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## The Origination and Evolution of Radio Traffic Analysis: World War II

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*The bombing of the Philippines by the Japanese on 8 December 1941 came as a shock to the United States even though some Americans were braced for other attacks following the infamy of Pearl Harbor the previous day.<sup>1</sup> After the near destruction of the U.S. fleet in Hawaii, the Japanese were focused on the rows of B-17s and P-40s parked neatly in the mid-day sun at Clark Field. MacArthur's air force was destroyed on the ground on that Monday afternoon without a fight.*

*On that day, Lieutenant Howard W. Brown, a radio intelligence veteran attached to the Second Signal Service Company at Manila, changed the mission of the Army intercept unit from Japanese diplomatic to potentially more lucrative air force communications and began reconstructing the tactical military nets serving the attacking Japanese. Thus began U.S. Army radio traffic analysis in World War II.*

*In Europe, our entry into the war spurred closer cooperation with British signals intelligence. Radio traffic analysis, as indeed the entire field of Sigint, was comprehensively developed by the British following more than two years of war with the Germans. Bletchley Park, home of Britain's Government Code and Cipher School (GC&CS), became the center of Allied Sigint efforts in World War II. This included the preparation and training of U.S. Army and Army Air Force traffic analysts for support to combat operations in the theater. The U.S. European Theater Sigint organization in London eventually replaced GC&CS as the organizer of the U.S. Sigint effort in the Mediterranean and for the invasion of the continent in 1944.*

*By the end of the war, several thousand men were engaged in Sigint in the Pacific and in Europe. Traffic analysis was finally recognized by the Army as a formal and separate Sigint discipline, and, no doubt, contributed much to the final victory. This is the third in a series of articles concerning the development of U.S. traffic analysis.<sup>2</sup>*

1. William Manchester, *American Caesar: Douglas MacArthur 1880-1964* (Boston: Little, Brown and Co., 1978), pp. 205-06. More than eight hours before the attack on the Philippines, BG Leonard T. Gerow, Chief of the Army's War Plans Division, confirmed the attack on Pearl Harbor to MacArthur by telephone. Gerow also told MacArthur to expect an attack in the near future. We as a nation were strategically surprised and, like most Americans at the time, MacArthur was in shock or, as others have done, was experiencing "sensory overload."

2. See "The Origination and Evolution of Radio Traffic Analysis: The World War I Era" *Cryptologic Quarterly*, Vol. 6, No. 1, Spring 1987 and "The Origination and Evolution of Radio Traffic Analysis: Between the Wars," Vol. 6, Nos. 3-4, Fall-Winter 1987-88. Traffic analysis existed as a function in World War I and clearly practiced by the Army under LTC Frank Moorman. However, it was Navy LT Joe Wenger's experiments on Japanese Grand Fleet maneuvers between the wars which was the basis for the separate Sigint discipline known as traffic analysis.

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## THE SOUTHWEST PACIFIC AREA

Howard Brown was a corporal in the Tenth Signal Service Company assigned to the Radio and Telegraph Office, Fort Santiago, Manila, in the early 1930s. In an adjoining room, the Signal Corps had for a short time a small intercept station where Brown became familiar with the Japanese Kana code. The station intercepted Japanese press broadcasts and any Kana code it could hear in order to sample communications activity in the Pacific area. Although very little attempt was made to analyze traffic in Manila, Brown knew<sup>3</sup> it contained commercial ship-to-shore, shore-to-shore, and ship-to-ship messages plus Japanese Army and Navy messages.

In September 1933, Corporal Brown entered advanced Signal School at Fort Monmouth, New Jersey, where he helped design a course on intercepting the Japanese Kana code. Brown was supposed to be sent with a group of other Signal Corps personnel to start communications intercept activity in Tientsin, China, in December 1934. The group never arrived in China, however. The plan was canceled and the men assigned<sup>4</sup> instead to the intercept station at Fort McKinley, Rizal Province in the Philippines.

Brown left the Army in 1936 to work for a commercial radio station in Manila (MacKay Radio). Major Joe Sheer, who was on MacArthur's staff in Manila and the OIC of the Army intercept station there, convinced Brown to apply for a commission. Brown was a second lieutenant operations officer in the unit for only ten months when U.S. forces were attacked.

Beginning early Sunday morning 7 December 1941, the Japanese attacked American, British, and Dutch military forces in the Pacific. Japanese military forces struck at Hawaii, the Philippines, Hong Kong, Malaya, and the Dutch East Indies. American forces in the Philippines were caught completely off guard even though the attack on Pearl Harbor came only nine hours earlier. Although authorized by Washington to attack the Japanese on Formosa, MacArthur hesitated because he thought the Philippines would be declared neutral and the Japanese would not attack. From Washington, U.S. Air Force General Hap Arnold phoned MacArthur's air chief, Major General Lewis H. Brereton, on that morning ordering him to disperse the aircraft in the Philippines to guard against a Japanese air attack. At 0925 on 8 December (Philippine time), the Japanese bombed northern Luzon<sup>5</sup> but still there was no American reaction.

While the American pilots were at lunch, 54 bombers and 56 fighters attacked and destroyed the radar station and 16 P-40s at Iba Field, west of Manila. At Clark Field, American aircraft were all bunched together, wing-to-wing, when the Japanese aircraft arrived overhead. The aircrafts on the ground were virtually destroyed in a matter of minutes. Nichols Field, Nielson Field, the huge naval base at Cavite, and a number of other military installations in the Philippines<sup>6</sup> were all bombed the week of 8 December.

3. SRH 045, "Reminiscences of LTC Howard W. Brown," 4 August 1945, Signal Security Agency, Washington, D.C., p. 1. The station folded within two months, however, due to equipment failures.

4. *Ibid.*, pp. 2-5.

5. Manchester, pp. 208-09. MacArthur did not give the order to attack the Japanese on Formosa with his B-17 bombers because he thought the war could be contained and that the Philippines would be declared neutral. At 0925, Brereton learned that carrier-based aircraft had bombed northern Luzon. They still had ample time to protect the aircraft in the Manila area. MacArthur approved an aerial attack on Formosa. Reconnaissance photographs were taken, developed and evaluated. By that time, it would be too late.

6. *Ibid.*, pp. 210-12. Also, p. 215, General Masaharu Homma had been ordered to conquer the Philippines within 60 days. His forces made minor unopposed landings in southeast, northern and western Luzon on 9 December in order to divert MacArthur and prod the Americans to split their forces.

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Meanwhile, the radio intelligence men in Manila wasted little time in assuming their hastily devised wartime coverage plan. Until December 1941, the station at Manila concentrated<sup>7</sup> on intercepting Japanese diplomatic traffic. The first military communications that Brown and his men intercepted on the eighth was a Japanese air-to-ground net which was passing DF bearings to the bombers on their route to Manila.<sup>8</sup> Realizing the potential for warning, Brown tried to convince the local air defense organization of the value of heeding the reports based on Sigint. It was not until he arranged to have some air warning officers sent to the station on 15 December to help plot the incoming bombers, that the warnings were used to alert the forces in the Manila area. The Japanese, however, continued bombing the major military installations on the islands prior to their invasion force landing at Lingayen, 100 miles west of Manila, early on 22 December 1941.

The station was evacuated on Christmas Eve and the men moved to Corregidor with the rest of MacArthur's staff. All radio intelligence was halted and the men were reassigned to the Signal Section as communicators during the emergency. Eventually, Brown was able to convince his superiors to allow him to reopen an intercept station colocated with the 60th Coast Artillery Anti-Aircraft (AAA) Command Post in the Malinta tunnel on Corregidor. From 8 January until mid-February 1942, the make-shift station monitored the Japanese air reconnaissance nets. Brown's men passed Sigint alerts to the air defense unit which, based on those reports, shot down six Japanese reconnaissance aircraft.<sup>9</sup> Browns' tip-offs included a predicted time and direction so the AAA guns were loaded and cocked to shoot at the aircraft, locally referred to as "Foto Joe," as they tried to gain altitude following a pass over the rock.

Traffic analysis of this Japanese air-to-ground net revealed a control and 14 outstations. The control station was at Sama, Hainan Island with one outstation in Indo-China, one outstation near Hong Kong, and 12 other unlocated outstations. The net, which combined operational and aircraft ferry information, included two Japanese naval stations.

By mid-February 1942, the U.S. Army radio intelligence unit at Corregidor consisted of five officers, six enlisted men, and four HF radio receivers.<sup>10</sup> Their first two priorities were

- "1. intercept, circuit analysis, traffic analysis, and reconstruction of Japanese tactical circuits in the Philippines and
2. monitoring Japanese Army Air Force circuits, reconstructing nets, and furnishing warning information."

The men in the Malinta tunnel were able to reconstruct the nets and easily follow the progress of the Japanese land invasion force routes from Damortis, from Lingayen to

7. SRH 045, pp. 8-10. The original crew consisted of OIC MAJ Joe Sherr and operators LT Brown, TSGT Messer, SSGTs Sarata and Hall, SGTs Card and Phelan, CPLs Nurss, Stein, and Rehn, PFCs Gelb, Maslak, Kapp, Kincade, and Simmons; and clerks SGT Hightower and PFC Bradbury. In May 1941, the Army and Navy Sigint organizations on the Philippines held a conference at which they decided to exchange raw and derived radio intelligence information between the Navy at Corregidor and the Army station at Ft. McKinley in Manila. However, only diplomatic intercepts were exchanged.

8. *Ibid.*, pp. 23-25. The first intercepts were from an HF Morse net (5220 kHz) used by the Japanese to pass bearings from ground stations to the bombers on their way to Manila. Net control was on Formosa and there was an observation station in the Manila area.

9. *Ibid.*, pp. 26-30 and Manchester p. 224. The Malinta tunnel was about 100 feet long and the temperature was about 95 degrees Fahrenheit. It was jammed full of men and women under siege by the Japanese. The entire Filipino-American garrison numbered about 10,000.

10. SRH 045, p. 36. The additional three officers were apparently battlefield commissions to the operators of Sheer's unit.

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Zamboanga, and from Davao. Callsigns and frequencies were static and they were able to get DF support from the Navy on Corregidor. Brown and his men furnished the G-2 with information about Japanese forces movements "by inference from traffic analysis, information as to where the Japanese might next be expected to move."<sup>11</sup> This information was critical to MacArthur as he was in the process of performing a double retrograde maneuver to move his forces out of Luzon into the Bataan peninsula and onto the island of Corregidor. The move was to buy time until reinforcements could reach the hard pressed Filipino-American garrison. But reinforcements were never sent and the Philippines eventually succumbed.

#### RETREAT TO AUSTRALIA

At President Roosevelt's insistence, MacArthur left Corregidor for Australia to lead the defense of the Southwest Pacific from a larger base of operations. On the evening of 11 March, MacArthur, with his family and staff, boarded four PT boats for the first leg of their trip. Thirty-six hours later, they made landfall near the Del Monte plantation on the island of Mindanao 560 miles from Corregidor. Their last leg was a 1,500 mile flight to Darwin in a B-17.

Between 27 and 31 March, eleven men of the radio intelligence unit on Corregidor were evacuated to Del Monte by what was left of MacArthur's air force - four damaged P-40 fighters. They were to set up an intercept station there to continue radio intelligence support in the Philippines. Considering the predicament of the forces on Corregidor, that was futile. Five of the men eventually made their way to Australia, arriving there in mid-April 1942.<sup>12</sup>

One of the successful was First Lieutenant Howard Brown who helped set up a joint Australian-American intercept station at Townsville in the Spring of 1942. Brown was also instrumental later in creating the Sigint organizations attached to the Air Force (Radio Squadron, Mobile)<sup>13</sup> in the Pacific during World War II.

Lieutenant Colonel Joe Sherr, who had been Brown's OIC in the Philippines, was also evacuated from Corregidor with MacArthur. In Australia, Sherr was appointed chairman of the British-American Committee which was the predecessor of the Central Bureau Brisbane (CBB), a joint Australian-American Sigint organization. Sherr was recognized as the head of U.S. radio intelligence in the southwest Pacific area until his death in an airplane crash in September 1943 at Calcutta.<sup>14</sup>

Some of the survivors of the Philippines later joined the 126th Radio Intelligence (RI) Company at Townsville in Queensland in early 1942. This unit, which was shipped out to the Pacific in February, literally followed the battles in the southwest Pacific area during the next several years. The 126th RI Company was eventually placed under the operational control of the U.S. Air Force Far East in June 1943 to provide warning to the U.S. Fifth Air Force which was subordinate to MacArthur's Southwest Pacific Command.<sup>15</sup> The 126th provided intercept and traffic analysis support for MacArthur's

11. Ibid., p. 37. The Japanese codes were not penetrated until 1943.

12. SRH 364, "History of the Signal Security Agency, Volume I, Organization, Part II, 1942-1945," 13 April 1948, pp. 331, 335.

13. SRH 045, p. 56. As a lieutenant colonel, Brown was later in charge of radio intelligence in the Southwest Pacific Theater as a member of MacArthur's signals staff. See also Ronald Lewin, *The American Magic: Codes, Ciphers and the Defeat of Japan* (New York: Farrar Straus Giroux, 1982) p. 126.

14. SRH 364, p. 330.

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jump into Hollandia, Dutch New Guinea in early 1944, before parts of the CBB could be transported to the area.<sup>16</sup>

By March 1944, the CBB consisted of over 4,000 persons and included a traffic analysis and control section in the intelligence branch.<sup>17</sup> It detached personnel for traffic analysis support throughout the Southwest Pacific.<sup>18</sup> (CBB had been set up in April 1943 to centralize intercept and cryptanalysis of Japanese communications in support of MacArthur's Southwest Pacific Area command. It was never apart from CINCSWPA's headquarters: first in Australia, then at Hollandia, and finally at Leyte in the Philippines.) Lieutenant Colonel Abraham Sinkov, one of William Friedman's original cryptanalysts, was one of three assistant directors.

Despite the breaking of the Japanese diplomatic Purple code by Friedman before the war, Army Sigint was woefully unprepared for the war that followed. In addition to a critical shortage of personnel, there was no system for dissemination of Sigint, senior officers were ignorant of its potential, and there were no techniques to exploit military communications in the absence of cryptanalytic success. There is no doubt that traffic analysis for the Army was born in the 95-degree heat of the Malinta tunnel and not as a result of any wisdom or planning imparted from Washington.

#### SIGNAL SECURITY AGENCY

The Army's Signal Security Agency (SSA)<sup>19</sup> opened a cryptographic school in October 1942 at Vint Hill Farms, Warrenton, Virginia, to train cryptanalysts, traffic analysts, and related technicians. Although the Vint Hill Farms school presented a formidable curriculum in cryptographic skills, it was the expediency of war, from 1941 through 1943, that shaped the Sigint organization and skills of the men fighting the Japanese. It was a totally different story in Europe where the Americans relied initially on the British to provide the expertise and advice.

After a visit to England by U.S. Army Sigint personnel, the use of traffic analysis techniques formally began at Arlington Hall in April 1942.<sup>20</sup> Analysis of traffic was initially concentrated on the Japanese problem in the Pacific. The first challenge was the solution of code numbers to indicate message center placenames in Japanese Army messages. The traffic analysts at Arlington Hall had their first success in September 1942 and, by June 1943, had solved practically all 12 Japanese Army message number systems used on the military networks of the Imperial Headquarters in Tokyo and the Southern Field Force.<sup>21</sup>

15. SRH 227, "Unit History 126th Signal Radio Intelligence Company, February 1941 - September 1945," p. 52. The 126th Signal RI Company was originally activated at Ft. Monmouth, New Jersey in February 1941 as the First Signal RI Company. There were three platoons: intercept, DF and wirelaying but no TA. From March 1941 until February 1942, the company was located at Ft. Meade, Maryland. It participated in the Carolina maneuvers September - 6 December 1941. The company arrived in Australia on 10 April 1942.

16. Ibid., p. 20.

17. SRH 364, pp. 377-78.

18. SRH 227, p. 85. The traffic analysts assigned to CBB apparently kept extensive card files in which all frequencies copied by the intercept companies and their detachments were indexed. Japanese net communications and operational information were reported directly to MacArthur's G-2, Major General Willoughby.

19. The SSA was known as Signal Intelligence Service until 1943.

20. SRH 349, "The Achievements of the SSA During World War II," ASA, Washington, D.C., 20 February 1946, p. 14. The first SIS mission was to GC&CS at Bletchley Park.

21. Ibid. The analysts quickly improved. They solved the Japanese water transport organization message number system within a month of its introduction in April 1944. Half of it was in hand in the first 48 hours.

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The contribution of traffic analysis to U.S. military intelligence began with the location of military message centers attached to Japanese unit headquarters in the Pacific. Coupled with communications net reconstruction, the analysts were able to identify troop locations, chain of command, and order of battle. As we were not reading Japanese Army messages until well into 1943 and then only spasmodically, this contribution by the analysts was critical to the war effort in the Pacific.

Traffic flow analysis, that is, studies of variations in Japanese Army traffic volumes and patterns of station activity, was used to provide some warning of impending Japanese Army activities. All Japanese divisions south of Manchuria were located by the traffic analysts through a painstaking analysis of communications between field units and headquarters. Movements of units in the field were tipped by readdressals of messages and compromises in unit code names.<sup>22</sup>

The SSA began producing Sigint reports based on traffic analysis from November 1942. Inferences as to troop, ship, and aircraft movements, were based on the fluctuations of the volumes of traffic handled in the most active Japanese radio centers. Except for the destruction of the *Take* convoy in 1944, however, this method did not work for convoy sailings in the Pacific.<sup>23</sup>

For all intents and purposes, Japanese enciphered ground force communications were not penetrated until 1943. The Wireless Experimental Center at New Delhi made the first break into the Japanese Army high level communications system in March 1943.<sup>24</sup> Due to different Japanese cryptographic methods employed at radio centers, decrypts of the Japanese water transport code were extremely fragmentary, i.e., only a few messages and sometimes only a part of a message text was made available. Most of the intelligence derived from Japanese Army communications was a result of an, "analysis of the significance of many technical phenomena. Traffic analysis, i.e., the study of traffic patterns and all other traffic phenomena by methods short of cryptanalysis, was a consistent source of intelligence about locations and movements of Japanese units."<sup>25</sup>

One other important observation could also be made: Exploitation of these communications required an organization of men and equipment far beyond what could be easily accomplished in the field. Although some special units in the field were necessary for immediate and direct support to a theater commander, a very large and technologically sophisticated organization was needed to correlate the massive amounts of information available through signals intelligence. Arlington Hall, through cryptanalysis and traffic analysis, produced combat intelligence in support of forces half way around the world from Washington.

22. Ibid., pp. 13-14.

23. Ibid., p. 21. Traffic analysis of Japanese communications helped track the convoy to Manila on its route between Shanghai and New Guinea. On board were the Japanese 32nd and 35th Infantry Divisions bound to meet MacArthur's advances in April 1944. The convoy was intercepted near Luzon and virtually destroyed by U.S. submarines. Nine merchant ships and 12 escorts were sunk. Four thousand Japanese troops and loads of equipment were lost at a time when MacArthur was penetrating the southern Japanese defenses in New Guinea at Hollandia. See also Lewin, p. 247 and SRH 035, "History of Special Branch, MIS, War Department," 1942-44, pp. 42-44, 47-48.

24. SRH 035, p. 31 and SRH 349, p. 10. SSA at Arlington Hall and, to a lesser extent, CBB in Australia, began reading the system from April 1943.

25. SRH 035, p. 33.

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## ARMY SIGINT UNITS IN THE FIELD IN WORLD WAR II

Relations between theater Sigint organizations and Arlington Hall concerning control of U.S. Army and Air Force signals intelligence units in the field were always problematic during the evolution of the Sigint system in World War II. Not only were there differences of opinion between Washington and the theaters concerning the control and direction of Sigint, there was a lot of debate in Washington itself about the transfer of the SSA from the Signal Corps to the Military Intelligence Service (MIS).

At the height of this debate in 1943, Colonel Carter W. Clarke, Chief of Special Branch, MIS, forwarded a staff study on the subject of relations with field agencies involved in Sigint, to Major General Strong, head of MIS, on 12 February.<sup>26</sup> The study, incidentally, defined traffic analysis simply as "information derived from studies not including the actual texts of the messages."

The study, more importantly, also clarified the state of traffic analysis as seen from Washington in 1943. Traffic analysis in the field, properly interpreted and coordinated, was recognized as being able not only to provide strategic intelligence for the War Department but also to support local commanders directly. It was also apparent that the benefit of traffic analysis to global management of collection and cryptanalysis was fundamentally understood.

Traffic analysis comprises the study of enemy communications for the purpose of gathering information of military value without recourse to cryptanalysis of the text of intercepted messages. From such studies a certain amount of special intelligence of a tactical and strategical nature with regard to the enemy order of battle, direction of movements, massing of troops, probable intention, withdrawals, etc., can be derived. In addition . . . a large amount of technical intelligence valuable to the intercept and cryptanalytic functions of the Signal Security Service is obtained. In general, the technical information obtained from such studies, when applied to *global intercept and cryptanalytic problems, must be derived from a global analysis of traffic.* For the proper functioning of units collecting data upon which such studies will be based, their administrative control also must parallel the administrative direction of global intercept and cryptanalytic functions.

*The local commander can obtain considerable benefit from the results of traffic analysis as regards special tactical and strategical intelligence derived therefrom, because such special intelligence is based primarily upon enemy communications in close proximity to his sphere of activity . . .*

While it is not so far reaching in consequence as that which might be obtained from a successful cryptanalytic study of a high grade enemy cryptographic system, the results may sometimes be available instantaneously, and are subject only to proper interpretation on the part of the local staff and prompt coordination of the pertinent data by the central agency.

In the European theater, Bradley's 12th Army Group came into being on 1 August 1944 in Normandy and with it Patton's Third U.S. Army was unleashed on the Germans. Two of Patton's Corps were put into action south of Avranches in France on that day. With these two Corps were two Signal Service Companies. The 3253rd Signal Service Company was attached to XV Corps and the 3254th to VIII Corps.<sup>27</sup> Each of these companies was comprised of eight officers and 121 enlisted men, including 14 traffic analysts. The 3253rd, after having been trained at Burton Bradstock in England, had arrived at Omaha Beach on 12 July.

26. SRH 276, "Centralized Control of U.S. Army Signals Intelligence Activities," 30 January 1939-16 April 1945, pp. 35-36.

27. SRH 042, "Third Army Radio Intelligence History in the Campaign of Western Europe," prepared by Signal Intelligence Service of Hqs Third U.S. Army, 1945, pp. 1-3.

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The 3254th was activated at Marbury Hall near Cheshire in England on 19 April 1944. By June 1944, this company was located at Lyme Regis on the southern English coast and was intercepting Germany Army radio transmissions.<sup>28</sup> The company had arrived in Normandy on 29 June.

The make-up of these companies was typical of the Sigint units assigned to U.S. Corps in Europe during World War II. Patton also had a Sigint unit supporting his Army headquarters. The 118th Signal Radio Intelligence Company<sup>29</sup> was twice as large as the companies assigned to Corps. Patton had 32 traffic analysts (29 enlisted men and 3 officers) in this unit supporting his headquarters. The 118th was established on 20 April 1942 at Fort Sam Houston, Texas, and arrived in England on 11 January 1944. This unit began intercepting German traffic on 26 April from Dartford in Kent.

Companies like the 3254th attached to V Corps were usually organized into a radio intercept section, a DF section, a traffic analysis section, and a cryptanalysis section.<sup>30</sup> The analysis sections performed the following four functions:

- a. Traffic analysis and processing of intercepted traffic and identification of radio nets.
- b. Cryptanalysis of enemy low grade codes and ciphers.
- c. Determination of German order of battle and maintenance of files on enemy units and personalities.
- d. Compilation of statistics on the technical aspects of communications to aid in the identification and analysis of traffic by others.

The traffic analysts read the intercept logs, identified units, reported their activities, and kept order of battle and personality files up-to-date based on identifications from communications intelligence. They also posted the various situation maps. The DF plotting was done by the traffic analyst and so was the basic intelligence and technical reporting.

The analysts published a daily activity report to higher and lateral headquarters which was a complete record of radio intercept results. The format of the report included the following sections:

- I. Intelligence Summary
- II. Decodes and Translations
- III. Technical Summary of Nets
- IV. Message Counts
- V. DF Bearings
- VI. Code Identifications and Cipher Values

At the army level, the traffic analysts coordinated the intercept and analysis of the corps Sigint units. They also provided the liaison point with flanking armies and the Army Group. All reports and documents, including the use of collateral information from captured documents, were regulated and controlled by the traffic analysts.<sup>31</sup> In short, the traffic analysts were the hub of the Sigint units assigned to corps and armies.

28. SRH 228, "Histories of Radio Intelligence Units, European Theater, September 1944–March 1945," Volume I, for more information about the 3254th Signal Service Company and other such units in the theater.

29. SRH 042, p. 9. The radio intercept section maintained 24 hour operations as follows: shift 0001–0800, eight positions; shift 0800–1600, 15 positions; shift 1600–2400, 15 positions. The unit had HF and VHF intercept capabilities, that is, HF Morse and HF/VHF voice. The analysts constantly complained about the lack of high volume, quality DF.

30. Ibid., pp. 9–10.

31. Ibid., pp. 12–19.

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By January 1944, the back of the German Army was broken following the failure of their offensive in the Ardennes. The bulge was eliminated and Patton was free to strike into Germany. In January, the 17 divisions of the Third U.S. Army moved an average distance of 100 miles in sub-zero temperatures. This Army was responsible for over 130,000 enemy casualties (killed, wounded, prisoners)<sup>32</sup> during the Battle of the Bulge. To help understand the contribution of the traffic analysts, the following quote is a good example and is taken from the Third Army Radio Intelligence History in the Campaign of Western Europe.<sup>33</sup>

Painstaking analysis of procedural characteristics and good direction finding . . . enabled radio intelligence agencies to keep 11 Panzer Division identified and located during the first two weeks of the months (when ground contact was often inconclusive) in a wide area around Saarburg. During approximately the same period, it was further possible to determine the presence of specific elements of the 130 Panzer Lehr in the general assembly area of Bitburg, again when ground sources could not reach that far behind the lines.

#### THE 3250TH SIGNAL SERVICE COMPANY AND THE V CORPS

The following quote, part of a passage in the Sigint History of Third Army,<sup>34</sup> was marked by William Friedman to be read by the Plans and Policy Group in October 1945 at the Army Security Agency:

The traffic analysis officer in the company, who would have a knowledge of radio intercept communications, and signals intelligence, should be appointed to be in complete charge of the operations of the radio intelligence company. He would probably also act as the liaison officer with the G-2 section. This officer must have extensive training and background to successfully accomplish this mission. An understanding of all problems in obtaining radio intelligence is absolutely essential.

Although the author perhaps exaggerated the position of the officer-in-charge of the traffic analysis section, it does give us some idea of the value placed on traffic analysis by the Third U.S. Army during World War II.

Sigint support to Patton's V Corps was the responsibility of the 3250th Signal Service Company. This company, which was originally part of the 29th Infantry Division, arrived in Greenock, Scotland on 11 October 1942.<sup>35</sup> It set up an intercept station, known as "LIMBO," and sent its traffic to the Signal Intelligence Division (SID) attached to Hqs European Theater of Operations, USA (ETOUSA) in London. (The SID, headed by Colonel George A. Bicher, was the U.S. theater Sigint authority, roughly equivalent to the British Y Service.)

The company moved to Devon in May 1943 and began intercepting German Army low echelon traffic in July 1943. There were no traffic analysts or cryptanalysts assigned to

32. GEN George S. Patton, Jr., *War As I Knew It*. (New York: Bantam Books, 1980), pp. 216-17. Patton was among the most enthusiastic users of intelligence during World War II, especially Sigint. He was obsessed with speed, surprise and audacity. Instantly responding to unexpected opportunities given to him by Sigint, Patton's brilliant performance must be, at least in part, attributed to his use of intelligence. See Harold C. Deutsch, *Ultimate Consumers: Intelligence and the Operational Art in World War II (ETO)*, U.S. Army War College, Intelligence and Military Operations Conference, 22-25 April 1986 for additional insights into the use or misuse of intelligence by Wavell, Auchinleck, Montgomery, Alexander, Eisenhower, Clark, Bradley, Patton, and Rommel.

33. SRH 042, p. 46.

34. *Ibid.*, p. 59.

35. SRH 228, pp. 122-24.

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the 3250th until March 1944 when a traffic analysis section from the 118th RI Company was transferred to it.<sup>36</sup> During the Spring of 1944, the company prepared itself for the cross-channel invasion.

The 3250th moved across the channel in two echelons spending several nights in early June under sporadic enemy air raids. The company was assigned to support V Corps, which was initially attached to First U.S. Army. Detachment A of the 3250th landed on 7 June at Omaha Beach and found itself in the most formidable strip of beach terrain in Normandy. Although Montgomery's 21st Army Group knew the static German 716th Infantry Division was in the area, they failed to notify Major General Gerow's V Corps that the veteran 352nd Infantry Division had also moved into the area.<sup>37</sup> Bradley, at this time Commander of the First U.S. Army, seriously considered pulling V Corps out of the beachhead on D-Day in view of German strength in its area.

Detachment B of the 3250th finally landed at Omaha Beach on 8 June after having lost most of its equipment from enemy fire. On 9 June, the company moved to St. Laurent sur Mere about one half mile from the Germans. The 3250th immediately set up an intercept site, a traffic analysis section and a message center, and they were providing Sigint support under fire by 9 June.<sup>38</sup> They moved away from the coast with V Corps on the 11th.

From June until September 1944, the 3250th was out of action for only three days while V Corps was making an encircling movement in the Falaise Gap. The company participated in the hard fighting in June and July<sup>39</sup> in western France and was also part of the breakout with Patton after having being placed under his command with V Corps from August. From early August until 6 September, the company moved ten times in 261 miles, laid 143 miles of wire, sent 2,924 messages, intercepted 2,687 enemy messages and copied an average of 28 nets a day.<sup>40</sup> They took 93 DF bearings, their trucks moved 11,694 miles and they used 2,950 gallons of gasoline. The only negative thing one could say about them during this period was that two men went AWOL after the taking of Paris!

After the stalemate in October and November, the Germans opened up a fifty-mile offensive from Monschau to Echternach in the Ardennes at dawn on 16 December. From that day until Christmas Day, the 3250th Signal Service Company suffered nearly 20 percent casualties including four killed in action.<sup>41</sup> The DF team was completely knocked out of action for a period of time. During action in western Europe, the 3250th Signal Service Company operated 12 receivers which covered the frequency spectrum between 100 and 3500 kHz<sup>42</sup> all day every day within ten miles of the Front during some of the most mobile operations ever conducted by the U.S. Army.

36. Ibid., pp. 126-35.

37. Carlo D'Este, *Decision in Normandy* (New York: E.P. Dutton, 1983), pp. 113-14. M. G. Gerow was the same person who informed MacArthur about Pearl Harbor and warned him of a potential attack on the Philippines. This is the beach at which the commander of the Sixteenth Infantry Regiment exposed himself to German fire raking the troops on the morning of 6 June and declared: "Two kinds of people are staying on this beach, the dead and those who are about to die. Now let's get the hell out of here."

38. SRH 228, pp. 139-44.

39. Ibid., p. 200. On 2 July, the 3250th made contact with the Germans on 2743 kHz and arranged to exchange six "Krankenschwestern" (nurses) captured at Cherbourg by V Corps.

40. Ibid., p. 188.

41. Ibid., pp. 150-55.

42. Ibid., p. 186. The 3250th experimented with VHF intercept 32-36 MHz but found it much less useful than HF traffic.

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The traffic analysis section decoded enemy traffic as it was intercepted, equated the messages with DF, evaluated its importance, and reported its significance directly to G-2, V Corps. The following men were part of that section:<sup>43</sup>

|                         |  |
|-------------------------|--|
| 2LT Edward W. Snowdon   | PFC George M. Kreamer                      |
| SGT James W. Boeldt     | PFC Ernest S. Lent                         |
| CPL Kent E. Jimmerson   | PFC Bernard Marrow                         |
| T4 Arnold H. Weiss      | PFC Robert F. Griffin                      |
| T5 Frederick A. Kennedy | PFC Walter R. Larson                       |
| T5 Russell Ultman       | PFC Gaylord W. Hymen                       |
| T5 John G. Guzzell      | PFC Malcolm E. Spangler                    |
| PFC Harold E. Fassberg  | 2LT Raymond J. Mondor (for a short period) |

#### THE 114TH SIGNAL RADIO INTELLIGENCE COMPANY

The 114th Signal Radio Intelligence Company supported Bradley's 12th Army Group from 26 August 1944.<sup>44</sup> It arrived in the U.K. on 12 February 1944 and was in France on 14 August. Its traffic analysts numbered 24 and they were organized into a platoon. The analysts were originally trained at Vint Hill Farms and Arlington Hall in 1943.

In Europe, the analysts worked eight-hour shifts with six men per shift. A shift (known as a "trick") consisted of a T3 Chief, a T4 Controller, and four analysts (T4/T5). The controller had telephone communications with the trick chiefs of the intercept and DF platoons. As callsigns were intercepted, they were forwarded to the analyst controller who decided whether to copy the net or not.<sup>45</sup> The decisions were based on the communications net structures developed by the traffic analysts.

The traffic was delivered to the analysts every hour. They sorted it by net and read it. Every two hours, the controller telephoned the G-2, 12th Army Group to report the significance of any intercepted communications activities. Every 24 hours, the analysts put out their electrical summary: nets listed by frequency, by callsign, identification to known organization, time of activity, type/number of message passed, traffic analysts' remarks and DF results. These technical summaries<sup>46</sup> were passed to Hqs ETOUSA (SIS), First (British) Signal Intelligence Company and the 113th, 114th, 116th, 118th, and 137th RI Companies serving SHAEF, the First U.S. Army, the Third U.S. Army, the Seventh U.S. Army, and the Ninth U.S. Army.

The intelligence officer of the platoon made daily trips to Hqs 12th Army Group to attend the G-2 brief for Bradley and to read incoming situation reports.<sup>47</sup> On two separate occasions, a task force was formed to assess the value of VHF intercept. Twice they conclusively proved the German traffic between division and battalion was of little value. However, the traffic up echelon from division was considered critical.

43. Ibid., p. 168.

44. Ibid., pp. 293, 356.

45. Ibid., p. 359.

46. Ibid., p. 360.

47. Ibid., p. 361.

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The 114th RI Company served the 12th Army Group from August 1944 until the end of the war. It consisted of the following men:

|                                  |  |
|----------------------------------|--|
| 1LT Thomas F. Doyle, OIC         | T4 Edward G. Stuart                        |
| 1LT Harry W. Vest, Assistant OIC | T4 Harell W. Tate                          |
| TSGT Roy F. Duke                 | T4 Theodore L. Welton                      |
| SSGT Lester H. Otterman          | T4 Jay C. Werlof                           |
| T3 Human P. Ellenbogen           | T5 Darwin C. Lasher                        |
| T3 Harold Kiken                  | T5 Warren McAlpine                         |
| T3 John Whitman                  | PFC Frank G. Griffin, chauffeur            |
| T4 Charles S. Dodd, Jr.          | PFC Ralph S. Mundy, chauffeur              |
| T4 Harold C. French, Jr.         | PFC Joseph J. Pecarraro, chauffeur         |
| T4 Armen B. Loosarian            | PFC Donato Russomanno, chauffeur           |
| T4 Dean W. McPheters             | T4 George Lynch, machine code clerk        |
| T4 Roy F. Moore                  | T4 George H. Field, machine code clerk     |
| T4 Joseph B. Rounds              | PFC Robert N. Brainard, machine code clerk |

#### SIGNAL SECURITY DET "D" AND SIGNAL INTELLIGENCE DIVISION

In addition to the support provided by the 114th Signal Radio Intelligence Company, the 12th Army Group had attached to it a special Sigint unit which was designated the Signal Security Detachment "D" (SSD "D").<sup>48</sup> This unit was tasked to produce Sigint in direct support of the 12th Army Group from the solution of German medium and low grade tactical codes and ciphers. It was also responsible for the coordination and technical supervision of Signal Radio Intelligence Companies and Signal Service Companies operating under units assigned to the 12th Army Group as well as technical liaison with the 21st Army Group and higher headquarters. All of its technical data<sup>49</sup> was forwarded to SID in London. Quite understandably, SSD "D," an advanced element of the SID, also had a sizable traffic analysis contingent attached to it.

The Signal Intelligence Division was responsible to Hqs ETOUSA for receiving, training, and assigning Sigint units to operating forces in the theater. It was established in 1942 and it planned the expansion of Sigint units for the European theater and the Mediterranean area. By January 1944, a traffic analysis element was embedded in the General Intelligence Section. In early 1944, the section went to a two-shift operation to begin preparing itself for the hectic months ahead.

Through the Spring of 1944, SID was mainly concerned with preparation of the analysts to be attached to the various Sigint companies destined for direct support to combat units in the theater.<sup>50</sup> In May 1944, SID hosted two conferences focused on preparing officers of the traffic analysis units slated for operations in France. The officers discussed mutual field problems and standardizing operational procedures and methods.

48. SRH 048, "Summary of Operational Activity of Signal Security Detachment 'D', 12th Army Group, ETO, 1 September 1944 to 1 April 1945," pp. 1-4.

49. *Ibid.*, p. 4. This archival document is an excellent report on the Sigint produced by SSD "D" during World War II. Its product went to SHAEF Main, Sixth Army Group, 21st Army Group, Eighth Air Force, First U.S. Army, Third U.S. Army, Ninth U.S. Army, 15th U.S. Army Forward, 12th Army Group Main, 12th Army Group Tactical, Hqs First Allied Airborne Army, and Ninth Air Force Advance.

50. SRH 357, "History, Signal Intelligence Division (ETO), June 1942-July 1945." This theater-level Sigint unit was headed by COL George A. Bicher.

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## THE BRITISH INFLUENCE ON AMERICAN TRAFFIC ANALYSIS

Although the U.S. Navy engaged in traffic analysis in the early 1930s, traffic analysis was not part of Army lexicon until World War II.<sup>51</sup> For the British, traffic analysis was a staple of intelligence in all three services from the 1930s.<sup>52</sup> In 1935,<sup>53</sup> British traffic analysts were the cornerstone of the effort to estimate the military build-up in Nazi Germany, especially the operational air strength and the disposition of Hitler's bomber and reconnaissance units. For the Royal Navy, exploiting the German Navy's callsign system made it possible to estimate the number of U-boats and surface units.

Just after the Poles passed ENIGMA machines and their original work on German encipherment solutions to the British and French in the summer of 1939, Gordon Welchman was hired off the Cambridge campus and sent to Bletchley Park to study "callsigns and discriminants," the groups of letters and figures which appeared in the preamble of German ENIGMA messages.<sup>54</sup> His making of lists and charts in the hopes that "something would turn up" resulted in several solutions of the German callsign system from which the structure and order of battle of the German forces in the west was surmised. Welchman eventually devised the system of 24 hour operations in Hut 6 at GC&CS which became the model for the Sigint process during the war.<sup>55</sup>

It is no wonder that by the time Americans began arriving in Europe in great numbers, they were bound to be heavily influenced by the British methods and procedures. By 1943, the two countries adopted standard terminology: Traffic analysis was the study of communications networks and of procedure signals, callsigns, low grade codes and plain language assisted by direction finding and other technical aids.<sup>56</sup>

51. See footnote 2.

52. F.H. Hinsley, et al. *British Intelligence in the Second World War: Its Influence on Strategy and Operations*, Volume I (London: Her Majesty's Stationery Office, 1979), p. 23. The British Navy established an operational intelligence center in 1932 to study foreign traffic and administer Navy intercept stations. This, according to Hinsley, was the official start of traffic analysis in the British Navy. The RAF added traffic analysis as a function to the Air Ministry, Intelligence Branch in 1935. The British Army continued to work at traffic analysis without a break from 1919. In 1938, an inter-service Operational Intelligence Section (traffic analysis and DF) was established at GC&CS at Bletchley Park.

53. *Ibid.*, p. 53.

54. Gordon Welchman, *The Hut Six Story: Breaking the ENIGMA Codes*. (New York: McGraw-Hill, 1982), p. 34.

55. *Ibid.*, p. 76. In the Registration Room of Hut Six, continuous traffic analysis of incoming intercept was performed by Welchman's people. In the Intercept Control Room, Bletchley was in constant touch with individual stations to assist them in concentrating on the most valuable traffic. In the Machine Room, the cryptanalysts researched the traffic and, in the Sheet Stacking Room, they attempted to break into the key for the day. The actual decrypting was done in the Decoding Room. Decrypts were passed to Hut 3 for translation, selection and forwarding.

56. Hinsley, p. 21. The British also apparently influenced the Soviet Sigint and traffic analysis efforts during World War II. The British had a small intercept station in the Caucasus (which was closed in February 1943 by the Soviets) and one near Murmansk (established July 1941) in support of the defense of the Arctic convoys. To improve Sigint collaboration at Murmansk to the benefit of the Allies, the British offered the Soviets information about German naval radio procedures and British methods of TA in exchange for expansion of the British station and better facilities for transmitting back to the U.K. Soviet suspicions of British intentions were aroused eventually and the station was closed. In the summer of 1941, the British sent an officer to give the Soviets information about German Air Force tactical/ground station callsign systems. In August 1942, the officer was an accredited representative of British Sigint in the Soviet Union. The Soviets never reciprocated. See Hinsley, Volume II (1981), p. 63.

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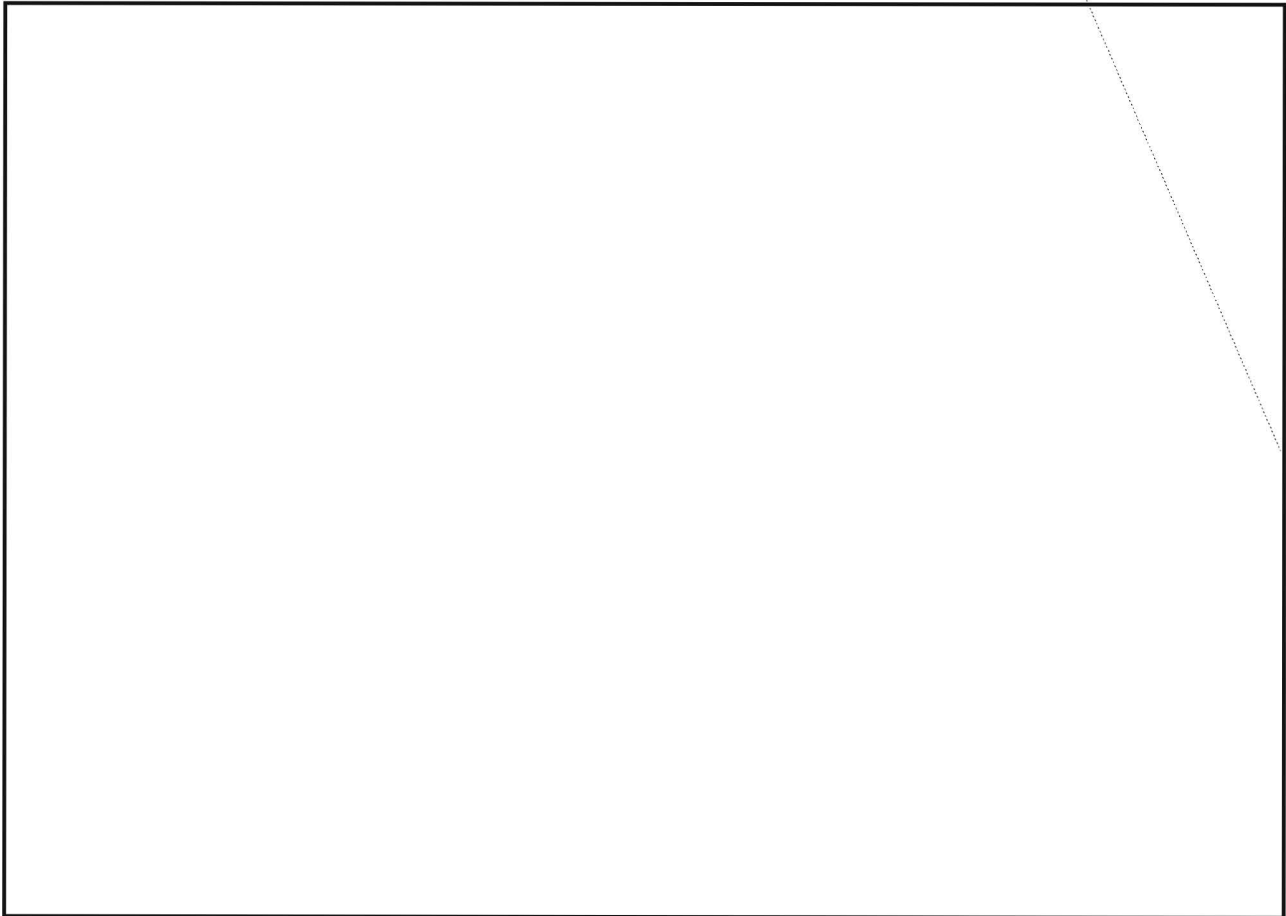
EPILOGUE

By the end of the war, traffic analysis was firmly seated in U.S. Army intelligence. Although forgotten after World War I, the Army relearned the value of traffic analysis from the bitter experiences of December 1941 and from the British experiences with German and Italian traffic from the mid-1930s. By 1950, the Army's basic cryptographic technical manual<sup>57</sup> described traffic analysis as follows:

A great deal of information of military value can be obtained by studying signal communications without solving the cryptographed message constituting the traffic. The procedural methods used have yielded results of sufficient importance to warrant the application of a special term to this field of study: namely, traffic analysis, which is the study of signal communications and intercepted or monitored traffic for the purpose of gathering military information without recourse to cryptanalysis.

(b) (1)  
(b) (3)-50 USC 403  
(b) (3)-P.L. 86-36  
(b) (6)

57. SRMA 009, "Basic Cryptography," Department of the Army, Technical Manual, TM 32-220, April 1950, p. 10.



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## Appendix

## U.S. ARMY SIGINT UNITS AND SUPPORTED FORCES IN WORLD WAR II

*European Theater:*

Signal Intelligence Division (SID) – Hqs ETOUSA, London  
 121st Signal Radio Intelligence Company  
 124th Signal Radio Intelligence Company

Signal Security Det "D" (SSD "D") – 12th Army Group  
 114th Signal RI Company  
 116th Signal RI Company

113th Signal RI Company – First U.S. Army, ended at Weimar, 21/4/1945  
 118th Signal RI Company – Third U.S. Army, ended Stephankirchen, 20/5  
 137th Signal RI Company – Ninth U.S. Army, ended ?

3250th Signal Service Company – V Corps, ended Lobes, Cz., 8/5/1945  
 3251st – VI Corps, ended the war in Leipzig, 30/4/1945  
 3252nd – XIX Corps, ended the war in Friedberg, 7/5/1945  
 3253rd – XV Corps, landed Omaha Beach, ended Zwiebrucken, 4/1945  
 3254th – VIII Corps, landed Utah Beach, ended at Bad Berka  
 3255th – XII Corps, ended at Rosenheim, 22/5/1945  
 3256th – XX Corps, ended at Ried, Austria, 5/5/1945  
 3257th – XVI Corps, ended at Bege sack, 17/5/1945  
 3258th – XIII Corps, ended 12/5/1945  
 3259th – III Corps, ended at Rosenheim, 23/5/1945  
 3260th – VI Corps, ended at Sonderbuch, 26/4/1945  
 3261st – XXI Corps, ended Schwebhim, 16/4/1945  
 3262nd – XVIII (Airborne) Corps  
 3263rd – Third U.S. Army, ended Ecking, 21/5/1945  
 3264th – SSD "D"

*Mediterranean Theater:*

117th Signal RI Company – Seventh U.S. Army, ended Augsburg 31/5/45

848th Signal Intelligence Service – AFHQ (North Africa/Italy)  
 122nd Signal RI Company – North Africa  
 123rd – North Africa  
 128th – North Africa  
 3200 SIS Det – Fifth U.S. Army

*Air Force:*

Ninth Air Force in Europe was supported by the 951st Signal Radio Intelligence Company (Aviation) which became the Third Army Air Force Radio Squadron Mobile (3 RSM). Four of its detachments were distributed as follows:

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Det A - Ninth AF  
Det B - IX Tactical Air Command supported First U.S. Army  
Det C - XIX TAC supported Third U.S. Army  
Det D - XXIX TAC supported Ninth U.S. Army

*Pacific Theaters and other areas:*

101st Signal RI Company - Hawaii  
102nd - Alaska, Air Defense Command  
111th - Second U.S. Army  
115th  
116th  
119th  
120th - Trinidad  
121st - Canal Zone  
122nd - Iceland  
124th  
126th  
129th

*Air Force*

136th Signal RI Company (Aviation)  
138th  
139th  
140th  
952nd  
953rd  
954th  
955th  
956th  
957th  
958th