Wikipedia write of a world band radio: "Modern battery-operated portable shortwave radio receivers, often called world radio or world band receivers, are marketed primarily to those wishing to receive international broadcasts, and are offered in a range of compact 'travel size' to smaller 'pocket size' units."

Many receivers of this type tend to cover more than just the Short-Wave (SW) Bands with the majority also receiving Long Wave and Medium Waves, Broadcast FM and in some cases air-band. In addition, many are more than capable of excellent reception on the amateur bands using SSB/CW. Most models have an internal ferrite rod antenna that is sufficient for general reception on the LW/MW bands and also utilise a telescopic whip for use on SW, which in some cases can be adequate. This being said users, like Georg in his review, often wish to improve reception by connecting an external antenna to the radio.



End Feds, Magnetic Long Wire 'Balun' and World Band Radios

Keith Rawlings G4MIU looks at UNUNs for world band radios before introducing the latest release of AN-SOF.

Clearly there are differences between these receivers and those that are classed as 'Communications Receivers'. Disregarding differences in form factor and operational layout, a communications receiver usually requires an external antenna and they generally have a coaxial socket on the rear chassis, commonly of the SO239, BNC and sometimes Type-N variety, although some may also have a terminal for direct wire connection.

While I can't speak for all models of World Band Radios, those that I have experience of do not use such a connector for external antenna input.

Obviously there are benefits to using an external antenna with a world band radio on HF. Even clipping 20-30ft of wire to the set's telescopic antenna can make a vast improvement, although it may be prone to picking up household generated noise.

A lot of these receivers, however, will have a coaxial input to accept a 3.5mm audio jack and this permits an external antenna to be connected using a screened coaxial feeder, thus giving more antenna options.

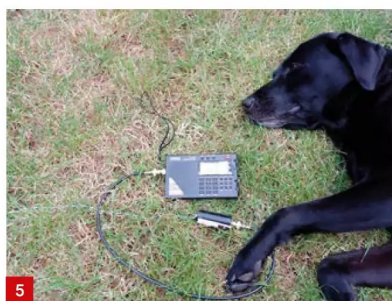
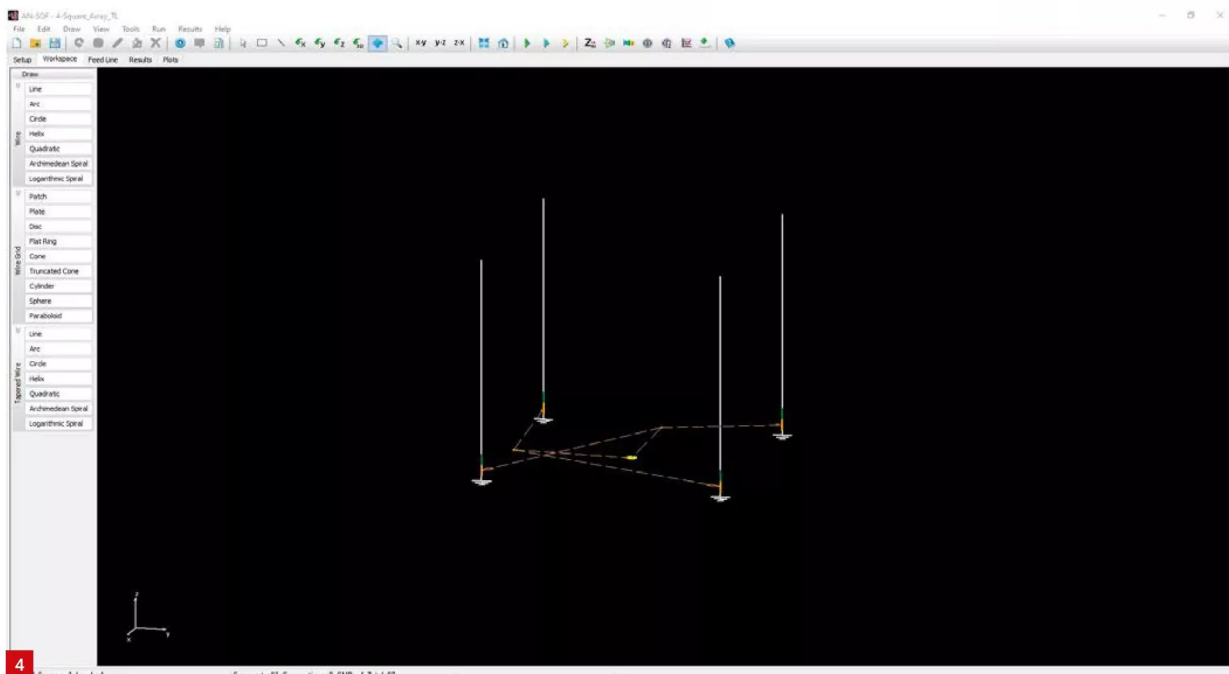
Fig. 2 is a photo of a Sangean AN 60 clip-on/plug-in wire antenna designed specifically for use with world band radios. It has around 23ft of wire conveniently wound onto a reel with a clip adaptor for use on receivers that only have a telescopic whip. It also has a 3.5mm jack plug for radios that have a suitable socket fitted. Here it is shown clipped to the whip of a Sony ICF-7600D although this radio does have a 3.5mm external antenna input.

Using screened cable will reduce noise generated by a variety of nearby devices and will also allow the antenna to be located away from the radio, possibly outside and away from noise generating sources (hopefully).

Cable such as RG174/RG316 can quite easily be soldered to a 3.5mm phono plug but larger cables such as RG58 can cause a headache. There is an easy work around for this as there are 3.5mm-to-BNC female adaptors available quite cheaply, which will allow readily available RG58 leads fitted with BNC plugs to be used, Fig. 3.

Getting back to Georg's review and Paul's question about connecting a unun (or balun), it is es-

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sential to use coaxial cable to get best results from such a device.

An MLB is effectively a transformer that converts the high impedance of a random end fed into something nearer the 50Ω required by the radio, *although this output impedance will vary depending on the impedance of the wire.*

Being a passive device an MLB will not cause any IMD issues and there should be a noticeable

increase in signal strength due to the improved impedance matching, often negating the need for an AMU (antenna matching unit) for general reception in some cases.

An MLB has a direct electrical connection between the antenna and radio ground and depending on circumstances this may provide a path to ground reducing static build-up on the wire, although in this case I am thinking more in the way of an MLB being used with a communications receiver that has been provided with a ground system.

Theory tells us that signals are mainly transferred by the transformer magnetically, reducing signals in the electric field and, at lower frequencies especially, this may help reduce electrical noise.

The specifications of MLB's vary; the type used by Georg are intended for LF/MF and HF use and have an input impedance of 1kΩ. They are biased to be more efficient on the lower frequencies and

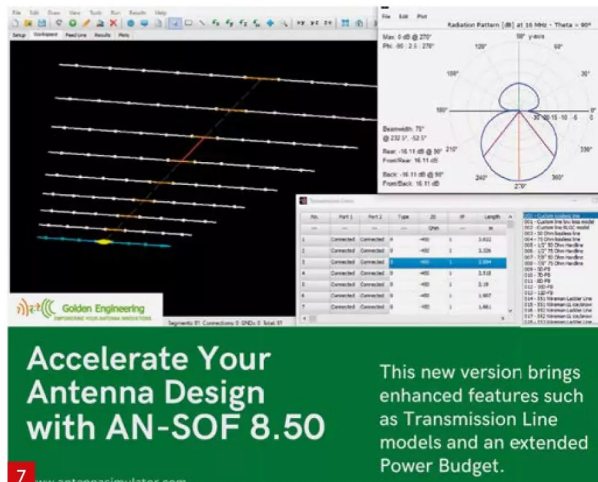
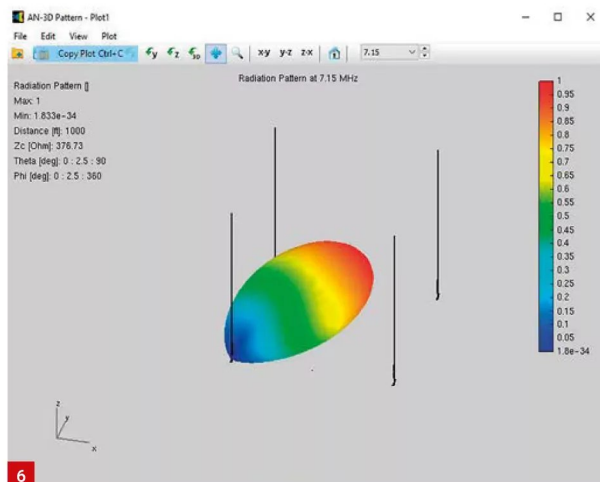
bandwidth is <1dB loss at 100kHz to 20MHz and <3dB loss at 30MHz. This makes them useful on lengths of wire 20-60ft or more and makes it possible to locate the MLB and wire outside and run the feeder to the radio using screened cable.

I am, in the main, thinking in terms of reception using portable/world band radios but an MLB can equally be deployed in other receive-only scenarios, even those that use an AMU.

Depending on AMU design there may be cases where the unit may find it difficult to cope with excessively high impedance presented to it and an MLB would be capable of bringing that impedance down to a manageable level.

In the case of wide band SDR's, using an AMU will most likely affect receive bandwidth in one way or another whereas an MLB will present more even matching over the HF range. This will make it simple to tune from band to band and in those receivers that are capable of presenting a wideband waterfall display, such as something

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like the Winradio G31DDC, which can display a real-time waterfall from 0-50MHz, a more even response will be seen over the waterfall range.

Using appropriate materials, such as a T130-2 core and 18SWG wire it is possible to make an MLB suitable for transmitting and an internet search will bring up a variety of designs.

But as the photo, **Fig. 5**, shows, even Dylan can relax in the garden while listening to Short Wave on a Tescun PL330 using a 25ft length of wire fed into an MLB!

AN-SOF News

AN-SOF have released version 8.50 of their Antenna Simulator, which has a comprehensive update over previous versions, including a number of significant new features. Now incorporated are:

Transmission Line Models: The software now has over 160 transmission line models, which are accurately based on real cable datasheets. This simplifies modelling of phased arrays and feed systems that have multiple transmission lines. Users can benefit from enhanced accuracy while accounting for RF interference on coaxial cable shields using AN-SOF's hybrid model.

Enhanced Zoom Functionality: This makes editing intricate details considerably easier. V8.50 introduces a convenient zoom-in option with the click of a button. This is easily accessed using the expansion box through the toolbar's magnifying glass icon to fine-tune small wires within large structures easily.

Extended Power Budget: Valuable insights may be obtained with the integration of Front-to-Rear (F/R) and Front-to-Back (F/B) ratios into the Power Budget table. F/R and F/B plots may be explored as a function of frequency with a simple click on the table headers in the Results tab. This essential data may be found included in the CSV output file during bulk simulations.

Expanded Compatibility: AN-SOF now supports current sources defined via the EX 6 command of

NEC-4.2 when importing NEC files. This means that it is seamless to import NEC files to take full advantage of AN-SOF's capabilities.

Insulation Integration: Importing NEC files becomes even more versatile with support for wire insulation defined via the IS command. Here, insulation may be added to individual wires or the entire setup effortlessly, thus providing greater customisation options.

Improved Far-Field Calculation: AN-SOF 8.50 offers enhanced far-field computation, ensuring accurate Directivity and Efficiency calculations for all scenarios. Whether a real ground plane is set or an infinite substrate slab combined with the Vertical, Horizontal, or Custom options in the Far-Field panel setup AN-SOF returns precise results.

The set-up procedure has altered slightly from older versions.

Firstly AN-SOF project files should be backed up because once a project is opened and saved with version 8.50, it can no longer be opened with a previous version.

The previous version needs to be un-installed and all folders whose names start with 'AN-SOF Professional' need to be deleted from the previous installation directory.

Once run the installer will prompt for an installation directory and do not select a folder within the Program Files or operating system folders. Instead, install it in the root of drive C:\ or in a subfolder created by you. It is recommended you keep the default folder, which is C:\AN-SOF Professional 8.50.

Then start AN-SOF 8.50 and activate it using the same key you used for version 8.20.

The informative user manual has been updated for the new version and Chapter 14 is now dedicated to 'Transmission Lines'.

A number of new models have been added to the library demonstrating the use of transmission lines such as a simple dipole, 5 and 9 element log-periodic for 12-20MHz, a phased collinear

Fig. 1: Old and New: World Band Radios.

Fig. 2: Veteran Sony ICF7600D connected to Sangean ANT60 Travel Antenna.

Fig. 3: BNC to 3.5mm Jack Adaptor. **Fig. 4: AN-SOF Design Screen of a 40m band 4-square antenna.**

Fig. 5: Dylan enjoying Short Wave Radio 'Alfresco'.

Fig. 6: AN-SOF Simulated 3-dimensional plot of the 40m 4-square. **Fig. 7: AN-SOF promotional depicting 9-ele Log Periodic and Transmission Line Table (AN-SOF).**

for 21MHz, a stacked dipole array for 144MHz, a 3-element inverted-V array for 40m and a 4-square vertical design, **Figs 4 and 6**.

Details of this update came in right on my submission deadline so I have not had a great deal of time to make an evaluation but of these updates the addition of the Transmission Lines feature is certainly a welcome one.

At first look it seems a wire is drawn and segmented, which will become the transmission line. Then selecting Transmission Lines from the 'Draw' drop-down menu a number of pre-set cables may be selected for the line. (In addition, custom lines with various options may be added by the user). Cable details are already set in the software so it just remains to select the line length, which will be set in the same units as selected in the 'preferences' during set-up. The wire to be used as a transmission line is then right-clicked, the Source/Load/Transmission Lines option is selected and the position of the 'Ports' of the line are selected by moving the slider to the appropriate position in much the same way as sources or Loads are positioned. The Transmission Lines drop-down is once again opened and an 'x' is entered into the 'Ports' cells of the table that connect to the appropriate segment.

Fig. 7 is a promotional image for the new version while a fully functioning trial version with a 50 segment limit may be downloaded from:

<https://antennasimulator.com>

Read more radio news and reviews at www.radioenthusiast.co.uk/news

Colin Redwood G6MXL

practicalwireless@warnersgroup.co.uk

The 15th Annual *Practical Wireless* 70MHz Contest takes place on Sunday 24 September 2023 from 1300 to 1600UTC.

The contest is split into two sections. The low-power section with a power output limit of 10W enables Foundation Licence holders to compete on an equal basis with other low power stations. The high-power section allows stations to run up to the full power permitted by their licence.

You may operate from a fixed location or portable subject to complying with the spirit and letter of prevailing government coronavirus regulations and guidelines.

For those new to the 4m band, the *PW* 70MHz contest is a great introduction to the friendly nature of contesting found on the band.

Equipment

The choice of equipment at 70MHz (4m) continues to improve.

For SSB and CW operation, Yeasu's FTdx10, Kenwood's TS-890, Icom's IC-7100 and IC 7300 transceivers all offer the 4m band in addition to the traditional HF and 6m bands.

Less well known is the Noble NR-4SC, a dedicated 4m SSB/CW (but not FM) transceiver. The UK version of the older Yaesu FT-847 also covers 4m and can often be found second-hand.

Transverters are still used by some 4m operators and are available from a number of sources. Most use an intermediate frequency (IF) of either 28MHz or 144MHz, taking the 28MHz output from a transceiver and mixing with a local oscillator to give 70MHz for transmit and vice versa on receive. Transverters usually require drive levels much lower than the full output power of most HF and VHF transceivers, sometimes as little as a few milliwatts. You may need an attenuator unless your main transceiver has a low-power output to suit your transverter.

A number of FM transceivers for 4m are available from several manufacturers including Anytone, MyDEL and Wouxon.

Antennas

Many stations will perhaps be using nothing more than a simple dipole or quarter-wave vertical. Stations with Yagi antennas are likely to have fewer than six elements. A number of suppliers now offer commercial 4m Yagis and Moxons.

Vertically polarised antennas are generally used for FM and AM operation. For SSB and CW, most stations use horizontally polarised antennas. For those who like building antennas, there are a number of designs for the 4m band on the *PW Antenna Collection Archive Disc*.



The 15th Annual Practical Wireless 70MHz Contest

Colin Redwood G6MXL invites readers to participate in the Practical Wireless 70MHz Contest.

Operating

I'd suggest spending some time on FM and AM in addition to SSB and CW. If you are unfamiliar with the 4m band, you could be surprised at just how many stations are using these modes.

In recent years there has been increasing activity from the continent in addition to activity from almost all parts of the British Isles, including a number of EI stations. It is easy to miss out on contacts simply by not rotating directional antennas in all directions. Don't forget that slow QSB (fading) is a common occurrence on the 4m band, so you may miss a station altogether if you don't rotate a directional antenna a number of times during the contest. The QSB can cause stations to disappear for a minute or two and then re-appear.

Entries

Don't forget to submit your entry after the contest. Although electronic entries via email are preferred and make the task of the adjudicator much easier, legible paper entries continue to be welcome. The email address for logs is entries@pwcontest.org.uk

Do make a note in your diary now. The 15th *Practical Wireless* 70MHz Contest takes place on **Sunday 24 September 2023**. If you plan to use batteries, don't forget to charge them a day or two before. Remember to put a reminder in your diary to submit your entry to be received by **Tuesday 10 October 2023**. Let's hope for some good weather and propagation on the day so that we can all have a really enjoyable time. **PW**

Sign up to our FREE email newsletter at www.radioenthusiast.co.uk

The 15th Practical Wireless 70MHz Contest Rules

www.pwcontest.org.uk

1. General: The contest is open to all licensed radio amateurs, fixed stations or portable, using SSB, CW, AM or FM in the 4m (70MHz) band. Entries may be from individuals or from groups, clubs and similar organisations. The duration will be from 1300 to 1600UTC on 24 September 2023.

All stations must operate within the terms of their licence and only transmit within the 4m licensed allocation. Stations using transverters are reminded to be careful not to transmit out of band.

Subject to licence conditions, split frequency operation is permitted for the purpose of working stations in countries with different 4m allocations. Cross-band contacts where either station is not operating between 69.0 and 71.0MHz will not count for points.

Entrants must observe the band plan for their country and keep clear of normal calling frequencies such as 70.200MHz. Entrants must avoid using any frequency that is obviously in use for non-contest purposes. **The 4m band is not an exclusive amateur band in many countries. Contest stations must allow all other users (including non-amateur users) of the band to carry out their activities without hindrance.**

The station must use the same callsign throughout the contest and may not change its location. Entrants not operating as a fixed station must use the /P callsign suffix.

2. Contacts: Contacts will consist of the exchange of the following minimum information:

- (i) callsigns of both stations (**including any /P suffix**)
- (ii) signal report, standard RS(T) system
- (iii) serial number: a 3-digit number incremented by one for each contact and starting at 001 for the first contact
- (iv) locator (i.e. full 6-character IARU Universal Location for the location of the station).

Information must be sent to and received from each station individually and contacts may not be established with more than one station at a time. Simultaneous transmission on more than one frequency is not permitted. If a non-competing station is worked and is unable to send his full universal locator, his location may be logged instead. However, for a square to count as a multiplier (see rule 4), a full 6-character locator must have been received in at least one contact with a station in the square.

Contacts via repeaters or satellites or using any digital voice modes (including D-STAR, Fusion and DMR) and data modes or machine generated modes, such as FT4, FT8, JT65, PSK31 and RTTY, are not permitted. The use of the DXCluster, ON4KST chat or similar is limited to setting up contacts and not for requesting or passing reports, serial numbers or locators, which must only be exchanged on the 70MHz band.

3. Power: In the low-power section, the output power of the transmitter or transverter final stage must not exceed 10W PEP. If the equipment in use is capable of a higher power, the power shall be reduced and measured by satisfactory means. Stations cannot rely on feeder loss to meet the 10W power limit. In the open section, stations may use whatever power they are permitted to use by their licence conditions.

4. Scoring: Each contact will score one point. The total number of points gained during the contest will then be multiplied by the number of different locator squares in which contacts were made (a square here is the area defined by the first four characters of the universal locator). Example: 52 stations worked in IO81, IO90, IO91, IO92 and JO01 squares; final score = $52 \times 5 = 260$.

Only one contact with a given station will count as a scoring contact, even if it has changed its location, e.g. gone /M or /P. If a duplicate contact is inadvertently made, it must still be recorded in the log and clearly marked as a duplicate (not necessary in computer logs submitted by email).

5. The Log: Logs must contain the following information for each contact:

- (i) time (**UTC - NOT BST**)
- (ii) callsign of the station worked (**including any /P suffix**)
- (iii) report sent
- (iv) serial number sent
- (v) report received
- (vi) serial number received
- (vii) locator received (or location).

The preferred form of a log is a computer file in REGTEST, .log, .adi or .edi formats sent by e-mail. This may be generated by contest logging software such as MINOS or EISDI's SDV, provided it contains all the information listed above. Alternatively, a file in any other suitable format (such as the spreadsheet available on the contest website www.pwcontest.org.uk) or in plain text provided each of the items above is separated by a separating character such as a comma or tab are acceptable. Give the file a name including the station call sign (e.g. g6mxl-p.log), and send as a standard e-mail attachment to entries@pwcontest.org.uk. **email entries will be acknowledged within eight days.** If there is any problem with your entry, you will be contacted by email.

Log sheets and covering information sheets for paper-based entries are available for downloading from the contest website:

www.pwcontest.org.uk

6. Entries: The covering information listed below must be provided with each entry. The preferred method of submitting this is by the use of the online facility on the website. Alternatively, the information may be written in the e-mail message to which the log file is attached. For entries sent by post, it should be written on a separate sheet of A4-sized paper.

The information required for every entry is:

- (i) name of the entrant (or of a club etc. in a group entry as it is to appear in the results table and on the certificate)
- (ii) callsign used during the contest **including any /P suffix** (e.g. G6MXL/P)
- (iii) name and address for correspondence
- (iv) location of the station during the contest
- (v) full 6-character locator as sent during the contest
- (vi) whether single or multi-operator (a single-operator is an individual who received no assistance from any person in operating the station, which is either his/her permanent home station or a portable station established solely by him/her); if multi-operator, include a list of operators' names and callsigns
- (vii) a full description of the equipment used, including transmitted PEP output power
- (viii) if you are entering the low-power section and the transmitting equipment (including any transverter employed) is capable of more than 10W PEP output, a description of the methods used (a) to **reduce** and (b) **measure** the output power
- (ix) antenna used and the approximate station height in metres above sea level (ASL)
- (x) if you receive or send a report of poor-quality signals (e.g. wide/splattering), full details of

the complaint, including time, callsign, nature of complaint and actions taken **during** the contest to investigate and resolve

- (xi) the following declaration must be included in the e-mail text or written and signed by the entrant: *"I confirm that the station was operated within the rules and spirit of the event and that the information provided is correct".*

Failure to supply the required information may lead to loss of points or disqualification.

Entries & Other Information

Entries by email must be sent to

entries@pwcontest.org.uk

Paper entries should be sent to:

Practical Wireless Contest, c/o Colin Redwood G6MXL, 53 Woodpecker Drive, Poole BH17 7SB.

Entries must be received not later than Tuesday 10 October 2023. Late entries will be disallowed.

Any other general comments about the station, the contest and conditions during it are welcome. Photographs relating to the operation may also be sent by email. They may be used for publication in *Practical Wireless* or on the contest website.

You will be asked, with your entry, to agree to the holding and processing of your log and to the publication of the results. Warners Group Publications data policy can be seen at:

www.radioenthusiast.co.uk/privacy-policy

7. Miscellaneous: When operating portable, obtain permission from the owner of the land before using the site. In particular observe any restrictions on access. Always leave the site clean and tidy, removing all litter. Observe the Country Code.

8. Poor Signals: Make sure that your transmitting equipment is properly adjusted and is not radiating a broad or poor-quality signal, e.g. by over-driving, excessive speech compression or low voltage supply. On the other hand, be aware that your receiver may experience problems due to the numerous strong signals it will have to handle and that this may lead you to believe that another station is radiating a poor signal. Before reaching this conclusion, try heavy attenuation at the received input. The use of a high-gain RF pre-amplifier is likely to worsen strong-signal problems so if you do use one, it is best to be able to switch it off when necessary.

If after making the checks above, you are certain that another station participating in the *PW* 70MHz contest is radiating poor quality signals, please call the station, giving your callsign, and tell them about the problem. You cannot expect a station with a poor signal to do something about it if they are unaware! If you receive or send a report of poor-quality signals (e.g. wide/splattering), you must record on the cover sheet full details of the complaint including time, callsigns of stations involved, nature of complaint and actions taken **during** the contest to investigate and resolve.

9. Adjudication: Points will be deducted for errors in the information sent or received as shown by the logs. Unmarked duplicate contacts in paper-based logs will carry a heavy points penalty. Failure to supply the complete information required in rule 6 may also lead to deduction of points. A breach of these rules may lead to disqualification. In the case of any dispute, the decision of the adjudicator will be final.

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Ian J Dilworth G3WRT and Andy Dickson G8DJF
practicalwireless@warnersgroup.co.uk

Don, the editor, asked me to provide some introductory articles to microwaves, including this one on Microwave propagation.

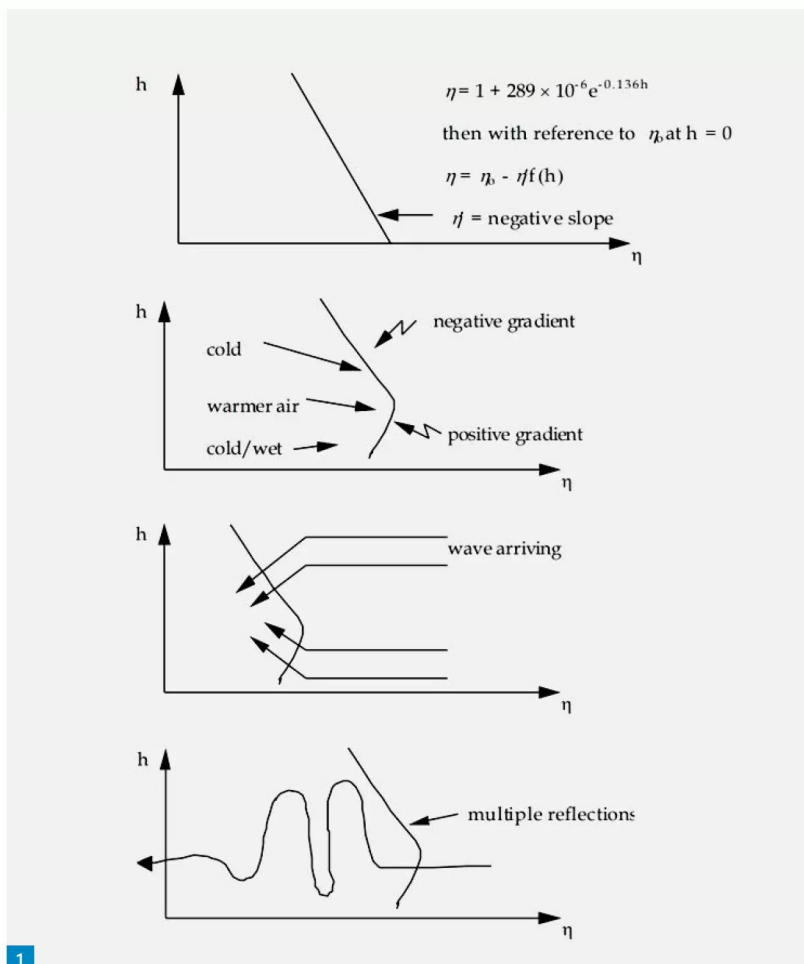
I have tried, so far in this series, to illustrate Microwave hardware, systems design, antennas, relevant EM modelling and now practical propagation together with the realities in practice. All demand attention to detail and it is no different for microwave radio propagation, terrestrial or earth-satellite, Earth-Moon. Since this is a *PW* series I generated I feel at liberty to update equipment aspects and practical advice here because it is relevant.

Microwave, VHF and UHF radio propagation is different to ionospheric propagation. But only in one significant parameter. It depends on the density of the propagation path. That density is summed up in the terrestrial weather-related relationship shown in **Figs 1 and 2** and the associated parameters. For clarity the time axis is ignored in all but the last illustration. The gradient of the refractivity 'N' with height indicates that the higher the wave interacts the less the density and hence the greater the speed of the EM wave. This is why assuming the illustrated slope of 'N' then an EM wave launched into it is naturally bent toward the ground.

Of course, microwave, UHF and VHF communications with satellites invariably requires a path through the troposphere and the ionosphere. Interlinked satellites are an exception at 60GHz, the oxygen resonance. These satellites in orbit exist outside the Earth's influence and can communicate between each other at 60GHz for covert reasons undetectable from Earth. All these atmospheric, tropospheric, and ionospheric layers have their effects, which in the case of the troposphere depend on the elevation angle of the satellite. Upper troposphere ice crystals abound, and they can become an influence as they can be aligned by the electric field between Earth and the troposphere and significantly affect polarisation changes but that is outside my remit here. However, note the very strong electric fields present in rainfall events, which are clearly evident in **Fig. 3**.

Radio Refractive index (RRI)

Fig. 1 can be more conveniently expressed as the radio refractive index (RRI) 'N'. I do not think readers will appreciate seeing the math's, which are summarised in the sidebar. But they are readily available with a web search for those interested. The atmosphere/troposphere is horizontally layered getting less dense with height. I prefer to illustrate



Fundamentals of Microwave Propagation

Ian J Dilworth G3WRT and Andy Dickson G8DJF cover some aspects of microwave propagation as well as updated advice on suitable equipment.

this in a novel way with the highly successful ingenuity helicopter, **Fig. 4**, on Mars (2022/3 so far) who's atmosphere is much less dense than the Earth's. Nevertheless, the same mechanisms apply. Landing the helicopter away from the base station rover could lose contact if the ground is lower at the landing place, this is operated near 2.3GHz. So, it is a serious practical consideration. On Venus, where the density is far greater than the Earth, communications with any rover will be far more difficult, even ignoring the surface temperature! I fully expect a graphene

constructed Venus's rover and helicopter in the 22nd century. Too late for me to observe, sadly.

The Earth's tropospheric density varies with the weather but in, usually, non-extreme ways although climate change is certainly changing the parameters to be expected worldwide.

So thus are the satellite and terrestrial communications design criteria for broadcast and communications we all rely on in 2023 and beyond even for our mobile phone networks, especially 5G. Studying Fig. 1 parameters and the local weather indicate the dynamic time

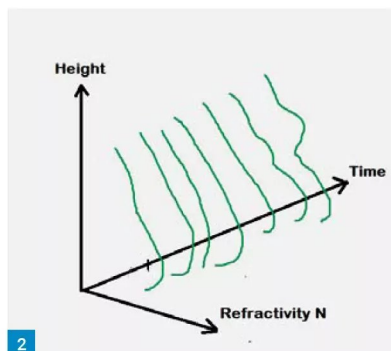


Fig. 1: A normal tropospheric gradient as a snapshot in time. On the Earth's moon this is vertical except perhaps in the pole regions where ice exists. Back to Earth followed by an anomalous condition where there is an elevated 'duct.' Followed below by a wave entering this region from above and below. Both can occur in practice. Then the normally mixed reality = rather complicated and never stable over prolonged periods.

Fig. 2: A dynamically changing refractivity inversion sketch including the time parameter.

Fig. 3: A real rain cell to scale. Notice the large raindrops at the front and much turbulence in the resultant RRI dynamism. Followed by heavier rainfall of smaller drop diameters. The wind is toward the left which cants the oblate raindrops. In general, horizontal polarisation interacts more strongly than vertical. Circular is the worst possible polarisation in all respects with rainfall events, which it must be remembered causes significant microwave attenuation.

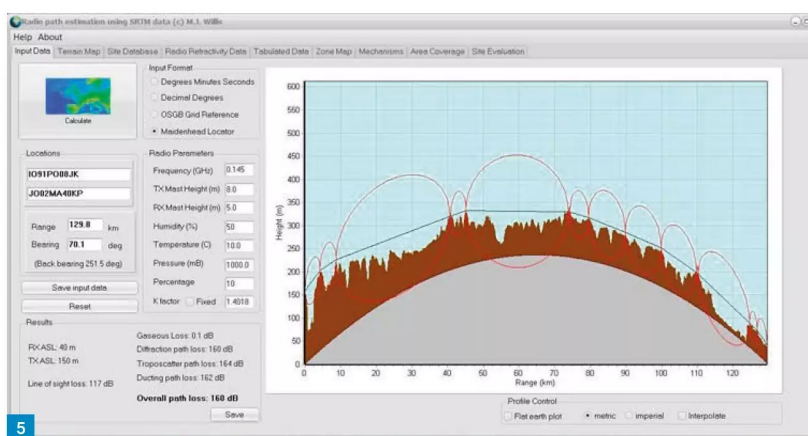
Fig. 4: The highly successful Mars helicopter 'Ingenuity' operating near 2.3GHz on its 45th flight as I type. How fantastic is that reality! However, if it lands below the mobile base, it is simply lost apart from unpredictable terrain dependent diffraction scatter. On Mars that is easy to do because of the weak beam bending due to the sparse atmosphere compared to the Earth, as illustrated in figure (1) if you imagine the slope as nearly vertical. It is vertical on most of the moon (however it does have polar ice so some vapour there). So, microwave propagation understanding including diffraction is critically important.

Fig. 5: Readily available (free) software allows predicting the path and modelled losses between places, supplied by G8DJF. Shown first using earth curvature between G3WRT and G8DJF ~ 100 miles @ 144MHz.

variable variations to be expected as illustrated in the last sketch.

Sea Paths

A sea path is clearly going to be different to a land-based microwave path simply in terms of humidity. On the East coast of England ducts frequently occur across the sea allowing long distant microwave communications. A duct can occur where the bending of the EM wave has the same curvature as the earth. Also accompanied with frequent anomalous radar re-



flections from boats/ferries across the North Sea. The conditions (ducts) all dissipate over time but can last for many hours/days especially over the sea, usually in a high-pressure

region. Fog is particularly evident on such occasions (highly dense) before it dissipates and can then result in long distance microwave communications.

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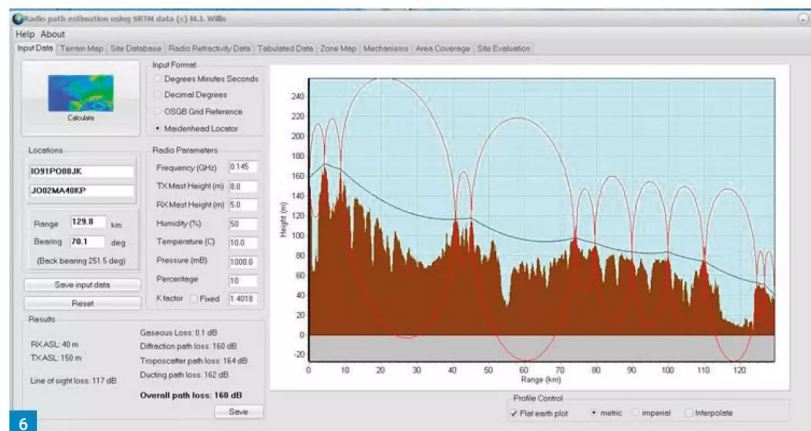


Fig. 6: Or corrected for earth curvature. The red lines are the Fresnel zones or the diffraction scatterings involved. What fabulous free, sophisticated software.

Fig. 7: The Parabolic equation method, with enough RRI data (usually obtained by measuring balloons) can allow modelling such as is illustrated here. Depending on hills and gradients.

Fig. 8: Fresnel zones encompass all the reciprocal energy transfer and 90 % is in the first 3D volume. This is why it is important to avoid obstacles in this 3D space at microwaves. So, antenna height is centrally important to avoid obstacles. Otherwise, diffraction scatter governs and that is typically -20dB and more relatively. RRI beam bending and Earth curvature must also be accounted for in this planning or at least an awareness of it.

Fig. 9: This is what a real rain fronts at ~10GHz can produce in terms of RRI enhancement in three polarisations (V, H and C), followed by scatter and then rainfall attenuation. It is obviously complicated. Not the least compounded by ground reflections and antenna co-polar and cross polar characteristics. The RRI enhancement ahead of the rain is however obvious. Interestingly it also occurs after the event indicating the turbulence occurs at both ends of the event or by a following much lighter rain event.

Fig. 10: Rainfall attenuation on a terrestrial path – scatter from the front. The heavy raindrops, which are larger, usually lead the way. They have the bigger scattering albedo. Always combined with RRI turbulence. Note to avoid severe loss of rainfall on the antenna feeder (window) they are inverted in this offset front fed antenna, which avoids the aperture blockage of a Cassegrain but adds the inconvenience of the Tx/Rx hardware mounting. My 40GHz system employing a Cassegrain antenna minimises feeder loss at the expense of aperture blockage and subsequent loss of gain. Fig. 11: A Cassegrain antenna characteristic including associated Co-polar and Cross-polar sidelobes. The actual radiation pattern is far more complicated.

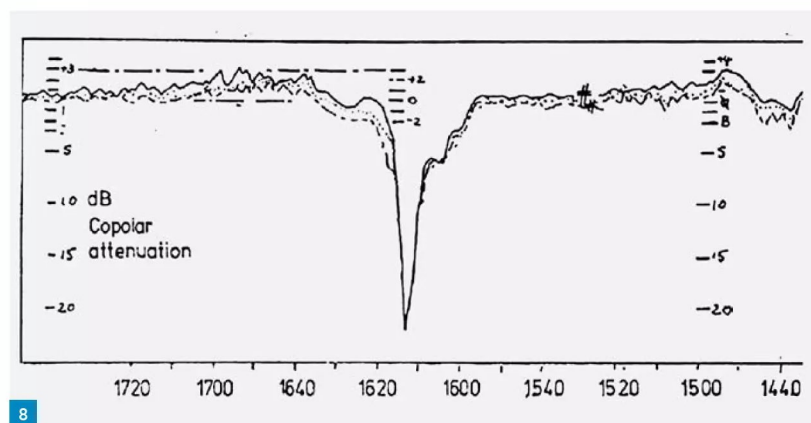
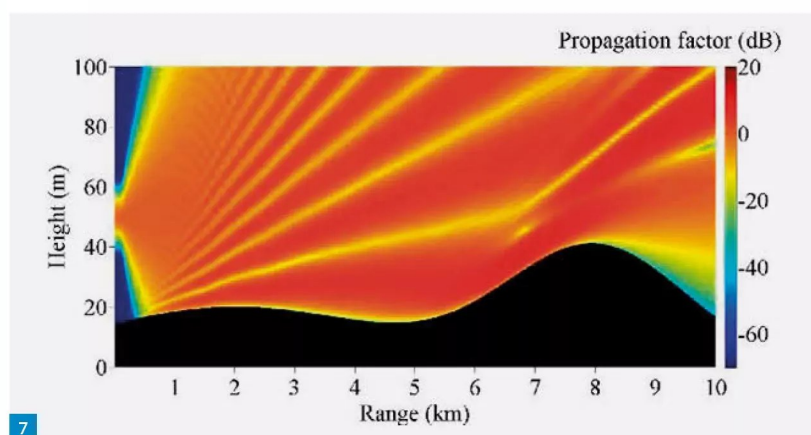
Fig. 12: The new Icom 106GHz unit. It is clearly not very well protected from the weather.

Rainfall Attenuation and Scatter

The illustration in Fig. 10 shows a typical high intensity rain event. Radiation scatter from the front, significant attenuation through it. The albedo of raindrops is strong at microwave frequencies, especially from larger raindrops. The key thing to note is it is a very transient phenomenon. It is always mixed with very strong RRI turbulence, which severely complicates interpretation. Rain scatter or RRI? Or most probably both as illustrated in Fig. 8. I knew one radio amateur, now SK, who spent days and weeks waiting for a rain scatter/RRI event!

Diffraction Scatter

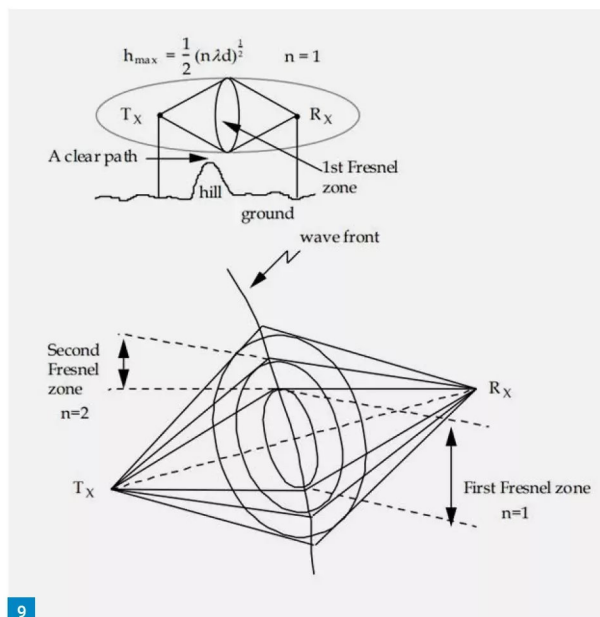
Diffraction scatter is an ever-present interaction between EM waves and the local topology, structures and terrain. It is by no means to be ignored. It can be important, but it is usually at a much



Troposphere Anomalous Microwave–VHF Propagation

There are frequently occurring occasions when the density of the atmosphere does not decrease with height as illustrated in Fig. 1. Given the curvature of the earth such conditions can result in long distance microwave propagation or indeed very shortened than wished for propagation (as will be the case on Venus with its very dense atmosphere). Of course, this is relevant to our many micro-

wave links worldwide, terrestrial and satellite. The design criteria and antenna diversity are becoming increasingly important with climate change. Fig. 5 shows the earth curvature for a link and the flattened earth and the Fresnel zones (only 144MHz for illustration) and Fig. 6, which are relevant but hardly introductory. Fig. 7 illustrates what the parabolic equation method can offer in terms of propagation prediction, with sufficient RRI versus height data from a Radio Sonde balloon!



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lower level, say ~20dB below other propagation effects, depending on wavelength, and the scattering object size in terms of wavelengths and the associated Fresnel zones.

Fresnel Zones

The energy (mass transfer! – yes, it is mass transfer as Einstein showed) in a communications link is 90% contained in the first Fresnel zones as illustrated in **Fig. 9**. This is why it is important to elevate a microwave antenna to avoid obstructions and resultant losses. It is I hope self-explanatory. Trees do however grow, a factor to be noted in link planning!

Trees leaves and foliage

Trees and their leaves very strongly interact at microwave frequencies (and above). I first experienced this reality by going out with my 10GHz Kuhne transverter portable and a relatively small TE10 mode horn (+25dBi) antenna. It was shockingly educational to hear the summer backscatter from the first place I set up, admittedly in a wooded river Orwell estuary area! I soon realised it was rather optimistic of me. This was with 200mW at 10GHz and even at that power I detected overwhelming backscatter. The bottom line is trees and leaves are very seriously incompatible for microwave operation once they become anywhere near the Fresnel zones. It also pays to remember that the sidelobes of reflector or Horn microwave antennas are usually quite poor (say ~10dB) so their contribution can be seriously significant irrespective of the main lobe even ignoring the cross-polarised components as illustrated in **Fig. 11**. Imagine the reality and the complication if I had actually added co-polarised sidelobes to this illustration. An edu-

cational but useless communication experience and do not expect your local contact people (on the cellular phone in this instance) to understand. You are on your own, as I discovered. In this case at 1296MHz talk back and 10GHz, both unsuccessful. This illustrates that commitment is required on both ends of a microwave link. They are never casual events in my experience.

Aurora

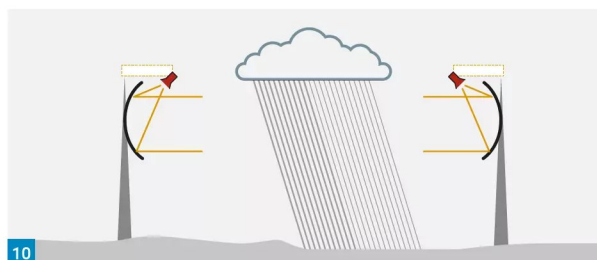
Particles from the Sun can result in highly energised ionisation that can extend influence on the lower microwave frequencies but are outside the scope of this introductory article. They do not happen very often. Almost always in 11/22-year cycles. A very short time indeed cosmologically or indeed in a person's lifetime.

Millimetrewave and above to THz

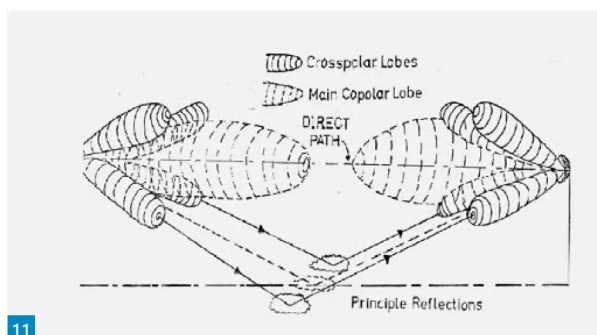
I restrict myself to microwaves here but the terahertz region is an area where medical advances are certainly very possible to help humans. Not though in communications, which apart from outer space is a waste of time terrestrially apart from the optical THz window. Molecular resonances in the atmosphere are the significant objects. If anyone wants more, then do let the editor know. I will be delighted to expand on these aspects. They are relevant and interesting.

Future Microwave Hardware and Requirements

I have a Kuhne 10GHz to 144MHz (G3) transverter and I can highly recommend that hardware, which can be GPS slaved at 10MHz and once weatherproofed is light and readily mounted remotely but that is no easy task. The new (2023) Icom IC-905 incorporating 10GHz, as an op-



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11



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tion, **Fig. 12**, is certainly a new bit of expensive kit to consider although I have no experience. I would however comment that in a British climate I would be majorly reluctant to place my Kuhne transverter at the external antenna outside for any time. There are too many dissimilar metals involved and frankly it is not designed to do that task. So, a professional unit, by Icom, I expect to be a far better practical proposition – but it is still amateur in its market. My ~40GHz (Tx and Rx) units have professional and temperature-controlled sealed boxes with Cassegrain antennas as illustrated in **Fig. 13**. In warmer climates a cooling (Peltier) system will also be required. The characteristics of these antennas mean that sidelobes always illuminate the Earth when used terrestrially as illustrated in **Fig. 11**, which is why it is necessary to minimise these sidelobes by good design – rarely the case for simple front fed reflector antennas. The Kuhne transverter would be fine inside those relatively expensive

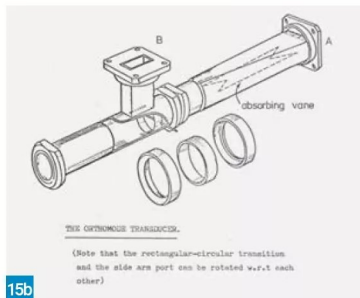


Fig. 13: These are temperature controlled (40GHz) enclosures, Tx and Rx bistatic I used as CW bistatic radars and really if you are to place these outside, that is what is actually required. Slaving to GPS is yet another problem. It is not expensive or difficult but just requires thought and after all a free resource in the sky. But for temporary/portable operation much more convenient and cheaper things are possible. But you will likely end up frustrated because point-to-point microwave communications demands accurate antenna pointing and above all frequency accuracy. That is probably the best-selling point of having a panoramic spectrum display. Microwaves/Millimetre wave are relatively expensive compared to HF if done well and to produce repeated results. Note that long term 'poisoning' of the semiconductors can occur in monolithic mmwave hardware designed to produce milliwatts of power so 'surplus' items are not necessarily what they might seem. This is what is actually required for mm waves operation, in this case +40GHz and the antennas then become sensible sizes and manageable. Whereas 10GHz reflector antennas of equivalence are much less manageable but far cheaper! Also do not forget the tripod mounts (In this case BBC Broadcasting surplus) required and probably motorised azimuth and elevation panning is the way to go given RRI dynamic changes.

Fig. 14: Typical rear view of a Icom IC-905 arrangement and multi frequency offset front fed antenna compromise.

Fig. 15: An alternative to a Tx/Rx mechanical relay? an orthomode transducer (OMT) ~50dB isolation at best on orthogonal polarisations. Designed by me. It would demand a total change in amateur operation but result in a cheaper high power X band setup. TE10 mode to TE11. A way to avoid high power 10GHz relays.

enclosures. Long term, outside, they are certainly required and very worthwhile in expenditure. The Kuhne series are built in cheap tin-plated enclosures, and also are now being produced in milled enclosures by the new South African owners. The former is certainly not suitable for outside exposure.

GPS Locking

GPS locking/slaving of microwave oscillators is a key requirement in 2023. Although the IC-9700

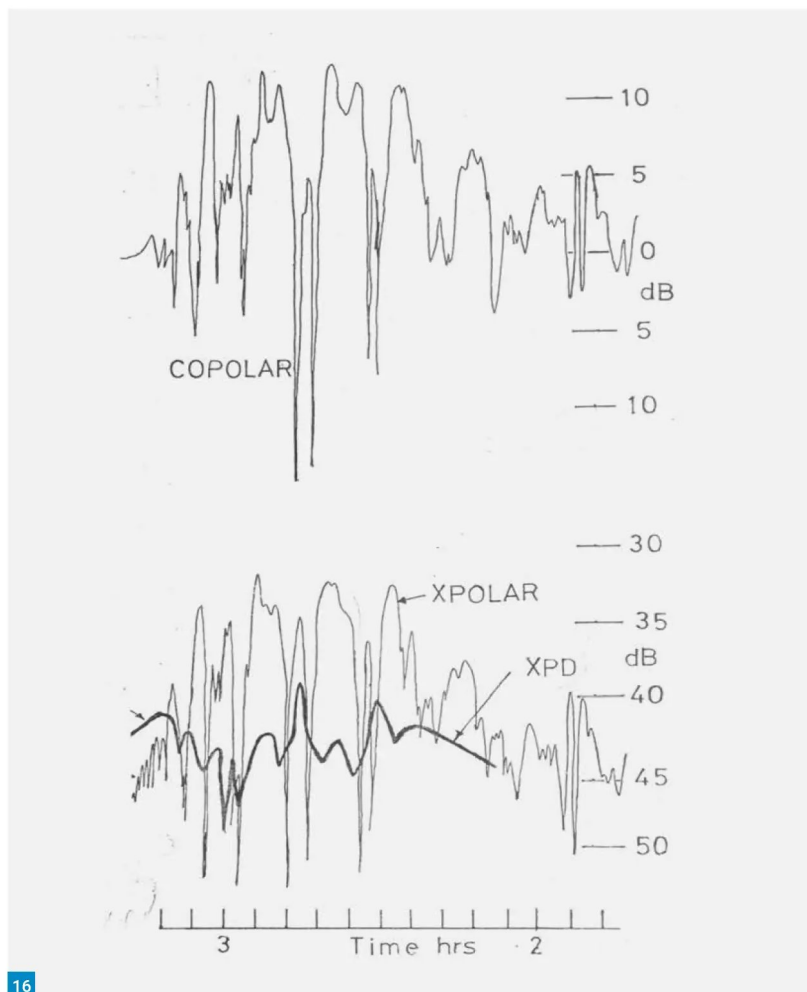
does not incorporate GPS slaving of its local oscillators the new IC-905 does. This is a significant advance and advantage and it does include the 10GHz option according to Icom UK. Fig. 14 illustrates the 10GHz hardware and connectivity.

Not for the Faint Hearted!

Microwaves demand a lot of effort compared to an HF (wire antenna) operation. Plus, a location with no trees in the way. Even the above with a remote head unit. All this requires effort,



determination and is not for the faint hearted. Then you will also undoubtedly, eventually, realise you need a remote PA 'bolt on' and the associated power supply together with associated RF cabling. The IC-905 option is quoted as 500mW at 10GHz. Plus, far more importantly and practically a relatively high-power microwave transmit/receive relay – they are becoming available at sensible power levels and low insertion losses albeit having to design one's own microstrip mounting because packaged UT141 are relatively lossy and rather expensive. Then add to that robust weather protection and even internal temperature control. Which is why many avoid that and have separate antennas but that just simplifies and also complicates, having to have two antennas but it can allow a (CW) doppler bistatic radar tool as shown in Fig. 13. The waveguide orthomode transducer (OMT) arrangement illustrated in Fig. 15 offers a way forward here with ~50dB isolation, but serves to illustrate the level of involvement you can end up making. In this case the use of orthogonal polarisations, yet to be exploited on the air and even yet less to be adopted. You are warned, but microwaves opens up another fascinating world. I have not even mentioned monitoring the hydrogen resonant line (1420MHz), which is another interesting aspect of microwaves to explore. It is not all about amateur radio communications. Fig. 16 illustrates a measured anomalous propagation event in two linear orthogonal polarisations at 10GHz. In Fig. 17 the overall wide spectrum is illustrated and is significant by the oxygen



ig. 16: This illustrates a measured (real and true) ~10GHz extreme RRI event over an hour or so. 10dB enhancement over clear air propagation is very unusual and likely due to antenna characteristics as illustrated in Fig 11. This is two polarisations (V and H) and their cross-polarisation discrimination (XPD). This is likely a good way to avoid a high-power X band Tx/Rx relay by using orthogonal polarisations and an OMT.

Fig. 17: The microwave absorption spectrum, dominated by rainfall. Then broadly at ~60GHz by oxygen dipole. Note the resonance of water vapour at ~23GHz again broad, and the dominance of rainfall flooding out molecular resonances because of the significant albedo of rainfall. As a result of a very broad drop size distribution compared to the wavelength and the volumetric resonances.

Fig. 18: A xtal controlled 2m 6146 PA circa 1970, with NBFM modulator (left). The 2 x 807 AM modulator is far bigger. Both are for sale!

resonance at 60GHz. But note rainfall albedo dominates all of these resonances over a very wide frequency spectrum to 350GHz because of the 3D raindrop size distribution and microwave interaction.

I recently had an HF (40m) contact with someone who started with me on VHF in ~1967. After 50+ years no less! We are now separated according to Figs. 5 and 6. I decided to try again on 2m AM. For nostalgia. He did not. We will see. Which will likely embarrass him by several dB and his IC-9700 compared to my 55-year-old homebrew 6146 PA and 2 x 807

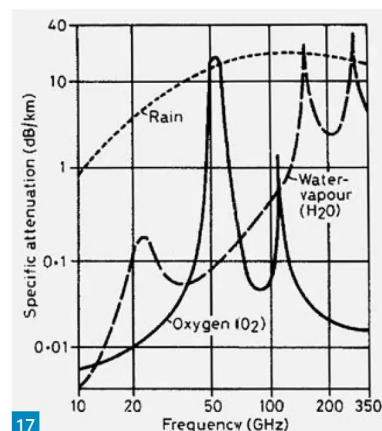
modulator (none of which is 12V) and about four times larger and far heavier, **Fig. 18**. How interesting is that for real actual progress? And it does indicate the real progress we are making. Interestingly the power supplies are nearly the same size. Progress is much slower than we tend to assume. Even on 2m AM or the Creed teleprinters we used then and the print copies I still have in my logbooks. The simply splendid logic based AFSK design he produced with G30UV (SWM Jan. 1972), which avoided the problem of frequency drift and FSK at VHF and above. I mention this to illustrate that path

Radio Refractive Index

The refractivity 'N' depends on the pressure P(mb), the temperature T(K) and the water vapour pressure e (millibars):

$$N = 77.6 P/T + 3.73 \times 10^5 e/T^2$$

The relationships are meteorologically complex. However, the result is that the radio transmission is bent down or upward by an amount that depends on the rate of change of 'N' + and - with height. A launched Helium balloon (Sonde) plus sensors and associated telemetry or storage can measure 'N' accurately. In Fig. 1 I have also used the more traditionally accepted density symbol Greek neta in a correct but less convenient expression of the relationship.



profile and very much more than that he, G8DJF, kindly provided, in terms of tools, are available on the web now.

We have a long way to go to fully understand radio propagation. Mars, Venus, the Earth, and the moons of Jupiter. On the Earth's moon to thoroughly understand diffraction scatter in that environment will become very important quite soon. Jupiter and more relevantly its moons will be yet another aspect altogether - so many sferics there for example but that is far beyond Mars for humans and probably several centuries ahead in reality. **PW**



Joe Chester M1MWD
m1mwd@gmx.com

Testing, Testing, Testing

Joe Chester M1MWD gets started on his mission to be completely self-contained!

While waiting for the new equipment to arrive, I 'reactivated' a dead laptop, and got to work with the software. I read almost everything I could find online about various data modes, and watched YouTube videos too. I immediately eliminated JT65, which is mostly used for Moonbounce and other exotic experiments. But it still left a long list of modes, and associated software. Of course, FT8 was easily top of that list.

I never had much interest in data modes, much preferring chatting on SSB. But a recent dinner conversation added an interesting observation, which had not occurred to me before. We were discussing 'keeping in touch', generally, and I said I preferred people to just call on the phone. Which caused shrieks of amusement around the table. "No one phones any more" was the summary, delivered through wide grins. "It's all text and internet messaging these days". Now I knew this to be true, and indeed I do text and message. But I hadn't carried this over to my radio operating. The point being that FT8 is rather the radio equivalent of texting? Not completely; the range of messages is much

curtailed, compared with texting, but the general principle is the same. We live in the text and messaging era. Busy people, with complicated lives, much prefer the asynchronous nature of data communications. And as I have said elsewhere, we, as radio operators, cannot push back the clock.

Getting Going with FT8

Getting FT8 up and running is no great enterprise. Download the software, enter a few details in relevant boxes, select the rig from a drop-down list, and audio interface to match the sound card, and that's it. The problem was the need for an antenna in order to do a full test. I have outside antenna restrictions here (they even state 'no wires'), so casting around for a solution, my eyes fell on the pair of counterpoise wires from the AX1. I dug out a binding post adapter, and strung the two wires around on the top of the wardrobes. Unbelievably, I got

matches on several bands with 10W from the IC-7300 and the manual tuner. With an indoor random piece of wire. Nice! Which was enough for me to get FT8 up and running. Ticks a box on the project list!

FT8, in a way, performs a similar role to WSPR, in that it indicates that the radio is receiving calls, and from where these stations are calling. Unlike WSPR, you can exchange signal reports, but not much else. **Jordan Sherer KN4CRD**, a relatively newly licensed operator at the time, saw this as an opportunity. He rewrote FT8 to allow for more elaborate QSOs. He calls this JS8, and the app is called JS8Call. While doing this he also added some interesting extra features. One of which he calls Heartbeat - a fully automatic feature, which responds to check calls. If someone sends a heartbeat message, anyone else on frequency who hears the call responds automatically with callsign, locator and signal strength. So, this was the next piece

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Fig. 1: Lots of toys, old and new!

of software to get running. And it has lots of other interesting features too, to which I will come back.

The software is very similar to FT8, with similar screens, and boxes to fill. After dinner one evening, I power it up, set it to 7.078MHz, USB (not NOT LSB!), and see nothing. After a few minutes I trigger the Heartbeat (a box clearly marked HB), and the 7300 goes into its transmit-listen and decode cycle. Less than a minute later I get a message from two stations, AD2KOW/P and RV1AN in KO59DW. Again, 10W with a piece of wire thrown over a wardrobe. I reply to both with their signal strengths. But I accidentally trigger an interesting feature. It says "message to RV1AN, ready to send". Jordan calls it store and forward. Which harks back to my early days pre-Internet, and the testing of various store and forward technologies. This store and forward feature allows JS8 users to reach beyond their immediate propagation range. Imagine it! Working stations you can't hear! It works like this. I can use JS8, in HB mode, to find out who is hearing me. I can then in turn ask them directly who they are hearing. I can even send out an @allcall message, to ask if anyone is hearing a particular callsign. With this information, I can then send a message, addressed step by step, to a callsign which I cannot hear or contact directly. This message gets stored on the intermediate user's JS8 app, and is relayed to the next user in the chain when they come on air. Extraordinary! Jordan has invented the amateur radio equivalent of a store-and-forward network (yeah, been there done that Pactor thing ages ago – but this doesn't need a TNC!). Amazing! I look forward to getting out portable, with a decent antenna, and using these features more fully.

Of course, this says nothing about the obvious inefficiency of my antenna, and everything about the power of **Joe Taylor's** weak signal algorithm to pull even extremely marginal signals out of the air. But that's two items ticked off on my worklist. Next on the software list is PSK and RTTY. And then happy news. My IC-705 is scheduled for delivery today. And the new tablet PC. Christmas – is it last year late, or an early this year?

Coming Together

A careful unwrap, keeping all the various bits of packaging, and there it is, my new IC-705. So, push in the battery, connect to a power supply, and to my 'wardrobe' antenna. Its 1930UTC. The 14MHz band powers up. And the waterfall shows a large signal on 14.252MHz – it's our old friend **S57DX, Sasko**, booming signal. He is working DX, at a station a minute. Just plain poor practice to tie him up trying to hear my 5W

from that piece of wire. So, I didn't try to call him. Then switch to a VHF rubber duck, switch to 145.600, and there is a chat in progress on the local repeater. Tick another box. I also add the Windcamp RC-1 antenna adapter to the radio, to add a vertically-mounted SO239 socket. This is to avoid stressing the BNC socket on the side of the radio – all antennas will get attached to this adapter.

By the way, I was pleasantly surprised to see that the radio was supplied with the rather excellent 3150mAh BP-307 battery, instead of the original one with half that capacity. And with charging via a USB-C connector; so out /P my small Tecknet 15000mAh power bank will keep the operating battery charged up nicely. I have an SD card with UK repeaters, so it's a moment's work to put it in the slot and load up the repeater frequencies. A small negative – I had to get tweezers to get the card back out; the slot is wedged in behind the front panel overhang; very awkward with 'thick' thumbs! But a nice feature is the screen display switching off to save the battery power. I checked the firmware, and it is up to date. It was good to know that the transceiver had survived its 10-day sojourn in the hands of the delivery companies.

By comparison, as a Windoze neophyte (after all these years), it took several hours to get the tablet PC up and running. It looks a familiar system, but Windows 11 is nothing like MS-DOS (hihi), and the manufacturer has his own views of what people using these tablets should be doing with them. So, it was constant web searching to find out how to turn off the bloatware that came with the thing ("we notice that you haven't logged into our game center, please do so now to avail of a reduction in the subscription fee", and many more similar), and update software, and drivers etc. I'm not done. It seems that because it's a PC, the assumption is that it is a multiuser PC. It's not. It's mine. So, I have still not succeeded in getting the thing to stop asking if I want to set up another user account, or to boot up without having to enter a password. But I got WSJT and JS8Call installed before I gave up for the night. Nearly there.

What's Next?

Next up, the challenge of D-STAR. I am up and running on DMR, so I'm hoping that this will help somewhat. However, I can't really get started until my callsign is registered with the D-STAR system. Which, currently, for UK operators is a manual process run by ICOM UK – i.e. I have to send them an email and wait until this process is completed. US operators can apparently register themselves. And I am also waiting for a CD to arrive from an ICOM vendor with the ICOM remote operation software. But there is another and cheaper solution for this, which I will tell you about next time. **FW**

NEWS EXTRA



SWAINS ISLAND DXPEDITION: Ronald

PA3EWP sends information about this forthcoming activation of a rare one.

After many years of preparation, it is time to go on a DXpedition to Swains Island. Our first attempt was 2 months before Covid, so we had to cancel our plans. After two years when the borders opened again but we had some trouble to charter a ship. But finally, it happens! From 4 to 17 of October we will be active from Swains with a team of ten operators from Germany, the Netherlands and the USA using the callsign W8S.

The plan is to run four stations simultaneously 24 hours a day from two different camps. Two additional stations are available at each camp for the operator that still likes to operate or the scheduled operators can do FT8 on the third station.

The camps are located about 500m apart on the beach with a clear view to Europe, Japan and North America. We are active in the modes: CW, SSB, RTTY and FT8. The plan is to operate simultaneously on certain bands with two stations. QSL cards go through our QSL manager **Charles MOOXO**. We will try to upload our logs daily via satellite to Club Log, where you can get very valuable information about propagation.

www.swains2023.com

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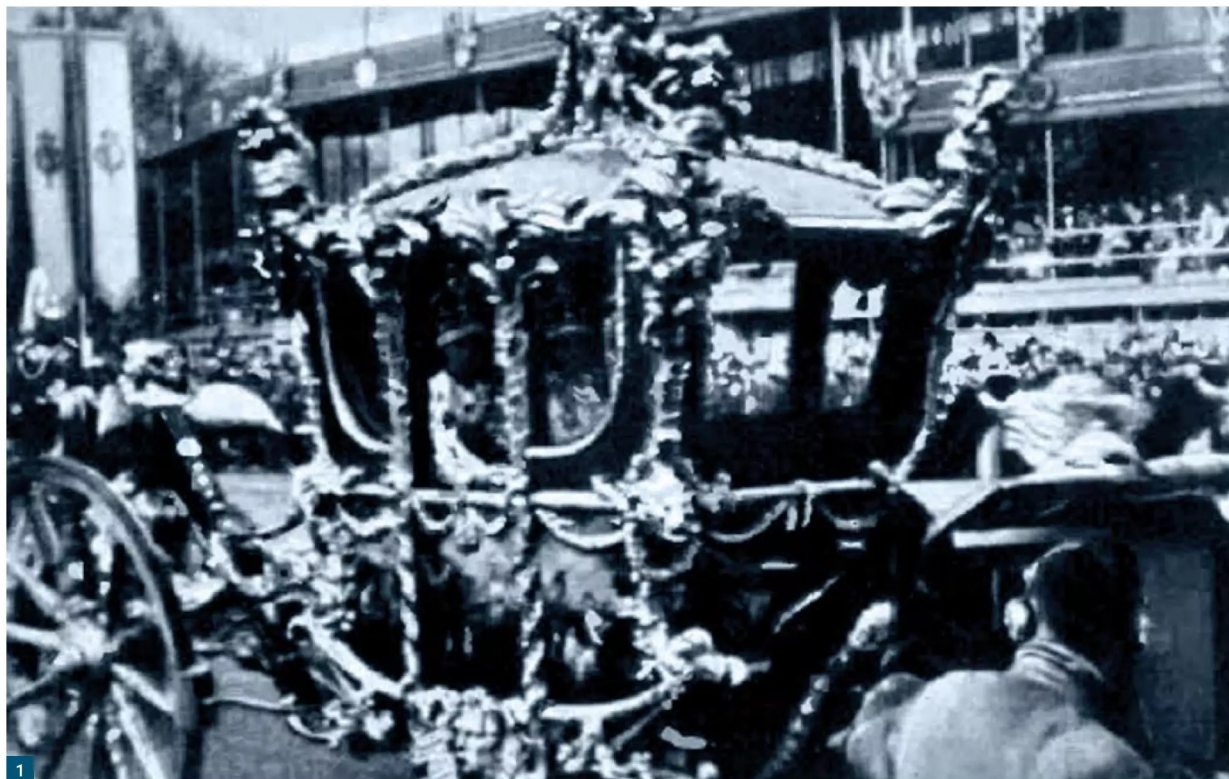
Swains2023

We would like to thank everyone who has already made a financial contribution and we appreciate that very much. During the preparation phase of this DXpedition we have the largest costs, and most of the costs will be paid by the operators themselves. Our main sponsor is currently the German DX Foundation (GDXF), along with the European DX Foundation.

The photo shows team members visiting the CDXC stand in Friedrichshafen in June.

See you in the pile-up!

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BBC Coronations (Pt V)

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. Also featured are the continuing sagas of the BBC Cymru-Wales Centenary and 100 years of BBC Scotland-Alba. And we continue the series about the development of Swiss Radio and Television since 1933, turning our attention to the start of colour television in 1968.

Keith Hamer

Keith405625.kh1@gmail.com

Garry Smith

Garry405625.gs@gmail.com

Televising the Coronation of **King George VI** and **Queen Elizabeth** in 1937 was an extremely important landmark in the history of the *BBC Television Service*. The BBC's mobile television unit, making the first 'true' television outside broadcast, enabled viewers to enjoy, in the comfort of their own homes, the spectacle of the Royal procession, **Fig. 1**. The television pictures of the King smiling as his carriage passed by the cameras captured the imagination of the viewers and of the Press, who declared it "the supreme triumph of television to date".

Before the Coronation, a number of outside broadcasts were transmitted from the grounds of Alexandra Park, but these were limited in scope due to the comparatively short lengths of *Emitron* cable used to connect the site with the station control room. Viewers were treated to exciting demonstrations of golf, archery, sheep-dog trials, horses, model aeroplanes, locomotives, a boxing match, and anti-aircraft guns in action. A lot of useful experience was gained and the broadcasts were classed as "successful experiments".

There was only one break in the whole of the Coronation Service. This was at the most solemn moment of the *Communion Service*, after the *Sanctus*, during the *Prayer of Consecration* and the *Communion of the King and Queen*. All the microphones in the Abbey were intentionally switched

off. The sound was replaced by a choir in St. Margaret's Church singing a Communion hymn.

Vintage Coronation Wireless Equipment

This month's wend through vintage copies of ragged newspapers and magazines has divulged an advertisement for the *Murphy Supersonic Heterodyne Console*, which was produced just in time for the Coronation, **Fig. 2**.

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 *Murphy Console*, originally featured in an advertisement dated May 1937:

"BETTER REPRODUCTION

Like snatching aside a curtain.....you did not realise was there!

OUR engineers will tell you that we have managed to improve reproduction still further in the new Murphy Console by a lot of technical improvements – flattening out the response curve, for instance – extending the upper and lower registers and lowering the bass resonance to 45 cycles. They will explain that we are using an improved output valve and a special cross-braced cabinet – and when they have finished most people will be just as wise as when they started. What matters to you is the result, and I can tell you that the result is very good indeed. The trouble with this set is that it 'spoils' you. After you have listened to it for a bit you realise for the first time that your present set seems 'muffled'. I can best

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Fig. 1: King George VI and Queen Elizabeth passing by one of the BBC television cameras on 12 May 1937. Fig. 2: An advertisement in May 1937 for the *Murphy Supersonic Heterodyne Console*, manufactured just in time for the Coronation. Fig. 3: The Swiss monochrome monoscopic test card was radiated in 1968 with a set of superimposed colour bars. Fig. 4: A caption announcing in German, French and Italian that a colour test transmission was about to be radiated by the Swiss +PTT. Fig. 5: An example of one of the test slides radiated during a test transmission for colour in 1968. Fig. 6: The opening ceremony of Swiss colour television on 1 October 1968, was attended by Marcel Bezençon, Roger Bonvin (robed), André Guinand, and Fritz Locher, together with four young lady announcers.

explain the effect it has on most people by saying that it sounds as if a curtain (which you have never realised was there before) has been snatched away from in front of the orchestra or speaker, and the atmosphere of the studio seems to be brought right out into your own room. It is a fact that I have never heard any other set generally available to the public that has such good reproduction.

E. J. POWER

NEW MURPHY CONSOLE

Supersonic Heterodyne receiver with extraordinary fine reproduction. New Alphabetical Tuning Scale and Cathode Ray Indicator for easy and accurate tuning. Variable Selectivity. Noise Suppression between stations. Very beautiful Cabinet in figured Walnut and straight-grained Elm.

£17. 10. 0

Other models include:

Mains Table All-Wave Superhet with Alphabetical Tuning, £15. 10. 0.

Mains Table Superhet with Alphabetical Tuning, £11. 10. 0.

Mains Table Superhet, £8. 5. 0.

Battery Table Superhet with Alphabetical Tuning (excluding batteries), £10. 15. 0.

Battery Table 'Straight' H.F. Receiver (excluding batteries) £6. 10. 0.

HIRE PURCHASE TERMS ARE AVAILABLE ON ALL MURPHY SETS

All Murphy sets, exclusive of valves and batteries, guaranteed for a year. Prices do not apply in Irish Free State.

Murphy Radio Limited, Welwyn Garden City, Herts."

This glowing description by a seemingly unbiased person would probably tempt people to buy one of the Murphy radios on offer, especially because of the features, including *Supersonic Heterodyne*, an *Alphabetical Tuning Scale*, *Variable Selectivity*, *Noise Suppression* and the futuristic *Cathode-Ray Indicator*, not forgetting the beautiful Cabinet in figured Walnut and straight-grained Elm.

However, perhaps everything wasn't quite as it initially appeared. The person putting his name to the brand of radios was **Edward J Power** who just hap-



BETTER REPRODUCTION

Like snatching aside a curtain

..... you did not realise was there!

OUR engineers will tell you that we have managed to improve reproduction still further in the new Murphy Console by a lot of technical improvements—flattening out the response curve, for instance—extending the upper and lower registers and lowering the bass resonance to 45 cycles. They will explain that we are using an improved output valve and a special cross-braced cabinet—and when they have finished most people will be just as wise as when they started. What matters to you is the result, and I can tell you that the result is very good indeed. The trouble with this set is that it “spoils” you. After you have listened to it for a bit you realise for the first time that your present set seems “muffled.” I can best explain the effect it has on most people by saying that it sounds as if a curtain (which you have never realised was there before) has been snatched away from in front of the orchestra or speaker, and the atmosphere of the studio seems to be brought right out into your own room. It is a fact that I have never heard any other set generally available to the public that has such good reproduction.

E. J. POWER

Other models include: Mains Table All-Wave Superhet with Alphabetical Tuning, £15. 10. 0. Mains Table Superhet with Alphabetical Tuning, £11. 10. 0. Mains Table Superhet, £8. 5. 0. Battery Table Superhet with Alphabetical Tuning (excluding batteries), £10. 15. 0. Battery Table 'Straight' H.F. Receiver (excluding batteries) £6. 10. 0.

HIRE PURCHASE TERMS ARE AVAILABLE ON ALL MURPHY SETS

Murphy radio

2 Murphy sets, exclusive of valves and batteries, guaranteed for a year. Prices do not apply in Irish Free State. Murphy Radio Limited, Welwyn Garden City, Herts. Welwyn Garden City, Herts. C. R. Gannon 677

pened to be one of the two people who originally established the *Murphy Radio* company!

Known to his friends as Ted, he was born in 1899 to Irish parents in Clonfort, County Galway. He lived on the family farm until 1907 when his father, an army sergeant, was transferred to mainland Britain. His parents separated, and in 1910 his mother took the family of four children to Manchester. The use of Morse code to arrest the infamous **Dr Hawley Crippen** on-board the transatlantic liner, *Montrose*, on 31 July 1910, and subsequent return to the UK on *SS Megantic*, sparked the young boy's imagination. He was convinced that radio was the thing of the future. As soon as he left school, he enrolled on a short private course to study radio, and then, still aged only sixteen, joined the navy as a wireless opera-

tor. Over the next few years, he continued to study and gained practical experience of radio while at sea, before setting up as a manufacturer of crystal sets and transformers.

In 1924, he married a young wigmaker and apprentice hairdresser named **Irene Bevan**, known always as **Rene**, with whom he was to have four children. For a period, he worked as chief engineer for *McMichael Radio*, but then left to establish his own business in Slough, repairing radios and manufacturing inexpensive wireless receivers.

In 1929, he decided to join an old family friend, **Frank Murphy**, in setting up a new manufacturing company. Unlike Edward Power, Frank Murphy had very little practical experience of radio manufacture but believed that he could break into the market by producing reliable, competitively priced

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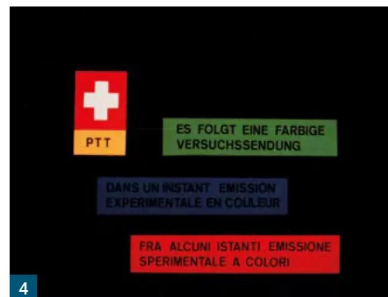
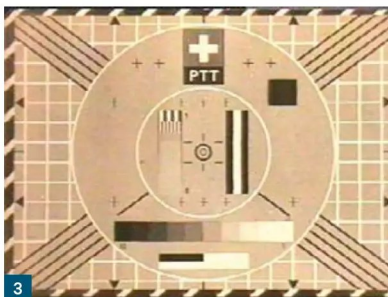
sets that performed well and were, above all, simple to operate. *Murphy Radio*, in which Edward Power was a partner and chief engineer, was pioneering in its overall business strategy, engineering and cabinet design. Every aspect of the company's activities – from the layout of the factory at Welwyn Garden City to even the design of the cardboard boxes used to package the wirelesses – was scrutinised in minute detail and evaluated by the two entrepreneurs in the firm's early years. In addition to the factory in Welwyn Garden City, a manufacturing facility was established in Islandbridge, Dublin, Éire. By 1933, the company employed 500 people and manufactured around 33,000 wireless receivers each year.

Following Frank Murphy's resignation, Edward Power became chairman of the company in early 1937. Under his guidance, the firm prospered and retained its reputation for good-quality engineering and innovative design. In 1938, their '46' *Table Model* cost £9.15.0, the equivalent of around £500 today. It was marketed as a 'moderate price' model, despite its significant price tag. The tuning scale featured the names of over 50 of the principal short, medium and long-wave stations on its three-colour display. Its design included a rounded, tapering cabinet and an oval-shaped loud-speaker aperture with a narrow white surround. It was veneered with contrasting French walnut and black walnut.

During the Second World War, Murphy Radio entered the field of military communication, developing high-performance radar valves. After the war, the company went on to design and build equipment for use by the British Navy, principally the 'B40' series. Thereafter, its electronic division continued to produce military, as well as medical and acoustics equipment.

The company decided to enter the post-war television market in 1948. The company was floated on the stock market in 1949 and Edward Power became a very wealthy man. By 1955, a factory had been established in Bessemer Road, Welwyn Garden City, to manufacture television receivers. The site was expanded in 1959. By 1962, however, he was convinced that television manufacturers had to combine into fewer, larger units, and he allowed the *Rank Organisation* to buy control of the company. Murphy Radio effectively became merged with the, then, highly respected *Bush* brand-name. The newly merged company became known as *Rank, Bush, Murphy*. Television and radio production was discontinued in 1964 when the company expanded into electronics.

Prior to his career in radio and television production, he was a well-respected pioneer in the field of art, always searching for the newest and most radical avant-garde works that he could find in various locations around the world, including Paris, New York and London. Following his retirement, he devoted more time to collecting expensive and unusual works of art. Edward Power died in 1993.



BBC Cymru-Wales Centenary, Pt V

The first Welsh-language television melodrama series, *Pobol Y Cwm* (*People Of The Valley*), took to the airwaves on 16 October 1974. The programme centred around the residents of a Welsh-speaking agricultural community in the fictional village of Cwmderi. It was originally transmitted on BBC1 Wales and, briefly, throughout the UK on BBC2 with English subtitles in 1994. Other Welsh drama series such as *How Green Was My Valley*, starring **Stanley Baker** and **Sian Phillips**, were soon considered to be 'classics'.

BBC Wales launched its own web pages in 1997, with the *Bitesize* educational website starting in 1998. This offered bilingual educational resources for primary and secondary school students. In 2014, *Cymru Fyw* began publishing Welsh-language news reports and feature articles.

On 28 September 2020, *BBC Wales Today* (hitherto broadcast from Studio C2 at Broadcasting House in Llandaff, Cardiff) joined forces with the presentation and radio teams of *BBC Cymru Wales* at new headquarters in Central Square, Cardiff. The first bulletin from the building was coverage of the Welsh government's daily Covid-19 pandemic briefing.

One hundred years on from 13 February 1923, the BBC's *Director-General*, **Tim Davie**, and the *Director of BBC Cymru Wales*, **Rhuanedd Richards**, indicated that 2023 will see more content from Wales than ever before.

The Centenary coincided with the launch of a new BBC Radio 2 programme from Cardiff with **Owain Wyn Evans**. This was the first daily weekday programme on Radio 2 to be broadcast away from London-based studios.

Rhuanedd Richards, Director BBC Cymru-Wales said: "The BBC was the first media company designed to serve the whole of Wales and its impact on our country – its culture, its languages and its economy – has been profound."

"Originally conceived as a local radio station for Cardiff, the BBC in Wales has evolved into a national, bilingual digital media organisation producing content for Wales and the rest of the UK."

"Our investment in the creative economy has been a catalyst in making Wales a primary location for video production, and we are proud to be creating content in both the Welsh and English languages, which provides value for our audiences."

BBC Scotland-Alba Centenary, Pt V

Television in Scotland officially began on Friday 14 March 1952, using the 405-line system from the Kirk o'Shotts transmitter. Initially, all programmes came from London, but some with a Scottish flavour were made using an Outside Broadcast unit.

Between 1958 and 1967, one of the most popular programmes was *The White Heather Club*, hosted by **Andy Stewart**. The show featured traditional Scottish songs, country dancing, kilts and, of course, the skirl of bagpipes. At its peak, the



series attracted 10 million viewers from across the UK.

By 1962, there were plans to establish studios in Edinburgh and Aberdeen for television news interviews. Eventually, BBC Scotland were given permission from London to 'opt out' of the national network. When BBC2 arrived in Scotland on 9 July 1966, (having begun in London two years earlier), broadcasts began in monochrome on 625 lines using CCIR System I from the Black Hill transmitter. On 1 July 1967, BBC2 became the first European service to introduce PAL colour. A mobile control room allowed BBC Scotland to make their first colour programme, *Ring In The New*, for the Hogmanay celebrations in that year.

In 1971, BBC Scotland's Queen Margaret Drive Studio 'A' in Glasgow became one of the first regional studios in Britain to introduce colour television. In September 1998, *BBC Choice Scotland* was launched as the BBC Scotland's first digital service.

When BBC Scotland moved their headquarters to BBC Pacific Quay in 2007, state-of-the-art digital studios were built and a number of programme production departments, including Children's Television, were transferred from London.

By the mid-60s, television coverage had reached over 97% of the population and radio, 96.1%. The *Great Glen Chain*, a ribbon of links and transmitters across Scotland, indicated that the BBC were making an ambitious attempt to extend their services to outlying and thinly populated areas, despite it being a very expensive project.

Service Information: Switzerland, Pt VII

Colour television began in Switzerland on 1 October 1968. Prior to the introduction of colour, there were heated technical discussions as to which system should be adopted. When the BBC experimented with colour in 1958, the three main systems (NTSC, PAL and SECAM) were extensively evaluated. In 1965, officials and television engineers from 33 nations held a meeting in Vienna at the *Conference of the International*

Radiocommunication Consultative Committee (CCIR). There was no agreement as to which standard should be adopted within Europe. A further conference was held a year later in Oslo. Again, there was no overall agreement so it was left to each individual European nation to decide which colour system to adopt for themselves.

In Switzerland, the Federal Council entrusted all the technical aspects of television, including the installation of transmitters, vision links and certain studio equipment, to the *Direction Générale des Post-, Telefon- und Telegrafenebetriebe* (+PTT). The totally independent +PTT engineers evaluated the three colour television systems "unencumbered by industrial interests and questions of prestige", according to the +PTT Director-General, **Fritz Locher**. Following extensive tests conducted between 1965 and 1967, it was unanimously agreed that the PAL system, developed in Germany, should be employed. Test transmissions using PAL (Phase Alternate Lines) were particularly impressive in the Swiss Alps, where the transmission of television signals was a special challenge.

The adoption of the PAL system was formally agreed upon by the Federal Council on 15 August 1967. Unfortunately, this decision annoyed many inhabitants in the French-speaking *Suisse romande* region, consisting of the Jura, Valais (Wallis), Genève (Genf), Vaud (Waadt), Fribourg (Freiburg) and Neuchâtel (Neuenburg) Kantons, where viewers required dual-standard television receivers that were compatible with the SECAM system if they wanted to watch programmes in colour from neighbouring France.

In keeping with most television services around the world at that time, Swiss television stations radiated the test card when there were no scheduled programmes, **Fig. 3**. A set of colour bars was superimposed over the monochrome monoscopic test card. In addition, the +PTT and SRG also transmitted various test slides to demonstrate colour television, **Figs 4 and 5**.

Prior to the introduction of colour, +PTT engineers were kept very busy upgrading the television network and studios. It took less than two years

for most of the technical work to be completed.

The main transmitters at Mont Pèlerin, Chasseral, Bantiger, Jungfrauoch, St. Chrischona, Uetliberg, Albis and Säntis, together with relay stations throughout the country, were ready to broadcast in colour. In total, there were 120 transmitters capable of delivering colour television signals.

Colour television in Europe officially began on 1 July 1967, on BBC2. West Germany followed about one month later. Colour television soon became available in the Netherlands and France. When colour started in Switzerland from *Studio Bellerive* in Zürich on 1 October 1968, the Director-General of SRG, **Marcel Bezençon**, gave the instruction: "Technique, que la couleur soit!" ("Technical team, let there be colour!"). The launch of colour television was officially declared by Federal Council member, **Roger Bonvin**, who was head of the *Federal Department of Transport and Energy*. The opening ceremony was also attended by SRG Central President, **André Guinand**, Fritz Locher, and four young lady announcers who represented the official national languages in Switzerland, **Fig. 6**. Each announcer was presented with a bouquet of red roses by Roger Bovin. The programme, advertised as "an evening of colourful television", continued in the best Swiss federal tradition with productions from the four regions of the country. German-speaking Switzerland contributed a show called *Holiday in Switzerland*. This was a satire on tourism in the country. Ticino television presented *Il Laghetto di Muzzano*, an item about water conservation using the example of a small lake near Lugano. French-speaking western Switzerland broadcast a musical piece called *Le chanson de Fribourg*. Finally, for the Rumantsch region of Switzerland, there was an item about the artist, **Alois Carigiet**. He was a Swiss graphic designer, painter, and illustrator, perhaps best known for illustrating six children's picture books set in the Alps, called *A Bell for Ursli*. They were written by **Selina Chönz**. In 1966, he received the inaugural *Hans Christian Andersen Medal* for children's illustrators.

Télévision suisse romande broadcast their first evening programme in colour in 1968. The year was also the first where more than one-million Swiss households had a television set.

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

Stay Tuned!

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

Read more radio news and reviews at www.radioenthusiast.co.uk/news

Rob Dancy G3JRD

practicalwireless@warnersgroup.co.uk

We use a large vocabulary, and seldom stop to think how all the words and phrases arose. Here are a few of the ones we often use:

Electron About 3,000 years ago, the Greeks acquired amber, a fossil formed from pine resin. When rubbed with fur, it attracts small items to itself, as electrons are transferred, giving it a charge. Elektron was their name for amber, hence our word Electron. The ancient Greeks never found out why amber did this, clever though they were, so they turned their attention to **Helen** and the Trojan wars instead.

Electronics came into being when at the beginning of the 20th century valves were developed. Valves rely on a cloud of electrons around the heated cathode for their operation, so it was natural to coin the word Electronics. Now, with semiconductors all the rage, in which as many positive charges ('holes') are kicking around as there are negative electrons, perhaps it should be called Electroholics, but that might have caused confusion with Alcoholics.

Transistor was probably coined by electrical engineer **John Pierce** of Bell Laboratories in 1947, from 'Transfer' and 'Resistor', the early transistors being tested in the common base mode. The input resistance is a forward-biased junction, so it is low, while the output is a reverse biased junction and a high resistance. This produces a voltage gain, as almost the same current flows from emitter via the base to collector. (**Herr Ohm** told us all about $V = I \times R$)

'73' and '88' The telegraph was the first successful application of an electrical communication system, and the Morse code was used on it from the 1830s. Operators in the USA soon found they were sending the same things before and after a message, so figures were assigned to many of them, including '73' and probably '88', which we have continued to use. '88' looks like two pairs of lips kissing each other?

Telegraph Poles. The first wooden poles put up in continuous lines around the world were for the telegraph systems, not unreasonably called 'Telegraph Poles'. That is still their name, though they have been Telephone Poles for the last hundred years, and in a chat with a neighbour recently it was noticed that she mentioned 'telegraph pole'.

CW (Continuous Wave), in which the carrier is not continuous but interrupted, usually with the Morse code. MCW is a continuous carrier with an audio tone used to modulate it using Morse, so MCW is more CW than CW is. This utterly confused scribe is unable to understand why, but at least we all understand each other. (Well, most of the time?)

Cat's Whisker Radio. When radio broadcasting started, many cat's whisker sets were used, using high impedance headphones. It was very difficult

The Origins of some of our Words and Expressions

Rob Dancy G3JRD has some amusing and fascinating anecdotes relating to various terminology in amateur radio and electronics.

to get the whisker in the best place on the little piece of galena or carborundum, but it gave a thrill to many people to be able to hear speech or music remotely. The BBC station, 2LO, was opened in 1922 from London. Valves soon took over in domestic receivers, which at first used batteries for power, superseded in the 1930s by the must-have 'All Mains' domestic radio sets.

Ham. No - nothing to do with the "*I'll huff and puff, and blow your house down*" creatures. It is fairly widely accepted that it was professional telegraph Morse operators in the USA, around 1900, that started calling amateur operators 'Hams' in contempt of their 'ham fisted' use of the Morse key. As often happens, the recipients of the insults found it amusing and it soon became standard notation for us Ham-Fisted lot.

Semiconductor Not something between a conductor and an insulator, as one sometimes reads. As we all know, a pure semiconductor crystal has all the eight outer (valance) band electrons tied up, four of the electrons belonging to the nucleus and four shared with adjacent nuclei so there are no free electrons for conduction, an insulator. Add a few parts per million of a chemical with five electrons in its outer orbit, and it becomes a conductor of electrons, or 'N' type. Add a few parts per million of a chemical with only three electrons in its outer orbit, and the poor suffering crystal has a lack of an electron into which an electron can pop, leaving a hole behind into which another electron can pop, leaving a hole into which another electron can pop and so on. It looks like a hole moving in the opposite direction, making it a 'P' type. Going on from there to diodes, transistors, thyristors and the rest would quickly see you fast asleep, so I won't go on.

Germanium Diode When Radar receivers were developed using microwave frequencies, diodes had to be used at the front end of their receivers. At those frequencies a received signal has to be mixed right at the beginning with an oscillator output, to produce a much lower one that can be handled by conventional means. A diode is a good non-linear device for this to happen. Germanium was easily obtained in the early 1940s, but diode manufacturing was very difficult, as there was no knowledge of how the point-contact diode worked because those clever men **Bardeen, Brattain** and **Shockley** at Bell Laboratories did not suss out all the intricate details of semiconductors until 1947.

The early germanium diodes were sealed in a

glass tube about five millimetres in diameter and length, with a small piece of germanium held at one end, and an S-shaped thin wire pressed onto its surface from the other end - all rather hit or miss, mostly miss. With luck and a following wind, the point contact was at a place on the germanium that was crystalline, and a diode was the successful result. I have it on good authority that about one in two hundred that were made were usable, and the other 199 were scrapped. No wonder they cost the earth, but they were essential for the microwave radar equipments, which were vital during WW2.

Transceiver Now that is a nice word, a combination of parts of Transmitter and Receiver. Trying to put the Receiver bit first results in some difficult words, so Transceiver it is. The word goes back to the 1920s, which is surprising. I have one, an IC-718. It has 31 controls on the front panel, and about nine of them are used. I have no idea what the rest are for.

ARRL The American Radio Relay League was founded in 1914, and now has over 170,000 members. Ever wondered why the American equivalent to our RSGB has Relay in its name? Unlike Britain, an American amateur can use a phone patch unit to connect his radio into the telephone system. They are encouraged by the government to use amateur radio to connect anyone who wishes to talk to someone else, via amateur radio and a telephone. But even before that, and long before the USA had a long-distance telephone system, radio amateurs passed messages by Morse code from one to another until they could reach their final destination, offering a service to folk for whom the only alternative was a letter, which could take days to arrive. Hence the inclusion of 'Relay' in the ARRL title. Now, with all the new technology, and very cheap calls all over the world, the younger generation must wonder what all the fuss was about.

RSGB (Radio Society of Great Britain). (See also 'Regular Supply of Good Beer'). The RSGB was founded in 1913, so we beat those Yankees across the pond by a year.

PW The excellent *Practical Wireless*. The use of the word Wireless shows its age. Affectionately known in the past as Camm's Comic, **F J Camm** was the editor from 1932 to 1959. He was not the only well-known member of the family. **Sir Sydney Camm**, the designer of the Hawker Hurricane, was one of his brothers. Didn't they do well! **PW**

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Wanted

VINTAGE FIREWORK COLLECTOR. Do not light the blue touch paper and burn British Heritage, private collector will pay cash and collect from anywhere, licensed explosive storage.
 Call Tony on 07956 506300

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VALVES AND ALLIED COMPONENTS? For free stock list and/or advice, Please contact me: Geoffdaves337@gmail.com
 Telephone 01788 574774

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Contact Kristina Green Tel: 01778 392096
 Email: kristina.green@warnersgroup.co.uk

Bargain Basement

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EDDYSTONE 940. GWO and sparkling condition. Has not been messed with. £150. **BROOKES AND GATEHOUSE 'HERON'** DF. Aerial and compass in fitted wooden case. In excellent condition. £50.
 Call 01302 391030 **DONCASTER**

For Sale

YAESU FT897 multiband transceiver fully operational, leads mic FP30 mains power supply £550 inc postage. **MAT K100** auto ATU with CAT cable for Kenwood used twice £120 inc postage
 Call Denis on 07969 735841 or 01241 878182

Wanted

OLD HALF INCH FERRITE RODS. Must be half inch 12.7mm in diameter and be six inches long or more will pay good money for the old rods.
 Call Peter Tankard: 0114 2316321 or Email peter.tankard@gmail.com **SHEFFIELD**

Rallies & Events

All information published here reflects the situation up to and including **26th July 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 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

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 assistant 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

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:

Tel 07777699069

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

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

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. For the latest information, check the website.

Malcolm M00LG

01480 214 282

events@hunts-hams.co.uk

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' (See also next entry).

Martyn (G3UKV): 01952 255416

John M0JZH: 07824 737716.

www.gqrp.com/convention.htm

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.

Martyn (G3UKV): 01952 255416

John M0JZH: 07824 737716.

www.gqrp.com/convention.htm

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

10 September

CAISTER LIFEBOAT RADIO RALLY:

Raffle, onsite 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.

Tel 07711 214 790

m1bfi@outlook.com

24 September

(change of date from 8 October)

HACK GREEN MILITARY SURPLUS & MILITARY RADIO HANGAR SALE:

Hack Green Secret Nuclear Bunker, Nantwich, Cheshire CW5 8AL. Sale of electronic equipment, amateur gear, components, military radio items, and vehicle spares.

coldwar@hackgreen.co.uk

www.hackgreen.co.uk

Facebook: HGsecretbunker/

24 September

BURY ST EDMUNDS RADIO RALLY:

The Rougham Tower Museum IP32 7QB. Opens 9.30am (Traders 8am). Trade stands, Table top sales, bring and buy, Local radio clubs displays, RSGB Book stall, Raynet. Refreshments available from the Museums cafeteria and toilet

facilities. Entry £3. Table top sales £6. Traders and vans £12 (no need to pre book). The Rougham tower Museum (94th BG of the USAAF 8th Air Force during WW2) will be open to the public (free entry). So come along and make a day of it. (BB CBS CR CS FM RSGB)

rally2023@bsears.co.uk

24 September

WESTON SUPER MARE RADIO SOCIETY 8TH RADIO & ELECTRONICS

RALLY: The Campus Community Centre; Worle, Weston super Mare BS24 7DX. Entry is at 10:00 am and is £3 per person. Under 16s free of charge. The *Campus* is very close to Junction 21 of the M5 Motorway. (CR | FP)

07871 034 206

westonradiosociety@gmail.com

www.g4wsm.club

1 October

49TH WELSH RADIO RALLY: Llanwern High School, Hartridge Farm Rd, Newport, NP18 2YE.

7 October

DX FEILE: Shannon Springs Hotel, Ennis Road, Shannon, Co. Clare. DXpedition presentations, DX Quiz, Pile-Up Challenges and Jumbo Tombola Raffle etc. Convention Day Ticket: €20. Single Room for Saturday 7th, Convention Day Ticket, Lunch, Evening Dinner, Breakfast Sunday morning 8th...€240. Double Room for Saturday 7th, 1 x Convention Day Ticket, 2 x Lunch, 2 x Evening Dinner, 2 x Breakfast Sunday morning 8th...€320. Twin bedded Room for Saturday 7th, 2 x Convention Day Tickets, 2 x Lunch, 2 x Evening Dinner, 2 x Breakfast Sunday morning 8th...€340. Early Booking is advised due to limited availability.

eidxg.com

15 October

HORNSEA ARC RALLY: Driffeld Showground, YO25 9DW.

Les, 2E0LBJ.

01377 252 393

lbpinkney1@hotmail.co.uk

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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Your Letters

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Mr Pye

Dear Don,

Your article on the Pye range in this month's issue (August PW) was interesting. In another life, I used to fly the Alton Towers helicopter, and the Chairman was also on the British Tourist Board, as a result of which we got round to quite a few interesting places. One day we went to the Cambridge area and landed on some grass outside a large building. While the Boss was away, a nurse rolled up with a wheelchair, in which was a nice old boy who asked to see the radios, which were fixed frequency due to the limitations of my Aviation Radio Licence. We had quite a chat, during which he mentioned that the gear in the helicopter was a long way from when he used to design radios on the back of an envelope. That was when I asked about who he was, and it turned out to be **Mr Pye**.

Capt Phil Croucher

Head Of Training

(Caledonian Advanced Pilot Training)



them when you're running 100W, you won't work them with 1kW, just improve your antenna instead.

5) Optional Prefix and Suffix. Amateurs operating in England will be able (If they want) to insert the letter 'E' into their call as a secondary locator. Amateurs operating in the rest of the UK will be able (if they want) to drop the secondary locator letter. How will award schemes such as DXCC cope with this? If that's not enough the suffix /A, /P or /M will not be required (as presently), but ANY other suffix, such as /QRP MAY be used.

If all this is to save OFCOM time, what other ridiculous proposals would they make when they have time on their hands?

Nigel Ferguson G0BPK
Pontefract, Yorkshire

(Editor's comment: Thanks Nigel. I have been asked by another correspondent whether PW plans to give advice on responding to the Ofcom proposals. On reflection, I don't think it's appropriate – I would prefer every respondent to make up their own mind about what is proposed. But to pick up on some of your points: The reissue of past calls has not been handled consistently in the past. For example, as you say, you have been able to secure a particular call as a club callsign. At one time it was only close relatives of the Silent Key who could obtain the earlier callsign. So some consistency is certainly to be appreciated. But, equally, I wouldn't want any Tom, Dick or Harry to take on my callsign after I pass away – hopefully my son or granddaughter, both licensed, will upgrade in time to secure it in due course! As for power levels, there is surely an incentive to upgrade to Full if it permits 1kW rather than 400W – a significant difference in power, especially for international contesting where most other countries have 1kW or more. I believe NoVs for 1kW have only been available for experimentation at VHF/UHF, for example for Moonbounce operation, although I stand to be corrected on that. But perhaps most contentious, as you say, is the proposal, which incidentally Ofcom have floated previously, several years ago, to do away with regional prefixes and to allow any suffix. While I understand that, as far as Ofcom is concerned, the UK is a single entity, the use of regional indicators goes back several decades and removing them or, at least, allowing them to be used indiscriminately, would cause utter confusion for amateurs around the world. And as for suffixes, /PRACTICALWIRELESSISGREAT

Kent Rigs

Dear Don,

I read in the August magazine the testimonial for Kent-Rigs from **Simon Bagg** regarding the quick and successful repair of his AOR AR7030 receiver.

Mick has repaired a couple of my FT-290Rs and (yes) my Belcom Liner 2, which I bought second-hand in 1977. He was also quick with his successful repairs at a very reasonable cost so I would also recommend Kent-Rigs to anyone needing repairs to their radios or other electronic equipment, whether old like mine or more modern of course.

Jon Stow G4MCU

Hockley, Essex

Ofcom Proposals

Dear Don,

I read OFCOM's daft (possibly typo) proposals a couple of weeks ago. I only read the first half, but after that I had to lie down in a darkened room. I have never read anything so ridiculous for years. I believe these proposals could be the death knell of amateur radio in the UK as we know it, possibly something that OFCOM have wanted all along.

They already refer to it as Hobby Radio and not the Amateur Radio Service. What I made of the document, as far as I read, was that OFCOM wanted to reduce the time spent on amateur ra-

dio to give them more time for other matters, though probably not dealing with all the QRM on the bands due to fake EU badged equipment and equipment with certain components missing on the production run after accreditation had been achieved. To deal in full with everything in the document would require an article in PW, so I'll only comment on a few and list the others with brief comments.

1) Selling off (oops, sorry I mean transferring) the callsigns of Silent Keys. This could cause distress to the family and friends of the SK, especially if the call was being misused. To avoid this I have acquired the call G3SYC, the callsign of a respected 6m operator, and member of our club, as a club callsign. We use this call once a year on 6m as a memorial to him.

2) Microwaves for Foundation Licensees. OK if experienced professionally, but otherwise?

3) Allow amateurs to change callsigns periodically. Why?

4) Increase Power Levels. 100W for an Intermediate Licensee? What is the incentive for anyone to upgrade to Full? A Full licence would then only be of benefit to a few, those wishing to operate abroad, or need a SES, NoV or a Club licence. 1KW for full? Apparently you can get a NoV for this now. We are at the moment allowed 400W, how many amateurs run 400W? How much difference does 1kW make over 400W? If you can't hear

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anyone? Personally, I see no problem with allowing Foundation Licensees to build their own gear and operate on the 2.4 and 5GHz bands – more use of those bands is to be encouraged.

But there's much more – as I said in last month's editorial, readers should go through the whole document. There are new rules on airborne operation, remote operation, beacons, repeaters and more. Several of these changes are to reflect new areas of interest, such as high-altitude balloon experiments, while others reflect new technologies, particularly interconnection with the internet. There are 17 consultation questions in all – do take the time to think about each and respond as you feel appropriate.)

Dear Don,

OFCOM's licensing consultation contains many reasonable proposals. But, on reaching paragraph 5.55, things go south. We're told, in very nebulous and poorly-crafted words, that use by amateurs of the 5MHz band is not compatible with the primary user.

Except, in the UK, we've been on 5MHz for some years now, and I'm not aware of any complaints from the primary user – the military. Given that 5MHz has strong short-medium propagation characteristics and many European countries have access to the band, it's unclear how closing 5MHz to UK amateurs, if that is OFCOM's intent, would materially reduce harmful interference to the primary user within the UK (and the military can of course be expected to be active well beyond this limit).

Seeing as OFCOM repeatedly state, sometimes using bold red type to ram the message home, that there will be no changes to band access, this statement about incompatibility and therefore the suggestion that 5MHz will be taken away from amateur access is both contradictory and very troubling.

A request for OFCOM to explain this has thus far gone without acknowledgement or explanation.

**John Rowlands MW1CFN
North Wales**

(Editor's comment: Thanks for raising this John. I suspect what they are saying is that we are unlikely to get the additional, harmonised allocation available now in many other countries. But, as you say, the wording is far from clear.)

Out and About with Radio

Dear Don,

Absolutely, as commented by **G6NFE** (August 2023), out and about in the big outdoors (on a sunny day, especially) knocking off a few QSOs is a 'real pleasure playing radio'. Yep, leaving the house-bound shack behind is nowadays becoming an almost necessary requirement for more and more of us engaged in the art of radio.

And like **Richard**, particularly during the summer months when I have some free time, it's bliss to break free of my shack and head for the hills. No neighbours and no worries. Set up the equipment and antenna, usually a random wire or a vertical, and dive in HF or VHF wise and fill my boots.

Again, as **Richard** points out, it's sometimes amazing when parked up on a high hill, what can be worked using low power, tiny antennas and a vintage FM rig. I recall one time working a maritime mobile station aboard a yacht in the Bay of Biscay from Sidmouth using a Yaesu FM FT-208R handheld. It was so unexpected, I dined on the experience for ages.

Once upon a time I was obsessed with building those tiny OXO type CW transmitters (featured in *Amateur Radio On A Budget*). I built so many, it seemed as if they were coming out of the woodwork, so to speak. Back in the days of early *Sprats* (G-QRP Club magazine), these mini marvel RF generators could be put together for less than a fiver! And with a bit of judicious judgement and a bit of patience, tail-ending QSOs more often than not, it was always a surprise when your call sign popped out of the headphones. Besides, running low power can be very addictive. But of course, this can only happen if you like CW. So maybe a resurgence of these cheap CW transmitters into the general ham populace will bring forth a homebrew revival. Unless that is, someone somewhere can bring to market a kit-build no-frills multi-band HF SSB rig for £25 (my plastic-cash is standing by). There would be plenty of eager customers, but would the exercise be commercially viable? Probably not. Many of us can live in hope. But there again, as **Alexander Pope** opined in his *Essay of Man* poem, hope springs eternal.

**Ray Howes G4OWY
Weymouth**

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

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OCTOBER 2023 ISSUE
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AT ALL GOOD NEWSAGENTS

THERMIONIC VALVE TESTING: David Hodgkinson GI7TPO looks at testing of valves, useful for those taking care of and restoring old gear.

CW BANDPASS FILTER DESIGN: Alpar Cseley HA8KT addresses the design of bandpass filters for CW reception.

FROM ANOTHER ERA: Georg Wiessala puts together a temporary RTTY/CW receiving station with some vintage gems from the makers of the ERA Microreader and avoids computers altogether, for once.

THE RCA-VICTOR AR88: Philip Moss M0PBM gets to grips with this class receiver.

DAB BAND SCANNER: Kevin Ryan describes his solution for a scanner to identify band openings.

There are all your other regular columns too, including HF Highlights, World of VHF, Antennas, Book Reviews, Vintage TV & Radio, What Next, The Morse Mode, Amateur Radio on a Budget and Data Modes as well as your Letters, the latest News and more. And, yes, we will have some previously promised articles that have had to be held over due to space constraints.

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* Photo shows the FTDX101MP

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*2 ABI: Active Band Indicator

*3 MPVD: Multi-Purpose VFO Outer Dial

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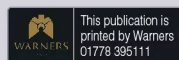
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Welcome

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 80th 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.

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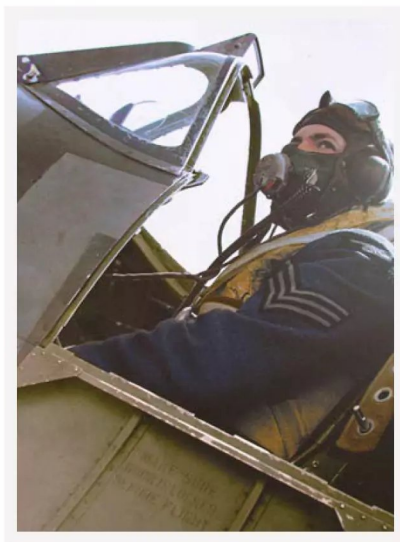


118 URSULA'S DEMISE

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.

After the outbreak of war in September 1939, there followed eight months of what became known as the 'Phoney War'. However, it was clear that large-scale fighting would ultimately follow, and a British Expeditionary Force was sent to France before the end of that year. As part of that BEF, a large Air Component was supplemented by an Advanced Air Striking Force. In total, these air forces amounted to 25 squadrons, six of which were Hawker Hurricane-equipped fighter squadrons. The remainder of the RAF force in France comprised largely light bombers and Army Co-Operation squadrons. Eventually, however, the '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.

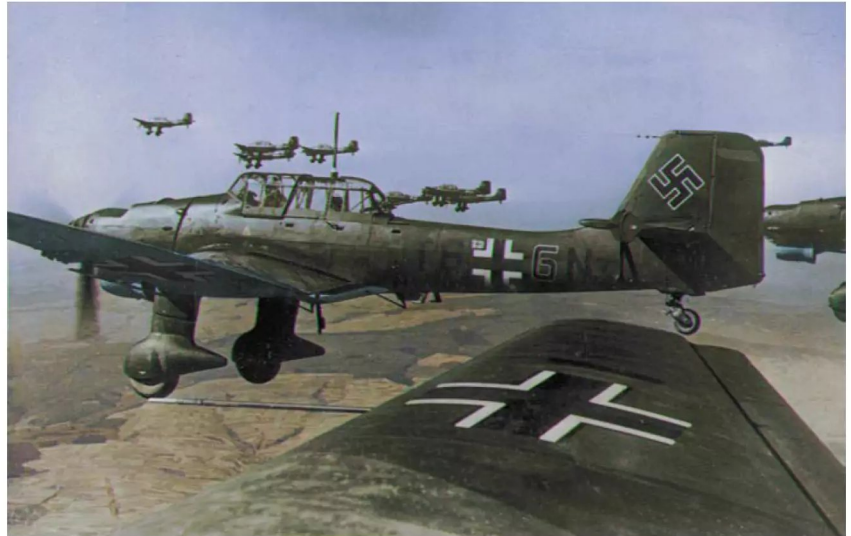
Below right Panzer IV tanks roll across France in May 1940. The German advance was rapid and overwhelming, and within six weeks France had collapsed and the BEF were evacuating from Dunkirk.

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



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.



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.

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FULL
FEATURE
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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.

Air 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. ■

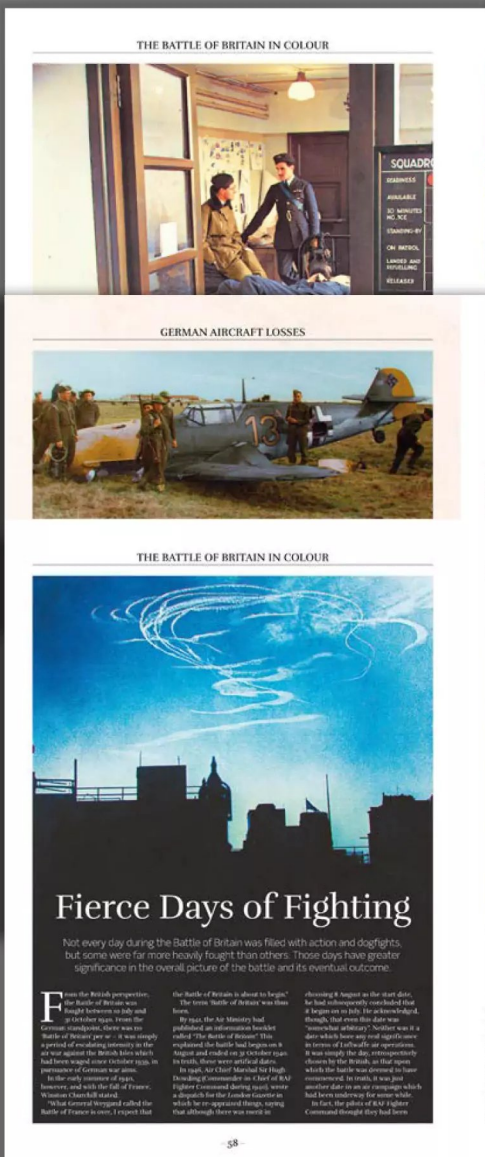
THE COMMANDERS



Air Chief Marshal Hugh Caswall
Tremeneere Dowding, C-in-C,
RAF Fighter Command, 1940.

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