DOWN THE LINES: US ARMY COMMUNICATIONS IN EUROPE, 1942-45

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by

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ABSTRACT

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The incredible complexity of the Second World War continues to fire the imagination of the public and historians, alike. However, historians have largely ignored the immense importance of communications within the respective campaigns. This thesis will begin to redress this oversight by showing the role of military communications within the United States Army in Europe during World War II.

In the wake of the war, the United States Army's Center of Military History commissioned a large series of histories detailing the conduct of the US Army during the war. Interestingly, there were three entire books devoted to the Technical Services; specifically, the Signal Corps. In the decades after, the Center of Military History has continued to provide examination of the signal services, with a branch history of the Signal Corps published in 1994. Despite this profound endorsement, the academic community has not seen fit to give this subject its due diligence. Modern histories of World War II make very little mention of the difficulties of communication, if any mention is made at all. Even amateur efforts have been spotty and sometimes slipshod.

Using a variety of modern texts, period works, and primary research at the National Archives, this thesis will use a narrowing lens approach to showing the multi-faceted dimensions of military communications. From lessons learned in the Pacific and the Mediterranean, the organization and implementation of cohesive communications allowed command and control to function. By the commencement of Operation Cobra in July of 1944, the US Army had the most complete and flexible communications organization on the planet. The success of this organization can be seen most clearly

during the German Winter Offensive of 1944-45, known as the Battle of the Bulge, when despite the rapid penetration of Allied battle-lines, at no time was communications cut-off between Northern and Southern forces.

KEY WORDS: Military History, Military Communications, World War II, US Army, Signal Corps.

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GLOSSARY OF TERMS

AM – amplitude modulation, a radio system in which the data of the signal is encoded within variations of signal power (amplitude).

Carrier signals – a commercial wire system that allowed a single wire to be used for multiple simultaneous transmissions.

Crystal control – a system of radio tuning using the piezo-electric characteristics of precisely ground quartz crystals to allow instant push-button tuning to the crystal's manufactured frequency.

FM – frequency modulation, a radio system in which the data of the signal is encoded within variations of signal frequency.

Hertz – a measure of the number of radio wave oscillations per second. During WWII, this was referred to as cycles per second.

PTT - Postes Télégraphes et Téléphones, the French Postal Service, which controlled wire and telegraph lines within France.

Radio relay – a system of beam-antennae radios utilizing high power sets to transmit over large distances despite interfering terrain features.

RPL – Rapid Pole Line, a system of overhead wire construction substituting two 20-foot building timbers for the usual 40-foot telephone pole.

Spiral Four – a communications cable in which four wires were spiraled around a central core, covered with insulating material.

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CHAPTER I

Introduction

Military history is a subject that continues to fascinate the amateur and professional historian alike. As the professional historian's craft has evolved over the years, greater attention has been paid to the myriad complexities inherent in all aspects of armed conflict. Within this popular field, western historians hold a particular fascination with the Second World War. Whether from a desire to explore the last "good" war, or a more professional drive to understand the most destructive war in human history, historians have spent the years since 1945 trying to cope with the war's terrible cost and lasting effects. Even in the new millennium, scholars struggle with many of the questions surrounding World War II. For the military historian, this war presents a situation where most of the lessons from previous wars were suddenly upended. Perhaps for this reason, as well as to understand how this conflict changed the face of warfare between nation-states, military historians have examined the weapons, tactics, strategy, logistics, production, organization, and conduct of the war.

Despite these and many other subfields within the history of the Second World War, there is one that has almost become forgotten as the actual events recede from collective memory. The study of military communications represents nothing less than a fundamental oversight on the part of modern military historians to understand the critical links between commanders and their armies in the field. Without realizing it, the process of commanding armies spread over a wide area has devolved into a simple moving of pieces on a map. In actuality, the communication links between officers and subordinates have been a vital concern during all wars, but especially World War II. As armies grew

in both size and complexity during the nineteenth century, the commander could no longer effectively control the movement and disposition of an army on the battlefield by physical presence alone. Entrusting subordinates with a greater degree of individual initiative could help on the fringes of the battle, but subordinates were often unaware of the overall picture. This potentially left elements of armies vulnerable to isolation and destruction. Communications had to evolve from the horseback messenger, through the telegraph, and on to telephone and radio systems.

In the years after World War II, the US Army commissioned a large series of academic works on the Army's role in the war. Known collectively as the "green" books for their original green binding, the process of documenting the entire war was a massive undertaking for the fledgling US Army Center of Military History. Begun in 1946, the production of these works took decades. Within these volumes, three books stand out for their extensive coverage of communications. The three books on the operations of the US Army Signal Corps, *The Emergency*, *The Test*, and *The Outcome*, represented an attempt to catalog the immense contributions made by that branch to the Army's ultimate triumph. Tragically, these highly detailed works have become largely forgotten, and as a result, almost no modern histories of World War II contain mention of any aspect of military communications. Stokesbury's *A Short History of World War II*, Keegan's *The Second World War*, and Hastings' *Inferno: The World at War, 1939-1945*, all make various mention of some of the many technological innovations of both Allies and Axis powers during the course of the war. However, while tanks, aircraft, trucks, radar, and atom bombs are all discussed at least in some aspect, the positive transformation of communications during the war is completely absent. It is interesting that a number of

veterans-turned-military historians seem to better understand the critical importance of communication in warfare. While its subject is outside the realm of this work, Robert Forczyk's *Tank Warfare on the Eastern Front 1941-1942* makes mention of radio communications several times within the context of the German ability to call for *Luftwaffe* support of ground operations.[1] As a former tank commander himself, Forczyk must understand the importance of effective communications for the conduct of modern mobile warfare. There is also some small interest in communications within the amateur history sector, though without a strong professional backing for the field, much of the work remains questionable in its assertions and sources.

This work represents one of a very small group of hopeful first steps in reintroducing military communications to the mainstream of professional military history. The previously mentioned US Army Center of Military History continues to produce academic work on the subject of communications. Rebecca Robbins Raines produced a branch history on the Signal Corps entitled *Getting the Message Through* as recently as 1996. Examining the evolution of the branch from its creation during the American Civil War, Raines describes the many changes and innovations during the years since. Because some aspects of military communications involve the understanding of scientific principles in physics and electrical engineering, there is also a small amount of cross-field work on the subject. Dr. Richard J. Thompson, Jr.'s 2007 work on the adoption of crystal tuning for radios in the US Army, *Crystal Clear: The Struggle for Reliable Communications Technology in World War II*, provides an excellent overview of the struggle to utilize this new technology during the war, despite (or perhaps because of) his

[1] Robert Forczyk, *Tank Warfare on the Eastern Front 1941-1942 Schwerpunkt*, (South Yorkshire, UK: Pen & Sword Military, 2014). p. 49.

background in science and mathematics. Even though these works offer the hope of a rekindling of the field within the greater body of military history, there is an enormous amount of work remaining before military communications can take its place within the narrative of the Second World War. Additionally, the complexity of the communications subject presents a challenge to the historian. Therefore, it is important to describe the narrow focus of this work. An admittedly important aspect of communications, signal intelligence, is not examined. It is certainly true that the efforts of many groups to intercept and decode Axis signals paid handsome dividends during the European fight. However, this subject has been examined in numerous works over the years. This work will therefore confine itself to the study of communications within the US Army, as well as the systems for allowing command and control of its elements.

Before diving into the subject of communications within the US Army in World War II, some clarifications need to be made. The study of signals during the war in large part revolves around the Signal Corps itself. The Corps was not only responsible for organizing the systems of communication within the Army, it also bore the responsibility for research, development, production, procurement, and supply of a host of technical gadgets. Of course, wire and radio communications were the hallmarks of the new, modern system. But the Signal Corps also led research and development projects that produced radar in all of its many functions, for aircraft detection, gun laying, navigation, and even all-weather bombing. Additionally, the Signal Corps was expected to provide trained signal personnel for every branch that required it. Not just the Army, but the Air Corps, the War Department, and even the military weather service relied on the signalmen to a large extent. The Signal Corps also was responsible for ensuring and

controlling the communications of Army commands from the division level all the way to the President. Below the division level, signalmen were under the control of their unit commander, but these men were still both trained and equipped under the supervision of the Signal Corps. In many ways, the story of improvement and evolution within the Signal Corps represents a microcosm of communications within the Army itself.

What follows is an examination of communications within the US Army during the war. Chapter 2 begins with the state of the system before the US entry on 7 December, 1941. As with all aspects of the Army, the Signal Corps was woefully unprepared for the modern war it was suddenly expected to conduct. Even though maneuvers in the Carolinas and Louisiana had revealed glaring deficiencies in the existing signal plans, new equipment and procedures were still in their planning and early production phases when the war formally began with the bombing of Pearl Harbor. In Europe, the Signal Corps got its baptism of fire alongside the Army in North Africa. Concurrently with the Army as a whole, the Signal Corps learned valuable lessons that would inform its future use and equipment. Sicily and Italy presented their own unique challenges with continued improvements for the signalmen. However, as Paul Kennedy explains in *Engineers of Victory*, the problem of an amphibious assault against a fortified position was a daunting one. In spite of its challenges, an amphibious assault would be required to invade the Mediterranean and the European mainland. In Chapter 3 this work looks at the buildup of forces in Britain prior to the planned invasion of the continent and the D-Day invasion of Normandy. By the summer of 1944, a truly astounding amount of personnel and equipment was stockpiled for the invasion of France. Despite this, the assault on Utah and Omaha beaches was still the greatest challenge faced by the US

Army up to that time. The signalmen of the First US Army struggled to establish effective communications amid the enormous complexity of Operations Neptune and Overlord. Nevertheless, the valuable experience from the Mediterranean paid off, with a robust and efficient communications system quickly established on the beachhead. Chapter 4 deals with the aftermath of the Normandy landings, the breakout from the hedgerow country, and the German winter offensive of 1944-45. It was here that the Signal Corps experienced in essence its "final exam". To its credit, the emphasis on flexible communications, and improvised solutions to problems served the signalmen well. Also within this chapter, the new ability of the Army to coordinate with its various arms comes to the fore. Following the breakout from Normandy, effective communications between infantry, armor, artillery, and air power formed the US Army into a formidable fighting force capable of dealing decisively with many different battlefield situations. Finally, the concluding chapter describes the last months of the war in Europe, and its aftermath for the Signal Corps. Here also is a brief glimpse into the lasting effects of modern communications on US military as well as civilian life. It is fervently hoped that this work will contribute to a new exploration of communications within the context of the Second World War. It is also hoped that with a greater understanding of the most expensive war in human history, in terms of both production and human lives, new ways may be found to prevent its repetition.

CHAPTER II

Pre-War and First Steps in Europe

During World War II, the United States Army was able to attain levels of command and control that had not previously been seen. By the end, commanders were able to communicate effectively and continuously with far reaching combat elements, as well as the multitude of support structures that facilitated modern war. Yet the examination of US Army communications in World War II must begin not with the eventual successes of the Battle of the Bulge or Operation Cobra in 1944. Instead, it must begin with the lessons learned in the Mediterranean, including North Africa, Sicily, and Italy. Concurrently with the army as a whole, the communications organization and structure learned invaluable lessons in the fires of combat -- lessons which would benefit it enormously in the years to come.

Following the bombing of Pearl Harbor on 7 December, 1941, the US suddenly found itself in a global war. Although some foresight on the part of Roosevelt and his staff, as well as rising Lend-Lease production, had begun to prepare the US industrial economy for a war footing, there remained an immense shortage of organized production for the implements of war. Following a policy of isolation that reigned supreme after the Great War, the US Army was miniscule compared to what it would become. From its pre-war low of under one-half million troops, the Selective Training and Service Act of 1940 eventually drafted over ten million servicemen by 1946.[2] Among the many facets of modern war that US production would have to accommodate, the production and use of advanced signals equipment was one of the most difficult and complex. However, for

[2] Peter Doyle, *World War II in Numbers*. (Buffalo, NY: Firefly Books Ltd., 2013). p. 29.

all their grumblings about lack of preparation, the commanders of the Signal Corps found that with the creation of a new modern army, essentially from scratch, there existed an opportunity to modernize quickly with cutting-edge developments in communications.

Peacetime military maneuvers of the late 1930s had shown numerous deficiencies in the communications organization and equipment of the US Army. Particularly in the case of the Texas and Louisiana maneuvers in May of 1940, the Signal Corps was revealed to be deficient in many aspects of the rapidly modernizing Army. With its pre-war emphasis on domestic defense, the Signal Corps was reliant on commercial wire circuits to handle much of its expected workload. While many new innovations were in development, the radios on hand were deemed unsatisfactory. The "mobile" radio SCR-197 could not function without the men first stopping, setting up equipment, and starting the power generator.[3] Radio frequencies were overcrowded and subject to frequent interference, and there were extensive calls for wired communications links, far beyond previous estimates. Additionally, much of radio's role in these maneuvers was limited to the wireless projection of hand-keyed Morse code. Some of the many takeaways from these early experiences were a greater provision for the construction of wire communication lines, the decision to pursue crystal tuning for vehicular radios, and the gradual adoption of frequency modulation (FM) for radio. Afterwards, FM sets began to see wider development, though AM was also used throughout the war. Also, there was a clear need for voice communications or at least, high-speed telegraphy. Hand-keyed telegraphy was too slow and required personnel trained to use Morse code, who were in short supply.

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[3] Rebecca Robbins Raines, *Getting the Message Through: A Branch History of the U.S. Army Signal Corps*. (Washington D.C.: US Army Center of Military History, 1996). p. 241.

The sudden drive to increase military production in the early years of America's participation in the war drove the Signal Corps to unprecedented levels of authorized expenditure. The end result of this rapid expansion in signal spending was that by the end of September, 1942, more than 2.5 billion dollars in contracts had been awarded to American and Canadian companies. A further 3 billion was available pending the creation of more industrial capacity.

While radio has captured the imagination and attention of historians, especially after Operation Overlord, it was wire communications that connected the Army. "Wire and wire signaling devices had long been the core of signal operational equipment and, in providing the bulk of communications for large Army installations in World War II, would remain so."[4] Radio was invaluable in providing communications for units on the move, especially tanks and aircraft, but wire and telephones continued to link units from companies up to army corps. Additionally, the vast complex of supply, logistics, medical, intelligence, and many other departments utilized wire communications to coordinate with the frontline troops. However, the construction of wire in a combat theatre was hampered by the tedious task of constructing overhead lines for single-channel communications.

Two innovations solved this problem. The first was the use of commercial carrier technology. "Thanks to the application of the commercial carrier system to the military, a single wire circuit could carry not one but several signals simultaneously."[5] Therefore, the number of wire lines that had to be constructed was drastically reduced. However, the wire of the time, W-110-B, was both very heavy and prone to electrical shorts.

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[4] *Ibid*, p. 63.
[5] *Ibid*, p. 63.

Additionally, it was excessively vulnerable to enemy fire and climatic conditions. The innovation that solved this problem was a British invention known as spiral-four:

> It received its name from the arrangement of its four wire conductors, which spiraled around a fiber core. The whole, wrapped in wire shielding, then encased in an insulating rubber jacket, was devised to provide long-range carrying power with minimum electrical loss and cross talk. Flexible, half an inch in diameter, of a tensile strength over 600 pounds, yet not excessively heavy, it could be handled far more expeditiously than other cables that the Signal Corps had used before.[6]

In addition to these properties, spiral-four was able to provide voice communication over a distance of up to 40 miles without using any repeating equipment. Finally, the robust structure of the cable allowed it be simply laid on the ground or buried in a shallow ditch, greatly relieving the construction requirements for armies in the field.

Of course, the use of wire communications in wartime was nothing new. Telephone and telegraph lines had featured prominently in the Great War, and every belligerent country in the world used this technology heavily in the Second World War. What made this war different, however, was the volume of traffic and the speed of transmission. The primary impetus to increase the speed of Morse signals came from the Army Airways Communications System, who used a system of radiotype to send weather reports between distant stations. "At this date AACS weather reports had to be manually enciphered, transmitted, and deciphered, all of which took so much time, often in the hands of rather unskilled operators, that the reports might be received hours later, too late to be valuable."[7] The solution came in the form of automatic radioteletype, RTTY. This system synchronized two machines, far distant from one another, and automatically handled encoding and decoding as well as message transmission much faster.

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[6] *Ibid*, p. 66.
[7] *Ibid*, p. 219.

Although wire would handle the bulk of communications in Europe, there remained a critical need for reliable radio communications. Certainly, infantry and armored units in motion relied on radio, but also aircraft and transoceanic communications. While the military radio industry changed very rapidly, a look at a few of the most widespread radio types is warranted.

For the infantryman, portability was the key factor in a successful radio. Pre-war models often required either multiple men or pack animals to carry the disassembled radio, which had to be set up before a link could be established. For this reason, the primary infantry radios of the US Army in World War II were made smaller and had a correspondingly limited range. Until the new infantry radios SCR-300 and SCR-536 could be ready for service, the army had to make use of existing sets, such as the SCR-511. The "pogo" radio, as it was known, was a single man-operated AM radio operating between 2-6 megahertz (MHz). The nickname came from its unusual appearance. The antennae for the 511 sat atop a short vertical staff, with the battery and transmitter attached to the infantryman's body. While some poorly trained communicators thought the stake at the bottom of the staff was for stabbing into the ground, it was actually intended to be placed in the guidon holder on a saddle. Stabbing it into the ground subjected the set to an impact it was never designed to withstand. The 511's range of up to 5 miles was impressive for the time, but the set was widely disliked because it was bulky and interfered with the signalman's movements. The SCR-300, or "walkie-talkie," was designed in 1942, though it did not reach front line units until Sicily in 1943. Carried on an infantryman's back, it weighed 38lbs and had a range of about 3 miles. The carrying soldier or a closely following officer could operate the set while on the

move. This radio was frequency modulated, and operated from between 40-48 MHz. Of course, it was not a perfect set. For one thing, the radio utilized a 15-pound battery and consumed one battery charge every 20-25 hours. This meant an almost continual supply of fresh batteries had to be sent to forward units. The final, and perhaps best known, of the infantry radios was the SCR-536, or "handie-talkie". Originally designed as a stop-gap radio for use by paratroopers, the SCR-536 became one of the most widespread radios of the Second World War. Weighing only 6 pounds and covering a frequency range of 3.5 to 6 MHz, the 536 was an infantryman's friend. The problems with the SCR-536 were that it was a pre-set, single channel radio. This meant that the channel could not be changed in the field. Additionally, it had a limited range of up to one mile in ideal circumstances. On confined battlefields, such as within a city, this range could be severely reduced. For example, the report on the battle for Brest by VIII Corps in 1944 stated, "SCR 536 radios proved to be of little value, as transmission and reception was unsatisfactory in buildings."[8]

While the infantry struggled between effectiveness and portability, the commanders in the field suffered no such trouble. Simply put, the SCR-299 was the field commander's communications dream come true. Originally commissioned for the armored forces, the SCR-299 was widely adopted by large infantry units and even British allies. This large set was commonly mounted in a truck or half-track, with a towed power supply. As long as the vehicle could be provided with fuel, the SCR-299 could transmit a reliable voice signal up to 100 miles. Furthermore, when using sky-wave transmission

[8] VIII Corps report, *Fighting Cities*, 1944; *Records of the Adjutant General's office, 1917-* (General's Office); *WWII Operations Reports 1941-48* (Op Reports); Record Group 407 (RG 407); National Archives at College Park, College Park, MD (NACP)

(the bouncing of the radio signal off the atmosphere), it could send continuous wave telegraph signals over 2,300 miles.[9]

The Army Air Corps (later the US Air Force) and artillery units also used radio extensively. Gone were the days of World War I biplanes using hand signals or flares to communicate with each other and the ground. Now the pilots needed to be able to quickly communicate with ground control and each other. The adopted radio was the SCR-522. Converted from the British TR-1143, the 522 was smaller, lighter, and covered a larger frequency band: 100-156 megahertz. It also featured crystal-tuning, which allowed quick and reliable selection of up to four pre-set channels. In fact, the major problem with the 522 was that there were never enough of them. The superior nature of the set, combined with the interchangeability of parts with British sets, caused the British to immediately order five thousand of the new radios. However, this was blocked by the Assistant Chief of Staff G-4, General Arnold, who decreed that US demands must be met first.[10] Despite the feverish demand, domestic production of the new set was sluggish. British concerns over secrecy caused production to languish well beneath the optimistic projection of 3,000 per month.

There are a few technical factors affecting the use of radio in wartime that must be explained -- namely, the differences between AM and FM. Amplitude Modulation (AM) involves the transmission of radio waves with the message contained in the form of fluctuations in power, amplitude. While this system certainly functions, it is highly susceptible to changes in the power as it travels through a medium, such as air. These

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[9] Raines, *Getting the Message Through.* p. 293.
[10] Dixie R. Harris et al., *The Signal Corps: The Test (December 1941 to July 1943).* (Washington D.C.: US Army Center of Military History, 1957). p. 80.

power changes take the form of static on the signal and can come from a large number of possible sources, including: atmospheric disturbances (the Aurora Borealis), solar activity, storms producing lightning, and even the electrical systems of vehicles and buildings. In contrast, Frequency Modulation (FM) involves the carrying of the message through slight variations in the frequency of the radio waves. Since the receiving FM radio set filters out other modifications to the signal, there is no loss of fidelity due to environmental conditions.

Radio waves travel through many different mediums. Although radio does travel through the ground (ground-wave), this form was limited in its usefulness during World War II and hardly used. Instead, radio waves were broadcast through the air, either within line-of-sight or by bouncing the signal off the ionosphere (sky-wave or skip-wave). For battlefield communications, the vast majority of radios utilized line-of-sight transmission; however, this is something of a misnomer. While the signal between two radios is clearest in a direct line of sight, radio waves bounce off most surfaces, allowing communications to function even in heavy jungle, albeit with a greatly reduced range.

Radio and wire communications handled the vast majority of messages in the US Army in World War II, but they were by no means the only systems in use. Visual messaging, courier messengers, and even pigeons all provided yeoman service throughout the war, although their contributions varied widely by theatre. Perhaps the strangest of all signal services were the pigeon units. Seemingly anachronistic, the unique ability of pigeons to return unerringly to an established position allowed them to function when all other forms of signaling failed. However, the use of pigeons was limited in the case of rapid movement of forces. “Before the birds can be used in any

situation, their home loft must remain in one place at least a week before they will settle there, having become so familiar with the location that they return to it invariably."[11] Pigeons were often used as backups to more modern systems, or in times of radio silence when there were no wire lines available. Not all physical messengers had wings, though. The US Army utilized a large number of couriers to move messages. Simple soldiers, motorized vehicles, and even aircraft were widely used to communicate between units of soldiers or even theatres of combat.

Visual signaling was widely used at the lowest levels of army organization, especially the squad or platoon. Simple hand signals could be used to communicate with comrades over very short distances without alerting the enemy to one's presence. However, these signals were rudimentary by later standards, able only to convey simple commands. Signal lights or flashlights could transmit prearranged signals at night or even use Morse code for more complex messages. Even marker panels were used to communicate with aircraft overhead.

Before any overseas communication system could be created, an enormous number of highly-trained specialists were needed. Signal Corps personnel required advanced training in a number of technical disciplines. The problem of creating such a technically proficient force was daunting. "The scope of technical signal training was broader than ever before. It had penetrated a field of study hitherto occupied only by scientists and confined to highly scientific institutions such as research laboratories."[12] The training of these technicians at a sufficient rate was a cause of great concern for

[11] *Ibid*, p. 382.
[12] Harris et al., *The Signal Corps: The Test*. p. 186.

Signal Corps leaders, and the scarcity of well-trained operators would be keenly felt in North Africa.

The primary signal school at Fort Monmouth, New Jersey was created in 1925 and stood as the sole signal training center for the US Army by the start of World War II. Obviously, the capacity for training signalmen of all types had to be quickly increased. Additional training centers at Camp Crowder and Camp Kohler were created by the summer of 1942. However, there remained significant problems. The Signal Corps was responsible for providing trained personnel in many different areas, not just radio and telegraph, but radar operators, cryptographers, pigeoneers, clerks, and even truck drivers. Additionally, the rapid pace of preparation for Operation Torch caused men to be pulled from the schools before their training was complete. One of the problems was organizational. Army Tables of Organization and Equipment (TO&E's) had not kept up with the sudden transition to a wartime footing, so there were shortages of men in training. "Where Tables of Organization existed at all, they were unrealistic for both air and ground units."[13] An attempt at a solution was to shorten the scope of the training programs in order to produce recruits faster, but this simply caused a greater demand since there would be more men needed to cover all the jobs.

Signalmen were also expected to be combat proficient, since they would often be at or near the front lines. However, there was an early lack of marksmanship training at both Camp Crowder and Fort Monmouth. Each training center had thousands of recruits in training, yet there were only 400 World War I-era rifles at each facility.[14] The primary weapon of the signalman was the M1 Carbine, yet there was no training or even exposure

[13] *Ibid*, p. 188.
[14] *Ibid*, p. 190.

to this weapon. The struggle to balance combat and signal responsibilities was never completely solved. Even in May, 1944, a JASCO (Joint Assault Signal Company) unit was asked "To what extent must signal units provide their own protection?" The unit's response was, "They cannot provide protection and get communications installed soon enough. We are prepared to provide protections but it retards us." Furthermore, the unit reported that basic combat training was inadequate.[15]

It was not simply the number of recruits that worried the Signal Corps leadership, it was the quality as well. Prospective signalmen needed a reasonably high degree of intelligence and formal education to absorb the tremendous amount of information in only a few weeks or months. However, so many branches were also seeking the best candidates that some unsuitable recruits were received:

> G-1 of the General Staff had informally promised that men for the Signal Corps' replacement training centers would be drawn, as far as possible, from the northeast, north central, and Pacific coast reception centers, in areas where the general level of education was higher. But an examination of the records of 338 recruits received at Camp Crowder on two days in midsummer revealed that they had come from Fort Bliss, Texas, and that fewer than one percent were college men; about 17 percent were high school graduates; 45 percent had completed grade school or had had "some schooling." Over 36 percent were illiterates.[16]

As the United States entered the war in Europe, a fundamental question was where to commit US resources and combat troops. Early calls for an invasion of France in 1942 foundered on the simple fact that there was no way to build the necessary stockpile of supplies and manpower in time. Nevertheless, US leaders felt compelled to contribute somewhere. Following pressure from Churchill, President Roosevelt agreed

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[15] 293rd JASCO, Report No. 39, Signal Questionnaire, 12 May, 1944; General's Office; Op Reports; RG 407; NACP.
[16] Harris et al., *The Signal Corps: The Test*. p. 195.

that North Africa provided just such an opportunity for the first Allied joint operations. The British campaign in North Africa had been hard fought since 1940 and it was here the US Army had its baptism of fire. For this operation, three separate task forces were assembled combining US and British forces. The Western Task Force would be convoyed across the Atlantic directly from America. Its job was to invade the Atlantic coast of Morocco. The Central Task Force, comprised of US and British troops, would land at Oran. Meanwhile, the British Eastern Task Force would attack Algiers.[17] Once landed, the plan called for the three forces to link up and push eastward, threatening the German rear. At the same time, rising British forces, now under General Bernard Law Montgomery, would attack westward and the German Afrika Korps would be caught in a giant pincer. Against the Allied invasion force of 63,000 men and 430 tanks, the Vichy French and Italian resistance was light. However, despite the peril of the two-front war in Africa, German forces finally got the reinforcements they had been pleading for since the campaign began. The first battle between German and American forces was a sobering experience for the green US troops, as well as their commanders.

While Operation Torch would ultimately be successful, the army and its signal personnel learned many difficult lessons. US industrial production was still mounting and the rushed preparations for Torch caused a drain on the buildup of forces in Britain. One of the problems in signals came from a desperate lack of spare parts for repair and maintenance:

> Unfortunately, spare parts were nearly always components of end items on the contract, and the pressure to get out quantities of end items was heavy and unremitting. Rather than interfere with production lines, manufacturers often asked for, and got, waivers on the required spare parts

[17] John Keegan, *The Second World War*. (New York: Penguin Books, 1989). p. 340.

> groups. The result was that increasing amounts of equipment did go out into the field, but, lacking spare parts, soon became immobilized.[18]

Even when the necessary equipment was built, there were widespread problems in getting it to the correct units. Early shipments of material to Britain had been poorly organized and catalogued. "Moreover, equipment was poorly marked, badly packaged, hard to identify, and often misrouted."[19] Compounding this problem was the fact that troops were shipped to England on fast troop ships while their equipment followed on slow convoys. With the need for immediate formation of units, rather than waiting for their equipment to arrive, units were frequently issued with equipment from existing stocks in Britain, causing a drain on the buildup of signals equipment for future cross-channel operations.

The available lessons from Operation Torch became evident very early in the operation. For one thing, during the beach assault, communications would be coordinated by signals equipment mounted in naval ships. For example, Patton's headquarters of the Western Task Force aboard the *Augusta*, comprised of a combined message center, was too large to fit in one room. The solution was to spread the center into multiple rooms in different parts of the ship. Not only did this cause confusion, but the signalmen operating the center were inexperienced and undertrained. These personnel were relieved of duty by Navy signalmen before noon on D-Day of Torch. After this correction, communications from ship to shore were only operational for two hours before being knocked out by the shock from the *Augusta's* own guns firing. Although the signals system was fixed and operating well by the end of the second day,

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[18] Dixie Harris et al., *The Signal Corps: The Test*. p. 325.
[19] *Ibid*, p. 342.

the loss of communications during the initial landings contributed to the signal difficulties.[20]

The second major problem of landing communications was one of pre-invasion organization. Although the commanders had planned for the early landing of multiple SCR-299's, including twelve separate sets across the three landing zones, very few made it to shore in the initial landings. The cause for this problem was a combination of rough seas that delayed unloading of ships and the fact that these heavy vehicle-mounted radios were loaded deep in the holds of the supply ships where they could not be accessed. As signal units came ashore, there was no equipment for them to operate and little knowledge of when and where it might become available. The equipment that did come ashore was sometimes useless by the time it reached them, since inadequate waterproofing caused numerous sets, especially vehicle-mounted radios, to become inoperable.

Despite these many problems, commanders and signal troops worked hard to improvise communication solutions. The excellent armored vehicle radios in the 500 series were used to transmit traffic through the command nets of the 1st Armored Division. The 1st Armored Division's signal officer, Col. Williams, explained this capacity for improvisation and flexibility. "We drove a tank up to a command post and sent [General Doolittle's] messages to the tank battalion headquarters, and from there they went to the combat commander, to the II Corps to Gibraltar and it really worked."[21] Some of the command nets were also supplemented by the use of small infantry radios, though only in separate nets and within shorter ranges.

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[20] *Ibid*, p. 360.
[21] *Ibid*, p. 356.

While radio had provided critical links in the first days of the invasion, as the forces moved east toward Tunisia, a vast network of wire communications was needed in its wake. While spiral-four cable could be lain on the ground, it was better to suspend it along traditional pole lines. These lines would be able to handle larger numbers of cables and thus, more channels for communication, provided that it was well back from the front lines. However, in North Africa there were few sources for the large numbers of forty-foot telephone poles needed. An expedient solution was Rapid Pole Line (RPL). Under RPL, two twenty-foot building studs could be connected to form the normal length poles. However, this was only partially successful, as the makeshift poles could not handle the weight of the lines and were adversely affected by moisture and sunlight. Another expedient solution was the assumption of control over French North African civilian telephone and telegraph cables. Although heavily damaged by German forces during their retreat to Tunisia, these lines were rehabilitated and pressed into service by the Signal Corps.

Despite these improvisations, the immense size of the North African theatre required still more communications options. It was here that the next great innovation in signaling also made its debut: radio relay. Originally taken from a request by Eisenhower to have communications in his car, radio relay allowed a signal to be transitioned from radio to wire, or vice versa. Radio relay also allowed a signal to pass quickly between areas impassable to wire lines, like very mountainous terrain.

> Upon the fall of Tunis in May, the mobile headquarters station radioed the news to Hill 609, whence it flashed back in four giant mountain hops over the 400 miles to Algiers, some twelve hours before the usual wire circuits became available and a message center was set up at Tunis. This first American Army radio relay system handled large quantities of II Corps traffic and press reports, with interruptions due to equipment failures or

> atmospherics amounting to less than 5 percent of the time, a percentage of outages much smaller than that suffered by wire lines in the same area.[22]

The problem with radio relay was the size of the equipment and its lack of portability. Usually, a radio relay system had to be installed on prominent hills and required conspicuous antennae. This meant that the system would be impractical near the front lines, where the equipment could draw enemy fire.

If Operation Torch introduced the American Army to the problems of modern warfare, especially amphibious operations, then Husky was the first test of lessons learned. One of the primary lessons from North Africa was the tremendous importance of effective communications to establish command and control. "Most important of all from the Signal Corps point of view, the North African campaign had again demonstrated the importance of military communications of the modern army. Army-wide acceptance of this fact significantly influenced all other campaigns to the end of the war."[23] While the landings in North Africa had been successful, there were numerous glaring deficiencies that had to be fixed before the Sicily invasion. To its credit, The US Army seemed to take many of these lessons to heart. There were much greater precautions against the shock of naval gunfire knocking out communications aboard naval ships. There was even the provision of a dedicated communications ship, the *Ancon*. These steps were still not sufficient to ensure effective communications, however. "The radio operators, the message center and code clerks, and the war room staff were badly cramped for space. Radio stations were scattered in widely separated places on the ship. This made it difficult to control operations, limited the number of channels that could be

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[22] *Ibid*, p. 373.
[23] Dixie R. Harris and George Raynor Thompson, *The Signal Corps: The Outcome (Mid-1943 Through 1945)*. (Washington D.C.: US Army Center of Military History, 1966). p. 27.

provided, and slowed up the clearing of radio messages."[24] Despite this oversight, there was no complete breakdown of ship-board communications during the landings, as had happened in North Africa.

The situation on the beaches was also much improved over Torch. For Husky, signal servicemen were allowed to prepare their own equipment for landing, especially ensuring effective waterproofing. Additionally, the failure to unload the truck-mounted SCR-299's was solved by mounting them instead in 2 ½ ton amphibious vehicles (Dukws). These vehicles were able to maintain communications offshore until it was safe to approach. In one case, two of these vehicles, finding themselves at the wrong beach, drove for six miles through the sea to reach their designated area.[25] Unlike the beaches of North Africa, the landings in Sicily proceeded well, with local command radio nets operating efficiently. While the landings went well for the signalmen, a new problem emerged. The rapid advance of Allied troops over the island quickly exhausted the supplies of wire that had been provided for the invasion. "There were some tight moments in the first three days of fighting, for the assault troops had brought in only sixty miles of assault wire and needed more than twice that amount."[26] While this initial difficulty was solved by the arrival of fresh supplies on the fourth day, the consumption of wire on Sicily continued to be enormous. "The II Corps' 53d Signal Battalion installed hundreds of miles of spiral-four in Sicily—in fact some 1,500 miles of wire lines of all kinds as the men kept up with the ground forces."[27]

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[24] *Ibid*, p. 33.
[25] *Ibid*, p. 34.
[26] *Ibid*, p. 36.
[27] *Ibid*, p. 42.

It was at Sicily that a new radio organization also saw its first use. The Signal Information and Monitoring service (SIAM) was designed to monitor friendly radio traffic, watching for improper security procedures and informing commanders of important developments before they went through all the standard channels. The response to the presence of SIAM was mixed. On the one hand, the monitoring for security breaches was widely used to ensure greater operational secrecy. However, the process involving interception of important messages was disliked. Col. Williams of the II Corps reported that, "entirely erroneous concepts were obtained from eavesdropping and from the reports of inexperienced, irresponsible liaison officers."[28]

Husky showed what effective communications could look like. Nothing in wartime ever works perfectly, but both the men and equipment in Sicily worked to the satisfaction of both field commanders and Signal Corps leaders. However, the next hurdle would be in Italy, and that operation would show that many things could still go wrong. By the start of operations against the Italian mainland in September of 1943, both army commanders and signalmen had gained valuable experience. Even before the pacification of Sicily in August of 1943, plans were already in progress for the next invasion. Sicily was an obvious "stepping stone" from North Africa to Italy, so it was no surprise that the next phase would be concentrated here. Unfortunately, although Italy withdrew from the Axis powers, German forces in Italy were strengthened and also knew the Allies were coming. The landings in North Africa and Sicily had been successful in large part because of a lack of concentrated resistance. This would not be the case in Italy. Operation Avalanche planned for the invasion of Salerno by American forces with

[28] *Ibid*, p. 38.

a subsequent linkup with British forces in the toe of Italy. German forces in Italy were well prepared for Allied arrival and the landing at Salerno was met with fierce resistance. "As the first assault waves reached the beach, enemy artillery, mortar, and machine gun fire began to rake the landing areas. German resistance was far heavier than it had been at the invasion of Sicily."[29]

Signal planning for Avalanche had continued to improve on the experiences of North Africa. However, enemy action swiftly complicated these intricate plans. "In the early morning darkness, members of radio teams often became separated, and as a result many teams were unable to operate."[30] The intense combat conditions on the beach did nothing to help preserve radio equipment, and many sets were damaged by rough handling or enemy fire. Signalmen also struggled with a shortage of signal vehicles, especially wire-laying vehicles. In desperation, the construction teams of the 36th Signal Company used infantry jeeps to move wire, and succeeded in laying 90 miles of wire on the first day alone. The link up with British forces was a precarious one, especially after a German counter-offensive threatened to split the two armies. Only a narrow strip of coastline linked the two forces, and through here, messengers rode at breakneck speeds on motorcycles to carry valuable information, often under artillery fire.

The Italian campaign quickly swallowed men and equipment at exorbitant rates. The signal planner for the invasion, General Moran, had wisely provided for extensive supply. In fact, signal supplies were arriving so fast that the signal supply troops had difficulty keeping up. The critical problem that emerged in Italy was a shortage not in equipment, but manpower. Moran lamented, "last night, six men allegedly radio

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[29] *Ibid*, p. 45.
[30] *Ibid*, p. 45.

operators came in. One was an infantryman with no communication training, one was a barber, and the others had only basic radio operator training."[31] By the end of the first week of the Italian operation, there were only fifteen qualified replacements for an army of signal personnel of over 20,000. Desperate, Moran cannibalized other uncommitted signal units, including Patton's 1st Armored Signal Battalion.

The topography of Italy also hampered the signalman, even as it strengthened the German defender. German forces could utilize existing cable systems while Allied troops had to create their own. Small infantry radios were not capable of utilizing the sky-wave, so the mountainous terrain often blocked transmissions. Additionally, the extremely rugged terrain limited the usefulness of vehicle radios like the SCR-299. Wire communications had to be utilized, but the construction of these lines was extremely difficult. In places, the terrain was so rough not even pack animals could carry the wire so it was hand carried by the troops. Breakages in even the spiral-four cables were common, due to both enemy fire and allied misuse. Infantry night patrols often used the wire as a guide rope during night missions or to help climb embankments. Spiral-four was robust, but never designed for this kind of treatment. Both messengers and pigeons were used extensively in Italy, with the pigeons carrying sometimes as many as 300 messages per week to a single headquarters.

The Italian campaign continued to the very end of the entire war, and as the troops moved northward in the winter of 1943-44, the signal load increased almost exponentially. Even in the opening states of the invasion, in September 1943, the code rooms of the US Fifth Army were averaging 23,000 code groups per day. In early

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[31] *Ibid*, p. 51.

October, the commander of the 63d Signal Battalion reported that even though he was authorized to use three SCR-299s for large volume traffic, he was actually using seventeen. All of these sets were in use continuously, twenty-four hours a day. Clearly the established guidelines for communications equipment were grossly insufficient for the task. "Signal officers in North Africa, Sicily, and Italy often felt that staff planning in Washington, especially at the War Department level, was unrealistic, not yet fully aware of the actual communications needs of such a war as World War II was proving to be."[32]

The US Army suddenly found itself thrust into a Second World War, with enormous deficiencies in manpower and equipment. However, by the end of 1942, the signalmen of the army had gained valuable combat experience and learned a great deal. Further operations in Sicily and Italy reinforced the importance of military communications in the prosecution of a modern war. However, the "final exam" lay ahead. By the start of 1944, major plans were in motion for a cross-channel invasion. This Operation Overlord would require previously unheard of amounts of men and materiel. (Western Allied) Victory in the war for Europe lay in northern France and Germany. The US Army and the men of the signal companies would need every advantage if they were going to crack Fortress Europa.

[32] *Ibid*, p. 51.

CHAPTER III

Buildup and D-Day Invasion

American campaigns in North Africa, Sicily, and Italy served to illustrate deficiencies in US equipment and tactics, particularly with regards to communications. However, by the time of the Normandy landings, many of these problems had been addressed. Nevertheless, the operation in Italy had shown that an amphibious landing in the face of organized and determined resistance was still not something to be taken lightly. "When, eventually, they did come ashore in France to pursue a full invasion, they were going to have to be very, very good."[33]

Despite British wishes for continuing offensives on the periphery of German territory, American military leaders understood that an invasion of France brought the best prospect of a victory. As early as 1942, some US military leaders had argued for the opening of a second front in France. Since the British Isles would be a natural jumping off point for such an invasion, American and Commonwealth forces began to build up forces in Britain for the European operations to come. "The first build up of men and equipment in England for a cross-Channel attack against the Continent had been drained away to North Africa in late 1942, and it had been necessary to build again."[34]

BOLERO was the codename given to the buildup of forces in Britain. Military leaders on both sides of the Atlantic quickly realized that American involvement in Europe would require an immense amount of supplies and manpower. Furthermore, the distance across the Atlantic meant that all supplies needed for operations on the continent

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[33] Paul Kennedy, *Engineers of Victory*. (New York: Random House, 2013). p. 234.
[34] Harris and Thompson, *The Signal Corps: The Outcome*. p. 75.

would have to be brought to England first. However, despite the rapid advances in industrial production in the US, it would take time for a comprehensive force to be assembled in Britain.

Even before the United States' formal entry in the war, the close relationship between America and Britain allowed for early steps at cooperation and coordination. In May 1941, a US army signal officer, Col. Matejka, was sent to England to begin working with the British. He quickly forged important links in what would become a complex, multi-faceted effort to become a fully Allied force. "By the time the United States entered the war, the Signal Corps had already established informal relationships and working arrangements with the British that paid handsome dividends later."[35] During the early buildup, there were many confusions and shortcomings, including among the Signal Corps. As was mentioned in Chapter 2, the early policy of shipping manpower and supplies separately but starting at the same time caused confusion in the British supply yards:

> Until May 1943, troops and equipment were shipped to the theater at the same time, organizational equipment being force marked. This arrangement was never popular with supply men. Troops sailed on transports, equipment was loaded on slower cargo vessels. Thus the time and place of arrivals of troops and equipment varied widely, and marrying up the troops and their organizational equipment meant expending an inordinate amount of time and effort…At times some units received two issues while others got none.[36]

Fortunately, this system was fixed by mid-1943. After that, a unit's equipment was sent ahead of the troops and both were quickly joined once the latter arrived in England. From a communications standpoint, even the buildup itself required an enormous amount

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[35] Harris and Thompson, *The Signal Corps: The Outcome*. p. 76.
[36] *Ibid*. p. 81-82.

of signals equipment, personnel, and infrastructure. Only through an efficient and flexible system of communications, even across the expanse of the Atlantic Ocean, could a suitable buildup of forces be organized. After all, the US Army's supply depots were scattered across the whole of the British Isles, including Ireland, Scotland, Wales, and England. Therefore, a comprehensive communications system was created which utilized radio, telephone and telegraph lines, messengers, and civilian circuits.

> By D-day, 980 telephone switchboards and 15 teletype writer switchboards served the various headquarters in the British Isles. The telephone switchboards had more than 1,200 positions. That is to say, more than 1,200 telephone operators sat at the 980 boards, endlessly plugging and unplugging the connections to 32,000 telephones….An average of 8,500,000 calls a month went over the system.[37]

One of the most troublesome of all military problems in the Second World War was the difficulty inherent in amphibious landings. The landings at North Africa, Sicily, and Italy varied widely in their exposure of this difficulty, with the landings in Italy showing the landing forces' vulnerability to enemy opposition. Yet the prospect of an invasion of France brought with it another sober reminder: the Dieppe raid. Three months before the invasion of North Africa, British Commonwealth forces, mostly Canadian, made an attempt on the port of Dieppe. It was a tragic fiasco, with the landings beaten back in less than a day, and over sixty percent casualties for the Allied troops. British leaders were therefore understandably cautious about an invasion attempt in France. The final decision to push forward with the invasion came from an unlikely source: Stalin. At the Tehran conference in the winter of 1943, Stalin vehemently rejected Churchill's plan for attacking German forces in the Balkans. His insistence on

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[37] *Ibid*, p. 79.

the opening of a second front against Germany reduced any possible argument the British might have had to postpone Overlord. The landings would happen in 1944.

Before boots hit the beach, however, there were innumerable items to be planned and coordinated between the Western Allies. Everything from the loading of ships and the coordination of aircover to the clearing of beach obstacles and the movement inshore had to be carefully considered and planned. For the Signal Corps, the landings in Normandy represented the greatest challenge they had ever faced. "Yet the signal plan for the invasion had to be fully co-ordinated among the services; indeed, it had to be co-ordinated as no other signal scheme had ever been."[38] To provide this needed high-level coordination, the Allies created the Combined Signal Board (CSB) in October 1943. This organization was responsible for deciding all matters of shared signals in the invasion. For example, the CSB "standardized the time basis and time expressions in messages throughout the theater: ordained a simple single-call procedure for all ground force radio communications: established telephone priorities; assigned cross-Channel cable and VHF radio circuits; and allocated radio frequencies."[39] This last function was a particularly troublesome one, as there were simply so many radios and other transmitters expected to be in operation. "Invasion plans called for a concentration of about 90,000 transmitters within a limited area of land, sea, and sky."[40] In an attempt to ration out the available frequencies, the CSB asked for departments to tell them how many frequencies would be needed. Naturally, this caused a massive overbid for the existing options, with frequencies between two and five megacycles being demanded in an amount exceeding

[38] *Ibid*, p. 86.
[39] *Ibid*, p. 88.
[40] *Ibid*, p. 89.

the available frequencies by seven times. Eventually, the CSB was able to reduce the requests to manageable levels, and further increased the number of available frequencies by reducing the signal space between assigned radio frequencies from five kilocycles to four.

In this highly congested radio plan, it is easy to see how the US Army's adoption of both FM radio and crystal tuning were crucial in preventing disorganization during the landings. If each individual radio operator had to manually tune his equipment, as much as the equipment and his limited training allowed, one can imagine the nightmare of signals bleeding into other frequencies. Of course, such technology was not easy to use. For example, when the CSB changed the signal space requirements, that meant an entirely new batch of crystals had to be ground for the newly allotted frequencies. There was little time to do so, however, since the new frequency allocations were not decided until 10 May, less than a month before the invasion.[41]

Ultimately, the signal equipment buildup for Overlord was on a similar scale to the buildup as a whole: gigantic. With the lessons of the Mediterranean campaigns well learned, signal officers requested and received an enormous amount of supplies.

> The Allies readied huge quantities of short- and medium-range radio sets, of wire-line stores for combat use by battalions, companies, and platoons. There were tens of thousands of sets waterproofed, their batteries fresh and fully charged; hundreds of thousands of miles of assault and field wire, enough for the 5 divisions by land and the 3 by air in the D-day assault, enough for the 16 divisions that would be in Normandy within five days, enough for the million men who would be ashore in three weeks, enough and plenty to spare for the losses in battle.[42]

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[41] *Ibid*, p. 89-90.
[42] *Ibid*, p. 91.

Experience in North Africa, Sicily, and Italy had shown that the amount of signals equipment needed for any operation was always greater that what was expected under a unit's TO&E. Fortunately, the delay of the invasion until 1944, coupled with cautious commanders wanting to prepare for the unexpected, allowed the collection of an immense amount of signal supplies.

US Army leaders made extensive plans for the signal disposition during the Normandy landings, but when the invasion actually took place, the confusion inherent in opposed amphibious landings quickly complicated the existing plans. The Normandy landings were much larger than any of the operations in the Mediterranean. Thus, the potential signal problems were larger. One of the most difficult problems of signals during the landings in the Mediterranean had been the difficulty in bridging the gap between beach and ship communications during the opening phases of the landings. Especially during Operation Avalanche, determined enemy resistance had greatly reduced the capacity of signalmen to communicate from ship to shore and back again. SCR-299's mounted in amphibious vehicles had helped, but until they could land on the beach there was still a lack of front-line information. A solution devised in the Pacific theater was the JASCO (Joint Assault Signal Company). Utilizing a mix of ground, air, and naval personnel, a JASCO unit's responsibilities included:

1. Provision of a means to each Battalion Landing Team for the control and direction of supporting naval gunfire;
2. Providing parties to request air support and to advise infantry commanders on the use of aircraft in the support of ground units;
3. To furnish teams for beach communications during the initial phases of the amphibious assault.[43]

[43] 295th JASCO; General's Office; Op Reports; RG 407; NACP.

In essence, these JASCO units coordinated naval and air support, and worked to quickly establish communications on the beach. To this end, the JASCO units were remarkably effective despite the stiff opposition encountered, especially on Omaha Beach. Despite losing much of their motorized equipment to enemy fire during the landings and the need to give away much of their hand-carried radio equipment to the infantry, they were still able to function. "With the remaining wire equipment and salvaged bits of wire picked up from the beaches, the JASCO men, still under fire, set up a skeletal wire system. This was the only communications system on the beach until noon of D-day."[44] The communications on Utah beach, where resistance was lighter, was easier to get established. The 286th JASCO was quickly able to establish radio and wire links between units and the naval support offshore.

As a unit concept, the JASCO served an important function, especially in liaison work between the disparate branches involved in an amphibious landing. However, it was this very multi-branch composition that caused some of the continual problems within some of the units. For example, during operations in Saipan the JASCO units reported unsatisfactory performance from some of the naval personnel.

> …release of the navy officers from the Joint Assault Signal Company would increase the overall operating efficiency of the unit. It is not a question of lack of cooperation, but in the Service consciousness, appreciable differences in training, different customs, and different regulations…Navy officers do not as a rule have the same attitude towards responsibilities for their men and equipment that is desired in an army officer.[45]

[44] Dixie Harris et al., *The Signal Corps: The Outcome*. p. 100.
[45] 295th JASCO; General's Office; Op Reports; RG 407; NACP.

The full extent of inter-branch difficulties within JASCO units is a subject for further study, but there is no evidence that similar problems arose during the Normandy landings.

While the US Army had plenty of practice by this point, there were still glaring problems. On Omaha beach, the landing craft were often destroyed by enemy shellfire, or attempted to release their cargo in water that was much too deep. Even on Utah beach, the veteran 50th Signal Battalion encountered severe difficulties in setting up a message center. "Prematurely landed in water so deep that most of their equipment was washed away, the men struggled ashore through heavy shelling and began operations as best they could."[46] Early communications on Omaha were not much better, with many infantry and vehicle radios being lost to enemy fire, water damage, and rough handling. This situation must have seemed eerily familiar for the veterans of the Italian landings. However, the first signal units to arrive with full equipment were generous in sharing their good fortune with the men who came before, and the radio plan for Overlord largely worked. The preponderance of crystal-controlled radios prevented the problems of signal bleed and frequency confusion, and while the British experienced some difficulties in radio reception during the midday hours, the American FM radios came through clearly.

Overlord also called for the inclusion of two US units of highly trained paratroopers. The 82nd and 101st Airborne Divisions were parachuted into France the night before the invasion. Their objectives were to capture crucial crossroads, both to protect the beach forces from an early counter-attack, and to secure the routes of forces coming off the beaches. However, a multitude of factors conspired to obscure the drop

[46] Harris and Thompson, *The Signal Corps: The Outcome*. p. 102.

zones and scatter the men. Cloud cover, enemy anti-aircraft fire, and inexperienced pilots all contributed to this debacle, with many units separated from each other by miles of unfamiliar terrain and darkness. "But being 'missing' was not the same as being ineffective."[47] Indeed, with remarkable tenacity the paratroopers created ad hoc units and succeeded in attaining practically all their planned objectives. However, the signal situation here was bleak. Combat troops who find themselves surrounded, even on purpose, rely on communications to bridge the gap back to their larger forces. Unfortunately, the poor jumping conditions, unfavorable ground, and defective equipment harnesses caused the loss of the vast majority of the paratroopers' radio equipment. The 101st Airborne Signal Company retained use of only two radios after the drop, and one long-range SCR-499 (an airborne conversion of a SCR-299). The 82nd Airborne Signal Company did not fare better, with only one short range and one long range radios recovered. Furthermore, with the widespread drops, wire communications were insufficient. A detachment of thirteen signalmen struggled with the task of laying wire that a full wire platoon of ninety-four men would have found difficult.[48] Without reliable communications, small unit commanders in the darkness were forced to rely on messengers to try to locate each other and form some semblance of cohesion. Stories of disjointed unit movements and uncoordinated attacks on enemy strongpoints abound.

Once the beachhead was secure, signal equipment flooded ashore and a complete wire system was in operation by the fifth day of the invasion. In addition, antrac systems were again used to bridge the gaps in the communications. General Bradley's Signal Officer, Colonel Williams, a veteran of the Mediterranean campaigns, had made

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[47] Kennedy, *Engineers of Victory*. p. 268.
[48] Harris and Thompson, *The Signal Corps: The Outcome*. p. 97-98.

provision for massive surpluses of signal material. Fortunately, the prospect of the Normandy landings had provided great incentive for Williams to attain all the pre-invasion supplies he might need from the home front.

> With General Bradley's quick authorization, Colonel Williams immediately requisitioned all the antrac equipment that the Signal Corps could have ready by mid-1944: about twenty-one 100-mile radio carrier systems, each consisting of 2 terminal sets and 3 intermediate relay sets to be placed 25 miles apart, plus 100-percent backup spares.[49]

These new AN/TRC-3 and 4 systems were much improved over the ones used in Sicily. The new equipment provided more channels for voice or telegraph transmission, and even a facsimile function for the relatively quick transmission of maps and photographs. It was this system, in a cross-channel configuration, that allowed photo reconnaissance aircraft returning to their airfields in England to transmit their pictures of strongpoints and camouflaged targets to the fire control personnel in the landing area within seven minutes of development.

Not even satisfied with these myriad communications options, the Allied invasion forces also laid cross-channel cables mere days after the landings began. Two undersea cables were laid from Royal Navy ships on June 10 and 17. Unfortunately, the Channel storm of June 20 that wrecked the Mulberry artificial harbors also destroyed the cables when ships' anchors were dragged along the seafloor during the storm. It took a strong effort to locate the problems and splice in repair cables, which brought both cables back on-line by June 28. "[the cables] were repaired as quickly as the weather permitted, although over ten miles of new cable had to be pieced into each cable to dodge the debris of the storm."[50]

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[49] *Ibid*, p. 92.
[50] L. H. Harris, *Signal Venture*. (Aldershot, UK: Gale & Polden Ltd., 1951). p. 205.

The buildup of troops and equipment in England was staggering in its scope. The actual invasion of France brought unprecedented numbers of men and vehicles across the Channel and onto the beaches of Normandy. "All told, the Allies mustered 2,876,000 soldiers, sailors, and airmen. They had 11,000 aircraft and several thousand vehicles, from great battleships to tiny landing craft that would hold a few men…"[51] The Signal Corps also dealt with an enormous amount of material. By early 1944, the Signal Corps "was handling approximately 2,500 tons of signal equipment and supplies each week."[52] The invasion of Fortress Europa was immense, and it had to be. German resistance on Omaha beach and later on the continent proved that the *Wehrmacht* was still a formidable opponent.

The landings at Utah and especially Omaha beaches proved extremely difficult, even for an army as prepared as it could be. The low-tide landings made equipment, personnel, and signal vehicles much more exposed to enemy fire as they moved across the wide open beach. However, with the exception of the initial beach landings, the communications plan for the invasion was quickly attained. Within mere days the flood of troops and equipment arriving on the beachhead enjoyed a comprehensive signals system, with radio paralleling the extensive wire networks. The expansive plan for the invasion had given its commanders the key flexibility that it needed to maintain command and control in the face of the confusion of war.

Ultimately, the landings in Normandy were a resounding success and the Western Front had been truly opened. While the breakout from the bocage country would still

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[51] James L. Stokesbury, *A Short History of World War II*. (New York: William Morrow and Company, Inc., 1980). p. 314.
[52] Harris and Thompson, *The Signal Corps: The Outcome*. p. 81.

present a formidable challenge, the success of Overlord cannot be denied. However, the failure of German forces to react quickly and decisively to the landings continues to be a difficult question. "The Allies' early success owed a great deal to the confused and hesitant response of their enemy as a result of the FUSAG deception, which continued to mesmerize the German high command long after the invasion."[53] In addition to this deception, which completely fooled the German high command and especially Hitler who thought that the real invasion would come at Calais, it must be added that the activity of the Allied air forces before and during the invasion caused significant communications failures for the Germans. While the full extent of this disruption is a subject that merits further study, there is widespread anecdotal evidence that the destruction of Axis communication lines in France, whether by air or French Resistance activities, had a paralyzing effect on the German commanders in the area. "General Richter, the divisional commander, was sitting at his battle headquarters. He did not know which strongpoints were still offering resistance. No news was coming through to him. No runners arrived."[54]

For the signalmen of the US Army, Operation Overlord would be the last chance to learn about the difficulties of communications during a large amphibious landing. With the exception of the invasion of Southern France in the face of light resistance, the Signal Corps could now focus on the lessons learned in the Mediterranean for communications across land. However, just as each amphibious landing had presented its own challenges, the construction of communications in France would not be easy. It

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[53] Richard Overy, *Why the Allies Won*. (New York: W.W. Norton & Company, Inc., 1995). p. 163.
[54] Paul Carell, *Invasion – They're Coming!*. (New York: E. P. Dutton & Company, Inc., 1963). p. 92.

would be here, in 1944 and 45, that US Army communications would face its final challenges of the war.

CHAPTER IV

From Operation Cobra to the Ardennes Offensive

By July 1944, the US Army was one of the best equipped and supported armies in the world. Vast organizations of medical, logistics, and morale infrastructure were all in place to ensure soldiers had all the support necessary for modern warfare. Additionally, a commander in the field could call on the support of other friendly units, naval and artillery gunfire, or even aircraft in a short time. What brought all of these diverse elements together was an enormously complex system of the most modern communications. Of course, following D-Day, the Allied armies continued to encounter unique difficulties.

Once the immediate beachhead was secured, the Allied armies attempted to move deeper into France. At the same time, British forces continued to attack Caen, an objective they had optimistically planned to capture on D-Day itself. Also, US forces moved west into the Cotentin Peninsula and its port city of Cherbourg. The port of Cherbourg was especially important to the Allies for the continuing supply system from Britain. However, by the time US forces secured the port on June 27, German forces had destroyed large portions of the port facilities, and it was not operational again until August.

After the Normandy landings, communications personnel wasted no time constructing a complete signals system within the Allied position. Slow progress after Overlord gave them time to establish multiple lines of communication, both wire and radio, with other Allied units and with command headquarters still in England. “First Army construction teams had begun to replace their hastily laid field wire with spiral-

four cable and were swarming over the commercial lines leading to Cherbourg, rehabilitating and readying communications for that port city, once it should be captured."[55] Nevertheless, this system of diverse communications would be sorely tested if and when an Allied breakout could be obtained.

As US troops and equipment tried to force a path away from the coast, they were stymied by the natural terrain of the French hedgerow country or *boccage*. "The hedgerows…were field boundaries planted by the Celtic farmers 2000 years earlier. Over two millennia their entangled roots had collected earth to form banks as much as ten feet thick."[56] This sort of terrain was ideal for the defender, and US forces had to fight hard for small gains. For their part, German soldiers showed a remarkable discipline, ambushing Allied units from cover or concealment. This was in spite of the heavy interference of Allied fighter-bombers, who continued to roam the skies attacking German targets of opportunity such as trains, vehicles, or concentrations of troops.

British and Canadian troops to the east of American positions were still fighting towards Caen. Unfortunately for them, German reinforcements were slowly being moved west into the fight, further strengthening the Wehrmacht's defense in that area. However, this did have the effect of pinning German forces in the east of the Allied position and preventing their use against American positions further west. In an attempt to produce a breakout, British general Montgomery initiated an operation named GOODWOOD on July 18. Following a massive aerial bombardment along a narrow front, Canadian armored forces attacked east between the Orne and Dives Rivers. Initially they made good progress, but the German forces organized a swift line of

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[55] Harris and Thompson, *The Signal Corps: The Outcome*. p. 115-116.
[56] Keegan, *The Second World War*. p. 390.

resistance and destroyed a large number of Canadian and British tanks before the attack stalled out.

By the end of Operation GOODWOOD on 20 July, 1944, Allied forces had fought their way to the planned position for D+17. However, July 20 was D+43.[57] Clearly, Allied forces were behind schedule and the German Army continued to provide stiff, if patchwork, resistance. The battles in the bocage and the swamplands of the Cotentin Peninsula inflicted approximately 40,000 US casualties within the First Army by the end of July.[58] They had also physically and emotionally exhausted the troops, the agonizingly slow and dangerous progress taking a steep toll on the men involved. There was some good news. Innovations in the field, specifically the "Rhinoceros," allowed much faster progress over any remaining hedgerows. The Rhinoceros was a field modification to the M4 Sherman medium tank. Large, heavy, metal points were welded to the tank's front hull, allowing the Sherman to uproot the dense hedges and plow through them without exposing the vulnerable underbelly of the tank. This field modification allowed faster progress through the bocage and reduced the limitation of units being forced to move along narrow paths against well-concealed defenses. Nevertheless, the German Army continued to mount stiff resistance. A full breakthrough was still desperately needed.

GOODWOOD provided a blueprint, but it was undertaken in the face of strong German positions. Farther west, German forces maintained a defensive line, but it was badly overstretched with practically no reserves or fallback defensive positions. German

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[57] *Ibid*, p. 391-392.
[58] Martin Blumenson, *Breakout and Pursuit*. (Washington D.C.: US Army Center of Military History, 1961). p. 175.

commanders in the region were forced by necessity to conduct warfare of a largely static nature, far from the rapid armored advances of the early campaigns. Even veteran and highly prized armored units, such as the Panzer Lehr division, were forced to hold sections of the battle line.

For COBRA, the traditional role of pre-attack bombardment was given to the US air forces. The plan represented an immense effort in terms of aircraft and ordinance. A group of 350 fighter-bombers would attack first, followed by 1,800 heavy bombers, followed by another 350 fighter-bombers, followed by 396 medium bombers; with a 500-strong fighter screen to protect the aircraft throughout.[59] Each aircraft element would be carefully orchestrated and choreographed in timing, altitude, and target area to ensure maximum bomb saturation effect and to reduce chances of friendly casualties. Despite these precautions, a number of Allied bombers dropped their bombs within American lines, causing casualties and reducing morale right at the start of the offensive. Nevertheless, German forces were pounded by the heavy bombardment, inflicting heavy casualties on men and equipment and stunning any remaining forces. "Bombing was more than many of them could stand: some went crazy, others surrendered or deserted, or drifted to the rear."[60] US forces, supported by roving fighter-bombers, moved quickly to exploit the damage. "In two days American forces drove 15 miles south all along the line."[61] As the initial breakthrough shattered the German lines and there were little to no German reserves, the First and Third US Armies were unleashed across the whole of France.

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[59] Blumenson, *Breakout and Pursuit*. p. 221-222.
[60] Overy, *Why the Allies Won*. p. 172.
[61] *Ibid*, p. 172.

Following the initial breakout, US forces advanced quickly. The *Wehrmacht*, however, was far from being a passive force in Normandy. On Hitler's orders, and against the advice of his generals, Operation Luttich commenced in early/mid-August. Attacking westward into the Allied flank, the operation was intended to cut off the southward advance and push the American armies back to the beaches. In this it was highly over-optimistic. Allied code-breaking gave Gen. Bradley prior knowledge of the impending attack and the American forces were prepared. Though the offensive did make some progress during the night of its initial kickoff, this was quickly reversed after daylight allowed Allied air attack on armor, vehicles, and troops. Even more serious, the stalled offensive left large numbers of German units exposed in the west of the Normandy front. Sensing the enormous opportunity provided by the Germans, Bradley altered the plans for the conduct of the southward drive. Sending only relatively small units of Patton's newly created Third US Army into Brittany, the rest were directed into an eastward race that threatened to encircle large portions of Germany's Army Group West. The larger battle to close what became known as the "Falaise Gap" resulted in the destruction of the majority of German units fleeing eastward toward the Seine River. Furthermore, the continuing Allied advance eastward relentlessly pursued the German forces. Successive rivers failed to stop the Allied advance until by late September it stalled just short of the Rhine River and the German border.

There exist a number of examples of the flexibility of Allied communications in the confusion during Operation Cobra. During the night of 29 July, German columns led by tanks attempted to breakthrough US positions at the la Penetiere crossroads. One column was engaged by US infantry and light tank troops but needed help, and so called

on the artillery of 62nd and 78th Field Artillery Battalions for fire support. However, the 78th was fighting a simultaneous battle of its own, engaging German tanks with direct fire from its self-propelled 105mm guns. The commander of the 62nd authorized its guns to split, with half continuing to fire direct on the enemy column, and the others firing on the other German column. The quick and effective communications system between such disparate elements toward a common goal is what allowed this victory. "In this six hour night engagement, 450 of the enemy were killed, approximately 1000 surrendered and 90 enemy vehicles were destroyed."[62]

The First US Army (FUSA) was one of the most experienced American army units in Europe by the start of COBRA. Although there were new replacements and some new units, many of the men of FUSA had gained valuable experience from earlier operations in France. "Since FUSA was the only American army to take part in the landings and initial combat on the Continent, it contained some of the best-trained and most experienced signal units."[63] For this reason, FUSA communications during and after COBRA were some of the most effective among US forces in Europe. Additionally, FUSA's role following the breakthrough was to wheel to the east, turning the flank of the *Wehrmacht* and pushing it toward Germany. However, the veteran *Wehrmacht* continued to offer stiff resistance, and with the establishment of the Falaise pocket, FUSA was tasked with containing and helping encircle the overextended German forces. This did not mean that the progress of First Army was slow. In fact, "At the height of the rush across France and Belgium, FUSA's command post moved on an average of every four

[62] Operation "Cobra", Operational History; General's Office; Op Reports; RG 407; NACP.
[63] Harris and Thompson, *The Signal Corps: The Outcome*. p. 117.

days."[64] It is important to remember the enormous complexity involved in moving an entire command post and maintaining or quickly reestablishing communications once arrived.

Just prior to the commencement of COBRA, General Omar Bradley, who had commanded US ground forces during and after D-Day, was promoted to command the newly operational 12th Army Group. General Hodges became the commander of First Army. Quickly establishing a rapport with his new commander, the FUSA's veteran signal officer, Colonel Williams, created a leapfrog communications system utilizing a duplicate communications system.

> FUSA's command post moves became virtually painless, considering the complexity of such an operation. Colonel Williams would select the next command post forward and would move his stand-by communications control to that point while the duplicate equipment was still in operation at the old post….As Hodges had remarked, "I never move anywhere until Williams tells me I can."[65]

Clearly, the commander of First Army understood the enormous importance of effective communications. The leapfrog headquarters system was recognized for its relative efficiency and was widely copied by other US commands.

Also of paramount importance following the initial breakthrough was communication with support aircraft. The fighter-bombers of Gen. Quesada's IX Tactical Air Command were essential in both reconnaissance and enemy interdiction. An observer wrote about a typical example of cooperation between combat commands and their overflying support.

> The tank column was just coming up within range of the brow of a hill as [the aircraft] appeared on the scene. "Hello, Kismet Red, this is Bronco. Have you in sight overhead. We have no targets now. Is there anything in

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[64] *Ibid*, p. 117.
[65] *Ibid*, p. 117.

> the woods off to the left or over the brow of the hill ahead?" Five minutes later the answer comes back, "Bronco this is Kismet Red…There are twelve Tiger tanks about four miles down the road retreating. Shall we bomb them?" "Yes, go ahead…" So the P-47's go down and catch the tanks in a ravine. They blast the lead tank in the first pass and stall it. The others can't turn around and they are caught like eggs in a basket. Systematically the P-47's work them over from very low altitude and destroy them all…[66]

This example shows the immense value of communications to allow close cooperation between ground and air forces. The further genius of this system was in installing VHF radio sets in tanks or command vehicles close to the front of a combat command. Unlike the standard infantry and ground vehicle radios, these VHF sets could readily communicate with Allied aircraft in the immediate area and provide a high level of coordination. Furthermore, FUSA began utilizing the service of an airman to liaison between the two elements. The simple fact is that an infantryman or tanker has difficulty describing terrain features to an overflying aircraft in a way that can be readily seen from several thousand feet of altitude. Thus, an airman liaison was invaluable in coordinating between ground and air personnel.[67]

Another important coordination took place between the tanks and infantry. Both of these forces relied heavily upon the other for mutual protection. Tanks were essential in reducing fortifications and combating both infantry and other armor, but the infantry was also essential to protect the tanks from enemy infantry tank-killer teams armed with held-held explosive launchers like the Panzerfaust, as well as camouflaged anti-tank guns. However, this necessity for communication was not solved so easily. The primary

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[66] *Ibid*, p. 121.
[67] Operation "Cobra", Operational History, Air Support Annex, August 1944. General's Office; Op Reports; RG 407; NACP.

infantry radios (SCR-536 and SCR-300) did not share any frequencies with the tank mounted radios. An early solution was to attach a telephone to the rear of the tanks that connected the infantry with the tank's interphone system. This was problematic because the infantryman was often exposed to fire while walking behind the tank and the tank was severely limited in its speed when followed by an infantryman on foot. A second idea was to issue modified vehicle radios to the infantry, but these sets were heavy and the unfortunate infantryman tasked with carrying them often left them behind when in danger. The final attempt was to put modified SCR-300 infantry radios in the tank turrets. Naturally this was disliked by the tank commanders who now had not only the reduced room in an already cramped space, but also had the added headache of radio operation on multiple sets. None of these solutions were deemed satisfactory and the answer continued to elude the signalmen of the Army until well after the end of the war.

While First Army conducted the initial breakthrough and moved south and east, the Third US Army (TUSA) was tasked to turn a breakthrough into a breakout. Activated under the command of General Patton, the Third Army's dash across France in 1944 remains one of the most famous events between Overlord and the Ardennes Offensive. From a communications standpoint, however, the Third Army's rapid deployment and advances presented a serious problem. "Third Army began operations short of signal units, equipment, and suitable frequency assignments."[68] Furthermore, the rapid movement of troops required a similar movement of the TUSA command post. Similar to Col. Williams of FUSA, Patton's signal officer, Col. Hammond, used a leapfrog arrangement of signal units setting up a forward command post prior to the commander's

[68] *Ibid*, p. 119.

actual move. In contrast to First Army, however, only the sparsest communications were established before the post had to be moved again. At the tactical level, radios continued to function adequately, but the rapid pace precluded the use of the extensive wire systems that commanders had grown to expect.

Third Army's problems of communication were exacerbated by the variety of objectives it sought. Middleton's 4th and 6th Armored Divisions were particularly troubled by communications failures. The divisions' rapid advance into Brittany led to a crisis of command and control, especially between Middleton and his divisional commanders. It became impossible to lay wire cables fast enough to maintain communications.

> After St Lo wire requirements increased continually. However the movement was too fast and the distances involved were excessive. In order to complete the circuits to the combat commands a team was started from each end, one laying wire towards the other. In many cases these and other lines were completed shortly before or after the command post moved on again.[69]

The distances even exceeded the capacities of the large vehicles radios in use, such as the SCR-299, which could provide voice transmission up to 100 miles under ideal conditions. Furthermore, an overall lack of radios in the divisions led to frequency overcrowding, with corresponding delays in signal transmission and comprehension. Messengers were widely used in an attempt to improvise a solution, but the distances, coupled with pockets of German resistance, meant that even a one-way trip could take up to a day. By that time, the orders were often obsolete. Fortunately, Gen. Patton had instilled in his divisional commanders a confidence and independence that allowed them to continue the

[69] Unit History, 142nd Armored Signal Company, 2nd Armored Division; General's Office; Op Reports; RG 407; NACP.

offensive, largely on their own initiative. "Needing to react quickly to fast-changing situations, they could hardly wait for orders, which might be out of date by the time they arrived."[70] Signal Corps units continued to work on the problem as the campaign in Brittany progressed, and there were some successes, such as the increasing use of radio relay. Having made itself invaluable during the North African campaign, radio relay was used extensively in France by Col. Hammond, who used the system to maintain communications between Patton and the other theatre commanders. "All together, during August, his men installed 28 radio relay circuits, operating over distances totaling 1,175 miles."[71]

Although the Allied armies moving through France brought a staggering amount of signal supplies with them in the summer and fall of 1944, they also needed to utilize a large number of civilian circuits for wired communications. This was much more difficult than it sounds. Not only had the retreating Germans spent considerable time and resources to damage these utilities, but French Resistance fighters had been tasked with destroying German communication lines, and they had also been almost continuously attacked from the air. Therefore, it was a herculean feat to bring many of these systems back into operation for the Allies. In the towns and cities, at least, the vulnerable central telephone exchanges were sometimes saved by the intervention of local French employees, who managed to deceive and limit the extent of the German destruction of these vital communications points. However, this mitigation was only possible in approximately one-third of the total civilian communications hubs. The resulting process

[70] Blumenson, *Breakout and Pursuit*. p. 353-354.
[71] Harris and Thompson, *The Signal Corps: The Outcome*. p. 120.

of repairing these central exchanges, as well as rehabilitating thousands of miles of overhead and underground cables, brought in a multitude of resources for the project.

The city of Paris, meanwhile, offered a tempting target for Allied forces during their rapid push eastward. However, this was an almost purely political or morale-based objective, as German forces reported to be holding the city were light and already engaged with French Resistance fighters. Indeed, Eisenhower was wary of committing his armies to the liberation of Paris, chiefly because they would afterward be obliged to support the civilian population logistically. While this may seem a coldly calculated position, it was understandable in the environment of logistical concerns that increasingly plagued Allied forces during the dash across France. With none of the large Channel ports in Allied hands, apart from Cherbourg, the massive amounts of supplies, equipment, and men were still being offloaded on the Normandy beaches. Then, they usually had to be driven by truck to the front, as the French rail system was largely destroyed by Allied airpower.

In the end, the question of Paris was pushed heavily by Charles de Gaulle, the commander of Free French forces within the Allied armies. De Gaulle insisted that Paris should be liberated by his own French division under Gen. Leclerc. Although ordered to destroy the city by Hitler, the German commander in Paris, Gen. Cholitz, did not, and after a failed attempt to defend the outskirts of Paris, it was officially secured on 28 August. Paris did contribute to logistical problems: “On 27 August airplanes began delivering 3,000 tons of food, medical items, and soap from the United Kingdom at the rate of 500 tons a day. General Bradley authorized a daily allocation of 60,000 gallons of

fuel…for vehicles delivering supplies to Paris."[72] For the continental communications system, however, the occupation of Paris presented an opportunity. As the capitol, Paris was the center of the entire French civilian telephone and cable system, the Postes Télégraphes et Téléphones (PTT). That system's repair gave army signalmen a chance to make up some of the lost capacity for wire communications to the armies that had occurred during the breakout. With the help of French civilian engineers, the Signal Corps wasted no time in repairing the damaged systems. "Five months after the liberation of Paris, almost 90 percent of the circuits in service in 1939 had been restored to service."[73] Even so, there were always problems, especially with the rapid relocation of a large number of Army headquarters and support staff commands to Paris before comprehensive communications could be established. In fact, "…a telephone system to serve a large headquarters such as COMZ or SHAEF required as much equipment as that necessary to serve a city of 30,000 people in the United States."[74]

As the Allied armies raced across France, they continued to strain their own logistics systems. Fuel became especially scarce, especially the farther away from the coast an army operated. "Gasoline shortages also hampered signal operations, particularly the work of the construction battalions. The TUSA signal units required nearly 5,000 gallons of gasoline daily."[75] Thus it was not primarily enemy action which stalled the advance of the Allied armies, but a lack of supply. However, the advance continued sporadically and more slowly, as fuel and other supplies allowed. General Eisenhower's "broad front" brought Allied forces to the very border of Germany, but

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[72] Blumenson, *Breakout and Pursuit*. p. 626.
[73] Harris and Thompson, *The Signal Corps: The Outcome*. p. 137.
[74] *Ibid*, p. 138.
[75] *Ibid*, p. 120.

with diminished supplies, only a few advances were given logistical priority. The majority of these supplies were kept in the north, where Montgomery's British troops attacked through the Netherlands in Operation Market-Garden. Further south, Hodges' 1st Army and Patton's 3rd attempted to make what progress it could. Between the two forces, the defensive sector west of the Ardennes was lightly guarded with resting US units containing large numbers of inexperienced soldiers.

The Battle of the Bulge, as it is called by American audiences, also known as the Ardennes Offensive, was actually named Operation Autumn Mist by the German commanders who conceived it. Autumn Mist was designed to repeat the rapid victory of the French campaign of 1940. In this case, however, the emerging panzer divisions would be targeting the port of Antwerp, whose recent capture by the Allies increased their supply. Surging out of the Ardennes Forest in fog and snow that kept Allied aircraft grounded, the American forces were caught completely off-guard when the German forces assaulted and overran FUSA units along a forty-mile front. Stunned by the sudden attack, Allied commanders rallied and poured men and equipment into the line to slow the advance and protect the flanks of the bulge. Fortunately, the belief among both Allied and German commanders that Germany did not have the strength remaining for a serious offensive proved correct. The leading panzer divisions developed a critical fuel shortage, while at the same time the following infantry divisions, moving without benefit of motorized transport, could not keep up with the rapid advance. Additionally, when the inclement weather cleared after almost two weeks, a veritable storm of Allied aircraft was unleashed upon the helpless German attackers.

In the first few days of the German offensive, FUSA bore the brunt of the attack, and its headquarters was understandably confused by the rapidly changing situation at the front. Less understandable was the absence of many of the staff officers on furloughs to Paris or the resorts in Spa. Without air reconnaissance because of the weather, it was difficult for Hodges' men to get an accurate picture of what was happening. Compounding this was the use of English-speaking German paratroopers dropped behind American lines that tightened security and delayed the ready transmission of information or passage of messengers. For his part, Hodges was noticeably absent from his headquarters during the critical first days of the offensive. According to some accounts, he was suffering from influenza that forced his deputies, particularly his chief of staff, Kean, to run the show.[76] Finally, as German units closed on FUSA's headquarters, Hodges was forced to move his HQ back out of danger on 18 December. Signal units were not prepared for this kind of sudden turn and some bottlenecking of communications resulted, but "…by the next morning personnel of the 17th Signal Operation Battalion had augmented the existing installations and used its mobile facilities to establish both telephone and teletype service to all major units."[77]

The critical point in the Ardennes Offensive was the crossroads city of Bastogne. In the first stages of the attack, Bradley dispatched the highly experienced 101st Airborne division to the city to prevent its capture. They arrived only the night before the first elements of the newly rebuilt Panzer Lehr division arrived at the town's outskirts. The entire city was surrounded and cut-off by the 25th of December, a sorry Christmas present

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[76] David W. Hogan, Jr., *A Command Post at War: First Army Headquarters in Europe, 1943-1945*. (Washington, D.C.: US Army Center of Military History, 2000). p. 212.
[77] *Ibid*, p. 215.

for the 101st. A better one was obtained the following day, when elements of Patton's Third Army arrived at Bastogne to relieve its worn defenders. Even while it was surrounded, the 101st was able to maintain communications with Allied forces through the use of radio relay equipment. With the headquarters section housed in a cramped basement, they were still able to beam communications quite literally over the heads of the encircling German units. Allied forces were thus not only aware of Bastogne's continued resistance, but also able to take heart at the 101st commander's refusal of a German surrender demand.

With the Wehrmacht attack running out of steam, FUSA prepared a counter-attack. Launched on 3 January, the new offensive pushed German forces back to their starting positions and the Battle of the Bulge was officially over by the end of January. Hitler had gambled on a surprise attack causing mass confusion and paralyzing the command structure as it had in 1940. By this time, however, the US Army Signal Corps provided a thoroughly flexible system of communications including redundant channels that allowed a close cooperation between all the affected Allied forces. Bradley himself gushed about the effectiveness of communications during the Ardennes Offensive.

> From my desk in Luxembourg I was never more than 30 seconds by phone from any of the Armies. If necessary, I could have called every division on the line. Signal Corps officers like to remind us that 'although Congress can make a general, it takes communications to make him a commander.' The maxim was never more brilliantly evidenced than in this battle for the Ardennes.[78]

As in all the many instances of Signal Corps personnel caught at or near the front lines, the signalmen in the path of the German attack in December of 1944 fought with conspicuous gallantry. In one case, an important radio relay station continued to operate

[78] Harris and Thompson, *The Signal Corps: The Outcome*. p. 157.

even after it was cut off from Allied forces and with a German anti-aircraft battery close by. The relay's position was so treacherous that it could only operate during daylight, when the sounds of battle and the front concealed the noise of its generator.[79] Clearly, the signalmen understood the crucial role they played in the success or failure of army operations, and were prepared to incur heavy risks to get the job done.

After the securing of the Normandy beaches following Operation Overlord, the US armies grew almost exponentially in complexity. To support this complexity, the communications systems likewise grew in scale and scope. In fact, the vast number of disparate units created a unique system within the First Army, the locator agency. This valuable administrative system was later copied by the other American armies in Europe. In many ways, the work of signalmen in US armies in Europe after D-Day presented the culmination of lessons learned in pre-war maneuvers, North Africa, Sicily, and Italy. Wire lines were heavily used when the armies were static or slow-moving. Radio attained primacy during fast movements. When all else failed, messengers could still be used. Throughout all of these different operations, from Cobra to Brittany, eastward to Paris, and on to the German Western Wall, the Signal Corps' emphasis on flexibility and improvisation was invaluable. Furthermore, it must be remembered that the work of the signalman is often a thankless task. Too often it was only mentioned when there was a problem. Yet the fact remains that throughout all the confusing changes, movement, sieges, attacks, and withdrawals, at no time did the commanding generals of the Allied forces lose contact with each other. Hodges, Patton, Bradley, Eisenhower, and Montgomery were able to quickly and effectively communicate with each other and with

[79] *Ibid*, p. 157-158.

their civilian masters in Britain and the United States. Even the German offensive in the Ardennes, which included the goal of disrupting Allied communications, was unable to dismantle the multiple redundant systems of wire, radio, and civilian circuits. It was this comprehensive system of signals that helped bring victory for the Allies in Europe.

CHAPTER V

Conclusions

The defeat of German forces in the Ardennes and the crossing of the Rhine into Germany brought no rest for the men of the Signal Corps. Further demands for wire and radio communications continued to come from every US Army in Europe. Yet with the surrender of Germany and the declaration of V-E Day, the Signal Corps could look with pride on a truly monumental achievement.

> During the eleven months of operations in the ETO [European Theater of Operations], Signal Corps soldiers had laid over 900,000 miles of field wire, 105,000 miles during the last month before the surrender. Some 650,000 miles of wire and 35,000 miles of cable went into the more stable systems. Since the landings in Normandy, the Third Army alone had covered 81,500 square miles of territory with communications circuits; 32,763 square miles during the last campaign.[80]

Their success was not limited to wire construction. Army signalmen, with the cooperation of the private industry, developed and produced over 100 different radio types with individual uses. Signal Corps achievements also extended to the home front, where the almost complete absence of industrial knowledge for mass production of specialized communications components had challenged American efforts to provide the equipment needed in the field. In particular, the risky decision to choose crystal control for radio frequency stabilization prompted an enormous increase in the production of quartz crystal oscillators. "The entire output of the crystal "industry" in 1941 was only 100,000 units. However, by the end of the war, a full-fledged industry numbering nearly 150 manufacturers was turning out over two million units *per month*."[81]

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[80] Harris and Thompson, *The Signal Corps: The Outcome*. p. 172-173.
[81] Richard J. Thompson Jr., *Crystal Clear: The Struggle for Reliable Communications Technology in World War II*. (Hoboken, NJ: John Wiley & Sons, Inc., 2007). p. 2.

The Second World War fundamentally changed the conduct of military operations. The harnessing of modern industrial capacity in the military applications of the state meant that the new emphasis on mobility and mechanization would only expand. For its part, the Signal Corps produced the most complete communications system up to that time. Despite its unpreparedness for major conflict in 1941, by war's end it achieved what only four years earlier would have seemed impossible. The most cutting-edge electronic systems were quickly harnessed to provide clear and reliable communications for every member of the combat team, from General to platoon leader. The early problems of implementation and operation were improved with the combat experiences of North Africa, Sicily, and Italy. Finally, US Army military communications reached its peak after the Normandy invasion. Even with the difficulties inherent to the rapid movement across France, the US armies was able to maintain cohesion and coordination not just with each other and their allies, but also establish close, mutual support between infantry, armor, air forces, support services, and logistics.

This process of signals development was not without its problems. Even leaving aside the unpreparedness in 1941, there were many flaws in the developing system arising from its complexity and rush for results. In many cases, the crash development of single pieces of communications equipment caused it to retain problems into production that might have been ironed out with greater foresight and cooperation. For example, the most widely used infantryman's radios, the SCR-300 "walkie-talkie" and SCR-536 "handie-talkie", couldn't talk to each other. Not only did the two radios not share frequency range, the 536 was an AM radio while the 300 was FM. Furthermore, many of the radios and other equipment did not feature interchangeable components or batteries.

As each radio was created almost in a void, exclusive of considerations for even similar systems, each consequently required its own unique supply and replacement parts system. Of course, further developments of equipment after the war's conclusion solved some of these issues, with the 536 being significantly updated for continued use. Specifically, the 536 was later developed to work on FM, and the tuning control was improved to allow the operator to quickly change frequencies by use of a plug-in crystal tuner.

After the war, the United States was determined not to retreat back into isolationism, which was seen as one of the failures of the First World War's aftermath. Nevertheless, a massive reduction in the armed forces from its wartime peak also impacted the operations and development agenda of the Signal Corps. Failure to maintain wartime standards of equipment and organization directly contributed to early difficulties in the Korean War less than a decade later. Just as the wartime industrial expansion set the stage for a massive economic boom in the US after the war, the post-war electronics industry was also primed. The technological developments of the Signal Corps thus contributed to the country's later transformation into an electronic-reliant society, rather than a mechanical one.

While it is easy to espouse the tremendous contribution made by military communications to the Allied victory in Europe, there is still much work to be done. The US Army Center of Military History's work has created a basis for examination, but additional primary research is still desperately needed. Not only must the Army's viewpoint be scrutinized and evaluated, but new work must also be done to bring the body of knowledge on this fledgling subject to a more current standing. The potential for this subject to contribute to military academia's evolving opinions of World War II is

considerable. As is the potential for the field of military communications within general military history.

The final analysis of this work must return to the importance of signals communication in warfare. Once armies were motorized and able to quickly move around ever-larger battlefields, communications became ever more essential. Gone forever were the days of commanders utilizing solely their physical presence to exert control. The size and complexity of modern warfare forbade it. Even more than seventy years after the end of World War II, military communications are more important than ever.

> Every day, at locations around the globe, signal soldiers operate the communications networks, both strategic and tactical, that constitute the Army's "nervous system." These dedicated men and women preserve the Signal Corps' proud traditions and uphold its motto, *Pro Patria Vigilans* (Watchful for the Country).[82]

As military conflicts continue to evolve, militaries increasingly look for technological solutions to complex battlefield problems. Military communications will always be at the forefront of these solutions, linking civilian leaders, commanders, and troops across vast distances and in every conceivable situation.

[82] Raines, *Getting the Message Through*. p. 409.

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Education

1. MA, History, Sam Houston State University, Huntsville, TX, August 2017
   Thesis: "Down the Lines: US Army Communications in Europe, 1942-45"
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2. Post-Graduate Coursework, History, Texas A&M University, College Station, TX
   15 hours of upper level history coursework completed as pre-requisite for graduate school

3. BA, Radio/Television Broadcasting, Sam Houston State University, December 2005

Presentations

1. Sam Houston African History Conference, Sam Houston State University, Nov 15, 2016
   Paper presented: "The 1st Italo-Ethiopian War, 1895-96"

2. The Woodlands Center 3rd Annual Student Research Symposium, April 9, 2016
   Paper presented: "Flag Signaling in the Royal Navy in the Age of Sail"

3. Academic Community Engagement Project, "Recovering New Harmony", Spring 2016
   Contributed on Presentation to City of Huntsville on lost freedman's colony
   Faculty Coordinator: Dr. Zachary Doleshal

Teaching Experience

1. Spring 2017 – Graduate Assistant, Department of History
   Sam Houston State University, HIST 1301: US History to 1876 (210 Students)
   Guest Lecture: The Argument over Emancipation, April 13, 2017

2. Fall 2016 – Graduate Assistant, Department of History
   Sam Houston State University, HIST 1302: US History Since 1876 (200 Students)
   Guest Lecture: WWII, The War of Resources: The Battle for the Atlantic, Oct 12, 2016

3. Spring 2016 – Graduate Assistant, Department of History
   Sam Houston State University, HIST 1301: US History to 1876 (50 Students)
   Guest Lecture: The American Revolution and Revolutionary War, March 21, 23, 25
   HIST 3339: French Revolution and Napoleonic Wars (20 Students)

4. Fall 2015 – Graduate Assistant, Department of History
   Sam Houston State University, HIST 1302: US History Since 1876 (180 Students)
   Guest Lecture: World War I, The Great War, September 25, 2015

Academic Organizations

1. Phi Alpha Theta, National History Honor Society, Sigma Phi chapter
   Sam Houston State University, Spring 2016 to present

2. SHSU History Club, Sam Houston State University, Fall 2015 to present