AWA Newsletter

#43

July 2009

Antique Wireless Association of Southern Africa

Inside this issue:

Reflections:

Has your activity on the bands been affected by the bad band conditions ?

I must say that up until now, I have tried to remain as positive as possible about the bands and the use of them, as well as using the different modes. The problem is that the lack of activity on the bands is also starting to take it's toll on many people who get on freq and sit and call CQ for a while, and then give up in a cloud of gloom because there is no one out there.

I sit and wonder at the reason why we would want to increase the use of the 40m band, when we can't even occupy the space we have already ?

So now we can also say we have the same use of frequencies as the other regions, but what did we actually gain ?

Well besides the few frequencies on the 40m band still being occupied by AM broadcast stations, I think we may have actually gained quite a lot.

At least now we will be able to get away from the power crazy linear users who insist on spreading themselves 10-15 kc either side of the frequency they are operating on, but there will also be a lot more room for us to play AM when we have the next leg of the Valve QSO Party.

More room means more stations calling on 40m and more entrants in the various contests.

I do hope this is going to be the start of more amateurs coming back to the band and a definite increase in activity. I do hope more and more people are going to be out there looking for contacts on the new frequencies that have been allotted to us.

I also hope there will be many more guys getting out their old valve rigs that have been able to operate on these frequencies since their inception and not be electronically locked out like the majority of new rigs on the market.

Come on, power up those valves and lets get out there and warm up the ionosphere with some good RF. After all, that's why we bought all this equipment, to keep us off the streets and in our shacks.

Best 73

De Andy ZS6ADY

AWA Committee:

- President—Rad ZS6RAD
- Technical—Don ZS5DR
- Net Controller—Willem ZS6ALL
- Newsletter/PRO—
  Andy ZS6ADY

Silent Key

It is with regret that we record the passing of Dick Busby ZS1AQD.

Dick has been a regular caller in the AWA SSB net both from his home and from ZS1MUS at Ysterplaat Air Base, where he has been involved in the restoration of many fine rigs and in the running of the Museum at the Air Base.

To his family and friends, our sincere condolences.

ZS0AWA

CW Net:

I was reading with interest an article on the SARL website about the fastest CW reader in the world and I could not even imaging being able to read at that speed.

"By age 15, Theodore McElroy was a leading telegrapher (Wirechief) for Western Union. In 1922, he won the world championship in Asheville, NC by copying code at 56.5 WPM. That record was beaten in 1934. So, he went back the following year (1935) and beat the world record again. On July 2, 1939, McElroy broke the world record code speed at 75.2 WPM, which remains unsurpassed today."

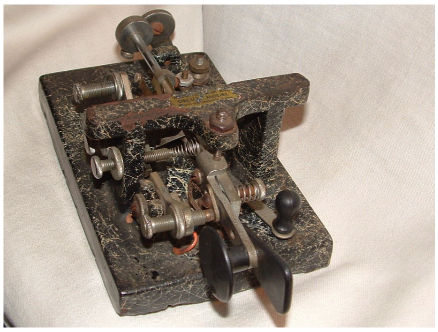
I cannot think how someone would be able to send CW at that speed, never mind be able to read at that speed. My brain still thinks in letters and not words. I am sure those guys must be thinking in paragraphs.

Besides which, they didn't even have electronic keyers then. How did they send code so fast on a straight key ?

My mind boggles at the thought of it.

Activity on the CW section of the band has been very quiet this last month. I must admit, I have not been around as often as I would like to due to other commitments, but the only stations heard have been Pierre ZS6BB, Barrie ZS6AJY and Johan ZS1WX.

It would be so nice to hear some more of the CW stations who take part in the



contests around the bands, keeping us company and keeping CW alive. Maybe they get frustrated at the slower speeds used by us mortals with slower brains, but would be great to hear them.

73

De ZS0AWA/CW …-.-

SSB activity:

Even though the bands have not been that good, we still seem to be managing to attract between 15—20+ people on to the net on 'Saturday mornings. I am sure it would be even more if conditions were better, but even in the days when the bands were open, I don't think we managed more than an average of 25.

If I can remember correctly, one Saturday we had 30 callers and Willem was beside himself trying to give everybody a turn. I do believe we are still one of the more active nets on the band and probably one of the most active club callsigns. Just to let you know, the AWA is registered as a club on the SARL books.

Although the SSB net is the least active, we certainly do not lack in numbers.

The 80 to 40 relay has certainly proved it's worth and on occasion we have had more people active on 80 than on 40, even though there are some who do not like to use 80.

The poor conditions resulting in lack of comms to div5 on 40m, have pushed some on to 80m and proved once again, it does work, and work well.

So next time you want to join the net on SSB and you can't hear the control station on 40m, try 80m and you'll be pleasantly surprised. Just remember to listen first to hear which frequency is active before you try calling.

Yaesu FTDX 100

AM:

Communicating with AM has certainly proved to be a challenge these days with noise on the frequency from summer and winter storms, cold fronts, DSL modems, power supplies, fluorescent lights etc all playing their part in pushing the level or QRN/M up in to S9 ratings. Making it extremely difficult to work on AM.

Yet, when it does work, it is absolutely perfect. There have been at least a few occasions this last month where AM conditions have produced FM quality signals between Div 5 and Div 6. And this is what makes it all worthwhile.

Then of course if we were not there, we would never have known about the good conditions, and would never have experienced the thrill of working in them.

There is something about AM signals that cannot be reproduced by anything else, and lets face it, there is a lot of nostalgia that goes with it.

I guess one has to be a little touched to play AM in these days and conditions, but believe me, it certainly is rewarding to hear a good AM signal going out from a rig that is bordering on 30 plus years. Some of them nearly 60.

Johnson Viking Ranger I

BC-348 - the receiver 1936 - 1953

During World War 2 several HF receivers were in common use. Of these we can detail a few, the R-1155 was a British receiver used by the RAF, in America several models were used, the RCA AR-88, the National Radio HRO and the RCA BC-348. Of all of these the BC-348 was made in the largest numbers and used throughout the war and into the 1950s in the Korean conflict as the standard radio receiver for many applications. Warfare relies on communications and up to date information, the BC-348 was a simple no frills AM and CW receiver even an inexperienced operator could use with a few hours training. The BC-348 was a direct development of the earlier RCA BC-224 receiver and used many of the same parts and chassis layout. In fact unless you looked at the model number closely you might think it was a BC-224 so similar was the front panel layout. This was probably a design brief so operators could quickly adapt to the newer design.

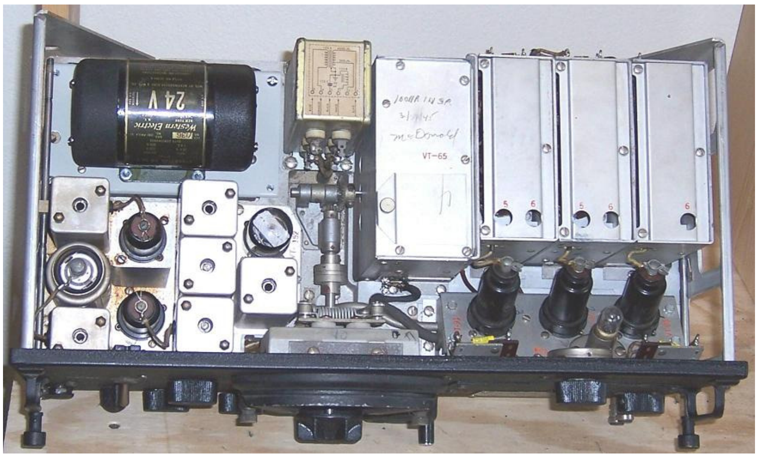
In total about 130,000 were manufactured running into 15 different versions during the war. The original design by RCA used a simple single conversion superhet with an IF of 915kHz which afforded good image rejection and adequate sensitivity using commonly available valves and a rugged chassis and front panel. The tuning dial used a clever shutter mechanism that blanked out all but the range being used.

BC-348 receiver

Two headphones sockets on the bottom left of front panel and the antenna terminals on the bottom right. The receiver is mounted on a shock-mounting tray. The knob at the top right is the dial lamp rheostat for dimming.

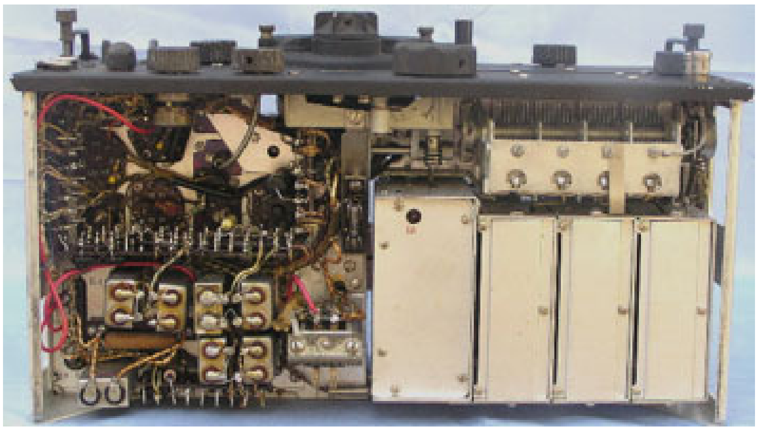
The AGC could be turned off and the RF gain adjusted manually and for CW a half-lattice crystal filter with a phasing control was fitted, making it an excellent CW receiver.

The BC-348 was used in airborne (B17 and B25 bombers), ground station and vehicular fit throughout the war. RCA, although the designer, had limited production capacity due to other more urgent commitments and the bulk of the receivers were made by others. The companion transmitter was the BC-349 but few of these reached the war surplus market.



Inside view of the BC-348 showing the 24V DC dyna-motor for valve HT supply. The RF stages are contained in screening boxes with the VFO in the centre of the chassis. The RF valves have grid top caps.

All the BC-348 receivers ran off a DC supply, some 24/28V and some 12/14V and all used a motor-generator to supply the high voltage to the valves. The 14V version used the DM24 dyna-motor and the 28V versions used the DM28, both delivered 220V DC at 70mA. The 14V version drew about 6A and the 28V version 3A. The valves were normally 6,3V filament and were wired in series-parallel to run off the battery supply. Many amateurs bought war surplus BC-348 receivers and modified them. Some modified models found on the market had a large hole cut in the front panel to fit an S-meter. The one serious failing for amateurs was the audio output was only suitable to feed headphones, either 400-ohm or 3,000-ohm, hence the two headphone sockets fitted. (In an aircraft loudspeakers were never used because of the high noise level). A common modification was to rip out the DC motor-generator and to install a mains transformer and rectifier valve with a loudspeaker driver stage. When a mains supply was installed the valves heater pins needed to be rewired to run off 6,3V. Some later versions used a 12SK7 valve but the 6SK7 was a drop in replacement for 6,3V heaters.



Underside of BC-348 receiver

The original design covered 1,5 to 18 MHz in 6-switched bands. Later, from the E version, a long wave direction finding facility of 200 to 500 kHz was added and the upper 5-bands squeezed to compress the coverage. The various versions were as follows: First production was in 1936 to replace the BC-224 receiver.

BC-348 RCA	1936		number manufactured unavailable	1,5 to 18MHz only
BC-348A	RCA	1940?	Did not go into production	
BC-348B	RCA	1941	number manufactured unavailable	1,5 to 18MHz only
BC-348C	RCA	1941	1529 sets made	1,5 to 18MHz only
BC-348D	RCA	1941?	Did not go into production	
BC-348E	S-C	1941	number manufactured unavailable	0,2-0,5 & 1,5-18MHz
BC-348F	RCA	1941?	Did not go into production	
BC-348G	RCA	1941?	Did not go into production	
BC-348H	B-R	1941	2717 sets made	0,2-0,5 & 1,5-18MHz
BC-348JW-G	1942		3948 sets made	0,2-0,5 & 1,5-18MHz
BC-348K	B-R	1942	787 sets made	0,2-0,5 & 1,5-18MHz
BC-348L	B-R	1942	7859 sets made	0,2-0,5 & 1,5-18MHz
BC-348M	S-C	1942	3738 sets made	0,2-0,5 & 1,5-18MHz
BC-348N	W-G	1942	8913 sets made	0,2-0,5 & 1,5-18MHz
BC-348O	S-C	1942	5487 sets made	0,2-0,5 & 1,5-18MHz
BC-348P	S-C	1942	number manufactured unavailable	0,2-0,5 & 1,5-18MHz
BC-348Q	W-G	1942	3329 sets made	0,2-0,5 & 1,5-18MHz
	W-G	1943	18,111 sets made	0,2-0,5 & 1,5-18MHz
	W-G	1943	8,122 sets made	0,2-0,5 & 1,5-18MHz
BC-348R	B-R	1942	11,996 sets made	0,2-0,5 & 1,5-18MHz
	B-R	1943	18,699 sets made	0,2-0,5 & 1,5-18MHz
BC-348S	B-R	1943	315 sets made	0,2-0,5 & 1,5-18MHz
BC-349AL	B-R	1942	11,996 sets made	0,2-0,5 & 1,5-18MHz
	B-R	1943	18,699 sets made	0,2-0,5 & 1,5-18MHz

Total 126,245 known production models

Note:

B-R is Belmont Radio, S-C is Stromberg-Carlson, W-G is Wells-Gardener

As can be seen from the above listing the most collectable versions are the K and S as these were made in small numbers. BC-348S receivers in original mint (unmodified) condition are known to sell for thousands of dollars on the collectors market. The most common versions to be found are the later Q, R and AL as these were made in the largest numbers. These sell for between $50 to $300 depending on condition.

As with all radio equipment from this era getting a BC-348 to work correctly is a challenge. Although originally built to a very high military standard and workmanship they can be a problem due to old age. Many of the paper capacitors used are now over 60 years old and often very leaky and need to be replaced with modern types. The moulded mica capacitors are also a source of trouble due to ingress of moisture and age. The carbon composition resistors are also known to change value with age, often going very high in value or open circuit. Valves generally do not suffer too much as they are run very conservatively, but a spare set would be a good idea to have to hand should they be needed. Switches, variable resistors and valve bases can be persuaded to work with cleaning and a coating of switch cleaner. The coil packs are generally very reliable apart from the wafer switches in them that need normal attention. One fault is the IF transformers sometimes go open circuit, the lead-out wires succumb to the rosin solder flux used and corrode away with moisture, and need some careful attention to repair.

(John ZS5JF)

The battle of the beams Part 1

(John ZS5JF)

The early part of World War 2 saw a massive effort to counter the Nazi Germany bombing attempts of mainland Britain. Prior to the outbreak of war the British Consul office in Norway received a mysterious large parcel of paper from an anonymous source that gave details of various radio-navigation systems, radar systems and missile research. The writer of the report was a disillusioned German scientist who had no belief in the Nazi Socialist ideals, but rather sided with the British ideals. This became known as the Oslo Report and was initially considered to be a plant by the Nazis to confuse the British intelligence system. Belief that this was too good to be true led to lethargy amongst the British intelligence officers. As the war progressed, it turned out that everything compiled in the report was true. Many in the upper circles of the military in Britain prior to the war refused to accept that Germany had radar or sophisticated systems to wage war. They were to be rudely surprised and it became apparent that Germany was much better equipped than Britain with many clever gadgets to strike at Britain.

Soon after war broke out the German air force (Luftwaffe) made many penetrating attacks into British air space with devastating effect. If it were not for the foresight of certain individuals it would have been a very different ending. Fortunately Sir Henry Tizard formed a group of engineers, scientists and other experts in the Air Defence Committee to ponder what Hitler and his armed forces were up to and come up with some counter measures. This committee was formed in 1936, three years before war broke out in Europe. One major step was the hurried design of a radar system known as Chain Home that covered from Scotland to Devon along the coastline. This could see far out into the North Sea and gave adequate warning of approaching bombers. Largely due to this the feeble RAF reserves were able to repel the might of the Luftwaffe daytime bombing.

With the defeat of the daytime bombing by the RAF the Luftwaffe changed to night time bombing. It soon became apparent that the Luftwaffe had a new and precise navigational system that relieved the pilots of accurate navigation. Traditionally night bomber navigators relied on stars and compass bearings to find the target and bombing was restricted to those nights when the Moon was illuminating the target area. On moonless nights navigation was much more difficult, as were cloudy conditions. Even on traditional non-bombing nights the Luftwaffe was achieving considerable success with the new radio navigation system.

This new system was based on a civilian aircraft guidance system designed by the German Lorenz company. The original Lorenz system was intended to guide aircraft to landing in poor visibility at airports and was installed at many airports throughout Europe as well as RAF airdromes prior to the outbreak of war. The antenna system had been designed by Robert Alexander Watt – later Sir Robert Watson Watt, regarded by many (incorrectly) to be the father of radar. The Lorenz system used a directional beam, which transmitted two slightly different beam heading with a small angular offset. The transmitter was a MCW type with a modulated CW carrier with about a 2kHz AM tone. The pilot when flying down the beam heard in the headphones an audio tone transmission that transmitted dots on one beam and dashes on the other. When flying exactly on the beam centre the signal heard was a combination of the dots and dashes, hence a constant tone. If the aircraft strayed to one side the pilot heard only a string of dots or dashes, so all the pilot had to do was turn slightly to bring the aircraft back on track.

What the Luftwaffe had devised was a much more sensitive Lorenz receiver known as Liechtenstein, which worked out to 200 miles from the transmitter station. The civilian Lorenz system used a low power transmitter with a range of about 30km and a relatively insensitive receiver on the aircraft. The antenna system at the beam station was a massive array of dipoles fed in phase and could be set with an accuracy of better than 0.1 degree error, and taking into account the curvature of the Earth. The beam at a range of 200km was only about 400m wide. The transmitters were code named Knickebein, which means crooked leg in German, and they developed about 1kW in the VHF range.

A scientist recently attached to the RAF intelligence service, Dr R V Jones, was assigned to this problem, code name Headache. Pretty soon it was obvious that the Luftwaffe had developed a new system of several high precision directional beams. The problem was what frequency these beams were transmitted on and from where? Jones, through decrypted Enigma messages, knew the band was likely to be somewhere around 75 MHz but not the exact frequencies being used. The transmitting stations were given cryptic code names by the Luftwaffe so a bit of guesswork was needed, and some luck, to visualise where these might be. A certain unnamed RAF intelligence officer was assigned to urgently procure suitable VHF monitoring receivers to find the beams. Amazingly as it seems, neither the RAF nor any military service in Britain had a suitable receiver. One could be designed and built but that would take time, and time was very short. A visit was made to several radio manufacturers and suppliers within Britain but failed to find a suitable receiver. By chance it was discovered that a company in Soho, London that catered for ham radio operators had recently been appointed as an agent of the American Hallicrafters company.

This company was Webb's Radio and the RAF officer discovered that a suitable receiver, the Hallicrafters S27, would cover the required frequency range. A single S27 was purchased for cash for evaluation and soon it was determined that it fitted the bill

(Continued on page 6)

and the officer returned to purchase as many as were in stock from Webb's Radio. In all about five hundred S27's were bought in this way, always for cash! The S27 covered the range of 27.8 MHz to 143 MHz in three bands, it could detect AM and FM and a later version known as the S27B covered 36 to 165 MHz. The writer had the fortunate experience in working with old man Webb's son who is Stephen Webb, G3TPW. The S27 was state of the art and used disc seal Acorn valves in the receiver front end with good sensitivity. The frequency readout accuracy from the tuning dial was more than good enough for the intended purpose. It's only major failing was it was never intended to be fitted to an aircraft with high vibration, but plenty of sponge rubber in the mounting tray solved this problem.

The first batch of S27 receivers were installed in several ageing Anson aircraft and flown in probing attempts to find the Lorenz beams. The S27 in its original form ran off 115V AC and special power supplies were hurriedly cobbled together to run them off the aircraft supply. The elusive beam transmissions were eventually found to be in the 60 to 75 MHz band and incremented in 0.5 MHz steps, soon a clearer picture emerged of the Luftwaffe radio navigation system. A scientist at the RAF Telecommunications Research Establishment (TRE) Dr Robert Cockburn was given the task of eliminating these Headache beams. He came up with a series of jamming transmitters, code name Aspirin (for the Headache problem), which initially were modified diathermy units used in hospitals. The first Aspirin transmitter was a free running power oscillator with no smoothing in the high voltage power supply so that it transmitted a broadband mush that confused the aircraft radio operator. Later Cockburn devised more powerful Aspirin jammers equipped with interfering dots sent out of sequence of the ground station tones. These were installed all over England at selected police stations that could be activated by a telephone call to the police stations required. The idea was that a pilot on hearing the false dots would turn towards the dash side of the beam and hence veer off course. These were code named Meacons (short for Mobile Beacons). Later in the conflict the Luftwaffe pilots were convinced the RAF were "bending the beams" and putting the bombers off the true course.

The modified Lorenz system was given the code name X Gerate (X Apparatus) by the German Luftwaffe and Dr Jones deduced this implied a system of cross beams. In fact that was exactly what it was. A high power station in Holland or Belgium laid a beam to the target and several cross beams (transmitted from France) gave distance to the target. All a pilot had to do was to vector onto a beam and then fly unassisted towards the target. A cross beam fell across the main beam and gave an early warning of the approach to the final destination. This second beam intersected the main beam about 30km from the bombing zone. A third beam lay across the main beam at 5km from the target. When the aircraft crossed this beam the bomb release crew member would start a special clock running in the aircraft. The final beam was laid across the main beam to intersect the target area. When the fourth beam was crossed the bombs were released automatically. This system gave an accuracy of about 200m at the target and caused severe damage to the target area.

To further counteract this efficient system Mosquito twin-engine fighter-bombers fitted with S27 receivers flew back along the beams to find the source of the Knickebein transmitters. Having identified the transmitter sites the RAF later sent heavy bombers to knock these out when the time was right.

An amusing aside to this "beam bending" is that the pilots of the Luftwaffe night bombers became so disorientated that one actually landed at a RAF base one night believing they were over an airport in France. This gave an important clue as the captured Lorenz receiver fitted was far too sensitive for the normal blind landing system in use. From this the British deduced the Liechenstein receiver was the clue to the system efficacy and confirmed Dr Jones suspicions as to how the X Gerate system worked. It also was found to have very narrow audio filters to just pass the 2kHz audio tone, so giving considerable freedom from interfering signals. The initial Aspirin transmitters with dots seemed to have little effect on the bombers; the crude diathermy transmitters were more effective. It was later discovered that the engineer monitoring the transmissions had incorrectly measured the audio tone and had recorded it as 1.5kHz, so the Aspirin dot jammers used this audio tone. That such a simple error had been made was inexcusable; he must have been tone deaf. Dr Jones when told of this error was furious and commented "He should be shot for such a sloppy piece of work", we don't know if he was! With the Aspirins modified to 2kHz audio tones the results were spectacular on the next Luftwaffe night sortie into British airspace, the confusion was unbelievable and many bombers flew in circles, some running out of fuel in trying to pick up the correct navigational beam.

While all this cloak and dagger stuff was going on the back room boffins of the RAF were working on their own navigational system to be able to bomb deep into Germany's industrial areas. The leaders of the RAF bombing squadrons insisted they could navigate without any special aids as their navigators, unlike the Luftwaffe, were well trained in astro navigation and dead reckoning. When statistics of bombs dropped to areas damaged from reconnaissance photographs were compared the story was completely different. This showed that less than 10% of bombs dropped came within a 5km radius of the target, the majority falling well out of the target zone often in open countryside causing little damage. Of greater concern was that the strings of bombs often fell on civilian areas causing many deaths. By comparison the Luftwaffe night attack on Birmingham showed 99% of the bombs fell in a corridor less than 500m wide.

An ingenious system, code name Oboe, was developed that gave great accuracy at up to 300km range, provided the bombers flew above 20,000 ft to be able to receive it over the curvature of the Earth. The system consisted of two powerful VHF transmitters in England with highly directional antenna arrays, linked to several radar stations for ranging and direction information. The main station was called Cat and the bomber flew on a course so that the distance between it and the Cat was constant. In other words the aircraft flew on a circular course with the Cat at the centre of the circle. The radius of the circle was chosen so that the aircraft flew over the target area. The pilot of the bomber was continuously updated by signals from the Cat as to the course corrections to make to stay on the correct track. The second station was called Mouse and when the aircraft was over the target it sent a signal that released the bombs automatically. Using the Oboe system bombers could place their loads within 100m of the target zone and much destruction was done with a relatively small number of specially equipped Oboe bombers. Later high speed Mosquito aircraft using Oboe dropped marker flares within 50m of the drop zone that the following heavy bombers without Oboe would aim at. This was the start of the 1,000 bomber night raids that effectively marked the beginning of the end for Germany.

A further Luftwaffe beam system developed when X Gerate was nullified by allied jamming was code named Y Gerate (Y Apparatus) and used a sinusoidal audio modulated signal from a ground station to the bomber. The audio was transferred to a transmitter in the bomber that then sent it back to the ground station on another frequency. This gave an indication of the range from the ground station by measuring the time delay for the signal to arrive back at the ground station. The transmitter station was code named Wotan, the Norse god who only had one eye. Jones correctly deduced this referred to a single beam. The major failing of this system, like Oboe, was that the ground station could only direct one bomber every ten minutes. The bomber was tracked by radar and the ground station gave the pilot instructions for his course and when to release the bombs. The other bombers were instructed to circle off the coast and were easy prey for the allied night fighters, now fitted with AI centimetric radar.

On discovering this new system Jones and Cockburn devised a simple but effective jamming strategy. They commandeered the closed down BBC television transmitter at Alexander Palace; London that operated in the correct VHF band of about 45MHz, and set up a spoof signal that blotted out the German ground station signal at the bomber. This system was code named Domino. Essentially the Domino system worked by receiving the bombers reply signal on 46.9MHz and retransmitted it back to the bomber on the ground station frequency of 42.5MHz without any delay. This had the same effect as a microphone placed too close to a loudspeaker and the whole loop howled if the spoof transmitter power was high enough. If the spoof power was less than that to cause howl-around the range was still wrong and misleading to the pilot and ground station. This completely upset the ranging system and the ground station operator range display was giving an incorrect result, as the signal had looped around the extra Alexander Palace leg and so added additional range. The net result was the ground station had no idea what the bomber's range actually was.

Initially, so as not to give the game away too soon, Cockburn started with a very low power output and gradually increased it night by night in small steps. At first the pilots believed something was wrong with the Y Gerate on his aircraft and aborted the mission, often dropping the bomb load over the sea as they returned to base. RAF monitoring stations listening to the pilots RT transmissions and the ground station operator heard the ground station giving orders to the pilot to check if any wires had come loose on the equipment. When the pilot, now very frustrated, confirmed all appeared to be OK the ground station gave the abort signal to the crew telling them the apparatus must be faulty and they must return to base. Finally, one night Alexander Palace transmitted its full 50kW power and totally obliterated any signals being sent by the ground station. After a few days of this elaborate spoof jamming the pilots lost all confidence in the system and refused to fly with it any more. The Germans never realised until after the war was over how they had been deceived by such a simple spoof jammer. It also highlighted that although the German navigational system was very well engineered, no thought had been given to how it could be susceptible to simple jamming methods.

The allied heavy bombers also had similar problems running the nightly bombing raids deep into Germany's industrial heartland. The German coastal radar consisted of the Freya, operating on about 120MHz. The Germans seemed to like giving code names to new equipment which if one was knowledgeable of Norse mythology the correct meaning could often be deduced. It was perhaps a foolish thing to do as Jones obtained much advance information about these system from the cracking of the German Enigma coded messages, the German's never suspected the British had cracked the crypto-codes so early in the war. Jones purchased a book on Norse mythology and discovered that Freya was once the mistress of Wotan, a one-eyed god, and Freya had a prized possession, a necklace. Further she was guarded by Heimdall, the protector of the gods, who could see 100 miles by day or night. So Jones deduced that Freya was a part of a chain (necklace) of radars with a range of 100 miles, which turned out to be exactly the case.

These long-range Freya radars being positioned at the coast could pick up the allied bombers as soon as they took off from their bases and tracked them all the way to the French, Belgium or Dutch coastline. Although the Freya had good range capabilities it was limited in height finding accuracy, so at best it could only place the bombers within an altitude range of between 2km and 5km. Behind the Freya's where lines of anti-aircraft guns (AA) and searchlights, this was the first line of defence. Further back towards Germany where more sophisticated radars called Wurzburg 1. These operated on 560MHz, had a range of about 75km and a small 3m diameter parabolic dish, which gave precise location to within 1° in azimuth and elevation. These were linked to more searchlights, AA batteries and the Luftwaffe night fighter command stations. The later larger Wurzburg Reisse version had a 8m dish but it's beam was too narrow to track a bomber and a defending night fighter simultaneously, so each site was equipped with two Wurzburg Reisse, one for the bomber and one for the defending Luftwaffe night fighter. A serious deficiency in the system.

To counter these measures Cockburn and his team invented Bromide jammers to be carried on the bombers. The first Bromide was a crude, hastily conceived, transmitter that transmitted an AM signal on 120MHz to confuse the Freya. The audio was derived from a microphone in the cowling of one of the engines and this produced a loud and harsh noise that completely swamped the Freya return echo pulses. Aspirin 2 was a similar transmitter to Aspirin 1 modified for aircraft fitting and tuned to the Luftwaffe night fighter ground station RT frequency for the fighter control directing, again with a microphone in the engine cowling to generate an annoying interfering signal. By now special VHF general coverage receivers had been designed and installed in selected heavy bombers to determine the enemy ground station RT frequency. About 1 in every 25 bombers had the jammers fitted to provide protection to the other bombers in the stream; these were spread throughout the main bomber stream to give continuous coverage. In addition several high power VHF stations in Britain were equipped with transmitters tuned to the Luftwaffe night fighter RT channels. These were operated by German speaking RAF personnel to send conflicting messages to the night fighters. This caused more confusion as often they would send a message that fog was closing in and all pilots must land immediately.

The later Bromide was more clever, it was a rapidly swept pulsed signal that ran up and down between 540MHz and 580MHz and beamed downward with dipole arrays at the Wurzburg ground stations. The effect of these jammers was to blot out the display on radars making it very difficult for the operators to gain any useful intelligence of the threat. Later Bromide jammers had a companion UHF general coverage receiver made by Eddystone that the radio operator could establish the Wurzburg exact frequency and then set the jammer transmitter on the correct frequency. In this mode the sweeping was turned off and the pulse rate continuously varied to give hundreds of false echoes on the Wurzburg display. At a range of 20km the bomber completely obliterated the Wurzburg display.

Dr Martin Ryle, G3CY, at TRE commented that it was easy to tell if a radar signal was German or British by simply listening to the transmission. German radar transmitters were precision instruments and were very stable in frequency, British radar transmitters wobbled about all over the band! The extra frequency stability was an unnecessary expense and served no useful purpose, but it was typical of the German philosophy that precision should be built into even mundane pieces of apparatus. Later when German radar apparatus fell into allied hands the attention to detail and almost watch-making precision was noted as an extraordinarily good piece of engineering. The writer can remember at Friederichschafen Ham Radio convention in the 1970s seeing German WW2 radar equipment offered for sale, the beautiful equipment was highly engineered and far in advance of the allied crude systems.

Another German ploy was to use the BBC medium wave transmitters to home onto. Knowing which transmitter was which was easy; one simply had to buy a newspaper to see the broadcast schedule. Having homed onto the correct transmitter it was a simple matter to direction find bearings to plot the wanted course. Once this became known to RAF intelligence all transmitters changed to carry the same broadcast. The Germans soon dropped this as a navigational aid. To ensure this could not occur again the BBC changed the programming content so that the public had to tune around to find the program they wanted to listen to, it was on a different transmitter every night, inconvenient but necessary at the time. Another ploy that was used was to send incorrect program information from a captured German spy, so the Luftwaffe was deceived as to the true transmitter being used. All of these tactics were short term and soon lost the advantage to newer methods being devised by both sides in the conflict.

In part 2 we will cover the allied spoof jamming of German broadcasts using the largest medium wave transmitter then built, 600kW, code name Aspidistra.

End of Part 1

Don's Technical Tip

AM Power

Why can I only get 25 watts of AM but my rig gives me 100 W or more on SSB ??

There have been many articles regarding AM and power readings and how this is derived, John ZS5JF gave a very comprehensive explanation in his article in July and August 2007. In a nutshell for the guys that don't want to do the mathematics. If you have a carrier of 100 watts and it is 100 % modulated you will get approximately 400 watts pep with all the inherent losses in the PA, bear in mind that this is our legal power limit.

So 25 watts of AM with 100% modulation will give you about 100 watts pep.

Don't try and push the envelope as all that will result is a melt down in your final tubes or associated components and your favourite Antique rig will need open heart surgery.

It is also recommended to run your modulation at about 90%, which will reduce your output power but give you good audio output and avoid interference caused if you happen to overdrive and exceed the 100% modulation level.

When you next load up that AM rig pull out your old station monitor or oscilloscope and monitor your modulation when transmitting, give it a bash and come and join us on Wednesday evenings, Friday afternoons and Saturday early mornings. We will be quite happy to give you any advice you require.

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http://harc.org.za/newsletters/AWA/

Antique Wireless Association of Southern Africa

Mission Statement

Our aim is to facilitate, generate and maintain an interest in the location, acquisition, repair and use of yester-days radio transmitters and receivers. To encourage all like minded amateurs to do the same thus ensuring the maintenance and preservation of our amateur heritage.

Membership of this group is free and by association.

Notices:

Swop/Sale:

Leon ZR6LLS, has this Hallicrafters station to sell or swop. Consisting of the SX140 Receiver, the HT40 Transmitter, D104 Microphone and a Brass Straight key. He is looking for an ATU he can couple up to his Icom 718.

Any interested parties can contact Leon on 0844500301. Leon is in Louis Trichardt.

Valve QSO Party:
Final results were transmitted on the SARL news, but here is a reminder fro the final standings.
AM: 1st Place Jan ZS4JAN, 2nd Place Andre ZS2ACP, 3rd Place Rad ZS6RAD.
SSB: 1st Place Jan ZS4JAN, 2nd Place Rad ZS6RAD, 3rd place Theunis ZS2EC.
Congratulations to all who participated and to the top scorers, your certificates are on their way.