Diamond Jubilee
For Wooferton's Wireless Wonder

In late June 2003 Rob Mannion G3XFD, fulfilled a long held ambition to visit the Wooferton short wave broadcasting station in Shropshire. Although no longer owned by the BBC, it still transmits the World Service...and many other programmes too!

The former BBC Wooferton h.f. transmitter station, which celebrates 60 years service in October 2003, is located right on the Shropshire/ Herefordshire border, directly alongside the main A49 Hereford to Shrewsbury Road and has always fascinated me. During my days with the former Independent Broadcasting Authority (IBA) I was privileged to visit all of the 'Wartime Three' high power short wave transmitters...**except** Wooferton.

Anyone - let alone a radio enthusiast - could not fail to be impressed at the 300 plus acre site which seems to dominate the area alongside the A49. Indeed, whenever I've stayed at the Wooferton Travelodge - only separated from the massive antenna farm by the main Hereford to Shrewsbury railway - I find it amusing to hear the familiar tones of the BBC World Service coming from the front door intercom system's loudspeaker as the station transmits programmes on frequencies ranging from 6 to 21MHz.

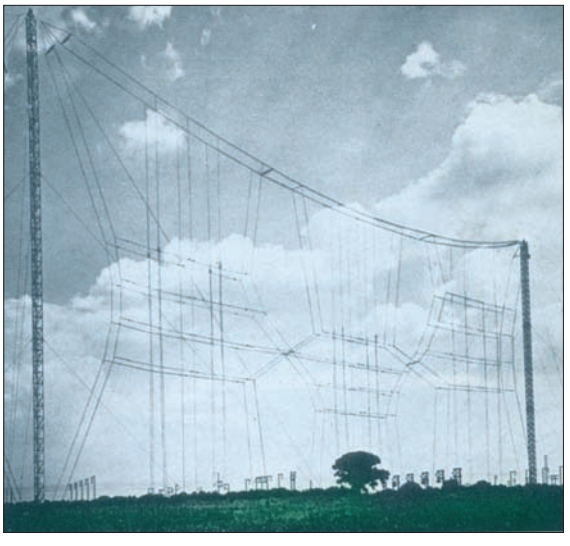
So, after many years of admiring the station from a distance - I was delighted to visit the installation along with **Kevin Nice G7TZC/M3SWM**, Editor of *Short Wave Magazine*. Kevin and I weren't to be disappointed...we had a truly fascinating day.

I should also mention that **Tex Swann G1TEX/M3NGS**, who along with his other work, acts as the PW Publishing staff photographer was also invited and was very much looking forward to attending. However, just a week before the visit...I suddenly remembered that Tex has a heart pacemaker...the significance of which we'd all temporarily overlooked!

Unfortunately, it was soon confirmed from the staff at Wooferton that it was inadvisable for Tex to enter the station. **In fact...a warning notice is clearly visible at the front gate to warn visitors of the possible dangers to pacemaker wearers.** Tex - although cleared to be able to operate his Amateur Radio equipment safely...was wise to avoid problems because during our visit (to the antenna farm in particular) the field strengths were being measured at up to 60V per metre!

Incidentally, Kevin and I were told during our visit that until health and safety rules were tightened...the staff often encountered field strengths of over 200V per metre...with no apparent ill-effects. And to back this up...I saw one car (full of healthy children) obviously leaving Wooferton after dropping Dad off for his shift. All the Wooferton team looked in the best of health too...so I leave you to draw your own conclusions!

● Fig. 1. The man behind the Wooferton visit...Dave Porter G4OYX. When Rob G3XFD arrived with Kevin G7TZC at Wooferton he couldn't resist photographing the G4OYX call-sign number plate, and the 'recep-tion' notice. Dave is one of the few Radio Amateurs who regular operates 300kW plus a.m. transmitters!



● Fig. 2: The Daventry trans-mitting 'beam' antennas circa 1937 - taken from a contemporary postcard (see text). Although no known photographs of the early antenna arrays at Wooferton were available to G3XFD - this array is fairly typical for the period.

Great Welcome

The Wooferton transmitter site is actually situated on the borders of Shropshire and Herefordshire. Apparently the transmitter buildings are in Herefordshire, with the antenna farm standing entirely in Shropshire...with the latter county claiming the rates!

On arrival, Kevin and I received a great welcome, including friendly greetings from **Barry Elding**, the Engineering Manager of the station. We also had the opportunity to meet a large proportion of the 26 staff during lunch which was served on our arrival.

Our host for the day, and in fact the prime mover of the event, was Senior Transmitter Engineer (STE) **Dave Porter G4OYX**. Dave, a dedicated professional Engineer since the early 1970s is seen posed alongside his car, **Fig. 1**. I couldn't resist photographing the G40YX callsign number plate, and the 'reception' notice too! He's one of the few Radio Amateurs who regularly - and legally - operates 300kW plus a.m. transmitters!

The photograph also shows one of the 92 metre (300ft) main masts in the background. Incidentally, at this point I should mention that Wooferton is a very difficult site to photograph...or at least to end up with pictures showing the grandeur of the antenna farm to its best advantage. This is because the site is actually built onto the bed of a one time lake...in effect a shallow bowl with no really high ground nearby for effective photography.

I've even tried to photograph the site from the very popular v.h.f. site at Clee Hill which is about 16km (10 miles) away. It didn't work, the masts can be seen, but the telephoto pictures lose the details of the antenna systems.

Incidentally, the transmitter buildings directly behind Dave G4OYX, are interesting as they're of war Second World War vintage. Unusually for broadcasting, the whole site had to be engineered without the use of basements and underground work because of the very high water table. (Water can be found literally less than one metre down on this site!).

The 'Utility' style of the brickwork provides a strong clue to the origins of Wooferton. And in fact, the site came into existence directly as a result of the 'Radio War'.

However, before I go any further I must pay tribute to my favourite, and extremely valuable, reference source...*BBC Engineering 1922 - 1972*, (*BBCEng*) by **Edward Pawley**. This absolutely superb, fascinating to read book (now a standard reference work) is unfortunately now out-of-print but can be purchased second-hand (Nothing can persuade the BBC to re-publish it).

Whilst mentioning *BBCEng*...if any of our readers has a spare copy for sale...Kevin G7TZC from *SWM* would like to hear from you! (I was fortunate enough to buy mine from a reader who answered my advert for a copy in *PW* during 1990).

It's also worth noting that *BBCEng* pays tribute to the work of Radio Amateurs in Chapter 5, (entitled Short Wave Broadcasting). Here the author

Fig. 3: Dwarfed by the main masts at Wooferton, Dave Porter G4OYX describes to Kevin G7TZC how the multiple wire dipole, stacked array antennas work together with their associated curtain reflectors. (see inset and text). The satellite dish antennas are used for transmission and reception of programmes to be re-broadcast, onward broadcasting abroad, and linking to other former BBC transmitters around the world (see text). 'Ground Maintenance Staff' (sheep) can be seen at work...keeping the grass short amongst the antennas.

Fig. 4: The antennas are fed by open wire feeders. Some feeders are of the familiar parallel wire type, although some sections (for matching and transformation purposes) are formed from caged wires. All feeders are carried on poles - well above head height.

Fig. 5: All antenna switching and transmission beam 'slewing' is carried out remotely with the aid of air operated switch gear. A slewing system for one of the main antennas is shown here (see text).

lists many well known Amateur pioneers who were also on the staff of the BBC itself.

However, in sharp contrast to the present day BBC (who paid scant tribute to the pioneers during the recent 70th anniversary of the short wave services) Pawley provided a well written tribute to the pioneers. He particularly draws attention to the work of **Gerald Marcuse G2NM**.

It was G2NM who, after he'd established regular h.f. contacts with another Amateur in Bermuda, had the idea of broadcasting to the Empire. From that initiative...with special permission from the then Postmaster General...the reliability of short waves for this purposes was realised.

Book recommendation: If you're interested in this aspect of Amateur Radio history, together with an informed look back at the hobby...I thoroughly recommend the excellent *World At Their Fingertips* book, written by the late **John Clarricoats G6CL** and published by **the Radio Society of Great Britain**. First published in 1967, and in paperback during 1993...this book is truly absorbing and informative. In my opinion it's a real 'must have' for your bookshelf!

The Big Three

During the Second World War it became obvious that the British had been left behind in the propaganda front - hence the eventual construction of the 'Big Three' transmitter sites. These joined the pioneering original (now closed and demolished) Daventry transmitter and numerous other temporary short wave sites - (mainly at existing transmitters).

Although often referred to as 'The Big Three'...in practice Wooferton, Rampisham Down in Dorset, are in reality four. This is because the other station - Skelton - in Cumbria is made up from two separate transmitter units on one large site.

Note: The 189 acre Rampisham Down site, near Maiden Newton in Dorset, was acquired in November 1939. The 320 acre site at Skelton accommodated two separate stations, one mile apart and was at the time the largest short wave transmitting complex in the world.

Fascinating History

Wooferton, the main subject of this article, has a particularly interesting history. And part of this was due to the high water table on the site.

Unable to use Marconi transmitters - which required basement 'crypts' to house the valve cooling plant - the BBC ordered 50kW transmitters from the Radio Corporation of America (RCA) in 1942. The wartime supply of the transmitters caused (to quote *BBCEng*) "*Some anxiety...and by January 1943 only one had arrived...but the remaining five were delivered in time for the station to opened on 17th October 1943*".

The typical understatement regarding the "*anxiety*" somewhat disguises the tragedy behind the prolonged delivery of the transmitters. The true facts are chilling...because the ship carrying the originals from the USA was in a convoy attacked by German U-boats and was sunk. My research indicates it took another five separate attempts to get all the RCA transmitters to the UK....by sending them in individual shipments. A classic example of not carrying all your eggs in one basket.

Antenna Arrays

The original antennas at Wooferton had 26 separate arrays for world coverage. They were supported between 15 stayed lattice masts ranging in height from 48 metres (150ft) to 99 metres (325ft).

The illustration, **Fig. 2**, is from a contemporary black and white postcard, originally owned by my Grandfather **Fred Durnford 2FD**, and now in my collection. It depicts a typical beam antenna array of the period, but at Daventry in 1937. (A photograph of the same installation appears on plate VII between pages 42 and 43 in *BBCEng*).

The modern antenna systems in use at the station comprise single band, dual band and four band arrays working within the station's 6 to 21MHz frequency coverage. However, there is one 'odd man out' antenna fitted between all the h.f. antennas...and this is the medium wave radiator for the BBC local service for Shropshire.

Although - when viewed from the nearby roads - the antennas look incredibly complicated...Dave G4OYX soon removed the mysteries. In fact he made sure we understood that nothing on site was complicated...it's just larger, and uses higher power when compared to our own transmitters and antenna systems.

Put simply...the antennas use arrays of 'stacked' wire dipoles arranged above each other. The system is then fed and phased so that maximum forward gain is provided. They are also extremely difficult to photograph, although Kevin G7TZC, in the **Fig. 3** (inset), made an excellent attempt!

Each array has a reflector curtain mounted one quarter wave (on the operating frequency) behind it. The Four band arrays can be directionally slewed electrically (by altering the phasing) to a maximum of 30°, whilst the single and dual band arrays can achieve between 10 to 15°. Dave commented that it might not seem much...but enabled (for example) the beamed coverage to be changed from Czechoslovakia (Now the separate countries of The Czech Republic and Slovakia) to the former Yugoslavia.

The antennas are fed by open wire feeders, **Fig. 4**. All antenna switching and slewing is carried out remotely nowadays and is achieved with the aid of compressed air operated switch gear. A slewing system in the main antenna farm features in **Fig. 5**.

The photograph, **Fig. 6**, illustrates part of the antenna slewing system and although it may not be immediately obvious...the pole supported open feeder wires in the immediate foreground form a Pawsey stub! (The shorting link of the stub can be seen almost exactly in line with the mast in the background).

Another stub was directly above my head - as you can see - as I took the photograph. The other equipment - looking like a miniature guillotine assembly (but using concrete blocks) is part of the feeder tensioning system).

And, as you can imagine...Kevin and I were truly fascinated with this large scale antenna engineering. Our

interest seemed at the same level as the high voltage r.f. above us...as the occasional crackling we could hear coming from the massive working arrays high above our heads!

Power Supplies

The power supply for the station was originally usually taken from the then public supply, but three 750hp diesel alternator sets were installed for emergency purposes. The turbo-charged diesel units were fully capable of powering the station on full load when working together.

Nowadays Wooferton is a very much valued customer of the regional electricity supply company. The supply comes in via the station's own substation from the 33kV/11kV distribution network.

Many Programmes

Many programmes, from a wide variety of countries and service providers are transmitted from Wooferton - and some of them proved to be a surprise! For example, although I realised there was a great deal of co-operation between broadcasters...I had no idea that Wooferton could sometimes be transmitting Radio Netherlands (RN) service (either in English or Dutch) to assist, while maintenance takes place in Holland.

The station has also had a long association with the Voice of America service which started in 1942. Indeed, for a period in the 1960s and 1970s the transmitter was heavily involved with VOA services.

Obviously, the main work is for the BBC, as Wooferton is contracted to transmit on behalf of the BBC. However, we also found out that along with carrying a number of religious broadcasters' programmes...an International short wave service for Wales is transmitted!

While were at the station some transmissions were being beamed to Iraq. It was fascinating to see the control room where programme links, and feeds were being monitored. The equipment here is ultra-modern and we were even able to change the beam direction on one (not on the air!) antenna array within a few seconds. It's even possible (via satellite and computer links) to get received signal field strengths from monitoring points many thousands of miles away!

Land-lines can be used for incoming services from the BBC's Bush House Centre...but nowadays a great deal of material comes via satellite links. In the control room Kevin and I were able to see many miniature (l.c.d.) TV screens associated with satellite links where - along with the television pictures - sound programme links are also transmitted.

Marconi Stalwarts

Although Wooferton has more recent, almost state-of-the-art - high power valved transmitters in its magnificent main hall, **Fig. 7**, some of the older Marconi 'Senders' are remarkable.

Incidentally, the term 'Sender' is a historic term for transmitters dating from the early days of broadcasting. The BBC's 'Senders' were then numbered from one onwards.

Sender 92, **Fig. 8**, was actually 'on the air' as Kevin photographed it...and we could see the high power valves under load - with the anodes and screens of the triodes and tetrodes glowing. The 'evaporative' water cooling system was entrancing to watch...but we were kept well clear of the e.h.t by safety glass panels.

What's truly remarkable about Sender 92, a Marconi BD 272 250kW (Senders 91 to 96 are all of this type) is that they were installed in 1964. And nearly 40 years later thanks to Marconi (and not least the dedicated station staff who seem to have to be plumbers as well as radio engineers!) these magnificent units are still running...very well indeed. Inside they're a mixture of very simple transmitter technology (very reminiscent of pre-war Amateur Radio) re-engineered for very high power and reliability.

As you might expect...TVI precautions had to be taken! However, it's interesting to read in *BBCEng* that even in the old Band I and III 405 v.h.f. TV days...the filters fitted by the BBC staff were very effective. And this was despite the station being located in an area suffering from low field strength TV reception from the Sutton Coldfield (near Birmingham) television transmitter.

Tradition Ends

A great tradition came to an end when the BBC sold off their transmitter sites. The sell-off in March 1997 was part of the move to provide funding for the introduction of digital broadcasting services.

The short wave broadcasting sites were actually sold to **Merlin Communications International Ltd** during the first week in April 1997, in a Management/Staff buy-out deal. The long and medium wave transmitters, along with v.h.f. and u.h.f. sites were sold to another company, **Castle Transmissions Service** (Now **Crown Castle**). However, both companies still transmit BBC programmes on behalf of the corporation.

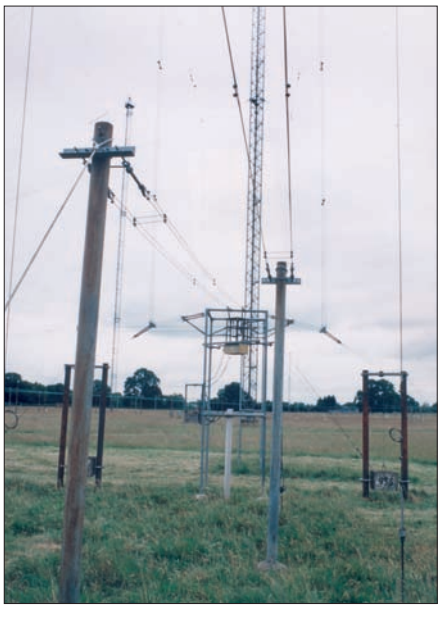
In October/November 2002 Merlin was sold to **Vosper Thornycroft** (**VT**), and are they're now known as **VT Merlin Communications Ltd**. Of course, VT are well known for their long history in defence equipment and shipbuilding for the navies of the world. I didn't let this go un-noticed in *PW*...commissioning **John Worthington GW3COI** to produce a cartoon showing an old Royal Navy frigate being used as a floating BBC World Service transmitter!

Following our visit to Wooferton I'm now planning to present the original cartoon - suitably framed - to the station's staff as a 'Thank you' for the wonderful day out! I've always taken an interest in the site...but whenever I drive past Wooferton in future...I'll remember my visit with Kevin, and the wonderful chance to understand the work of a dedicated group of people. *PW*

Club Visits To Wooferton

Pre-arranged visits (**Please see note in the text referring to heart pace-makers and the high field strengths which can be encountered on the site**) by organised groups to Wooferton are possible...provided enough notice is given and the number of people in each party is limited. In the first instance Club Secretaries and others involved in organising such visits are asked to apply in writing to the **Engineering Manager Barry Alding, Merlin Communications, Wooferton, Shropshire SY8 4AW**. And from what I've heard about the club visits...you'll have a whale of a time!

G3XFD



● Fig. 6: The photograph shows part of the antenna beam slewing system and although it may not be obvious...the pole and wires in the immediate foreground form a Pawsey stub familiar to Radio Amateurs! (See text).

● Fig. 7: The main transmitter hall at Wooferton. Unusually, because of the high water table...the transmitters do not extend below floor level (see text). Photo by Kevin Nice G7TZC.

● Fig. 8: Installed in 1964...and still going strongly! Sender 92, installed in 1964 is a Marconi BD 272 model, capable of 250kW (see text). Photo Kevin Nice G7TZC.