

The Biggest Aspidistra in the World

by Pat Hawker

In the late summer of 1968, as one of my last reporting assignments for the trade journal *Electronics Weekly*, I went to the Diplomatic Wireless Service site high up in the Ashdown Forest, near Crowborough, East Sussex. My visit was to cover the marketing of DWS's 32-tone Piccolo radio-teleprinter system [1] but, while there, I was invited by Harold Robin, DWS's chief engineer, to take a look at the 600kW 'Aspidistra' broadcast transmitter which he had installed in an 'enormous hole in the ground' in 1942. This was destined for 40 years (1942-82) to be the single most powerful MF broadcast transmitter in the UK and, initially, the most powerful in the world. That day, to the best of my knowledge, I became the only technical journalist ever to have been shown Aspidistra in all its working glory.

The large RCA transmitter had, in 1968, recently been modified to become the first UK broadcast transmitter with an all-solid-state EHT supply unit. The technical staff, in the underground transmitter hall, were busy constructing equipment for use at one of the overseas transmitter bases run by DWS. Harold Robin told me that he encouraged this in order to overcome the boredom of looking after transmitters that needed only occasional attention. Aspidistra was unique in being a medium wave transmitter able rapidly to change frequency - vital for its original role as a 'raiding Dreadnought of the Ether', but still in the 1960s operating daily in two different MW channels. General decor of the entrance and transmitter hall seemed curiously familiar; Robin explained that his 1942 building colleague, Cecil Williamson, had been responsible for some of the large Odeon cinemas built in the 1930s. The connection was still visible!

For years before (and after) my visit, I listened regularly to the BBC World and European Services from Crowborough; indeed I often took part at Bush House, with Henry Hatch G2CBB and others, in the *World Radio Club* programmes produced by Joy Boatman and then listened to the recordings from Aspidistra.

Wartime Memories

My original introduction to this powerful transmitter was very different. This was at a clandestine base-station near Bletchley in 1943, where we were in touch with the secret radios of the Intelligence and Resistance networks in France and Belgium. Sometimes, at night, we would tune around the medium-wave band for entertainment. We soon came across what seemed to be a lively German Forces station - 'Soldatensender Calais' - with attractive German popular music. One of the other operators, who spoke fluent German, soon pointed out that the interspersed announcements could not possibly be coming from an official German military station, with their alarmist and defeatist messages. We had, in fact, stumbled across Aspidistra

The Diplomatic Wireless Service

Paragraph 1 of Article 27 of the Vienna Convention on Diplomatic Relations, 1961, reads as follows:

"The receiving State shall permit and protect free communication on the part of the mission for all official purposes. In communicating with the Government and the other missions and consulates of the sending State, wherever situated, the mission may employ all appropriate means, including diplomatic couriers and messages in code or cipher. However, the mission may install and use a wireless transmitter only with the consent of the receiving State."

The Diplomatic Wireless Service (D.W.S.) which operates within the concept and terms of this Article of the Convention was constituted in 1947 as a semi-autonomous Department of the Diplomatic Service and is responsible for the transmission of telegrams for the Foreign Office, Commonwealth Office and other Government Departments to and from British Missions at some 70 posts overseas. The Head of the Service is the Director of Communications who holds the rank of Under-Secretary of State. The Headquarters are at Hanslope Park in North Buckinghamshire, while the Central Training School is at Poundon near Buckingham.

In addition, the D.W.S. operates four Broadcast Stations which relay the external services of the B.B.C. These are situated at Crowborough in Sussex, Malta, Cyprus and Masirah (an island off the coast of Muscat and Oman). Medium and short wave high power transmitters are used, that at Crowborough being capable of an output power of 600 kW and the one on Masirah Island of 1500 kW.

*A brief description of the functions of the DWS
(from a 1968 booklet)*

in its guise as a 'black' broadcasting station of the Political Warfare Executive (PWE) with the programmes coming from their studios in Milton Bryan, a few miles away, radiated also on HF as 'Radio Atlantic' and addressed to 'comrades in the command areas West'. It was not until much later that I discovered that all the PWE 'black' transmitters, including Aspidistra, were built and run by one of the Special Communication Units with which I served!

Soldatensender Calais (later Soldatensender West) reached not only the German forces and submarine crews stationed in France, but also civilians all over Germany. The infamous (but talented) Nazi Minister of Propaganda, Dr Joseph Goebbels, in his diary entry for 28 November 1943, wrote: "In the evening the so-called 'Soldatensender Calais' which evidently originates in England and uses the same wavelengths as Radio Deutschland - when the latter is out during air raids - gave us something to worry about. The station does a very clever job of propaganda, and from what is put on the air one can gather that the English know exactly what they have destroyed in Berlin and what they have not" [2].

Origins

The use of wireless to stir up dissent or subversion, as an extreme form of propaganda, is almost as old as broadcasting. To quote Julian Hales' *Radio Power*: "The Russians began it all with their subversive calls to German workers to join them in the early days of revolutionary struggle. In the inter-war years (1919-1939) a number of ephemeral operations came on

the scene, like Radio Corse Libre, or various anti-Nazi 'Freiheitsender'... The League of Nations made several attempts to ban all such stations.' [3]

A notable example of an early 'black' station was the use, by the German engineer Rudolf Formis, of a transmitter in a hotel in Czechoslovakia, just across the German-Czech frontier, from which he put out pre-recorded anti-Nazi broadcasts on behalf of Otto Strasser's 'Black Front'. (Strasser, a former Hitler supporter, had broken away from the Party to which he became violently opposed.) The Germans located the transmitter, then secretly crossed the border and attempted to kidnap Formis, but in the fracas, shot him dead.

Hitler's Germany (Radio Zeesen) and Mussolini's Italy (Radio Roma) were by then using HF broadcasting as a medium for Government propaganda in a number of foreign languages. In the wake of sanctions on Italy, following their 1935 invasion of Ethiopia, Italy began transmitting in Arabic a much stronger line in Anti-British programmes from Radio Bari, often in support of the Arab revolt in Palestine. The British Government became much concerned with these broadcasts and strongly urged the BBC to start foreign-language services to counter them.

For years, the BBC had opposed broadcasting across frontiers other than by the English-language Empire Service which officially started in November 1932. This was partly because the BBC was smarting under the loss of audience and public support to such European 'commercial' stations as Radio Luxembourg and Radio Normandie, and partly because it feared further loss of its independence from direct Government control. This was, in fact, something of a myth as the Foreign Office and other Government departments were already being consulted and shown in advance the scripts of many BBC talks on political matters. It is not surprising that some programmes were seen as unduly sympathetic to the USSR and the left-wing, since many of these talks were produced by a brilliant young BBC producer named Guy Burgess!

The turning point came in 1938 when the Government of only over-ruled BBC objections to foreign-language broadcasting but also set up its own secret organisations concerned with subversion and propaganda in preparation for the war that now seemed inevitable, despite the policy of appeasing Hitler that had dominated British foreign policy in the mid-thirties.

So the BBC, in close collaboration with the Foreign Office, finally launched HF services in Arabic for the Eastern Mediterranean, and in Portuguese and Spanish for South America where the Germans and Italians were gaining influence. The BBC also began to build up a Monitoring Service; this was expanded enormously during the war, located first at Wood Norton, Worcestershire, and then from 1943 at Caversham, near Reading where it still remains. This served not only the BBC itself but also provided daily summaries for the Services and the wartime Political Warfare Executive (Ministry of Economic Warfare). By 1945 there were some 1000 BBC staff engaged directly or indirectly in the monitoring of enemy broadcasts and press agency bulletins transmitted in Morse or by Hellschreiber.

1938 also saw the setting up of Section D of the Secret Service (SIS) under Major L. D. Grand to prepare for subversion,

sabotage and other forms of irregular warfare, and Electra House (EH) under Sir Stuart Campbell to prepare for propaganda, of all types, to enemy countries. A new semi-autonomous Joint Broadcasting Committee (JBC), initially under Major Grand but with BBC participation, began to provide a transcription service to overseas broadcasters; it was later brought under BBC control at Bush House (where it still remains) - Guy Burgess was again one of the production team. Even today, despite extensive research by W. J. West for his book *Truth Betrayed* (1987) in BBC Archives and at the Public Record Office, it remains difficult to disentangle just who did what in the period 1938-40, although there is little doubt that the Secret Service was a prime agency.

Munich

The Munich crisis of September 1938 and its immediate aftermath convinced the Prime Minister (Neville Chamberlain) that means had to be found to put the views of the British government directly to the German people via radio stations capable of being widely received in Germany. The BBC was advised to cease agitating for the closure of Radio Luxembourg and this station was used frequently in 1938 and 1939 to transmit (in German) recorded translations of major Government speeches - although little of these activities was disclosed to the British public. Some programmes were sent directly over telephone lines to Luxembourg, others were sent to Paris and there recorded on disc [4]. There is also some evidence that a transmitting base was established in Cyprus for broadcasts to Palestine; it is uncertain who ran this station



Winston Churchill in his famous siren suit, making a broadcast in 1942
BBC Photograph

in the years before 1956 when it was taken over by DWS and run by them (carrying BBC programmes) until the mid-1980s when it finally passed to the BBC.

Nearer home, the Secret Service planned to set up, ostensibly as a commercial service for UK listeners, a powerful transmitting station at Vaduz, Liechtenstein which, like Radio Luxembourg, would provide a strong signal into Germany. A 50kW transmitter was ordered from Lorenz. West [4] claims that this operation was covertly funded by SIS, being nominally run by a firm set up by Peter Hope who was secretly working for Richard Gambier-Parry, in charge of radio communications for SIS. It seems likely that the young engineer who joined Peter Hope - Harold Robin - knew that 'G-P', whom he had worked with at Philco in 1936-37, was involved.

Both 'G-P' and Harold Robin became major players in wartime 'black' broadcasting. 'G-P' (1894-1965) was educated at Eton; had served in the Royal Welch Fusiliers and the RFC in the Great War (thrice wounded); held amateur licence 2DV in the early 1920s; from 1926-31 was a member of the Public Relations Department of the BBC. In the mid-1930s he became Sales Manager for Philco (GB) and then from 1938 headed Section VIII (communications) of MI6 (SIS), throughout the Second World War as Colonel 1939-42, Brigadier 1942-46, Royal Signals, in charge of the Special Communication Units (including those of the Radio Security Service from 1941). He was made CMG in 1945, knighted (KCMG) in 1956. In 1939 he had become responsible for the Foreign Office HF network

for the transmission of diplomatic traffic. After the war he was appointed Director of Communications to the Foreign Service in charge of the semi-autonomous Diplomatic Wireless Service, which existed under the umbrella of Government Communications Headquarters (GCHQ) and its Composite Signals Organisation.

Harold K. Robin, CBE, born 1911, was educated at Oundle and City & Guilds (London University). From 1933-36 he was a professional radio engineer with STC, then in 1936 he joined Philco (GB). There he worked with 'G-P' who introduced him to Peter Hope who (probably with the help of SIS) obtained a franchise to build a commercial station in Liechtenstein. Robin went to Vaduz, keeping in touch with Hope in London by means of a 250W HF transmitter but, with the station still incomplete on the outbreak of war, he returned to London and rejoined 'G-P' at Whaddon Hall, building a succession of transmitting stations (communications and broadcasting) at Woldingham, Renscombe, Gawcott, Potsgrove, etc., and then Aspidistra at Crowborough. He became Chief Engineer DWS from 1947 until the early 1970s, when he became associated for a time with an Indian broadcast-equipment firm concerned with building high-power transmitters for the Gulf States.

British broadcasting, particularly external broadcasting, increasingly developed along separate lines. Even when war came in September 1939, the BBC, now nominally under the control of the Minister of Information, sought to keep all of its broadcasting in foreign languages, including German, as 'white' - its stations operating legally on authorised frequencies and openly identifying themselves, endeavouring to build a reputation for reliable news bulletins, rather than engaging in out-and-out, short-term propaganda against the enemy. Government supervision was significant even if hidden from the public. Many of the BBC staff were required to sign the Official Secrets Act; staff appointments and even outside talk-contributors were, without their knowledge, subjected to a Security Service (MIS) 'trace'; talks and even 'discussion' programmes were normally scripted in advance and often 'vetted'; transmitter engineers were expected to learn Morse and monitor enemy communications...

Black and Grey

There is a recognised language of subversive broadcasting. 'Black' broadcasts are those disguised as broadcasts by the enemy to their own people, from their own territory; 'grey' broadcasts are those from 'clandestine' stations attributed to or purportedly operated by dissidents, freedom fighters/resistance groups, etc., from a transmitter sited in another country. During WWII, between 1940-45, almost 50 different 'black' and 'grey' services were created and transmitted from Britain, not under the control of the BBC, but by Section D, then SO1 and then by PWE. Initially these were known as 'freedom stations', later as 'Research Units' (RUs). Most of the transmissions were on HF, based on four 7.5kW transmitters installed by Harold Robin, two at Gawcott, near Buckingham and then two at Potsgrove, just south of Woburn. Although PWE was initially (while designated SO1), linked with SOE (SO2), all of the transmitting stations were built and run by Section 8 of MI6 under 'G-P'.

The 'black' broadcasting operations were run, with no holds barred, by Rex Leeper (formerly of the Foreign Office News Department), Richard Crossman and Sefton Delmer from Woburn Abbey with recording studios at 'Simpson's'

(Wavendon Towers) and later Milton Bryan. Leeper and Crossman later left Woburn Abbey. Sefton Delmer, a former *Daily Express* foreign correspondent, who had been born in Berlin and had spent many years in that city, was in charge of the German-language services until the European war ended in May 1945. He believed that the BBC broadcasts were too soft and stodgy. He was not averse to the use of 'deception, lies, bogus messages, guesswork (and some intelligence material) and sometimes obscenity to create a weapon as sharp as the BBC with its inhibitions and passion for ideological debate was blunt... his motto was that 'the simplest and most effective of all black operations is to spit in a man's soup and cry Heil Hitler!' [5]

The British public was told nothing of these secret 'black' and 'grey' broadcasts, with speakers recruited from anti-Nazi Germans and refugees from the occupied countries, until Sefton Delmer published his memoirs *Black Boomerang* in the early 1960s. Later an account with more technical detail appeared in 1982 - *The Black Game* by Ellic Howe, a skilled typographer whose special skills were used during the war to forge leaflets, identity documents and other printed material in genuine-looking German typefaces on behalf of PWE, SOE and the Intelligence Service.

His book describes in detail the creation of the 600kW Aspidistra transmitter at Crowborough, based on technical and other details provided by Harold Robin. He recounts how no fewer than 48 different 'black' and 'grey' services were directed, at various times from 1940 to 1945, at 15 different enemy and enemy-occupied countries. Many of the programmes were recorded at 'Simpson's' and later at Milton Bryan.

Aspidistra's Origins

The medium-wave Aspidistra project was originally conceived by SO1 in the Spring of 1941 as a means of transmitting powerful, intruding signals on enemy frequencies. By November 1941 it was reported that a 500kW transmitter had been purchased in the United States (at a cost of £111 801. 4s. 10d.) and that the scheme had become known as 'Aspidistra', a name derived from the popular song made famous by Gracie Fields in the 1930s, *The Biggest Aspidistra in the World*. The costs were borne by SOE (previously SO2) but with further costs transferred to PWE since 'SOE have no claims whatsoever in the operation of the scheme'. [6]

In May 1941, the scheme was personally approved by the Prime Minister, Winston Churchill, and the same month PWE consulted Colonel (later Brigadier) Gambier-Parry ('G-P' or 'Pop') who had moved out of Whaddon Hall and was living at Wavendon Towers, the recording studio centre for PWE. He had by then overseen the merging of the Intelligence and Foreign Office radio communications, the setting up of the HF network for the distribution of signals intelligence derived from Enigma traffic under the Ultra priority classification, and was in 1941 in process of taking over the MI5 responsibility for the Radio Security Service (MI8c) and the building of its special intercept station at Hanslope Park.

Ellic Howe writes: 'It happened that he had learned of the existence in the USA of a "giant" 500kW medium-wave transmitter which had been constructed by RCA for sale to the New Jersey WJZ commercial station. However, its use had been forbidden by the Federal broadcasting authority because 50kW was the maximum permissible strength, and the apparatus

remained unemployed at RCA's factory at Camden, New Jersey.' [7]

'G-P' went to the USA, secured an option to purchase the transmitter and on return prepared a plan to erect and use the transmitter as 'a raiding Dreadnought of the Ether, firing broadcasts at unpredictable times at... the enemy's radio propaganda machine'. The plan was not disclosed to the BBC, who were much put out when they learned of it later.

Robin spent two months in the summer of 1941 in New York, attached to the British Security Co-ordination based in the Rockefeller Center and travelling daily to Camden. Under his supervision, the transmitter was modified so that it could be rapidly tuned, together with its antenna, across the MW band; it was also upgraded to be capable of 600kW RF output.

Meanwhile a site near Woburn, Bedfordshire, not far from the four 7.5kW HF transmitters, began to be prepared; then in August, the Air Ministry objected. By October a new 70-acre site was found high in the Ashdown Forest, near Crowborough. The BBC had by now become aware of the Aspidistra project and complained that the plan breached BBC and Ministry of Information policy not to drown the voices of German MW broadcasts and so disrupt the BBC monitoring of enemy broadcasts. They wanted to claim Aspidistra for their own 'white' broadcasts. Their campaign achieved partial success and it was agreed that the transmitter would carry BBC broadcasts on an authorised frequency when not otherwise engaged. Delmer, who always regarded BBC external services as stodgy and ineffective and was prepared to say so, went ahead with his own independent plans 'waiting for the right moment to act'. [8] Later the BBC, always ready to fight for its monopoly position, was to claim that Soldatensender Calais was damaging its own reputation. Though this did not prevent Hugh (Carleton) Greene of the BBC External Services suggesting that the 'black' programmes on the station 'were so funny that I have sometimes wondered whether they did not raise rather than depress (German) morale' [9] – a sentiment with which Goebbels clearly would not have agreed.

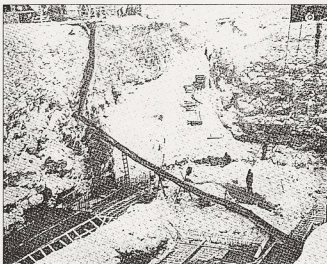
Nazi Propaganda

While Nazi propaganda broadcasts tend to be associated primarily with the 'white' MW and SW broadcasts of Lord Haw-Haw and his team of British renegades, they made effective use

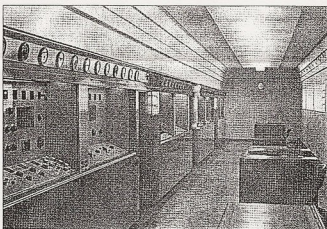
from 1940 of various forms of 'black' broadcasting. [10] I recall listening to 'Radio Arnhem' which in the winter of 1944–45 made use of the Dutch high-power MW transmitter (Radio Hilversum) to relay the popular Allied Forces programmes from the UK, daily from 6.25am to 11.00pm, but with skilfully interspersed short 'news' items and 'messages from POWs', etc. In Holland, with a much stronger local signal than from BBC transmitters, it was widely listened to by the forces bogged down in the 'hunger-winter' that followed the Arnhem disaster of October 1944. Those 'black' messages confused Dutch listeners but were also designed to stir up the already by-no-means harmonious relationship between the British and American Top Brass and servicemen. It has, for example, been conceded that a Radio Arnhem interjection in January 1945, praising Montgomery and disparaging the Americans, did little to smooth the ruffled feelings of the Americans who felt that Montgomery was claiming undue credit for his role in the defeat of the final attempt by the Germans to break through to Antwerp in the Battle of the Bulge in late December 1944. Delmer was convinced that it was necessary to fight 'black' broadcasting with equally tough, and if necessary mendacious, 'black' transmissions, much to the disapproval of the BBC.

Relations between Delmer and Hugh Greene became extremely strained in late 1942 and 1943 as Aspidistra came into operation, carrying at times Delmer's 'black' anti-Nazi broadcasts and at times the BBC European services. The feud over ownership and control of this 'raiding dreadnought of the ether' with its ability to change frequency was destined to last intermittently for more than forty years until finally, responsibility for all of the Foreign and Commonwealth Office transmitters was handed over to the BBC in 1985, by which time Aspidistra had been retired in favour of new transmitters at Orfordness, Suffolk.

Ellic Howe graphically describes the preparation of the Aspidistra site: 'During the spring and summer of 1942, Harold Robin was supervising the digging of a very big hole in the ground... The transmitter, its control panels and its large electric power generator were to be accommodated in a subterranean two-storey building, of which the ground floor was to be fifty feet underground with four feet of reinforced concrete on top. The whole area was covered with grass turf and when a number of fast-growing trees had been planted Aspidistra's location was effectively concealed. His colleague Cecil Williamson discovered a Canadian Army road-building unit in the



Excavation of the Aspidistra site in progress in 1941



One of the Aspidistra transmitter control panels

neighbourhood who found waiting for a Second Front a tedious period... they were delighted to bring along six bulldozers and explosives to loosen the earth and rocks. They completed the 'digging' in six weeks, apparently almost entirely on beer paid for from SIS secret funds. The structural steelwork, concreting and other building work was done by 600 workmen literally working around the clock... direct lines were installed to the Air Ministry, the BBC, and PWE's new studio at Milton Bryan, near Woburn Abbey...

On the Air

'Aspidistra was first employed operationally on 8 November 1942, immediately after it was known that the American landings ('Torch' invasion of North Africa) were proceeding successfully. It broadcast a pre-recorded speech by President Roosevelt and General Eisenhower's proclamations. Except for two 15-minute periods when it transmitted on the Rabat (French Morocco) Vichy-controlled wavelength, it was used to reinforce the BBC Foreign News Service for a period of 48 hours... One result of the broadcasts on the Rabat wavelength was that the Admiralty briefly supposed that Rabat had already been captured... an early 'example of counterfeit operations without first informing all on our side who might be misled by them.' [11]

The Soldatensender transmissions (as Soldatensender West) continued on Aspidistra right through until the night of 29-30 April 1945. Harold Robin recorded the final programme on large glass-backed discs, and these have been transferred to tapes now held in the Imperial War Museum sound archives.

The end of the war in Europe in May 1945 brought to an end 'black' broadcasting from the UK, although the Foreign Service through GCHQ launched special broadcast services from Cyprus in 1956 during the Suez crisis and from a 250kW BBC transmitter on Ascension Island in 1982 during the Falklands War.

During 1946-47, many changes were made in the British intelligence set-up. In effect, PWE (and SOE) were stood down, some elements returning to SIS. Section VIII (MI8c) including diplomatic and intelligence communications and the Radio Security Service were (perhaps unwisely) brought under the umbrella of GCHQ (formerly GC&CS) whose main centre moved from Bletchley Park to Eastcote, north-west London (and later to Cheltenham). A semi-autonomous Diplomatic Wireless Service became responsible, under the Director of Communications of the Foreign Office (a post with the rank of Under-Secretary of State to which Sir Richard Gambier-Parry was appointed) for diplomatic telegrams and also for the engineering and operation of Aspidistra and later overseas broadcast transmitters on Cyprus, Malta and Masirah Island in the Red Sea-Arabian Sea.

At Crowborough, 'black/grey' broadcasting was put on the back burner, power was reduced to about 150kW to meet international agreements (later restored to 600kW), and all programmes originated from the BBC. For 25 years, Aspidistra ran from power supplied by its own diesel power generators deep underground. This ended in 1968 when it became practicable to accept a supply from the mains, and silicon solid-state rectifiers were installed in the transmitter. In 1982, Aspidistra finally closed down and was dismantled, following the opening by DWS of its new high-power MF transmitter base at Orfordness, Suffolk. By then, DWS had changed its name to the Communications Department of the Foreign and

Commonwealth Office (FCO), with ultimate responsibility remaining with GCHQ. In mid-1985, following protracted negotiations, ownership and running of the Foreign Service transmitters, in the UK and overseas, was handed over to the BBC and the broadcasting engineering centre in Hanslope Park closed down.

Although Britain has, since 1945, largely opted out of 'black' and clandestine broadcasting, an American publication [12] of 1987, *Clandestine Radio Broadcasting - a study of revolutionary and counter-revolutionary electronic communication* by Lawrence Soley and John Nicholls lists over 200 clandestine political broadcasting stations that operated between 1948 and 1967 and from 1971 to 1985, transmitting highly political and subversive programmes in Central and South America, East Africa, and the Middle East. These included a number of operations funded by the CIA in the 25 years or so since the days of its anti-Castro station on Swan Island in the Caribbean. During the 1990-91 Gulf War, an anti-Saddam Hussein transmitter located in Saudi Arabia is widely believed to have been funded by the Americans. The history of 'black' broadcasting has not yet come to an end.

Further Reading

A detailed account of the building of Aspidistra, its wartime operation, the personalities concerned, illustrations, etc., can be found in *The Black Game - British subversive operations against the Germans during the second world war* by Ellic Howe, published in 1982 by Michael Joseph Ltd. A meticulously researched book on the secret radio propaganda wars during the 1930s is *Truth Betrayed* by W. J. West, published in 1987 by Gerald Duckworth & Co., Ltd.

References

- [1] 'Few tunes of glory for Piccolo' by Pat Hawker, *Electronics Weekly*, 2 October 1968.
- [2] Quoted by the late William Casey in *The Secret War against Hitler*, Simon & Schuster, 1989.
- [3] *Radio Power - Propaganda and International Broadcasting* by Julian Hale, Paul Elek London, 1975.
- [4] *Truth Betrayed* by W. J. West (see above).
- [5] As [3].
- [6] 'Most Secret' memo written by (Sir) David Stephens, secretary PWE, 24 November 1941, quoted in *The Black Game* (see above).
- [7] *The Black Game* (see above).
- [8] Quoted by Asa Briggs *The History of Broadcasting in the UK*, Vol. III *The War of Words*, published in 1970 by Oxford University Press.
- [9] As [8].
- [10] *Truth Betrayed* describes how the name Lord Haw-Haw was given to Norman Baillie-Stewart by Jonah Barrington of the *Daily Express*, but later became attached to William Joyce. From April 1940 the Germans ran three 'black' services directed at the UK: the New British Broadcasting Service (NBBS), Workers Challenge and Christian Peace Movement, mostly on SW but with some medium-wave transmissions.
- [11] *The Black Game* (see above) Chapter 16 'Aspidistra'.
- [12] *Clandestine Radio Broadcasting - a study of revolutionary and counter-revolutionary electronic communication* by Lawrence C. Soley and John S. Nicholls, Praeger, 1987. RB

Aspi 5, Task Z & Operation 'Silent Minute'

The Secret Story of the Vain Attempt to Jam the V2 - Part 1

by Pat Hawker G3VA

There is an ancient Chinese proverb that 'Success has a thousand fathers - failure is an orphan'. Most of the secret Intelligence successes of the second world war have by now leaked out. But there remain buried some remarkable engineering feats among the failures - not least I would suggest the construction by Section VIII of MI6/SIS of a 75kW VHF jamming transmitter in less than six weeks at the Aspidistra site in the Ashdown Forest near Crowborough, East Sussex. (For details of the building and use of the 600KW Aspi 1 MF transmitter see *Radio Bygones*, August/September 1992.)

Although in terms of casualties and damage, the V2 rockets launched by the Germans between 7 September 1944 and 27 March 1945 proved less serious than the V1 pilotless flying bombs, they were militarily even more significant in paving the way for the post-war development of intercontinental ballistic missiles with nuclear warheads and the concept of total mutual destruction.

Had it not been for the many problems of technology that delayed the operational phase (some 65 000 design modifications were made to the V2) the combined effects of the V1, the V2, and the unfinished long-range V3, with which it was planned to hit New York, might have saved the Nazis from defeat. There is ample proof that in 1944 the threat was taken extremely seriously by Churchill and the Chiefs of Staff once they had become convinced that the many Intelligence reports could no longer be dismissed as fantasy or deception.

From 1942 onwards such reports steadily increased. They came from SIS agents and Allied Intelligence and Resistance networks; from Prisoner-of-War interrogations and the bugging of senior POW officers at the special centre on Ham Common; from the Photographic Interpretation Unit (PIU) at Medmenham; from occasional Enigma and hand-cipher decrypts, augmented by interception of the German radar unit plotting test firings in the Baltic of V1s and V2s. All this activity, some initiated by him, was brought together and analysed by Dr R. V. Jones, SIS's Assistant Director of Intelligence (Science) - ADI(Sc). These partial and not always reliable sources gradually added up to convincing evidence of German progress in rocket weapons together with

an insight, though blurred, of their basic specifications. It was unfortunate that for many months, Churchill's own scientific advisor, Lord Cherwell (Professor Lindemann) continued to dismiss all reports as an elaborate deception by the enemy. He refused to believe that the Germans had developed a long-range rocket capable of delivering a worthwhile warhead on London.

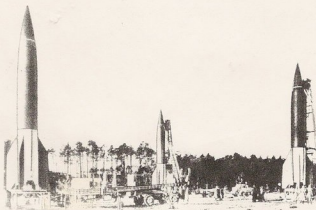
The story of how Dr Jones, alerted by The Oslo Report of November 1939 of the work being carried out at the German Versuchsstelle Peenemuende research station (cover name 'Heeres-Artillerie-Park (HAD)'), was able to assemble information on the V-weapons has been well told in his *Most Secret War* and in other books such as Brian Johnson's *The Secret War*. But there remained vital missing data - and some wrong assumptions. For example, right up to the launch of the V1 (FZG76) flying bombs in June 1944, it was believed that they were powered by rockets rather than, in reality, by low-cost pulse-jet engines with their distinctive put-put sound.

V1 Counter-measures

Fortunately, enough was known about the V1 to enable increasingly effective counter-measures to be planned and then put into effect. Just how effective they became is shown by the fact that, on 28 August 1944, of 94 V1 launches, 65 were destroyed by Ack-Ack (aided by microelectronic proximity fuses and American SCR-584 gun-laying radars), 23 by RAF fighters (mostly Tempests as these were faster than Spitfires and could overtake the V1), 2 by the balloon barrage - only 4 of the 94 got through to the London region!

In total, of the 8617 V1 flying bombs launched from sites in France, 2340 reached the London Civil Defence region, killing 5500 people and seriously injuring about 16 000. Horrific as such figures now appear, it should be remembered that at the height of the 1940-41 Blitz over 5500 people were killed in London alone, with a total of over 6900 in the UK, in the single month of September 1940; there were UK totals of 6300 killed in October 1940, and 6475 (4934 in London) killed in April 1941.

As Intelligence information accumulated, a massive RAF raid was mounted on Peenemuende during the night of 16/17 August 1943 by 600 aircraft, 40 of which were lost.



A battery of V2 rockets. The centre rocket is on the special carrier that formed a mobile launching gantry

This seriously disrupted the work on V-weapons and caused much damage. However, only one of the senior scientists (the prime target) was killed and many bombs fell on the associated foreign workers camp, killing a number of those who had been supplying information to British Intelligence. However, the raid caused rocket R&D to be largely transferred to Blizna, Poland, where it was soon identified by the Polish Home Army and from Enigma traffic. The major production plant for V2s was built in extensive caves in the Harz mountains near Nordhausen, invulnerable to bombing despite the impressive ending depicting an entirely fictional successful raid in the post-war cinema film about Crossbow.

Intelligence networks in the Occupied Countries were asked to report any information on possible preparations, including launch sites, for the use of rocket weapons. While this resulted in several valuable reports, Dr Jones singles out for special praise the reports of 'Amniarix' (Jeannie Rousseau, later Vicomtesse de Clarens) who worked for the Germans as an interpreter and who was able to pass reports to SIS via Switzerland where there were three SIS stations under diplomatic cover in radio contact with Whaddon. But there were inevitably also a number of misleading reports based on rumour rather than fact.

Much to the annoyance of Dr Jones, the task of assessing the feasibility and progress of the V-weapons was entrusted to a new 'Bodyline' (later 'Crossbow') operation under Duncan (later Lord) Sandys, MP, Minister of Works. He set up a number of committees to which were recruited, amongst others, British 'rocket experts' with no experience of Intelligence work.

The V2 Threat

The rocket, known initially to the Germans as *Aggregat 4* (A4) and later as *Vergeltungswaffe 2* (V2), was code-named by the British 'Big Ben'. In June 1944, after the first V1 flying bombs had been launched at London, the Prime Minister formed the 'Crossbow Committee of the War Cabinet', and became alarmed and annoyed when Dr Jones revealed that stocks of the V2 appeared to have already reached about 2000 (later shown to be an accurate estimate). The PM, shocked at this unexpected information, was even prepared to consider announcing that an attack on London by the V2 would be met by the release of poison gas over German cities.

One reason for Government alarm was that for many months it had been estimated that V2 warheads would contain at least 7 tons of high explosive. Similarly the size and weight of the V2 had been over-estimated in many reports, despite what later was proved to have been accurate information from several of the best agents. The higher estimates were generally accepted due to the continued insistence by Lord Cherwell that even if such a rocket existed the weapon could not possibly justify the effort being put into it by the Germans

if it carried only the same explosive power as the V1 (about one ton).

The Crossbow rocket experts for several months insisted that a rocket weapon would need to be very large to reach London since they assumed it would be powered by a solid fuel such as cordite, not appreciating that the German scientists had developed a far more powerful liquid oxygen/alcohol fuel. They also believed wrongly that it would need to be launched from an elaborate 'projector' when in fact the Germans had developed a mobile 'Meillier-Kipper' vehicle that brought the rocket to a simple concrete pad and then provided the vertical launching gantry.

As late as 27 July 1944, Sir Alwyn Crow, Controller of Projectile Development, was still stressing that 'The smallest

rocket capable of a range of 100 miles with 5-ton warhead would not weigh significantly less than 33 tons, or have a diameter significantly less than 5ft.'

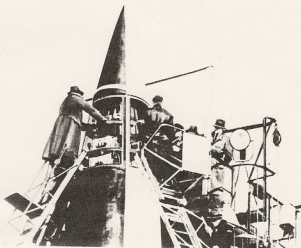
It seems once again to have been Dr Jones who had the foresight to recognise that such a horror weapon would have great appeal to Hitler almost regardless of the potential damage it could cause. Hitler had in fact given it high priority and personally ordered the construction of the unnecessary launch sites protected by some 3ft-thick concrete that had been detected and bombed by the RAF. In practice the operational launch sites were virtually un-

detectable from the air and could be changed frequently, basically as for the much later American 'Cruise' missiles.

But if Intelligence rather than the rocket experts had, by June 1944, a realistic and remarkably accurate assessment of most aspects of the V2, they lacked detailed information on how it was to be guided to the target area – although it was rightly estimated that accuracy would be about a ten-mile circle around the aiming point. This would still be sufficient to place rockets consistently within the Greater London area.

Radio Control

Agents had reported the V2 as being 'radio-controlled' but this might mean a complete tracking, guidance and ranging system, or a tracking system that would enable the Germans to confirm where it fell (such a tracking system was carried on many V1 flying-bombs), or conceivably just an initial radio-control system that would shut off the fuel-supply some 60 seconds after launch. It was known that the V2 guidance systems had been a source of difficulties and delays, and that some radio-control signals believed to be associated with the V2s had been detected at Beachy Head on about 27 and 30MHz. But more detailed information was urgently required to plan radio counter-measures that might have some chance, no matter how slight, of success. As Fritz Trenkle has made clear, the Germans developed progressively a considerable number of different radio guidance and tracking systems for their rockets although the majority of operational V2s



German engineers checking the radio equipment in the nose-cone of a rocket

depended on an inertial-navigation gyro platform – 'Das Mischgerät' – impervious to radio counter-measures.

Then in June/July 1944, two fortuitous events seemed to offer some reason for optimism. On May 20 the Germans fired a V2 with a dummy warhead from Blizna that fell in the river Bug some 80 miles north-west of Warsaw. It was found and then hidden by members of the Polish resistance until the Germans gave up the search. Polish Home Army Intelligence had earlier set up a secret operation to try to seize one of the trial rockets being fired from Blizna before it could be recovered by the Germans.

The London-Poles, whose Intelligence service was second to none, arranged that Professor Greszkowski at Warsaw Polytechnic should examine the radio equipment. Warsaw in turn radioed their London HQ and arranged for the rocket remains to be collected by an RAF aircraft from Brindisi, Italy (the aircraft nearly got stuck in the mud on the landing strip). It was then brought to London for further examination at RAF Farnborough. It seems likely that the recovered radio equipment was sufficient to show that while radio was used to shut off the fuel some 60 seconds into launch, using frequencies of the order of 50MHz (even this was later made automatic), the main guidance system appeared to be gyro rather than radio controlled.

Misleading Intelligence

But, perhaps unfortunately, on June 13 a V2 (possibly an A4b), without a warhead, launched from Peenemuende, went off course. As sometimes happened, it exploded in the air. The remains fell in Sweden. On July 31, two tons of the damaged components arrived in the UK after being 'bought' from the Swedes by the British in exchange for the promise of some mobile radar units. Although not appreciated at the time, the rocket was an experimental hybrid version that differed significantly from the production V2. It seems to have carried the sophisticated radio-guidance system (Wasserspiel, FuMG406) developed for the 'Waterfall' surface-to-air missile. But the system was so badly damaged that little detailed information could be obtained.

The FuMG406 radio guidance system used frequencies

of the order of 125MHz and 156MHz. It was tentatively assumed from the examination of the badly damaged V2 pieces at RAF Farnborough that, after all, the weapons might be fully guided by radio. This would make them vulnerable to radio counter-measures such as a high-power jammer transmitting on suitable frequencies. It could be presumed that any guidance system would come into operation only after the rocket fuel was turned off after the initial 'silent minute' of the launch. In this period the rocket ascended almost

vertically from the platform to which it was transported from an underground store on the specially designed mobile launching carrier.

Counter-measures

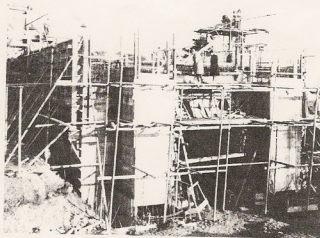
On 5 August 1944 the Air Staff prepared a 'Memorandum on Counter-Measures against Flying Rocket Attack' for the Crossbow Committee of the War Cabinet. The main text of this can be found at the Public Record Office, Kew under PREM 3/111.

The memorandum reported that five main chain radar stations between Dover and Ventnor were being fitted with special equipment for detecting missiles at heights between 5000 and 50 000ft (in practice this proved insufficient height since the V2 reached a height of about 75km); additionally radars at Martins Mills near Dover and Pevensey were being modified for greater heights.

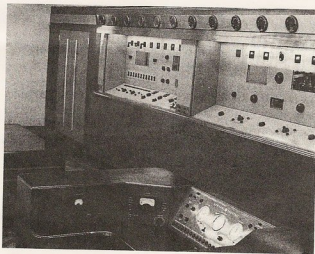
It added: 'In addition to the normal RAF Y radio interception services which maintain a continuous watch for enemy radio transmission, a special organisation to listen for rocket transmissions has been set up. This consists of coast stations extending from Lowestoft to Southbourne with a control centre at Beachy

Head. With radio direction-finding equipment, continuous watch is maintained on wavelengths which it is considered are likely to be used in the rocket control. Information obtained from these stations will be used to assist in determining the area from which enemy ground radio control is operating... An organisation for flash spotting and sound ranging has been set up.'

According to Brian Johnson, by August 15, the listening watch around 27 and 40-60MHz made use of some 60 Hallicrafters S-27 VHF and RCA AR-88 HF receivers and



The original building for Aspi 1 under construction in 1942



One of the General Electric HF transmitters installed in the semi-underground hall that housed Aspi 1 (probably taken about 1943).

Unfortunately, it appears that no photographs of Aspi 6 have survived (if any were ever taken)

the pre-war BBC television transmitter (which had been used as a jammer during the earlier Battle of the Beams) was ready to provide a jamming signal around 45MHz.

It was stressed to the Crossbow Committee in early August that: 'Radio counter-measures against the rocket are dependent on the availability of detailed technical information about the rocket radio equipment employed by the enemy. Only when further information is available will it be possible to say whether radio counter-measures can effectively interfere with the enemy's radio system... The present indications are that until more complete details of the enemy's rocket radio equipment are known, effective radio counter-measures against the rocket may not be possible. We believe, however, that it will be possible to interfere to a considerable extent with any radio ranging devices employed by the enemy to give them information as to the fall of the rocket.'

'The most urgent need in planning and providing the radio control of the enemy rocket and technical details of the radio equipment employed in carrying out radio control. The urgent need for this information is known to all the appropriate intelligence authorities, and every effort is being taken to obtain the necessary information, particularly from the rocket equipment obtained from Sweden and Poland. Aircraft fitted with radio jammers may be required to counter the enemy control of the rocket.'

Jamming Requirements

PREM 3/III does not refer to 'Operation Silent Minute' or 'Task-Z'. The construction of a VHF jammer directed against a Wasserspiel type radio-guidance system clearly needed to be more powerful than any previously built. To provide such a jammer became the responsibility of Section VIII at Whaddon. What happened is revealed here for the first time in detail. First by one of the Whaddon engineering officers concerned:

'I attended a briefing given by Brigadier Richard Gambier-Parry at the beginning of August 1944. Intelligence had become available that a German rocket weapon, to be known as the V2, was being prepared for launching against the UK and might be guided by a radio signal between about 120 and 180MHz. Our task was to identify and jam the guidance signal before the weapon reached the South Coast. It was estimated that a jamming power of about 50kW would be necessary. There was no known equipment in the UK or USA capable of providing this facility but it was wanted without delay.'

Section VIII had good liaison with the British radar research establishment (TRE) at Malvern, with the BBC, with Post Office Research at Dollis Hill, and with RCA Laboratories in Camden, New Jersey. A suitable building was being hastily constructed on the Aspidastra site at Crowborough, Sussex. As well as an adequate mains supply, there was a 1 megawatt, 3000hp, 16-cylinder Crossley Premier diesel engine and alternator as part of the 'Aspi 1' 600kW medium-wave installation. [Aspi 2, 3 and 4 were 100 and 50kW General Electric (US) HF broadcast transmitters installed on the site after completion of the 600kW MF transmitter.]

'Within a week arrangements had been made for RCA to send over water-cooled triode valves, a pair of which should

be capable of delivering 75kW RF power over the required VHF band. We obtained access to a site on Beachy Head for receiver and transmitter remote control facilities. Mervyn Wells of the Post Office set up the control link to Crowborough. Rowland Lees of TRE was seconded in order to use his expertise of VHF antenna systems. Louis Varney (G5RV) joined us temporarily from Hanslope Park (SCU3).

'Bob Peachy saw to administration. Bernard Walsh (the SCU catering officer), owner of Wheeler's Oyster bars in London, arranged accommodation for and feeding of the team. To this end he commandeered one floor of the Beacon Hotel, Crowborough. Overall management and sites facilities at Crowborough were provided by Harold Robin and Ronnie Watton. They took over a small engineering works at Crowborough to supplement the small workshop already on site. The design and construction team was mainly from the Whaddon and Hanslope Park laboratories and workshops.'

To be continued ...

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ASPI 5, Task Z & Operation 'Silent Minute'

The Secret Story of the Vain Attempt to Jam the V2 - Part 2

by Pat Hawker G3VA

In view of the urgency of the Task Z/Silent Minute project (with information becoming available to British Intelligence that the V2 attack could be expected to start during September 1944, the month after the initial briefing of the Whaddon team by Brigadier Gambier-Parry), the work had to be planned to a time-scale of weeks, rather than the months or even years needed for a peacetime project of this magnitude. It was decided that the fullest use should be made of conventional designs, using readily available materials and straightforward workshop facilities.

"We tried to avoid problems such as the machining of difficult materials to close tolerances and to manufacture, for example, several resonant circuit components of slightly different dimensions while the machines were set up, rather than spending time on more precise designs or risk having to re-set the machines should the component not cover the required frequencies" recalls a Section VIII engineer.

An immediate problem was the requirement for a 100kW, 7kV DC anode supply. The BBC was 'obliged' to provide the Ministry of Information transmitters that had recently been installed at Woofferton, near Ludlow. Within a couple of weeks, they had been dismantled by an RAF technical team and brought successively on a low-loader to Crowborough where they were reassembled.

For the heart of the jammer, two powerful, water-cooled RCA 880 valves were used for a balanced resonant-lines power oscillator, with the cooling water running through the resonant lines made from copper tubing of about 2-inch diameter. Frequency tuning was effected by sliding bridges driven by reversible DC motors on the grid and anode parallel lines.

Some idea of the urgency in which Task Z/Operation Silent Minute was tackled is given by the fact that the team worked around the clock in two shifts, 9am to 9pm and 9pm to 9am. And at times even these 12-hour shifts were made elastic. A Whaddon engineer recalls that he once worked from 9am to midnight and then next day 9am to 9pm - 27 hours out of 48!

At the beginning of September, several doodle-bugs (V1s) came down in the neighbourhood (one close enough to blow an engineering officer off the motorcycle he used to travel from the Beacon Hotel to the site). It was therefore decided that a second jamming transmitter should be built as an emergency reserve.

Capacitor Failures

With the completion of the first jammer transmitter, it was necessary to run it up gradually to full power. When this was attempted new problems quickly began to show up. The valve grid-coupling capacitors repeatedly failed due to

the very high RF current through them. An attempt was made to build suitable capacitors from polystyrene without much success. Eventually, the unorthodox solution was to use the grid-to-filament capacitance of type 889 high-power (50kW) transmitting triodes as used in Aspi 1 - probably the most expensive capacitors ever!

Another problem arose from the enormous currents circulating in the resonant lines coupling to adjacent circuits. The DC supply lines had a habit of glowing red, and the fluorescent lights in the building were as bright when switched off as when switched on! Nobody stopped to think of the potential radiation hazards to themselves. An unanticipated problem was also caused by the 600kW radiated from Aspi 1 just a few hundred yards away. When a 1-inch by 1/16-inch copper grounding strap was bolted to the Aspi 5 antenna feeder, the induced MF current caused it to glow red and then melt!

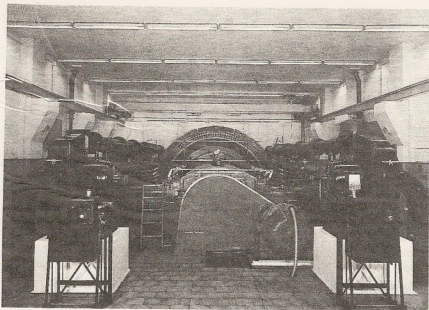
The jammer ran with a DC supply to its anodes of 90kW with an estimated continuous-wave RF of 75kW derived from calculating the energy absorbed by the cooling water and subtracting this from the 90kW input power.

At about 10pm on the evening of Friday, September 8 a phone call was received to say the first V2 had been launched at the UK a few hours earlier (it landed in Chiswick at 6.34pm, killing three people including an infant girl in her cot). The Whaddon engineers rushed to the site and Aspi 5 was successfully powered up within minutes under remote control from Beachy Head. There were further alerts in the following days but it would seem that few V2s were detected before they came hurtling down from the stratosphere. Even if the warnings had been given in time, Aspi 5 working on the frequencies of the experimental hybrid A4b/Wasserspiel system would not have affected the missiles.

Recollections

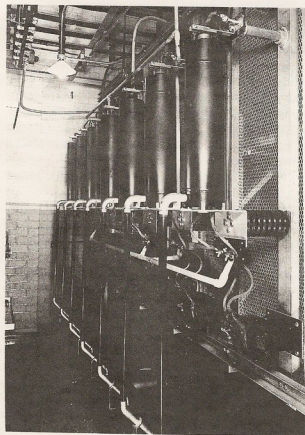
Additional recollections of those hectic days come from Harold ('Dick') Robin, CBE, the Section VIII engineer-in-charge at Crowborough: 'Task Z, as it was called at Crowborough, first came to me from C. F. Sutton, a propagation expert in the Air Ministry. He said that the Beachy Head intercept station were hearing signals on the VHF band when a V2 was in the air. Could I jam them? Not possible without some 50kW RCA HF transmitters recently installed at the BBC HF site at Woofferton, near Ludlow. "OK" he replied, "I'll get them for you ASAP".

"I immediately began work on a new building within the Aspidistra compound, but this time not underground like that for Aspi 1 and the G-E HF broadcast transmitters.

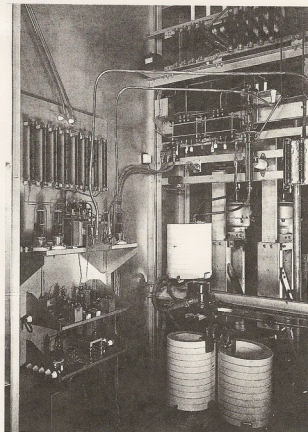


Until a supply could be brought in from the National Grid, an alternator driven by a 16-cylinder, 3000hp supercharged Crossley Premier diesel engine powered the transmitter

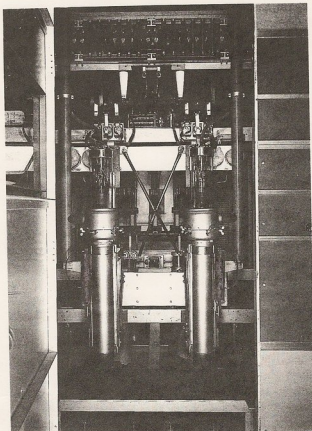
As mentioned in Part 1 of this article, no photographs of Aspi 5 have survived, if any were ever taken. These pictures of the 600kW Aspi 1 MF transmitter installation, taken in 1942, give an idea of the scale of the engineering involved in such high-power stations



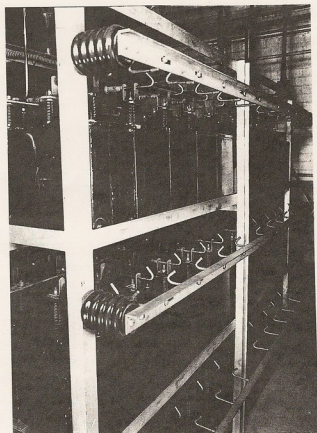
Main rectifier. Mercury-vapour tubes giving 12kV 12A



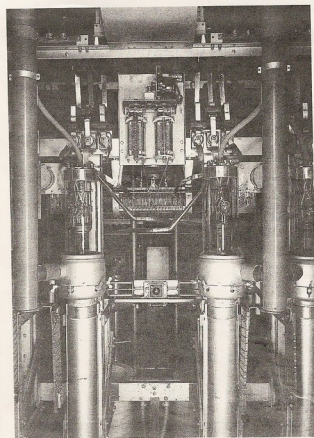
Modulator cubicle



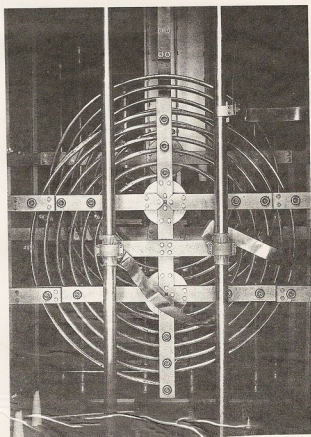
Transmitter driver stage, 50kW



Transmitter condenser bank



An RF cubicle - 200kW output from 4 RCA tubes 398



Transmitter output coils

Hundreds of brickies, working in shifts around the clock, built the 100ft by 200ft "Barn" with a wooden roof.

The VHF transmitter was made from two of the 880 valves from the GE transmitters (Aspi 3 and Aspi 6). The 889 driver tubes of these transmitters were used as coupling capacitors from the grid lines to the grids of the 880s. The tuning was effected by a bridge made to slide along the grid and anode lines with beryllium-copper fingers around the 2-inch diameter valve envelope.

In the meantime more of the RCA 50E transmitters arrived from Woofferton – the BBC was not well pleased at losing them! In the end we had all six of these transmitters. Frequency control of the VHF transmitters was devised and implemented by Mervyn Wells, a senior engineer loaned to Section VIII by the Post Office. He arranged a line pair between Beachy Head and Crowborough. From Beachy a variable audio tone was sent over the lines to Crowborough where the tone was amplified and rectified in a unit produced by him.

The tuning drive to the VHF transmitter used a long brass 1-in diameter rod with a square thread left- and right-handed to move the anode and grid tuning bars. The shaft of the rod was rotated by a direct-coupled DC motor controlled by a Ward Leonard set made by Neco Motors. This was about 1hp and worked well.

In practice, the system, so hurriedly set up, worked fairly well. When Beachy Head heard a likely signal, they tuned the VHF transmitter until the Crowborough signals fell on top of it. I don't believe we ever had any effect on a V2 but it was all a tremendous challenge and everybody enjoyed responding to it.

Afterwards the "commandeered" transmitters were sent back, with RAF help, to Woofferton and re-established for HF broadcasting. At Crowborough the "Barn" building, which still exists, was later used for various tasks, housing two Western Electric 50kW medium-wave transmitters with high-efficiency Doherty modulation; a Marconi 50kW HF transmitter; an RCA 50E HF transmitter; and an RCA 50E which I converted into a 50kHz (6000 metres) LF transmitter which was heard in Canada despite the problem that the radiation resistance of the 300ft mast antenna was very low.

With the first transmitter running well and the second nearing completion the Section VIII engineering team began to break up and return to Whaddon to continue with urgent work in connection with the war in the Far East. The team had successfully implemented 'Silent Minute' within less than five weeks and had the system working by the time the V2 attack began, although it had no possibility of affecting the gyro system.

A 125MHz radio guidance and tracking system may have come into use for some of the later V2 rockets launched in 1945, by which time all attempts to jam the V2 missiles from Crowborough or Alexandra Palace had been abandoned. Over 80% of those launched at the UK used the Mischgerät gyro system for guidance, accepting that the accuracy of the rockets was limited to a radius of roughly 15km of the aiming point.

By 27 March 1945, some 3600 V2 missiles had been launched (mostly from sites in Holland), about 1400 were directed towards London, 1265 towards Antwerp, 537 towards Norwich and other towns in southeast England, and relatively small numbers towards other towns in France

and Belgium. About 6000 were manufactured and the attack could have continued had it not been for the final Allied advance into Germany.

'Flying Gasholders'

Of the rockets directed at the UK, some 300 went astray or exploded *en route*, 1057 exploded on the mainland, 517 in London and 537 in 11 other counties. They killed 2754 people and seriously injured 6523 people, less than half the casualties caused by the doodle-bugs. But, they were formidable terror weapons. If you heard the explosion you had survived! But you never knew when one might arrive. It was not until 8 November 1944 that first the Germans and then the British media finally admitted the existence of the V2 attack – previously rumours were spread that the sudden explosions were due to gasholders, provoking many ribald remarks about 'flying gasholders'.

Many Londoners found it difficult to excuse a memorable Government whammy. This was the press conference called by Duncan Sandys on 7 September 1944, just one day before the first V2s came hurtling down from the stratosphere, at which, relieved that all V1 launch sites in France had finally been over-run, he claimed: 'Except possibly for a few last shots, the Battle of London is over' – a view reflecting the general euphoria of the moment that the war in Europe was about to end and the belief that V2 rockets could not reach London from Holland. It was also expected that Holland would soon be liberated by 'Market Garden' – an operation that successfully secured three important bridges but found the vital Arnhem bridge 'a bridge too far'.

The single worst V2 incident was in Antwerp, which suffered no fewer than 1200 V2s (more than twice the number that fell on London). A cinema was hit and 240 servicemen and 250 civilians were killed. In London, 110 people died when a rocket came down in Smithfield Market off the Faringdon Road; and on November 25 Woolworth's store in the New Cross Road, Deptford was hit, killing at least 160 people. The V2 attack lasted seven months; one of the two final rockets reaching the London area on March 27, the last day, fell in Stepney killing 134 people.

First Launching

My own memories of the V2 are less dramatic. The first successful operational launching of the V2 was not of the missile that exploded in Chiswick in the evening of 8 September 1944, but one that landed on the outskirts of Paris some 12 hours earlier. Comfortably still asleep at a SIS/SCU9 base in the pleasant 16th *arrondissement*, I was awoken by a distant but unusually loud double-explosion. Since there were no further explosions I returned to sleep. It was not until much later than I realised that the explosion had come from the first operational V2 to hit its target.

Later, in Holland, we were acutely embarrassed when the Dutch Underground in the northern (occupied) provinces firmly warned us that it would discontinue helping the Allies if the severe RAF bombing of the V2 launch sites near the Hague continued. I cannot now recall whether this was following the attacks of early 1945 or the disastrous raid by medium bombers of the 2nd Tactical Air Force on Saturday, March 3. This provoked an extremely strong protest from

the Dutch Government representatives in London. Details of the raid, which killed some 800 civilians and caused some 100 000 to be evacuated from their homes, had been brought to Brussels by the Secretary of the KLM airline company who successfully crossed the lines and reported 'The temper of the civilian population has become violently anti-Allied as a result of this bombardment'.

The RAF raids followed urgings by Herbert Morrison, Minister for Home Security, that more should be done to stop V2 launchings by using the RAF heavy bombers in mass attacks on the Dutch launching sites - advice that was firmly rejected by the PM and the Chiefs of Staff because of the inevitable slaughter of Dutch civilians. Exactly what went wrong on March 3 is uncertain. None of the 70 tons of bombs fell within 500 yards of the wooded Haagsche Bosch where the rockets were made ready for launching. Officially the blame was put on the briefing officers, with the RAF telling the PM: 'Investigations are not yet complete but it seems likely that the responsibility for what occurred will be traced to one or more officers who were responsible for briefing on this occasion... This lapse is at present the subject of a Service enquiry which may result in Court-Martial proceedings.'

In effect, it was soon recognised that the V2 was virtually immune from any form of counter-attack other than physical occupation of the launching sites. However, it proved possible to reduce the scale of the attack by some disruption of production in Germany and by attacks on the lines of communication. The possibility of SOE sabotage or Commando raids was mooted but abandoned due to the high level of German security surrounding the V2 operations.

Although, in the outcome, the Nazis gained little military advantage from the rockets that had taken them so long to bring into operation and had consumed so many resources, the advent of long-range rockets was soon seen as opening up vast new possibilities in the conduct of military operations: 'In future the possession of superiority in long distance rocket artillery may well count for nearly as much as superiority in naval or air power.' None of the public records at Kew in PREM 3/111 relating to the Big Ben rocket mention what may well have been in the minds of some: the possibility that such missiles would before long be capable of carrying nuclear warheads each powerful enough to wipe out whole cities.

On the credit side, it has to be recognised that the wartime development of long-range missiles and liquid-fuelled rockets led directly into the Space Age and all that has entailed.

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In addition to previously unpublished material on Task Z and Aspi 5 based on reminiscences of those directly involved, the following sources have been drawn upon:

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A V1 flying bomb and a V2 rocket, mounted on its 'Meillier-Kipper' mobile launch vehicle, are among exhibits in the missile area of The Aerospace Museum at Cosford, Shifnal, Shropshire. The Museum, located on the A41 close to Junction 3 on the M54, is open daily throughout the year (except Christmas and New Year) from 10am to 5pm

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