THE BIRTH OF SIGNALS INTELLIGENCE

The History of MI1(b)

John Ferris points out in the bibliography to his invaluable work The British Army and Signals Intelligence that "no historian has assessed the work of MI1(b) or MI1(e)" and that "while ample evidence survives on the latter organisation, the former may well remain forever in the shadows". I found this very reassuring since I had found virtually nothing and must confess that the following article is, to a great extent based on the History of MI1(b) which can be found under reference HW7/35 C480318 in the National Archives. What I found particularly interesting is that I have traced no published historian who has made any reference to or mention of this invaluable paper. I am obviously most grateful to the NRA for the opportunity to examine this document.

Unlike the Royal Navy, most of the records of the army’s signal intelligence from the Great War are not publicly available. What is available falls into three general categories; first, original reports from the organisations which collected signals intelligence – whether MI1(b), codebreakers at army headquarters, “IT” sets or traffic analysis, which are extremely rare. Second, a somewhat larger range of documents exists on signals deception, aircraft intelligence and the organisations and techniques of the signals intelligence service. Finally, much material survives of weekly summaries of traffic analysis reports in 1917 and 18 and on the interception and security of field telephone traffic between 1916 and 1918 and to signals security in general during 1918. Ferris helpfully quotes from these.

Even the limited military use of wireless communications in the Boer War inevitably led to the potential of wireless communications being seen. Suddenly, communication was possible between two points without wires but it was not until the outbreak of World War I that wireless technology advanced sufficiently for the army to use it as a successful tool and, inevitably, military interception came of age, however before this, revolutionised by its invention, the Admiralty had been able, for the first time, talk to ships at sea. There was a problem though, in that if they could hear the messages so could the enemy! This inevitably led to cryptographers being given the chance to come into their own for the first time.

At this time the navy led the army in many developments; in fact, the success of the work of Bletchley Park in World War II can be attributed directly to the work of Room 40, the unofficial name of the Admiralty’s World War I code-breaking organisation. It was not surprising that the navy led the way. There was far less pressure at the time on the army to make any real progress with wireless communications in any form. Cryptography had been studied in Britain before the war, mainly in the Naval Intelligence Department (NID), and, as a result, their specialists were able to read many of Germany’s diplomatic and operational signals within a very short time of the introduction of wireless. In 1902 a forward-looking (unusual in the Admiralty at that time) faction within the Royal Navy had decided that all naval cadets should receive a grounding in the basics of engineering and electricity and it was decided that Sir Alfred Ewing, the then director of naval intelligence was “the man to do it". Fortunately, Ewing had also “dabbled a bit", as he put it, with ciphers, having devised a “rather futile machine" to automate the task of enciphering and deciphering dispatches and so ciphers became part of the syllabus at the Naval College. Surprisingly, this gave NID greater influence within the Admiralty and their work would become of major significance later in the conflict.

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1 John Ferris The British Army and Signals Intelligence during the First World War Army Records Society 1992.
Wireless telegraphy (w/t) was still in its infancy at the outbreak of war in 1914. Although it was already being used by all warships and many merchantmen, no one could have anticipated the enormous increase in wireless traffic that waging war would bring about and that Room 40’s mastery of German Navy and diplomatic codes would have nearly as profound an effect on the outcome of the First World War as Bletchley Park’s penetration of Axis codes would have in the second.

The Admiralty’s Room 40 soon became a large and very professional code-breaking establishment despite the surprising initial hostility from line officers. To cope with the flood of intercepts, Ewing shipped in four language teachers from the naval colleges at Dartmouth and Osborne. Two of the four were to play vital roles some 25 years later: A.G Denniston who would be in charge of Bletchley Park in its early days before moving on to Berkeley Street to work on diplomatic codes and ciphers; and “Dilly” Knox who would be responsible overall for the solving of Enigma in the early days with only limited success before the Poles arrived on the scene. But for the work of Room 40, the Irish Easter Rising in 1916 might well have succeeded. Room 40 intercepted and decrypted at least 32 messages dealing with assistance to Sinn Fein which were exchanged between Bernstorff, the German ambassador in Washington and his government in Berlin.

Room 40, (or ID25, its correct title) had more success than the army in exploiting wireless communications and consequently became heavily involved in intercept work somewhat earlier. In the summer of 1914 the Admiralty received reports that the General Post Office had picked up German signals from their station at Lowestoft and so N.I.D quickly authorised an intercept station to be set up at Hunstanton to monitor this traffic, the coastguard hut being used to house the equipment with three volunteer radio amateurs assigned to man it. They were to be the first of the many Voluntary Interceptors or VI’s, whose work would later to prove to be so vital in World War II. The German high-power long-wave station at Norddreich, some 25 km from Berlin, proved to be an invaluable source of fodder for the code breakers, and as technology and equipment improved, they turned their attention to higher-frequency interception as well. In 1915 these intercepts helped the British to win the naval battle at Dogger Bank, and were to play vital roles in later naval engagements. Had they have been completely trusted by senior officers at the Admiralty they could, perhaps have led to an outright victory at Jutland.

The work of the Admiralty’s Room 40 was not appreciated everywhere. For most of the years it operated, the attitude of the naval staff towards cryptanalysis was hostile or, at best, indifferent. Lieutenant Clarke, a member of the “Room”, recalled how, at the time of Jutland, Rear Admiral Sir Thomas Jackson, Director of the Operation Division, “displayed supreme contempt for the work of Room 40”. He never came into the room during Clarke’s time there, apart from two or three occasions: on one of them when he came to complain that one of the locked boxes in which the information was sent to him had cut his hand; and on another to say, at a time when the Germans had introduced a new codebook, “Thank God, I shan’t have any more of that damned stuff”. His attitude towards sigint would also lead to Jellicoe and Beatty being seriously misinformed about Jutland.4

Far less is known of the work of MI1 and its history harder to trace. A department of the British Directorate of Military Intelligence, itself part of the War Office, it contained “Department C & C” which was responsible for ciphers and code breaking and MI1(b)

4 British naval success – if it can be called that - at the Battle of Jutland, and elsewhere, owed much to wireless intercept successes.
responsible for interception and cryptanalysis. Although they operated in parallel with Room 40, extraordinarily, during the war, there would be great rivalry between the two set-ups, [MI1(b) and Room 40] with little or no collaboration on code-breaking. It may also now seem rather strange that Room 40, originally intended to be a purely naval department, should have become so involved in diplomatic intelligence matters that, at best, had only indirect connections with affairs at sea but it has to be remembered that there were only these two cryptographic organisations in existence in Britain at that time. One major reason was that the Foreign Office did not view such methods with any favour (believing that reading other people’s mail was not a suitable occupation for gentlemen). In Kingslake’s *Official History of the Crimean War* he noted “the gathering of knowledge by clandestine means was repulsive to the feelings of an English Gentleman”\(^5\). Unlike the Germans who made full use of their overseas consulates for intelligence purposes, the Foreign Office was appalled by the idea of diplomats carrying out espionage, however discreetly. Indeed there is little evidence that they even knew of the existence of either of the other two organizations – certainly not the significance or extent of their work. Those were the days when the working day at the Foreign Office did not start until 11am. A similar attitude would, later, bring about the closure of the American Cryptographic Bureau. Apart from the expense, the residue of this attitude possibly accounted for the reluctance of the F.O. to take over responsibility for GC & CS from the Admiralty in 1922, despite the fact that the only traffic being studied in any detail at that time was diplomatic or political.

The formation of the Signal Service in 1912 as a separate and integral branch of the Royal Engineers was undoubtedly a great step forward in the evolution of signal policy before the European War but the British would not have a separate corps of signals in the war. At the outbreak, in August 1914, all the British Army’s signalling/intercommunication requirements were being met by the Royal Engineers Signal Services (RESS) which had been formed in 1908. Earlier, in 1870, the responsibility for all military communications was officially given to the Telegraph Troop of the Royal Engineers. Signalling had been the responsibility of the Telegraph Battalion until 1908, when the Royal Engineers Signal Service, a separate but integral branch of the Royal Engineers, was formed and which would go on to provide communications throughout World War I. It was about this time that motorcycle dispatch riders and wireless sets were introduced into service.

By 1914, radio communications, or wireless telegraphy (w/t) as it was then known, were being used by virtually all of the world’s military and naval forces even though many scientific aspects were still not fully understood and nor was the full potential of interception, or deception appreciated. The British Army was at that time, typically lagging behind the other major European powers – in not having a separate corps of signals. The communication services that were available to the British Expeditionary Force (BEF) at the outbreak of war in August 1914 can be summarised as follows:\(^6\)

- Visual signalling. (Long used by the army in the form of fire-beacons, semaphore, and the heliograph).
- Telegraphy. (Duplex [two-way] telegraphy; a relatively new invention dating from 1870).
- Telephone. (But initially only at the senior command level).
- Dispatch Rider services. (The use of motorcycle dispatch riders had just begun in 1908).
- Runners. (Battalion-level message carriers - often susceptible to high casualty rates).

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\(^{5}\) The ‘Intelligence Corps’ 1914 to 1929. A.F. Judge, a Study. March 2009. Privately printed.

\(^{6}\) Ferris ibid.
Wireless. (Wireless sets – nowadays called radios – were also being introduced in greater numbers in 1914, but their bulky and fragile nature made portability difficult).

Pigeons. (Front-line coded message carriers from late 1914).

Military Postal Service.

The signal service was ill-prepared for war in 1914 even though its creation had been undoubtedly a step forward in the development of a signal policy prior to the war. The RESS was by no means in overall control in 1914: each BEF artillery battery and infantry battalion had its own signallers and means of communication; other independent systems existed at the highest command levels. RESS only began to be in real control at the brigade level so a certain degree of chaos was inevitable whenever the two systems met or overlapped. Nowhere was this more evident than in the telegraph/telephone system, which was the prime method of intercommunication in 1914, and was becoming of increasing importance. Turf battles between the competitive signallers were not unknown, neither was the filching of essential signals material.

Unfortunately too many vital military intercommunications were over-dependent on a not very reliable French civil telephone system and that and the BEF’s own system, were far too open to interception by the very efficient and determined German listening squads. These squads were particularly active and effective close to the front line. British telegraph/telephone security systems were notoriously lax at this time; whole tactical plans were read out in plain speech over the telephone and listened to by the ever-alert Germans.

The move into more static trench warfare at the end of 1914 inevitably brought about essential, changes to the BEF’s signalling modus operandi. Training courses were organised for signallers at the division and brigade level and a successful attempt was made to bring in the free-booting infantry battalion signallers into a single uniform intercommunications operation; the artillery proved to be more resistant to the loss of its dedicated signallers. New military telephone systems were also slowly being introduced across the Western Front. Meanwhile, BEF HQ tried to impress on the more senior of the officer corps the need for the proper and economic use of the telegraph/telephone system to protect it from overload. Also, the officer corps was repeatedly reminded it was absolutely essential that there be an improvement in the level of security by strict adherence to the necessary security protocols. Certain senior officers tended to treat the system as their personal facility and were loath to change their imperious and careless ways.

An intelligence corps\(^7\) in the form that we might recognise it today was formed on 5 August 1914, the same day as mobilisation began under the direction of Brevet Major Walter M. St George Kirke (later general and knighted). Kirke later wrote:

“Immediately an ultimatum to Germany was decided upon, steps were taken to organise an Intelligence Corps in accordance with the provisions of the Staff Manual 1912, paras. 33 and 44. Although the need for an Intelligence Corps was already accepted in the War Office, nothing of its kind had ever before existed in practice. When the word to mobilise came on 4 August, I was ordered to take charge of Secret Service arrangements for the Expeditionary Force and (the creation of) an Intelligence Corps forthwith. The page here was completely blank and the puzzle was how to fill it.”

\(^7\) A.F Judge. ibid.
The British Army like its peers, collected intelligence through various different means. First, combat units, by reconnaissance, observation and with the capture of prisoners and their documents. German soldiers’ pay books in particular were to be held to be a very good source of intelligence throughout the war. Second, agent networks traced enemy troop movements as was done successfully through Belgium and Palestine but this source could offer little more in the way of intelligence. Decrypt intelligence was clearly less comprehensive and when war broke out in 1914, unlike in the Admiralty, there was no special branch of the War Office dealing with cryptography. As far as the army was concerned, neither cryptography nor intercept techniques had advanced very far. The rapid advance of the science of wireless telegraphy and the possibilities of interception especially of field wireless appear not to have been fully appreciated either before the war or for a very long period during it. Before 1914, no European (for that matter – any) army had come fully to terms with the cryptological consequences of the radio age because none of them expected wireless to be used routinely in war. They all held that effective communications would be maintained through telegraph, telephone and dispatch riders with radio serving as a tertiary mode of signalling. In Europe, no army would develop cryptographic systems. British procedures for signal security were primitive — in other words, average. Although a very small sub-section of amateur cryptographers was formed not long after the outbreak of war to decipher enemy intercepts, the converse, namely the security of our own ciphers was practically ignored.

In August 1914 a retired officer whose only practical experience of cryptography had been gained in South Africa offered his services to the War Office. He was commanded to form a sub-section of MO.5, the duties of which were to deal with and decipher intercepted German wireless messages. This sub-section consisted of five members in all, four of them civilians and from this nucleus there grew up finally the section that became known as MI 1(b) which, by the time of the Armistice, had a strength of 34 officers, 11 civilians and 40 women, a total of 85. The early work of the section was confined entirely to deciphering enemy wireless. Valuable intelligence was being gained for the first time following on from the interception of enemy messages. These intercepts were being dispatched to members of the newly formed Intelligence Corps at St Omer GHQ where they were acting as intelligence officers under the command of an officer of the General Staff. At this early stage in the war, though, the army had absolutely no experience of signals intelligence or its potential, but nevertheless, they were frequently able to make some valuable deductions about the opposing forces. It was laid down that, as far as possible, all intercepts should be dealt with locally, with only those that could not be deciphered being sent home to the War Office.

The decision was made to have a wireless compass manufactured, confirming the idea that the enemy’s HQs could be located by direction finding. Intelligence officers, who had been specifically assigned to study the contents of these intercepted messages, had realised that it would be an advantage to locate the position of the enemy wireless stations transmitting these messages. Two ex-Marconi technicians, Lieutenant Franklin and Captain H.J. Round, who had been seconded to the army for intelligence duties, were assigned to this task of designing a wireless compass and conducted experiments on the Wiltshire Downs near to Devizes with six masts and aerials erected in an arc, in an effort to locate the precise origin of a radio signal. By using loop aerials and taking bearings from more than two different locations, the

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8 Janet Morgan. Secrets of the Rue St Roch. Allen Lane 204. pp432
9 Ferris. Ibid. The British Army and Signals Intelligence, 1992
10 HW7/35 TNA
location of the transmitter could be pinpointed with, by then, some considerable
degree of accuracy.

Towards the end of 1914, a small convoy was sent across the Channel from Britain
to France. It consisted of two lorries and a car, loaded with special Marconi
equipment: two 70-foot (21-metre) masts; two receivers, each consisting of a crystal
detector and a soft-valve audio frequency amplifier designed by Round and two
Bellini-Tosi direction finders, similar to apparatus the company had first fitted two
years earlier to the great Cunard liner, SS Mauretania. By 16 December, the first two
wartime direction-finding (DF) stations were being tested on the Western Front. On 1
January 1915, the first weekly maps based on DF information were drawn up for
military intelligence. Initially, they only showed German wireless positions but soon
they would also indicate movement of trench wireless units and therefore troops, of
Zeppelin dirigibles and other enemy aircraft.

However, the Royal Flying Corps (RFC) were early and ultimately successful,
experimenters in attempting to adapt the technology to their reconnaissance aircraft
for artillery-spotting purposes and general aerial reconnaissance. Wireless sets were
installed in artillery-spotting planes, but as the earlier sets weighed 70 pounds, or so,
it usually meant the observer had to be left behind and the Royal Flying Corps (RFC)
pilot operated the radio himself. Since the messages had to be in Morse code this
was quite skilful multi-tasking. Some pilots preferred to continue to use signal lamps.

On 2 January 1915, the British Army set up its first Wireless Signal Company. The
following month, all the army crystal sets used for message interception were
superseded by Round's new valve receivers to match improvements already made
by the enemy. Further improvements followed. The coverage of Allied DF activity
with the Marconi antennae so increased their accuracy that 11 German spotter
planes were shot down in one week. When the direction-finding results were
compared with the content of the messages, on occasions, the transmitters could
often be matched with actual known enemy formations enabling intelligence officers
to follow formations and the positions of their headquarters even when the messages
could not be deciphered. Round was delighted with the results and moved his aerial's
baseline to Calais–Amiens. There were further developments made by Capt. Rupert
Stanley (RN) and his colleagues. Using two V-shaped earth-aerials attached to a 3-
valve receiver they found that they could hear enemy conversations at 100 yards and
several of these sets were ordered.\footnote{Hugh Skillen ibid.}\footnote{Hugh Skillen ibid.}

In the meantime, helped by research for the Zeppelin service, the Germans had not
been idle and using a low-resistance telephone receiver connected to a good earth
they could hear the conversations of senior British officers up to 3,000 yards from the
front line without any physical attachment to the cables. This discovery, which
coincided with some unofficial monitoring of Allied conversations by the wireless
experimenters, revealed that the Germans had obtained vital intelligence concerning
future engagements from the indiscretion of senior officers. When this was finally
discovered a ban was immediately put on all telephone conversations within 3,000
yards of the front line during 1915-1916 but it was not until 1917 that counter-
measures became reasonably effective.\footnote{Hugh Skillen ibid.} Step by step the counter-measures were
tightened but the main obstacle throughout the process was the frequent disregard
by telephone users of the orders relating to talking about forbidden subjects, the
worst offenders invariably being the more senior officers who had most to give away.
Appalling though it is, it is no exaggeration to say that thousands of casualties
resulted from these indiscretions during 1915 and 1916. Eventually it was realised
that it was essential to make sure that the quantity of information of value to the
enemy which was passing over the forward telephone wires should be reduced as
much as possible. Carefully framed orders and circulars pointing out the dangers of
overhearing were printed and these were issued to everyone in possession of a
telephone. Disciplinary action was threatened if orders were ignored or disobeyed.

Once again considerable difficulty was experienced in overcoming the inertia which
seemed to oppose all change and improvements in the army. Quite understandably,
obessed with matters of life and death on their own account, officers in the forward
area seemingly had no inclination or incentive to be careful when it came to what
appeared to them to be unimportant details of their telephone conversations.
Immediate necessity often overrode the general instructions for “discretion to be
observed” and the most momentous of plans were still being discussed in detail and
with a candour which was as naïve as it was dangerous. The earliest authenticated
positive information that the enemy was overhearing matters of importance came
from a British civilian who had been interned at Ruhleben camp overhearing the
medical orderlies at the camp hospital discussing with German visitors and
sightseers the possession of ‘an apparatus which was securing them valuable
information in this manner’. So pleased with this new invention, they could not keep
quiet about it. It is impossible to over-estimate the importance of what they must have
heard in 1915 and 1916 before the necessity for precautions had been taken on
board. A classic example of the results of this obstinate stupidity was brought to light
on the Somme in the autumn of 1916. After thousands of casualties had been
suffered during earlier attempts to capture the village, Ovillers-La-Boisselle was
finally taken from the Germans and, Allied troops billeted themselves in the enemy
dug-outs and converted cellars. In one of them they found a complete copy of an
operations order issued by one of the British corps for a previous operation. This had
been overheard by enemy interpreters, taken down from beginning to end and issued
to the German commanders in good time to enable them to take measures to defeat
the attack. As a result of this the battalions, leaving their trenches at zero hour had
been decimated before they had crossed no man’s land? It was not until this story
and several others of a similar vein had gone the rounds that officers began to realise
that discretion was not only desirable but a duty second in importance to no other.

The Germans had not been slow in continuing to develop systems. Once the German
Army became aware of the problems arising from interception they quickly brought in
efficient security and interception systems. They gained far more from interception
than they gave away. By July 1916 on the Western Front, Britain had only five
listening sets (called ‘I Toc’ or “IT” intelligence telephone sets whilst the Germans
had the Moritz field-telephone intercept system which supplied the German staff with
a considerable amount of information.14 To give some idea of their value as
intelligence collectors it is believed that of the 24 military units located and identified
by the Germans from January to March 1916 at least twelve had been obtained
through the use of Moritz. There is some evidence that Moritz also warned of the
precise time and place of many of the divisional attacks. Undoubtedly the German’s
greatest coup was the discovery of the date of the Somme offensive in 1916.15
Throughout 1916 it continued to provide first-rate intelligence on the British order of
battle and unit dispositions. According to captured documents the identifications of

14 Generalleutnant von Soden, Commander 26th Res Div until late 1916 has a number of interesting things to say in the divisional
history about interception of telephone calls along his front. At the end of 1915, he reported: “A new feature was listening in,
exploiting earth return systems by means of Moritz and Arend stations. As long as the enemy did not realise what was happening,
we were in a position to listen in to every enemy order and we got to know every company commander by name.” By June 1916,
it noted, “Greater care over the use of the telephone by our opponents, because of ‘something which must be kept secret.’ This
made interception much harder.”
the British order of battle acquired by the German listening (Moritz) sets up to March 1916 equalled the total from all other sources.

Telephone lines were tapped continuously by the enemy, which was comparatively easy as they were rarely buried and the trenches were close to each other. Such was the success of their interception that coded messages had to be sent in Morse along telephone lines. The Germans were able to intercept messages through the earth and mud and, to counter this, the Fullerphone was finally introduced by the British, superseding the D111. Invented by Major General A.C. Fuller, the first instruments were tried in France towards the end of 1915. The trials were successful and in 1916 supply started on a large scale to the delight of signals officers. Once again, messages could be sent right up to company headquarters with impunity. Eventually, the signallers were not allowed to communicate by telephone, unless using a Fullerphone, until they were out of range of the enemy.

Direction finding increased in its importance. A small network of DF stations had been set up in the UK at Leiston in Suffolk, Devizes in Wiltshire and on the roof of the War Office; designed to intercept signals from Zeppelins and were all linked to Room 417 in the War Office where the DF bearings were plotted on to maps. There were also intercept stations in Salonica, Cairo and Baghdad. As far as the UK was concerned, there was a naval station in Aberdeen and the GPO controlled stations in Seaham in Northumberland, Peterborough and Westgate in Kent.

As long as a war of movement existed on the Western Front the enemy’s wireless activity remained high and good results were obtained but the opening months of the Great War revealed a peculiar situation regarding signals and signal intelligence. Any defender in a developed area whether in France or East Prussia could communicate rapidly and securely by landline. In order to signal at all, any army attacking in hostile territory had to resort to wireless to a then unexpected degree. There was also the problem that ciphers were cumbersome and prone to error and speedy transmission was often the order of the day with the result that every attacker was tempted to send crucial messages in the clear. Credit has been given to Germany and criticism levied at the Russians for what happened before the battle of Tannenberg yet in France the German Army did precisely the same with identical results. Between September and November 1914 British and French forces intercepted at least 50 messages in plain language from German divisions, corps, armies and army groups. These provided invaluable insights into the enemy command and gaps in its line during mid-September 1914. Victory on the Marne was no miracle. Over the next two months similar en clair transmissions together with the results from the solution of German encoded messages meant that the BEF were warned of the precise time, location and strength of six full-scale attacks on its front, each involving four or more German corps. It could well be that without this Britain could have lost the ‘race to the sea’.

At the outbreak of war, the British Expeditionary Force 2nd Div. Signal Corps had five officers and 170 OR.s in three field sections and an HQ section. Each section was sub-divided into three cable attachments, each of one officer and 26 OR.s equipped with a horse-drawn cable layer, some outdated telephones and a back-up system of semaphore. Extraordinarily, only the cavalry was equipped with wireless rather than telegraphy equipment in 1914. Attached to each division and brigade, they had a

16 After intercepting un-encoded wireless messages from both Samsonov and Rennenkampf, the Germans were able to take Samsonov’s army by surprise with the force of their attack near the village of Tannenberg.
17 Ferris ibid.
18 Ferris ibid.
19 Hugh Skillen Spies of the Airwaves 1989
cable troop, a visual and dispatch rider troop and a wireless troop with three Marconi sets mounted in wagons. When the Western front reached stalemate the cavalry, no longer having a role, were “dismounted” and took their place in the trenches. Some cavalry sections, closest to the German lines, discovered that the enemy were sending a considerable amount of traffic by wireless and as the signals historian Major General R. F. Nalder put it, “Wireless sections turned their attention to other fields and, before long, they were being used almost exclusively for the interception of enemy traffic and with, occasionally, considerable successes”.21

As long as it was a war of movement, the enemy’s wireless activity remained high and good results were being obtained, however, with the advent of trench warfare and the stabilisation, or rather stagnation, of the Western front the enemy was able to introduce landline communications and his field-wireless activity dropped away to virtually nothing. There was, however, a certain amount of long-range wireless communication which remained fairly constant throughout the war, notably between Berlin and Constantinople, which was seldom of any great value, and between Hanover and America and Nauen and Spain; consisting mainly of German Foreign Office messages which were being dealt with mainly by the Admiralty. With the settling down to the grim and virtually unmoving struggle for position warfare in the winter of 1914, as mentioned earlier, cavalry ceased to play their original role, contenting themselves with a normal line system and wireless lost much of the interest and importance that it had been beginning to have. The increase in the use of small receiving sets with their heavy batteries for artillery observation purposes was a highly specialised branch and so was of little general interest the more especially as it was controlled by the Royal Flying Corps - although the Intelligence Corps were heavily involved - who had no particular reason for advertising its activities.22 So, wireless sank to a very third-rate position, not only in the eyes of the army generally but even in those of many signals officers who were not personally connected with it.

On the eastern front, radio always remained a major form of communication whereas in the Middle East it only became an effective means of communication around late 1915. By the end of 1914 and the beginning of 1915 the Western Front had ceased to rely on wireless and had turned to elaborate telegraph and telephone systems.

Since the original source of work for the sub-section had practically dried up – at least for the time being nor was there very much miscellaneous work from Scotland Yard for example with the various prisoner of war messages that were reaching Britain by cipher and other means to occupy the sub-section fully. It was decided that they should turn their attention to the great volume of diplomatic code messages being sent by cable routes which due to the censorship regulations were now, for the first time accessible. A start to this type of work was made with the American diplomatic codes early in 1915. All the staff came to this with no previous experience; there were no past records to give guidance and the problem of how to solve large codebooks had to be thought out ab initio.23 Despite the difficulties that this presented the three American codebooks currently in use were solved, together with several reciphering tables used with them. Once the task of solving the codebooks had been accomplished help in decoding messages was obtained by attaching to the section, convalescent officers who were not allowed to get involved in the more technical work.

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21 Hugh Skillen Ibid.
22 Ferris Ibid. Aircraft Intelligence
23 HW7/35 TNA
From the beginning of 1915 onwards the work of the section fell into two main divisions: the original work of dealing with purely enemy messages and this new venture the deciphering of neutral diplomatic codes. These roles were to remain good until the Armistice when other duties were added.

After the formation of the Military Intelligence Directorate in December 1915, the subsection was transferred from MO5 and placed under the Director of Military Intelligence with the title of MI1(b). At the War Office, Brigadier Anderson at MI1(b) was also getting useful information from his French allies as they had been able to pick up German military signals during the Marne offensive right from the outset of the war as the Germans had relied upon wireless telegraphy to communicate during the invasion of Belgium with the General Staff at Koblenz. One problem the Germans had was the unsuitability of their military cipher which was based on a fairly simple substitution–transposition system. This was a proven method of encoding messages, but a single error tended to corrupt an entire text. Under battle conditions the system frequently broke down, causing German operators to repeat the same message, perhaps as many as ten times, often finally resorting to plain language in their frustration; a cryptographer’s dream come true. The French were swift to take advantage of this and by the end of August 1914 they were reading a sizeable quantity of the German traffic and the French Ministry of War started work on the development of a chain of intercept stations based at existing forts along France’s eastern frontier. As their confidence grew, more information was pooled with MI1(b).

Helped by the experience gained during 1915 in the deciphering of the American codebooks the section successfully attacked and solved in 1916 the then current Greek, Swiss and Spanish codebooks. The Greek was of the greatest interest. Very long messages which were passing in great numbers between King Constantine of Greece and Berlin had, owing to the presence of Allied troops in Salonica, to be sent by wireless between Athens and Sofia and were duly intercepted. The solving of the code in which these messages were sent was of the highest importance. The strength of the section had been gradually increased through the year until by the autumn it had reached ten members. As the number of diplomatic codes that had been solved increased, extra personnel were required to deal with the great volume of messages in these codes. Even so, a great number of messages had to be left untouched, only those that appeared to be important being dealt with.

Communications along the Western Front were soon so bad, with scarcely a telegraph line left intact after each enemy bombardment, that the director of army signals was eventually forced to resort to the many hundreds of privately owned pigeons kept around St Omer. During the winter of 1914, the introduction of the use of carrier pigeons was regarded by the heads of the Signal Service as a matter of general interest only – something of a joke. Alfred Henry Osman, writer and pigeon-racer devised the Government Pigeon Service in 1915, accepting an unpaid commission. He set up the Home Forces pigeon service with eventually 22,000 pigeons on the French and Italian fronts most of which were supplied at his personal expense. He was later seconded to the Intelligence Corps to organise the use of pigeons in covert operations. The success of this service was due to the efforts of Major Alec Waley, MC who was chosen to run the pigeon service. Although he was beyond military age and with absolutely no military experience, at the outbreak of war he begged the War Office to be allowed to serve in any capacity. Mainly due to his persistence he was finally accepted as a second lieutenant in the Intelligence Corps which was then being raised. When it was decided to form a carrier pigeon service he was given the task. On 11 September 1914, 15 pigeons were handed over to the British 'Intelligence' by the French. These birds were intended to be used for
intelligence purposes only but, from this small beginning, grew a significant branch of the Signal Service which by 1918 would number a staff of 380 experts with 20,000 birds on the Western front alone. Astoundingly, throughout the war no fewer than 90,000 men would be trained to take care of and to fly pigeons. For some time after the early winter of 1914-1915 pigeons continued to be controlled by the Intelligence Corps and were primarily used for intelligence purposes. The “service” grew continually in the area around St Omer where the British GHQ moved for the operations as Ypres and Armentieres were famed for their pigeon fanciers. Lofts were requisitioned one after another and control over all flying of pigeons in the area occupied by the British Armies was essential as a safeguard against espionage

Wireless activity on the Western front had virtually died down by the end of 1915 but it was realised that, where his land communications were bad, the enemy would still be using his wireless and so two sub-sections of MI1(e) were sent out to the Middle East; No. 2 Wireless Observation Group to Egypt and No. 3 WOG to Salonika. At roughly the same time, other officers were sent from the UK to set up No.4 WOG in Mesopotamia. This also covered South Russia and Anatolia as well as its immediate front. These three Middle East groups worked in close co-operation, exchanging intercepts and sharing the results of their findings obtained from traffic analysis, cryptanalytic data and translations and the operation of the six DF stations, by then, extending from Salonika to Amara in Mesopotamia. They held a common cipher for secure communication with MI1(b), which was still the main cryptanalytical centre in London.

By August, local activity on the Egyptian front had increased so much that it became impracticable to send the all intercepts home to the War Office and so one of the senior members of the cryptographical section was sent out to Egypt in September 1916 to organise and train local staff in dealing with enemy field ciphers codes on both the Egyptian and the Salonikan fronts. The work on these fronts fell into two very clear divisions; German intercepts and Turkish. German was in general use on all fronts in the Near and Middle East with the exception of the Hedjaz. Turkish was also in general use on the Egyptian and Mesopotamian fronts and was used exclusively on the Hedjaz. The cryptographers were trained to deal locally with as many messages as possible. Unfortunately, the organisation of the MI1(e) Intelligence sections, comprising as they did, both cryptographical and wireless personnel, was bad and, finally in 1917, they again had to be reorganised.

During the winter of 1916 the Army developed a system of listening posts on the Western Front to eavesdrop on German telegraph lines up to 3,000 yards away. The equipment was called “I Toc” an abbreviation of interceptor telephone. Originally introduced by the French Signal Service, it consisted of a listening set or receiver using three, 3-electrode valves used in cascade for amplifying the alternating currents which were induced in loops of leads laid out as ground aerials in a V formation in no man's land.24 Unfortunately, the only way to set up the equipment was to physically take the wires and pegs out into no man's land, extend them as far as possible and then push the iron pegs into the ground. Not a popular task at any time but particularly not in winter!

Intelligence Wireless was finally decentralised in the spring of 1917. A defined establishment was laid down and all the intelligence stations in each army were built up to the allocated scale and combined to form the Wireless Intelligence Section of the Army Wireless Company. They were known thereafter as the Wireless

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24 A.F. Judge ibid. As described in an extract from The Signal Service in the European War 1914-1918, by R.E. Priestley a document held in the Intelligence Corps Museum archives.
Observation Groups (WOGs). Up to June 1917 the WT service, both in its operational and intelligence functions existed as a parallel though separate branch of the Army Signal Service. After that date the operational sections of the Army Wireless Company were transferred to the signal units of the appropriate formation with the intelligence sections passed to the operational control of a newly formed ‘special branch’ of the Intelligence Staff at GHQ which directed its activities and coordinated the results obtained.25 This special branch was known as I(e).

It was not until March 1917 that separate wireless intelligence and cryptographical sub-sections were formed in France. Very close liaison was maintained the whole time with MI1(b) who were assisting the cryptography sub-section with all the messages that had not been decrypted locally on the Western front just as they did in the Near East. This liaison between MI1(b) and I(e) at GHQ was to become even closer.

Eventually the British Army’s Listening Security Service consisted of 20-30 sets presided over by an Inspector of Listening Sets at GHQ with responsibility for intercepting enemy signals and monitoring Allied communications. Radio interception, then called Intelligence Wireless was nominally administered by the Signal Service but in practice, took its orders from a special branch of the Intelligence staff at GHQ. In March 1917 the position of inspector was abolished and the service transferred to Corps HQ where it worked in collaboration with the intelligence staff at army HQ. The resulting intelligence was sent to a special GHQ cipher bureau at Le Touquet for analysis and action by Captain Oswald Hitching26 an outstanding cryptographer - later to be described by his superiors ‘as being worth four divisions to the British Army’ - and his staff.

At GHQ the principal unit was the GHQ Wireless Observation Group charged with the “watching of the traffic and movements of the high powered German stations working at the rear”. However, due to the high quality of the German landline communications during the static battle conditions these stations were not very active and as a result the GHQ WOG often found itself mainly employed on monitoring the BEF’s own forward traffic for security breaches. Owing to the enemy’s security-consciousness, this monitoring of Allied communications developed into being their perhaps, most important function. The recording of German speech also led to the creation of a new army trade, styled ‘interpreter operator’.

By 1917, back at the War Office, the strength of MI1(b) had been increased to 14 and they had been outstandingly successful in solving diplomatic codes and ciphers. The personnel required for decoding and translating messages increased rapidly, reaching 43 by the end of the year. The growth of work on “trench” codes on the Western front referred to earlier brought about an increase of seven to the staff of the section in addition to those engaged on diplomatic messages.

By this time, the Near East sections needed very little help from London; all German and Turkish ciphers and all changes to the big Turkish military code were being dealt with by the cryptographers attached to the respective forces. By the close of 1917 the strength of the section had increased to over 50; diplomatic codebooks used by 14 countries were known; the trench codes used on the Western front were finally being

26 Originally destined to be a schoolmaster whilst teaching music at a prep. school he taught himself French and German by correspondence course so well as to gain an honours degree. Volunteering at the outbreak of war he was sent directly to France to work in the Field Censors’ Office where it was discovered accidently that he had a flair for cryptography. He rose to the rank of captain in charge of the C & C section of BEF GHQ based in Le Touquet.
adequately dealt with; all intercepted Turkish messages in whatever theatre of war were being deciphered and all German long-range wireless messages emanating from Germany to their agents in say Tunis or Constantinople were being deciphered. The situation in Palestine and Mesopotamia was not quite so favourable. Changes in the German cipher systems resulted in the new system being far more complex. Intercepts could not be dealt with locally and had to be sent back to the War Office in London. Fortunately, on the Salonika front, the Germans had begun to use “trench codes” which had been used previously on the Western front. Decodes of these previous messages were sent out from MI1(b) to the cipher staff at Salonika who were then able to read most of the messages that were of interest to them.

From this time until the end of the war, the main work of solving the German cipher systems, other than the trench codes on the Western front, could be said to have been done mainly by MI1(b). The systems used were far more complex than hitherto been used. Messages were received by bag regularly from Palestine all throughout 1918. The great strides that Britain had made in wireless reception enabled the German communications in the Caucasus and south Russia to be intercepted with greater accuracy in England itself. A close relationship was maintained with the cipher sections in the other theatres of war which were kept constantly and fully informed of all.

The artillery war of attrition still continued as fearsomely as ever. Wireless receivers were located directly at the battery site. To allow more than one observation unit to operate in the same area, a “clapper break” was devised to set a distinct tone for each respective aircraft’s signal. Signals were also heard and monitored at a central wireless station in each area. Should the wireless signal be degraded between any aircraft and their battery, the central wireless station could relay the target intelligence to the battery via a telephone line. Each side aggressively attempted to detect and jam enemy wireless communications, or inundate enemy receiving stations with bogus transmissions. The Germans even devised a “compass station” to detect and locate the source of wireless transmissions in order to direct scout patrols to the offending reconnaissance aircraft. The experiment had limited success due to the time lag between the location of the source and the arrival of the scouts, but the effort shows the critical impact of aerial reconnaissance upon ground operations during the Great War.

With artillery dominating this war of attrition further fields of intelligence gathering came into being as a result of this unavoidable communication by radio and the necessity of using codes. The effectiveness of artillery firepower depended almost entirely upon spotting and the direction of fire. Both sides were now becoming more and more skilful at it with wireless becoming more and more the primary method of communication. By 1918 the British were becoming quite sophisticated in their interception and the analysis of the traffic. This was based on work originally carried out as early as 1915 by Captain Lefroy27, a member of the radio unit of the RFC (Royal Flying Corps) who was later to become the chief of signals Interpretation in the Middle East. He had carried out some pioneering work in what was to become known as traffic analysis but it received very little attention until the autumn of 1916 when it was once again picked up by Lieutenant Ferdinand Tuohy28 who was the head of the wireless section at GHQ and a member of the Intelligence Corps. This information enabled RFC fighter aircraft to be guided on to the German spotter aircraft. “Some squadrons on standby, ready to act on this information, routinely

27 Ferris ibid. p14
28 Tuohy was later to publish three books on his WWI experiences in intelligence.
disrupted German spotting missions and destroyed enemy aircraft”. Ferris gives several interesting examples of reports (memoranda) sent by J.F. Tuohy (a Second Lieutenant in the Intelligence Corps based in the intelligence department in Wireless GHQ) to the Brigadier General General Staff, Royal Flying Corps which illustrate how the science of traffic analysis was already having an influence. According to Ferris “one informed although possibly biased British authority indicates that through this method 80% of the enemy’s spotting aircraft over an unspecified time and space were found and either destroyed or compelled to abandon their registration”. During March 1918 on the 4th Army front alone, 30 enemy spotting planes were shot down. There is very little evidence available but Ferris claims that what evidence is available suggests that by means of signals intelligence the time spent by enemy aircraft in spotting was reduced by 10% to 20%. Between October 1917 and March 1918, codebreakers of the Intelligence Corps were able to solve the traffic of 577 out of a total of 639 German spotting missions along the British front in time to give effective warning to troops about to be bombarded.

With the end of the war finally in sight, throughout all of 1918 the diplomatic workload increased on both quantity and scope. In addition to keeping abreast with the changes in the codebooks already solved of the countries mentioned, the Peruvian, three Romanian and four French codes were solved. The strength of the section handling diplomatic work was increased gradually throughout the year, reaching a total of 70 by the time of the Armistice and the staff handling enemy wireless and trench codes had risen to 15. At the time of the Armistice the total number of books solved had reached 52 together with several hundred forms of re-encipherment. 48 new “trench codes” had been solved while a total of over 700 German and Turkish field-ciphers with their different keys had been resolved.

The remaining role left to MI1(b) at the end of war in 1918, was the censorship of telegraphic cable traffic. Housed in Electra House, London, home of the Eastern Telegraph Company, (later to be merged into Cable & Wireless), it was abolished in 1919.

During the Great War it is fair to say that the British Army’s record in the development and use of signals intelligence was far from perfect. Between January 1915 and July 1916 it paid little attention to it. This was of little encouragement to those trying to do their best and resulted in security problems with field telephones. It took the appalling casualties of 1st July to bring this to the fore and for signals intelligence to be recognised as an increasingly valuable source of intelligence and its unique characteristic of its reliability. Finally GHQ came to appreciate that signals intelligence – particularly when it came to identifying order of battle and troop dispositions – was by far the most valuable methods of identification of divisional positions.

Signals intelligence was the smallest organisation of the British Army during the Great War collecting information through technical means rather than through the classical methods such as POW interrogations and the scrutiny of casualty lists and paybooks. According to Ferris, by mid-1916 around 75, and by the Armistice 1300, were involved in the collection of information by this method. By 1917-18 approximately 600 in the eleven WOGs and perhaps a further 200 under the War Office control in the UK.

Perhaps 25% of the radio personnel of the British Army – excluding those attached to the RFC – worked full-time on the interception of enemy wireless traffic. It is claimed that the allocation of so many operators to this field crippled the use of

29 Ferris ibid.
30 Ferris ibid. p23
wireless for British communication yet even then they were unable to monitor important categories of traffic such as plain language messages on the Home Front during 1918. About 8% of the army’s “Intelligence Corps” worked as codebreakers and traffic analysts in section I(e) whose function it was to derive intelligence from “enemy wireless sources, codes and ciphers”. Throughout 1917, 11 officers and some ORs worked with MI(e) in the Middle East. I(e) at GHQ France swelled from 10 officers and 36 ORs in August 1917 to 14 and 58 by November 1918 while another 2-3 and 10-20, respectively, served with each army in France and GHQ Italy. This strength was augmented by perhaps 85 personnel in the signals intelligence sections of the War Office MI1(b) and MI1(e). By the standards of the day this was a large strength exceeding that of the Royal Navy.’

Following a reorganisation of some of the branches of military Intelligence, in November 1918 after the Armistice, MI1(b) took on the additional task of constructing British codes and ciphers. At the same time the diplomatic workload became very heavy, particularly during the Paris Peace Conference requiring yet another increase in staff to over 100.

Great Britain had not fought this signals war alone. Liaison with the French Bureau des Chiffres had started as early as October 1914 and was vitally important, from a military point of view, throughout the war. The “trench codes” used on the Western front were, in part, common to the fronts of the British and French and were worked on simultaneously and all of the results were exchanged between both sides.

From the outset it appears that close liaison with the American army was maintained and it seems that all of the experience already gained by MI1(b) was placed at the disposal of the American cipher officers to the fullest extent. The superior material and manpower of the allies, with the entry of the United States in April 1917, finally turned the tide. The first American radio intercept station began operating on 8 December 1917 at the HQ of the French 2nd Army. It soon became so proficient that its hosts, the French, frequently requested copies of its intercepts. In 1918, the US Army Signal Corps established its first long range intercept station in Maine to listen to Europe, American 'Y' stations monitored transmissions to German agents in Mexico and South America. The US Army had used mobile intercept stations as well as land stations as early as 1916 on the Mexican border and US Army Intelligence brought its pre-war expertise with it to France with the American Expeditionary Force (AEF). US radio intelligence firmly established itself as an Army intelligence tool in France. In addition to monitoring US traffic for security violations, Signal Corps intercept stations located all along the enemy front intercepted enemy traffic and pinpointed the location by DF. The intercepted traffic was passed to the radio intelligence sections at GHQ and the two field armies, where specialists analysed them.

As far as the Italians, then allies, were concerned, there was practically no liaison due primarily to the very localised nature of the Italian front. None of these arrangements with the Allies went any further than military codes and ciphers; the very greatest security was observed over the diplomatic work that had become, by then, of such great importance.

A great deal had been learnt by the end of the war and more could have been learnt from what had gone wrong but peace and retrenchment left few links with the past. What continuity the Army preserved was overseas where the Russian revolution,

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31 Ferris ibid. p23
British operations in north Persia, the nationalist movement in Turkey and, later, the Turco-Greek fighting and the Arab rebellion coupled with the general spread of the use of wireless in the Middle East provided many worthwhile hunting grounds. Some were quasi-military, others of a quasi-political nature. After many changes of location, depending upon what was going on in the Middle East, Nos. 3 and 4 WOG were merged and renamed No.2 WT Company, finally taking up permanent residence about the end of 1923 at their new headquarters in Sarafand just a few miles to the east of Jaffa in Palestine. What was No. 4 WOG’s former station in Baghdad continued to be manned by No. 2 section of the company until mid-1929.

In India, too, Army Headquarters, Delhi, prompted by the War Office, was finally beginning to appreciate the potential value of sigint as a source of both military and political intelligence. Unfortunately, the existing resources at Army Headquarters, namely, two or three cryptanalysts and one WT intelligence officer (who formed the section responsible for them, O.3G branch) were inadequate for any major exploitation and interception, depending, as it did, on a temporary military station at Meshed, despite being reinforced on a part-time basis by three civil stations operated by the Posts.

This really brings the story of MI1(b), its formation and its work during the war to an end. What had been consistently apparent throughout the conflict was the great difficulty in finding the individuals with the necessary flair for cryptography. This was equally true of the purely military as well as the diplomatic side of the work. Really expert cryptographers could not be found ready-made and only experience made the individual who possessed the necessary mental qualifications and aptitude for the work into a skilled cryptographer. In the majority of cases it was found that the most likely source of technical experts lay amongst those trained in scientific and linguistic research. When it came to the work of decoding messages and amplifying diplomatic codebooks which had already been solved the permanent staff was drawn, almost invariably, irrespective of sex from members of the universities possessing high linguistic skills. In the final year of the war a form of examination was instituted for testing prospective candidates, designed to test the mentality as much as the knowledge of the individual, which proved to be of considerable help when it came to making the selection.

When a post-war inquest was finally held, it was concluded that in any army of the future some cryptographical knowledge should be imparted to all officers who might have to send messages in cipher. No real technical knowledge would be required of them but rather an understanding of the many pitfalls that could be avoided together with an intelligent understanding of the systems used and the reason for their adoption. Had such training been put into place in both WWI and WWII countless thousands of British lives would have been saved; this simple lesson still not being taken on when board it came to the war in the desert in 1941-2.

All of these ideas and other considerations led to the decision by Lloyd George’s government in November 1919 to authorise a complete reorganisation of the MI sections. The Diplomatic side of the work of MI1(b) was to be handed over to a central department of cryptographic experts (GC & CS) to which was attached a War Office liaison officer. A small nucleus was retained at the War Office for both constructive and instructive purposes and to keep in close touch with this central department. It was decided that the training of officers for “destructive” work in general would also be undertaken by this same War Office section. The idea behind this was that it would ensure that the knowledge and experience painfully learned through the war would be conserved and passed on so that, at the outbreak of war,
the army would not find itself as unprepared – cryptographically – as it did in 1914. If only it were so!

The British Army’s record in the development and use of signals intelligence was far from perfect. Between January 1915 and July 1916, in particular, it paid little attention to the matter. This embittered the pioneers of British military signals intelligence and led to the disaster involving the security of field telephone traffic in 1916. After July 1916, however the British Army overcame these problems and signals intelligence was recognised as an increasingly valuable and uniquely reliable form of information. By 1918, for example the Second British Army noted that the “special” nature of wireless intelligence called for very close liaison between (e) and the personnel responsible for assessing the enemy’s order of battle. British GHQ came to regard signals intelligence on the enemy’s dispositions and order of battle as being “always correct”, uniquely so in the field of intelligence gathering.

One lesson had been learned but had to be relearned in 1941 at Bletchley Park and which fortunately the Germans never learned. This was that cryptographical work is better performed centralised than decentralised. It was found during the war that officers engaged in cryptographical work in the more distant theatres of war inevitably lost touch with developments at home. This again was a lesson that had to be relearned after 1940. With the conflict on a single front, the problems presented tend to run along the same lines; varied and widespread experience can, as a result, be lost. This can cause a problem when the enemy suddenly introduces a complete change of system. The local cryptographer is less prepared, less able mentally to tackle a new problem than the cryptographer who is brought in daily contact with new ideas. It was discovered that this problem could be overcome by the frequent interchange of personnel between the home sub-section and the sub-sections abroad. It was frequently found that the intercepts on one front when combined and compared with the intercepts gained on another front could provide the clues necessary for the decipherment of some new system or series of messages. Here again centralisation is vital and was found to be the only method of dealing with such problems. The very closest possible liaison has to be maintained between home and abroad. It may be a statement of the obvious but this liaison, too, is better done in writing but when it came to distant localities such as Mesopotamia it was necessary to resort to cables. The result was that it was found essential that the further away the theatre of war the more need there was for an interchange of personnel.

This led to the complete reorganisation of MI1(b). The diplomatic side which featured largely in the later years of the war were handed over to a central department of cryptographical experts which was to form the nucleus of GC & CS to which was attached a War Office liaison officer together with the occupants of the naval Room 40. A small nucleus was retained in the War Office for constructive and instructive purposes acting closely with GC & CS. This unit would be responsible for the training of officers for destructive work both in future wars. Based on this nucleus, following the outbreak of war, on 29 September 1939 MI8, Military Intelligence Branch 8 was set up with responsibility for military signals intelligence in Caxton Street under Colonel D. Arcedeckne-Butler of MI1(b) and the military section of GC & CS was

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33 Ferris ibid. p. 22.
34 WO165/38)
placed under MI8 control. Many of the lessons painfully learned between 1914 and 1920 which had been forgotten had to be relearned.

MILITARY SIGNALS IN WWI
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PWC, February 2014