

**The following is an extract from Ex CPO Tel Duncan ‘Mac’ McInnes**  
**BEM book entitled “From Spark Transmitters and Crystal Set**  
**Receivers to Satellite and The Web”**

My story starts when I joined the Royal Navy as a Boy Telegraphist in **HMS St Vincent**. After our induction we were given an education test and then the thirty boys in the intake were put into their various grades. The top ten went to be trained as communication boys; the top five of the ten went to be trained as wireless operators and the second five were trained in visual signalling. The next top ten went into an advanced seamanship course while the last ten were trained as seaman.

Once the selections had been made you waited to join up with a class of thirty before you started your training. Our Instructor was a Petty Officer Telegraphist Snook, whose job it was to teach us to send and receive the Morse code at twenty two words per minute. Our technical instructions were given by a commissioned schoolmaster who instructed us in the mysteries of magnetism and electricity and the construction of dry and wet batteries which supplied the power to the valves in the receivers. In 1935 the Navy had no voice transmitters and the manual for our training was a manual written by a signal officer named Lieutenant **Lord Mountbatten** and a CPO Tel Welch. This manual was recognised as one of the best manuals of its time in the growing communication field. After our fifteen month course we were all examined as to our ability to send and receive messages. At school we were examined on the theory of wireless transmissions using spark and arc transmitters, the care and construction of lead acid cells and the property of aerials.

Exams passed we were then kitted up for sea. My first ship was **HMS Nelson**, the Flag Ship of the Home Fleet The wireless equipment on board was the latest at that time with a wireless transmitter that had valves and transmitted a signal of immense power. The receivers were made up of a tuner-amplifier containing four valves and a heterodyne unit to beat with the incoming signal to give you a Morse note of one kilocycle, but you could vary it to suit your own hearing. We also had what was described as a ‘breadboard transmitter’ which was a locally made transmitter with a frequency range of two to three megacycles. This set was an experimental one made by the warrant telegraphist and employed a new valve called the 807. This had a range of several miles and was used for intercommunication between ships of the Fleet. Every morning at eight o clock the operator on the Fleet Wave would call all the ships in the fleet and get them to tune their transmitter to the Flagships frequency. This usually took about thirty minutes depending on the skill of the operators. Once all the ships were tuned in the boy telegraphists were allowed to go onto a receiver and read a standard buzzer exercise. The results were sent in to the Fleet Wireless Officer for checking and evaluating the skills of the boys. Our schooling was continued onboard and we were examined regularly in all aspects of our communication skills. One job which regularly fell to the boys was to clean the aerial insulators and to do this we had to draw the Man Aloft Board and give it to the Officer of the Watch. This was to ensure that no transmission could take place whilst the aerials were being serviced.

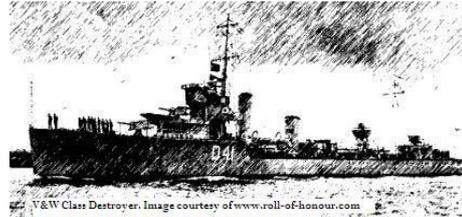


Aerials were treated with the utmost importance as there were no amplifiers to boost the received signal - that was yet to come - and when it did the importance given to aerial design and maintenance went into limbo only to be revived several years later when higher frequencies came into use during the first part of the war. With the use of HF communications the brute forces of arc and spark transmitter was

replace by lower powered valve transmitter with crystal controlled frequencies. This once again brought the design and construction of aerials to the fore.

The war years brought many changes in the way we communicated. We had voice transmitters to control the escort ships and merchant ships in the convoys. Crystal controlled low powered transmitters allowed us to transmit on the required frequency without having to heterodyne the transmitter to the receiving stations frequency. Alternators were fitted in ships to allow the use of mains operated receivers. Up to this time the ships were only fitted with DC dynamos. (I am getting carried away by the changes caused by the war).

After my stint on the Nelson I was posted to the **Vernon Flotilla** which consisted of a collection of World War One destroyers (the **Vs and Ws**) as well as four S class which were 950 ton destroyers that came into being at the later part of 1918. The Radio equipment on these ships consisted of a type 15 arc transmitter and a Marconi 4a spark transmitter with receiver amplifier A11 M11 and a note magnifier with a heterodyne unit. All the frequencies in use were in the LF /MF band.



Communication to submarines was via Rugby W/T station which transmitted on 16 kilocycles and could be read on the China Station. This station also transmitted a news service for the fleet. I remember reading the news about the loss of the submarine Thetis on the Rugby Broadcast prior to the outbreak of world war two. As a leading Telegraphist I served on **HMS Saladin** and at the beginning of the war I was given a set of parts to convert the type 15c arc to a type 34 valve transmitter and later the 4a spark was replaced by a Marconi-made TW12 which was run off a generator powered by a number of lead acid cells. This only had a frequency range of 1 to 3 megacycles but was later fitted with an adaptor which enabled us to transmit on the new HF frequencies of 4 6 8 and 12 Megacycles. This transmitter was later modified to be crystal controlled on certain frequencies. With this transmitter came our first AC powered receiver - the Marconi B28. In 1943 the American AR88s and HROs made their appearance and lasted to well after the end of the war.

War in the Pacific brought new technologies; Morse was transmitted by tape and the operators were taught to read it using typewriters instead of pencils and carbon sheeted pads and the speed was up to 25WPM. The stations which used to broadcast to ships in the Atlantic and Indian and Pacific Oceans on high powered medium frequencies now broadcast on high frequencies and ships communicated to shore on HF. The way in which the Navy communicated started to change at an alarming rate. Radio teletypes were installed in ships and messages were transmitted using the Murray code. This made it easier to send plain language messages in code using on line encryption machines. Ships were fitted with UHF transmitters and receivers using the teletypes to communicate over short distances. Aerials again came into the fore with **HMS Sheffield** being fitted with CWA {common aerial working} using only three aerials and being able to transmit on eight different HF frequencies using one aerial. To communicate with aircraft we could have up to eight different frequencies on one aerial and this was in the 100 Megacycle band.

I left the navy in 1960 and went to work for **Pye Telecommunication Ltd**, who were leaders in small HF transreceivers used extensively by taxis, ambulance, and coastal shipping - usually to a designated base station. We also serviced the 26 channel UHF sets which were used by shipping and harbour controls. I was sent to install one onboard the **Royal Yacht the Britannia** before she went on a world tour with the Royal Family. Pye also installed a low powered HF set on minesweepers for the Royal Navy which had a voice capability as well as Morse.

After two years with Pye I left to take up a position as a civilian foreman of signals with an army unit in **Singapore**. **237 Signal Squadron** was a component part of the Commonwealth Army Network and we communicated with Australia, Canada, Cyprus and UK. We used high-powered HF transmitters using single side band and transmitting radio teletype signals. We used triple diversity receivers and again aerial played a prominent part in our operation and we used rhombic aerials both for transmitting and receiving. On our **Bangkok** service, which was primarily to supply the Australian Signals with information, we used an aerial called a 'Sloping V' which was cheap and easy to construct and very efficient. During the confrontation with Indonesia in the sixties I was flown to **Labuan** and then to **Kuching** to help improve the communication to Singapore from those locations and found the use of 'Sloping V' aerial for transmitting and receiving solved the problem. In 1965 the MOD decided to give the operation of the HF side of their communications to the RAF and the Army would take over the Microwave Systems. Prior to this the Army had installed a satellite communication dish in **Amoy Queen** in Singapore, one in **Cyprus** and one near **Salisbury** and we conducted trials using eight American satellites until ours could be put into orbit. These trials proved very successful. I was then posted to **Germany** where the army were installing a microwave system to communicate with all of their bases in **BAOR**. The main reason was to become independent of the Germany telephone System which was becoming increasingly expensive. Using microwave systems and FDM {frequency division multiplex} systems we could carry up to 750 telephone channels which could also be made secure. The system stretched from the Elbe to London.

When this system was completed I was given the job of planning and implementing a television service for the forces in **Germany**. The restriction on this project was that it was not to be made available to the German population so we had to design the system around low powered transmitters with aerials designed to serve only the areas where the soldiers married quarters were situated. Part one of the project was in the northern part of **BAOR** where the army families had few amenities. The tapes were played in a caravan operated by the Services Kineme Corporation and transmitted by our microwave stations to the TV transmitters in the garrison areas. Finally, the headquarters of the system ended up at **Rheindahlen** with TV signals going out to every garrison area in BAOR.

On completion of the TV System I decided to retire to **Western Australia** to join my family. My life with radio was not yet over as I landed a job putting up two way stations on remote farm sites and for truck contractors, trucks, cray boats and yachts. For me it was going back in time to working for Pye Telecommunications in Southampton. Then came the explosion of mobile phones and that eventually killed the two way system and I retired. Now everyone is enjoying the internet and can send message all over the world from their computers and not only words but video and still pictures - all at the click of a button. All this has happened in seventy years - so one cannot but wonder what communications will be like in the next seventy years and if a conflict destroyed all the satellites would we be back to the 807 valve, a piece of string, and the Morse code?!