

LESSONS LEARNED TRAINING THE SIGNAL CORPS
THROUGH RAPID TECHNOLOGICAL CHANGE

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General Studies

by

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ABSTRACT

LESSONS LEARNED TRAINING THE SIGNAL CORPS THROUGH RAPID TECHNOLOGICAL CHANGE, by MAJ Mackenzie A. Cohe, 80 pages.

Since 2017, preparations for large-scale combat operations identified capability gaps in the current Army force. Army Futures Command (AFC) is addressing these gaps. AFC streamlined acquisition processes and materiel solutions force the institutional and operational Army to divide training priorities between current systems and expected future systems.

This thesis assessed current training strategies of the Signal Corps to operate new network systems developed by AFC. This case study analyzed historical examples and existing specialized units where new technology integrated into military formations and synthesized lessons learned and best practices to apply to future Signal training.

This thesis concluded that current signal training strategies prepare a ready and agile information technology workforce for faster acquisition cycles. Recommendations for further improvement included the reestablishment of the Division Signal Battalions, expansion of the Regional Signal Training Sites, and updates and revisions to TC 6-02.1, *The Signal Corps Training Strategy*.

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ACRONYMS

AAR	After Action Review
ADP	Army Doctrinal Publication
ADRP	Army Doctrinal Reference Publication
AFC	Army Futures Command
AFCEA	Armed Forces Communications Electronics Association
AIT	Advanced Individual Training
AR	Army Regulation
BCT	Brigade Combat Team
CAP	Certification Authorization Professional
CASP	CompTIA Advanced Security Practitioner
CCISO	Certified Chief Information Security Officer
CCNA	Cisco Certified Network Associate
CCNP	Cisco Certified Network Professional
CCoE	Cyber Center of Excellence
CE	Continuing Education
CECOM	Communications-Electronics Command
CIO	Chief Information Officer
CISA	Certified Information Systems Auditor
CISM	Certified Information Security Manager
CISSP	Certified Information Systems Security Professional
CMF	Career Management Field
CND	Certified Network Defender

CompTIA	Computer Technology Industry Association
COTS	Commercial-off-the-Shelf
CPN	Command Post Node
CySA	Cyber Security Analyst
DISA	Defense Information Systems Agency
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDM	Department of Defense Manual
ESB-E	Expeditionary Signal Battalion - Enhanced
FM	Field Manual
FSR	Field Service Representative
GCED	GIAC Certified Enterprise Defender
GCIH	GIAC Certified Incident Handler
GIAC	Global Information Assurance Certification
GICSP	GIAC Industrial Cyber Security Professional
GSEC	GIAC Security Essentials Certification
GSLC	GIAC Security Leadership Certificate
GWOT	Global War on Terrorism
IA	Information Assurance
IAM	Information Assurance Management
IAT	Information Assurance Technical
IET	Initial Entry Training
IMT	Initial Military Training

IT	Information Technology
JCSE	Joint Communications Support Element
JNN	Joint Network Node
LAR	Logistics Assistance Representative
LSCO	Large-Scale Combat Operations
MCIS	Mission Command Information Systems
MOS	Military Occupational Specialty
MSE	Mobile Subscriber Equipment
N-CFT	Network Command, Control, Communications, and Intelligence Cross- Functional Team
NCO	Non-Commissioned Officer
NDS	National Defense Strategy
NET	New Equipment Training
NETOPS	Network Operations
NMS	National Military Strategy
NSS	National Security Strategy
PME	Professional Military Education
RSTS	Regional Signal Training Sites
SAT	Signal Assessment Tables
SATCOM	Satellite Communications
SOFTACS	Special Operations Forces Tactical Assured Communications System
SSCP	System Security Certified Practitioner
TC	Training Circular

T&EO	Training and Evaluation Outline
TOE	Tables of Organizations and Equipment
TRADOC	Training and Doctrine Command
TP	TRADOC Pamphlet
TR	TRADOC Regulation
TWI	Training With Industry
WIN-T	Warfighter Information Network-Tactical

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CHAPTER 1

INTRODUCTION

The Technological Challenge

Reliance on superior technology is among the principal foundations of the western way of war. According to Geoffrey Parker, “military technology is usually the first to be borrowed by every society, because the penalty for failing to do so can be immediate and fatal; but the West seems to have been preternaturally receptive to new technology, whether from its own inventors or from outside. Technological innovation, and the equally vital ability to respond to it, soon became an established feature of western warfare” (Parker 1995, 2). The challenge presented with continuous technological innovation arrives when intersecting with Moore’s Law. Moore’s Law, first published in 1965, predicts that the transistor capacity for technology will double every 18-24 months (Kanellos 2003, 1). This model for predicting technological advancement approaches a critical point. As changes continue to occur at higher rates, it is now more essential than ever for the U.S. Military to find the best process to adapt to change or face potentially dire consequences.

Over the past several years, the U.S. Military shifted its training and preparation focus from the low-intensity conflict in the Global War on Terror (GWOT) to the challenges presented by near-peer competitors and large-scale combat operations (LSCO) (Vertuli 2018, v). LSCO presents a significant departure from GWOT, where the U.S. was uncontested in technological capability, to now in LSCO facing potential match or under-match in specific technical areas. In assessing readiness for LSCO, the Army’s Combined Arms Center identified 17 critical capability gaps, many of which fall into the

realm of Information Technology (IT) and mission command information systems (MCIS). Concurrently, the President's National Security Strategy of 2017 and the Secretary of Defense's National Defense Strategy of 2018 both call for streamlining the acquisition process for technology to reduce time required fielding new and more capable systems to military services. Referencing acquisition reform, the National Security Strategy states,

The United States will pursue new approaches to acquisition to make better deals on behalf of the American people that avoid cost overruns, eliminate bloated bureaucracies, and stop unnecessary delays so that we can put the right equipment into the hands of our forces. We must harness innovative technologies that are being developed outside of the traditional defense industrial base. (U.S. President 2017, 29)

The National Defense Strategy of 2018 further expands to "prioritize speed of delivery, continuous adaptation, and frequent modular upgrades." (DoD 2018, 10). The Army has already taken multiple steps to move in this direction with the establishment of Army Futures Command (AFC) and eight cross-functional teams, one of which is focused on future networks.

AFC and the cross-functional teams project a faster, more agile acquisition process. Specifically, the Network Command, Control, Communications, and Intelligence Cross-Functional Team (N-CFT) develops new technological systems for the Army's Signal Corps. These new processes challenge the preparation of the Signal Corps to learn and operate material developed by these organizations. The Army trained Soldiers for significant technological changes in the past, and current specialized organizations train for change today. Comparing and contrasting historical and present-day case studies identifies critical lessons learned for how the Army needs to prepare for this change.

Thesis Question

The thesis question is, are Signal Corps training strategies enough to prepare the Army's information technology workforce for agile technology acquisition cycles?

Subordinate research questions to this thesis are:

1. How did the Signal Corps train its Soldiers historically during other periods of rapid change?
2. How do current military units with unique missions and peculiar tactical network equipment train Soldiers to be prepared for change?

This research is significant because it can assist the Signal Corps in refining its training strategies, ensuring the preparation of their Soldiers in a culture of rapid change. Moore's Law states changes continue to occur at higher rates, making it more important now than ever for the Signal Corps to learn from past lessons and prepare to succeed in future conflicts.

Assumptions

This research assumes that AFC and the N-CFT are developing cutting-edge IT materiel solutions. With this assumption, research will not focus on technological capability development but on training readiness of Soldiers to use new systems.

Limitations

This research is limited to training and how it impacts readiness for combat operations. Analysis of historical and current training strategies identifies gaps between training and combat readiness in previous wars, and existing solutions to derive lessons learned and best practices. Research conducted remains at the UNCLASSIFIED level of

classification. This research does not pass this threshold to ensure the widest distribution of the resulting findings.

Key Terms and Definitions

The following terms described below define the meanings and context for which these terms concern this thesis.

(LSCO) – As defined in Field Manual 3-0, “Large-scale operations are at the right of the conflict continuum and associated with war . . . Large-scale operations are intense, lethal, and brutal. Their conditions include complexity, chaos, fear, violence, fatigue, and uncertainty . . . LSCO present the greatest challenge for Army forces” (HQDA 2017b, 1-2). The focus for Army doctrine and capabilities development is now LSCO. LSCO requirements drive current assessments for the effectiveness of training and readiness strategies. Figure 1 provides a visual depiction of LSCO on the conflict continuum.

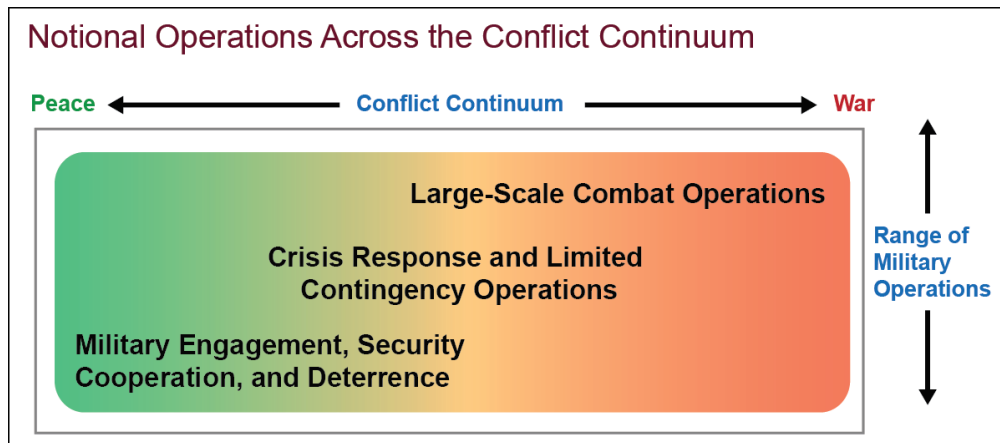


Figure 1. The Conflict Continuum and the Range of Military Operations

Source: HQDA 2017, 1-1.

Army's Leader Development Model – Doctrine defines leader development as “a continuous and progressive process, spanning a leader’s entire career... comprises training, education and experience gained in schools, while assigned to organizations, and through the individual’s own program of self-development” (HQDA 2012, 1-2). It divides these three areas into the Institutional (military schools and education), Operational (military unit-level training), and Self-Development (personal experience) Domains. This thesis research focuses primarily on the effectiveness of education and training in the institutional and operational domains. Figure 2 depicts the Army’s Leader Development Model.

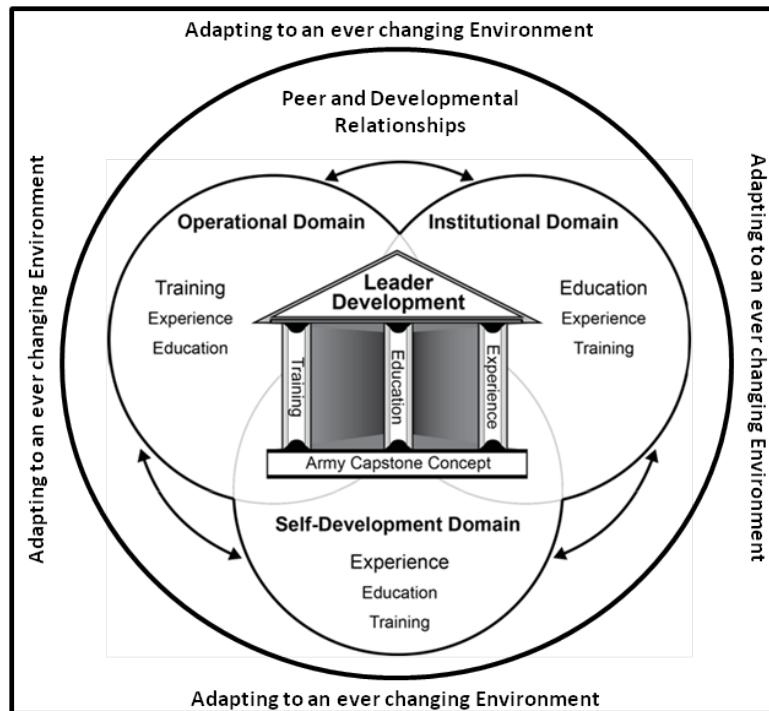


Figure 2. The Army’s Leader Development Model

Source: HQDA 2012, 1-2.

Near-Peer Competitor – This term, associated with the already defined LSCO, describes competitors to the United States with a similar level of capability in one or more areas. For this thesis, the primary near-peer competitors considered in LSCO operations are Russia and China.

Army Futures Command (AFC) – Army Futures Command is the newest Army Command focused on accelerating modernization and streamlining slow, bureaucratic acquisition processes. It recently declared full operational capacity on July 31, 2019 (Judson 2019, 1). As the new lead for modernization and technology acquisition, Army leaders must understand the role AFC now plays in driving change in the Army. The primary mechanisms for AFC to manage modernization are the eight cross-functional teams.

Network Command, Control, Communication, and Intelligence Cross-Functional Team (N-CFT) – This AFC cross-functional team serves as the lead for network modernization and addressing the challenges associated with the tactical network on the battlefield. It currently supports four lines of effort: unified network, joint interoperability/coalition accessible, command post mobility/survivability, and common operating environment (Network Cross-Functional Team 2018).

Training and Doctrine Command (TRADOC) – The U.S. Army Training and Doctrine Command, founded in 1973, shape the Army through four primary functions: TRADOC recruits and trains Soldiers, develops adaptive leaders, guides the Army through doctrine, and integrates formations, capabilities, and materiel. TRADOC performs its mission through five subordinate commands and 32 Army schools under eight Centers of Excellence (TRADOC 2020).

U.S. Army Signal School – The U.S. Army Signal School located at Fort Gordon, GA, as the subordinate of the Cyber Center of Excellence (CCoE) is the Signal proponent for the Army. As the proponent, the Signal School takes responsibility for developing and providing training and education in the institutional domain for all Signal Soldiers.

Military Occupational Specialty (MOS) – An MOS identifies duty requirements with closely related skills. Soldiers qualify in one or more duty positions within their field and, with enough on the job training, may be able to perform in other areas of similar complexity (HQDA 2019b, 26).

Career Management Field 25 (CMF 25) – CMFs identify a grouping of related MOSs that are managed together in terms of workforce and personnel considerations. MOSs in the same career field are similar enough that Soldiers serving in one specialty may possess the abilities and aptitudes for other specialties in the area (HQDA 2019b, 26). The Army manages all Signal Corps Soldiers through the CMF 25 MOS field.

Professional Military Education (PME) – PME is the “progressive education system that prepares leaders for increased responsibilities and successful performance at the next higher level by developing the key knowledge, skills, and attributes they require to operate successfully at that level in any environment.” PME links directly into career management models, eligibility for promotion, and future assignments for all Soldiers (HQDA 2017a, 235).

Initial Entry Training (IET) – IET encompasses all training provided for new Soldiers without previous military experience. The training produces “disciplined, motivated, physically fit Soldiers ready to take their place in the Army in the field”

(TRADOC 2019, 170). IET is closely related to Initial Military Training (IMT), which includes IET and also initial MOS producing courses for Officers and Warrant Officers.

Advanced Individual Training (AIT) – AIT is the MOS specific training provided to enlisted personnel following Basic Combat Training and results in MOS qualification (TRADOC 2019, 166).

Tables of Organizations and Equipment (TOE) – TOE is “a table that prescribes the normal mission, organizational structure, and personnel and equipment requirements for a military unit. It is used as the basis for the MTOE document” (HQDA 1990, 207).

Mission Command Systems – “Mission Command is the Army’s approach to command and control that empowers subordinate decision making and decentralized execution appropriate to the situation” (HQDA 2019a, 1-3) .This thesis defines a mission command system as any digital system that enables a commander to perform the command and control activities. The most common forms of mission command systems found in the Army include tactical networking and radio systems.

G6/S6 – G6 is the primary staff officer responsible for communications found on a General’s staff, typically at division and above levels. The S6 serves as the principal staff officer responsible for communications found in brigade and below organizations.

Signaler – For this research, the term signaler refers to any Soldier who historically performed functions of the Signal Corps. Currently, signaler refers specifically to Soldiers managed in CMF 25.

Summary

The Army took several steps to transition focus from the limited contingency operations of GWOT to the challenges of large-scale combat. Among these steps was the

establishment of AFC and the N-CFT. These organizations project to provide newer, more capable technological material to the Army at faster intervals. This thesis assesses the preparedness of the Signal Corps to train and operate new equipment as it is fielded by analyzing historical lessons learned and current best practices and comparing to current training strategies.

CHAPTER 2

LITERATURE REVIEW

Introduction

Four major areas of relevant literature inform this research topic. They are historical examples from throughout the history of the Signal Corps, current unit training plans and strategies, Government and doctrinal publications, and journal articles published by private organizations. These diverse writings provide a solid foundation for this research to consolidate, synthesize lessons learned and best practices, and provide recommendations for future training and research.

Historical Records

Several previous academic writings on historical signal training cover challenges faced preparing for conflicts and pose recommendations for future actions and research. The U.S. Army Signal School, U.S. Army War College, and U.S. Army Command and General Staff College published most of these writings. The first overarching document is *A Concise History of the U.S. Army Signal Corps* published by the U.S. Army Signal School. This document provided historical context and summary to explain the reasons for founding the Signal Corps and how it changed and adapted to the requirements of the Army as the nature of war changed around it (Coker and Stokes 1991, ii). The Center for Military History published an even more detailed history of the branch titled *Getting the Message Through*. This work helps to fill in gaps in historical perspective, particularly the accomplishments of the Signal Corps between wars (Raines 2011, vii).

Detailed research is available for conflicts beginning with World War I. MAJ Douglas Orsi published a Master of Military Art and Science Thesis in 2001 assessing the effectiveness of the Signal Corps during World War I. LTC Ronald Vandiver published a similar account of World War I comparing it to military challenges in the late 1990s. A declassified report on the effectiveness of the Signal Division during Operation Overlord from December 17, 1944, provides first-hand evidence of the training readiness and preparations of the Signal Corps. LTC Donald Fowler published an account from Operations Desert Storm and Desert Shield and the challenges faced by the 141st Signal Battalion during the conflict.

Several documents cover multiple historical periods for the Signal Corps, such as LTC Keith Snook's *The Evolution of the Signal Corps Organization*, discussing how the Signal Corps has adapted to wars to meet new and unforeseen challenges. Additionally, LTC Sherie Balko also researched these challenges throughout history and looked at how the Signal Corps developed Advanced Individual Training (AIT) to drive change across the regiment (Balko 1998, iii). A common theme shows both the Army and the Signal Corps developed solutions to evolve rapidly, ultimately overcame challenges, and won on the battlefield.

A recent, incredibly detailed, thesis by MAJ Adam Brinkman titled *The Modular Need for the Division Signal Battalion* (2017) shines a light on current deficiencies. It identifies the previous role the Division Signal Battalion and its commander played before modularity and correlates current leadership and training development struggles. Brinkman concludes with several reasonable recommendations to regain the value previously provided by these organizations.

Current Unit Training Plans and Strategies

Recent publications and documents outlined below cover current Signal training strategies and highlight some of the critical challenges facing the Signal Corps entering this current environment of change. These documents include doctrine published by the U.S. Army Signal School, training plans, and after-action reviews (AAR) conducted by units. They offer a realistic state of the regiment and offer a glimpse into how prepared present Soldiers are for new technological challenges.

Government and Doctrinal Publications

The primary government documents driving Signal Corps training requirements are Department of Defense (DoD) Directive Number 8140.01 *Cyberspace Workforce Management* and DoD Manual 8570.01 *Information Assurance Workforce Improvement Program*. These manuals define the DoD requirements for establishing and certifying the cyberspace workforce. The Signal Corps is the primary contributor of cyberspace workforce personnel to the Army.

The keystone doctrinal document is *The United States Army Signal Corps 2019 Training Strategy (TC 6-02.1)*. The Signal Corps published an update for this manual for the third consecutive year in 2019. Each year, this document continues to expand and provide consolidated training guidance to Signal and non-Signal leaders on how to train their formations. It creates a framework for certification that assists non-Signal commanders in understanding the unique and challenging training requirements that their Soldiers need. The findings of this research thesis will be submitted to the Signal School to assist in updating this document for future publications.

Journal Articles

Reputable journals publish many articles that cover the current and upcoming state of IT requirements for the Army. SIGNAL Magazine is the premier journal, published by the Armed Forces Communications and Electronics Association (AFCEA). Many articles from previous issues of the magazine track statements made by Signal leaders and the trajectory and priorities they provide for the regiment.

Finally, many articles and journal papers published on the success of corporations in the IT training realm also inform this research. Finding detailed and specific IT training plans from companies may be challenging as they can be considered sensitive to particular corporations. However, countless journals and articles publish generic explanations and best practices of these organizations. Due to the lack of concrete sources on commercial practices for IT training, this thesis does not derive any best practices or recommendations from the civilian industry.

Summary

There is a wealth of records and resources which cover the topics analyzed in this thesis. These sources include historical documents, unit training plans and strategies, government and doctrinal publications, and journal articles. The research in this thesis synthesizes the topics discussed in this previous literature and examines how the military can take lessons and best practices from history and current organizations to affect future training. This thesis fills an existing gap in knowledge by identifying key areas in which organizations have found success and identifies directions the Army and Signal Corps can continue to improve.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

The case study is the primary research methodology for this topic. This qualitative research methodology allows for a comprehensive analysis of multiple bounded systems over time. The method is ideal for selecting cases or subjects with certain similarities to compare but may otherwise be too divergent. The case study develops a holistic look at the problem and ultimately drives the analysis of interpretive results into a concise “lessons learned” for the case (Creswell 2017, 73-75). The analysis contained in this thesis requires multiple sequential case studies to provide a holistic answer to the primary and subordinate research questions. The analysis generated from these case-studies builds a list of “lessons learned” that, when applied to current organizations, answers the research questions.

The primary research question of this thesis is challenging to answer directly. The subordinate research questions support answering the primary question. Providing answers to the subordinate questions first creates a basis of comparison required to answer if Signal Corps training strategies are enough to prepare the Army’s information technology workforce for agile technology acquisition cycles. By first answering how the Signal Corps trained its Soldiers historically and how current military units with unique missions train Soldiers to prepare for change, it creates a baseline standard to compare against current Signal Corps training strategies.

Case Selection

The first step in the methodology is the selection of cases to analyze. Determining whether to examine individuals, groups, events, or activities is critical. Because the research question involves groups and organizations, groups are the best method for this case study analysis. Additionally, because the research subject is assessed against an environment of continuous change, looking at these cases at specific periods or events can help frame the analysis of these cases (Creswell 2017, 74). Analyzing groups and framing against specific periods creates case-studies with enough information to assess while limiting to a particular scope.

For this research topic, the study focuses on the Signal Corps as an institution. Specifically, the research asks how units trained for and responded to change historically. The historical periods of change selected all align with previous large-scale conflicts in which the Signal Corps participated. These cases provide the most relevant information as the Army again prepares for the possibility of LSCO. The historical periods selected are the Civil War, World War I, World War II, the Korean War, the Vietnam War, the Gulf War, and the Global War on Terrorism. Analysis of these historical cases synthesizes lessons learned and informs the answer to the first subordinate research question.

There are many choices for cases involving current specialized Signal units. For this thesis, the analysis includes 123rd Division Signal Battalion for its unique organizational structure, and 50th Expeditionary Signal Battalion – Enhanced and 112th Signal Battalion (Special Operations) for their unique equipment capabilities. Analysis of

those three units synthesizes best practices and informs the answer to the second subordinate research question.

There are many different methods to assess current signal training strategies. The chosen first case is *The United States Army Signal Corps 2019 Training Strategy (TC 6-02.1)* to inform the doctrinal strategy from the signal proponent. The next chosen example is the analysis of Department of Defense requirements from DoD Instruction 8540.01 and DoD Manual 8570.01 to identify internal and external constraints placed on the Army's IT workforce. Finally, analysis of current initiatives such as Regional Signal Training Sites and MOS consolidation further informs methods the Signal Corps uses to influence training readiness of the regiment. These cases develop a well-rounded analysis of overall current signal training strategies. Comparing these strategies to the results of the two subordinate research questions informs the answer to the primary research question.

Case Study Analysis

The next step of a case study is to collect data and research on these organizations. This research consists of a variety of sources such as documents, archival records, interviews, direct observations, participant-observations, and physical artifacts (Creswell 2017, 75). For this thesis, documents and archival records serve as the primary means of collecting data and research. These documents include historical records and writings, doctrinal publications, unit training plans and calendars, and journal articles. The literature review (Chapter 2) contains a detailed overview of key documents as they relate to this thesis.

Once data and research are collected, it needs to be analyzed. This analysis can be either holistic or embedded (Creswell 2017, 75). In this thesis, the analysis is embedded, drawing on the specific aspects of technological challenges and impacts to training Signal Soldiers. Embedded analysis scopes the content to allow focus only on the factors that affect this research while isolating irrelevant distractors from findings. This type of analysis contributes to the overall clarity of the study by highlighting only the topic-specific items and omitting material that does not affect the outcome.

Interpretation assists in identifying the meaning of the case and generating the “lessons learned” from the overall analysis (Creswell 2017, 75). Each identified case study concludes with a “lessons learned” or “best practices” section to highlight the importance to past, current, and future operations. The lessons learned and best practices consolidate into a list to compare against the signal training strategies. Common themes between the multiple cases connect and draw a summarizing list of focus areas for future organizations and leaders to consider. From the consolidated list of lessons learned and best practices, the author provides recommendations for updates to future training strategies and additional research studies.

Summary

The case study research method creates a focused and non-biased analysis of the different factors required for a trained and flexible Signal Corps as the Army’s IT workforce. This thesis conducts a series of case studies to form a complete picture and answer the thesis questions. The analysis begins with historical case studies from previous conflicts in which the Signal Corps served to derive lessons learned. Historical analysis is followed by a review of current specialty units to build best practices. Finally,

analysis of current doctrinal and institutional signal training strategies informs the current state of the Signal Corps. By evaluating the signal training strategies against the derived lessons learned and best practices, it answers the thesis questions and informs recommendations for future training and research. The case study methodology produces the best possible suggestions to the Army in preparation to enter a period of continuous change.

CHAPTER 4

ANALYSIS

Introduction

This chapter contains an analysis of Signal Corps historical lessons learned and current best practices. The analysis begins with the founding of the Signal Corps during the Civil War and progresses through World War I, World War II, the Korean War, the Vietnam War, the Gulf War, and the Global War on Terrorism. During each conflict, the Signal Corps faced training and technological challenges; this chapter captures the critical lessons learned. Following the historical analysis of lessons learned, analysis of specialized organizations derives current best practices. The selected organizations include 123rd Division Signal Battalion, 50th Expeditionary Signal Battalion – Enhanced, and 112th Special Operations Signal Battalion. Finally, the analysis of current doctrinal and institutional training strategies assesses if the Signal Corps is applying the historical lessons learned and best practices to prepare the Army’s IT workforce adequately.

Civil War

Albert J. Myer became the first Signal Officer in the United States Army on June 27, 1860 (Raines 1995, 7). While serving as a military doctor in Texas, he developed the signaling system utilizing flag and torch, now known as “wigwag.” This system simplified previous semaphore systems by reducing the number of flags and Soldiers required to signal from two to one (Raines 1995, 5).

The initial legislation establishing Albert J. Myer as the Chief of Signal was an essential step in creating the Signal Corps, but it also created several challenges. Initially, the Army only authorized Myer to serve as a Signal Officer. All other officers and signalers were detailed from their primary jobs to serve in this capacity. Conflicts of interest could arise if a Soldier's unit issued orders contrary to Myer's initiatives. Additionally, Soldiers detailed to these signaling jobs were not eligible for promotion or leadership roles in their parent units (Buck and Dale 1991, 8). In August of 1861, Myer proposed additional legislation to the Secretary of War "for the organization of a signal corps to serve during the present war, and to have the charge of all the telegraphic duty of the Army" to remove advancement barriers (Raines 1995, 9).

Albert Myer conducted initial training for signalers in June 1861, at Fort Monroe, Virginia. Officers learned the code and practiced sending and receiving messages. Training also included the use of telescopes to assist with visual discrimination at long distances. Additionally, they received riding and weapons training in preparation to complete their duties either while mounted or on foot. The initial signalers comprised the core of trained personnel who demonstrated the value of the Signal Corps during the early stages of the war (Raines 1995, 9-10). In August 1861, signalers synchronized an amphibious landing at Hatteras Inlet, North Carolina. In September 1862 at Antietam, Maryland, signalers reported Confederate troop movements that prevented Lee's armies from flanking union positions. In Fredericksburg during December 1862, flagmen signaled fire control for Union artillery forces and synchronized the nighttime withdrawal after the battle. These limited examples demonstrate the value that effective signaling provided to maneuver commanders on the battlefield (Buck and Dale 1991, 4).

After several years of bureaucratic challenges and demonstrated benefits on the battlefield, Myer's previous legislation was signed into law by President Abraham Lincoln on March 3, 1863 (Raines 1995, 12). The Signal Corps was officially born. Myer immediately established screening boards to fill the new authorized positions within the Signal Corps. He recognized the highly technical and mentally rigorous requirements of the Signal Soldier, and examined topics including reading, writing, composition, arithmetic, chemistry, philosophy, surveying, and topography (Raines 1995, 12). These boards allowed Myer to find the best candidates with the necessary skills to complete the job at hand.

Myer laid the foundation for institutional training in July 1863 by establishing a signaling course at the United States Military Academy (Raines 1995, 13). This training introduced future officers to the basics of signaling, so they would be prepared to serve in those roles or more effectively leverage the capabilities these roles provided on the battlefield. This course was discontinued at the end of the Civil War but demonstrated a way to nest the fledgling Signal Corps within the rest of the conventional force.

In 1864, Myer published *A Manual of Signals: For the Use of Signal Officers in the Field*. This manual codified the early Signal Doctrine, provided detailed principles of signaling, and used history to provide context for the importance of signal to military communications. Continued expansions and updates to this manual served as the foundation for signal training for nearly 50 years (Raines 1995, 13).

Lessons Learned

Albert J. Myer, the founder of the Signal Corps, produced several lessons learned with how he trained the first group of U.S. Army Signal Officers and flagmen.

1. He established rigorous testing before admittance into the corps. Tests ensured the necessary mental aptitude to succeed as a signaler and mirrored in today's military by several different screening processes to assess into a particular MOS. Given the highly technical nature of Signal Corps responsibilities, selection requirements for Soldiers must be equally high to set successful conditions for training and developing successful signalers.

2. Another lesson to learn from Albert J. Myer is the importance of combined arms training. All Soldiers must be able to perform basic tasks and not just unique tasks required of their MOS. Myer trained his signalers in technical procedures to perform their duties and also how to ride and shoot. He recognized that no matter how technically competent his corps was, if they could not fight on the battlefield, they would not be able to reach or maintain the key terrain required to perform their signaling duties.

3. Finally, Albert J. Myer taught the importance of codifying doctrine and embedding into institutional training. Myer wrote the book on Signal and used it to train and develop his Signal Corps. By placing procedures and standards in writing, he removed individual bias and interpretation that applied through verbal means of distribution. It also allowed greater dissemination to reach a more significant portion of the force and facilitated his personnel to train additional Soldiers as needed. By inserting signaling into institutional training, as he did at West Point, Myer embedded the basic understanding of it and set conditions for better implementation in the future. Institutional training was critical for building this foundational awareness to build future experience and operational capability.

World War I

The Signal Corps entered World War I untrained, ill-equipped, and poorly organized for the nature of the conflict. The trench warfare that developed on the Western Front of the European Theater rendered the traditional visual signal systems almost entirely ineffective for signaling over long distances. This new unforeseen challenge forced a drastic change in how the Signal Corps needed to fight and how it prepared its Soldiers (Coker and Stokes 1991, 16-17).

Due to the static nature of trench warfare and the developing technology of Morse telegraphy into voice telephony, tens of thousands of copper cable lines connected command headquarters with forward positions. Various techniques evolved from laying cables on the ground through trenches, on above-ground posts similar to telephone lines, or burying cables from one to six feet deep (Gannon 2014, 3). These new requirements forced the Signal Corps to expand training for Soldiers to teach them how to both run cables and operate radio and switching equipment from either end.

As the rest of the Army expanded for the size of the war, so too did the Signal Corps. Major General George Squier, Chief Signal Officer, oversaw this needed expansion. Under his watch, the Signal Corps' Land section expanded from fewer than 2,000 Soldiers to more than 55,000 by the end of the war. Additionally, the Signal Corps Aviation Section grew from a little over 1,100 men to over 150,000 at war's end. The aviation section was eventually removed from the Signal Corps on May 20, 1918 to establish the U.S. Army Air Corps (Coker and Stokes 1991, 16).

The enormous and sudden increase of Soldiers into the Signal Corps required a similar increase in the training capacity for these Soldiers. These Soldiers received their

basic training and mobilization from camps at locations such as Camp Alfred Vail, Camp Samuel Morse, Fort Leavenworth, and Monterey, California. For their unique job associated training, they attended the Signal Corps Radio School at College Park, Maryland, and the Signal Corps Buzzer School at Fort Leavenworth. To further supplement the volume of Soldiers, and technical requirements of the branch, signalers received training from civilian colleges and professional institutions. Training topics included radiography, telephony, telegraphy, photography, and meteorology (Coker and Stokes 1991, 17).

Direct commissioning was another method of filling in the ranks of the Signal Corps with technically qualified individuals. The Signal Corps turned to scientists and engineers from industry and educational institutions and commissioned them up to the level of Major. These experts in the field were vital not only to the success of the current mission and equipment but also to testing and developing new technological capabilities in combat environments (Buck and Dale 1991, 10).

Lessons Learned

World War I taught several lessons to learn from training Signal Soldiers.

1. The most important lesson is the value of civilian educational systems. Major General George Squier chose to leverage existing civilian education to handle the volume of new Soldiers and address the highly technical subjects of the material. Civilian education assisted the Army in several ways. First, it allowed for a much higher volume of Soldiers to train without having to funnel them all through the limited resources of a military school. Second, it did not require a lengthy curriculum development process.

Finally, because of the previous two advantages, it allowed for the tremendous time and personnel resource savings to be invested in other areas preparing for war.

2. Another lesson to learn from World War I was the direct commissioning of experts from non-military lines of work. These individuals arrived with the technical training and expertise to be successful as Signal Officers and only required additional tactical training. On the battlefield, they were instrumental in developing new technology for communications over distances that influenced the end of World War I but, more importantly, set the conditions for success in World War II. Including America's brightest minds into war efforts are essential to remember preparing for future conflicts.

World War II

In 1939, before World War II, the Army's Signal School at Fort Monmouth, New Jersey, conducted the premier signal training for the Army. Units and reception centers competitively selected signalers to attend training at the Signal School. The Signal School held ten-month courses using the "step-by-step" method, which was a self-paced curriculum that allowed Soldiers to progress from one topic to the next through self-study and proctored examinations. Soldiers completing these courses received diplomas in both wire and radio certifications. The Soldier's assigned unit conducted training for all other Soldiers who did not qualify for this intensive program (Balko 1998, 3-4).

World War II was the first conflict where mobile frequency modulation (FM) radio platforms played a grand role. These platforms enabled commanders to synchronize and control units across the battlefield in new and more lethal ways. This new capability grew the role of tanks and aircraft to operate and maneuver autonomously of infantry formations for the first time (CSI 1999, 11). Another significant technological

advancement for World War II were microwave radars. Trained signal operators used these systems to detect the Japanese bombers on December 7, 1941, before the attack on Pearl Harbor, Hawaii (Raines 1995, 234).

The U.S. participation in World War II saw another massive increase in the size of the Army, requiring the Signal Corps to increase in size nearly ten-fold. The Signal Corps again tapped into the civilian population to assist in filling requirements for technical expertise in what was then called the “Affiliated Program” (Snook 1998, 4). These technical experts filled only a small part of the requirement for professional operators and were spread across the force as the nucleus to build units around. The rest of the spaces filled with recruits willing to perform in the Signal Corps, but many lacked the mental and technical aptitude for which the previous “step-by-step” method optimized (Balko 1998, 6).

To account for this increased training demand, the length of courses taught at the Signal School reduced to just three months. Additionally, regional training centers established at Camp Edison, New Jersey, and Camp Crowder, Missouri, to increase the capacity of Soldiers training (Balko 1998, 5). By 1943, both the Pacific and European Armed Forces Headquarters established regional training centers to supplement further training needs (Balko 1998, 8). The following demonstrates the value provided by theater training centers:

One of the more notable programs initiated by signal planners at Allied Force Headquarters (AFHQ) was their training program. The need for a continuous signal training program became evident very early. Men were arriving from the United States without adequate training, too often taken from schools and training centers before they had finished their courses in order to fill urgent overseas requisitions. At the same time, as field commanders became increasingly conscious of the importance of signal communications and more aware of what

good communications could do for them, the standards of proficiency they demanded of their signal troops rose proportionately. (Thompson and Harris 1967, 528-529)

With reduced training timelines and lower aptitude of new Soldiers, the regional training centers faced a steep challenge. The Army adapted methods of instruction from the previous self-paced style to more rigid, lecture-based approaches. Training films and scaled training aids also assisted in classroom instruction. These changes accommodated the reduced academic fortitude of many of the recruits (Balko 1998, 7). Training became specialized to specific locations and job requirements to account for the reduced timelines. Streamlining the training each recruit received resulted in a focus on their job-related responsibilities. It also removed conditions not expected for the Soldier to perform in their specialty (Balko 1998, 5). In total, the regional and theater training centers developed 18 separate occupational specialty courses (Balko 1998, 8).

Lessons Learned

1. The most important lesson from Signal Training in World War II was training specialization. The depth and breadth of the requirements that the Signal Corps was responsible for made it impossible to be an expert at performing each role. Breaking distinct skills and tasks into specialties created efficiencies in training, and drove focus to develop expertise in only the required job. The Army must balance the benefits of specialization against the standard requirements or basic foundational tasks and skills all Signal Soldiers must possess. Curriculum designers should also consider the ultimate Army mission. Training cannot be so unique that commanders and Soldiers lose operational flexibility on the battlefield.

2. Another excellent lesson from World War II was the use of regional and theater training centers. The U.S. based regional centers extended both the reach and throughput of the Signal School in processing and training new Soldiers. The theater-based training centers projected influence forward and gave field commanders flexibility to prepare their Soldiers on the critical tasks and requirements their operations area required.

3. Finally, the lesson from World War I with the “Affiliated Program” repeats from World War I. The ability of the U.S. Army to leverage expertise and technological ingenuity from the civilian sector again was vital to success in World War II. The Army needs to maintain this civil-military relationship and continue to develop ways to take advantage and integrate unique civil capabilities and skills.

Korean War

In October of 1948, between World War II and the Korean War, the Signal School relocated to Camp Gordon, Georgia, where it remains to this day. The school continued using similar teaching strategies as developed in World War II. At the onset of the Korean War, the Signal Corps once again received a massive influx of new trainees, and these training strategies proved ineffective. The incredibly short, 17-month draft terms proved particularly challenging. “In the highly specialized Army of today, that is barely enough time to produce a ‘basic,’ let alone the highly-skilled specialists and technicians needed by the Signal Corps,” mused Lieutenant Colonel A.E. Holland, Signal Corps Center G-3 (Balko 1998, 10-11).

The curriculum transitioned to include laboratory and field exercises to maximize the value of short training windows. Instructors provided short lectures followed immediately by practical application either in a controlled laboratory or field setting.

Trainees spent the bulk of their time doing their future jobs and learning through experience rather than just listening to someone tell them how (Balko 1998, 12). This style of training proved useful with a higher percentage of the new trainee population.

Another challenge faced in signal training was new technology procurement. The harsh and varied terrain of Korea proved nearly impossible for previous Signal systems. Distances between command posts exceeded the capability of FM radio systems, and the topographic variations between mountains and ravines made placing wires generally untenable (Raines 1995, 324). New equipment continuously developed and fielded during the war, but the instructors at the Signal School lacked the expertise to teach it to recruits. To close this gap, the Signal Corps introduced the Training with Industry (TWI) program. TWI sent highly qualified officers and enlisted men to learn and train with civilian communications corporations. These Soldiers learned about new technology as it developed and brought this knowledge back to the Signal School as instructors (Balko 1998, 12).

Very-high frequency (VHF) microwave radios were among the solutions developed by the Signal Corps. These extended the communications range beyond that of FM radios, but still constrained by line-of-sight requirements. This limitation forced signal soldiers to establish communications stations at high, isolated locations, which were difficult to man, equip, and defend from enemy fires. Signal Soldiers often fought like infantry Soldiers to protect their positions (Raines 1995, 324).

Lessons Learned

1. The most important lesson learned from the Korean War is a balance between lecture and practical exercise during curriculum development. Lectures, while effective

for general knowledge and comprehension, prove ineffective during practical application of learned skills. According to *The U.S. Army Learning Concept for 2015*, “Adult learning is promoted when learner’s prior knowledge is activated prior to learning new knowledge. The learner observes a demonstration. The learner applies new knowledge. Demonstration and application are based on real-world problems. The learner integrates new knowledge into everyday practices” (TRADOC 2011, 14). Application is the critical step where learning occurs for most adults, and curriculum designers must find ways to incorporate the application into traditional lectures and demonstrations.

2. Another substantial lesson is the value of TWI. The commercial communications industry pushes the limits of technology and drives the future of military communications capabilities. Sending the best Soldiers to work in those environments to learn new technology in development and see the best practices in use by these organizations is invaluable for preparing formations for technological evolution.

3. Finally, all Soldiers need to train in the basics of combat and Soldiering. Though Signal Soldiers were not the ones maneuvering directly on the forward line of troops, they found themselves continuously under enemy fires as critical hubs in the Army’s communication lines. Training Soldiers, not only in their specific job but also to perform in combat roles, is an essential requirement for Signal training.

Vietnam War

As with previous conflicts, the onset of the Vietnam War brought another substantial increase in demand for recruits. With the limited lengths of drafted enlistments, the total time for Signal Advanced Individual Training (AIT) reduced to merely eight weeks. Reduced course length stressed not only the curriculum but also the

resources required to execute training. A solution developed to maximize resource efficiency was 24-hour reverse cycle training. The training Soldiers divided into day and night shifts, each working 12 hours a day. Multiple shifts allowed two training cohorts to share the same classroom and equipment without the typical resource downtime experienced in off-cycle hours (Balko 1998, 15).

New troposcatter systems developed during the war were the most critical piece of new signal technology. The new systems immediately deployed into combat. They provided high-assurance communications links, connecting command posts over 200 miles apart by bouncing signals off the troposphere of the Earth's atmosphere (Coker 1991, 28). Because these systems were brand new and limited in quantity, for the first two years, all went straight into combat operations. The Signal School was unable to provide adequate training without any of the systems on-hand. This deficiency placed an on-job-training burden on units already in direct combat in the theater for over two years (Balko 1998, 15).

Lessons Learned

1. The most important lesson to learn from the Vietnam War is the challenge of training new equipment at the Signal School. Military leaders must find a balance between fielding the best and latest equipment to forces in combat and providing it to the institutions required to train it. Any burdens such as training that can occur before deployment need to be the priority of effort. By placing a small number of new systems at the Signal School, the training reaches a much larger population at a much faster rate than if it goes to only deployed forward units. Prioritizing school house equipment

fielding ultimately reduces the time to train the entire force and optimizes units to prepare to use new equipment as they receive it.

2. Another lesson to learn is offsetting training times to overcome resource constraints. By creating multiple shifts and reducing down-time for equipment, more individuals can train without increasing the volume of equipment dedicated to training. Multiple shifts also contribute to efficiencies in training space, classroom areas, and training faculty.

Gulf War

In late 1988, before the Gulf War (Operations Desert Shield and Desert Storm), the Signal Corps began transitioning to a new tactical networking system known as Mobile Subscriber Equipment (MSE). MSE systems provided basic tactical computer networking down to the Battalion level and brought new levels of complexity into the military network. To account for the more robust network, the Signal Corps created multiple new MOS as well as new contractor-run courses. Contracting instruction from the company that developed the equipment reduced the curriculum development time and freed military instructors to focus in other areas (Balko 1998, 21).

However, several issues arose as the Army transitioned to the new communications systems of MSE. The 141st Signal Battalion in Ansbach, Germany, encountered one of the most significant challenges. The battalion turned in their old equipment and had about 40% of their formation permanently change station in anticipation of receiving MSE. Before fielding the MSE or receiving new MOS trained Soldiers to operate, the 141st received orders to deploy to Desert Shield. The deployment forced the battalion to recover turned-in equipment, scrap together additional Soldiers,

and then deploy to the Middle East without being able to train or validate their equipment or personnel. These rapid changes caused tremendous friction when establishing the network for the coalition forces' initial arrival into Saudi Arabia during Desert Shield (Fowler 1993).

Paralleling how the Signal School contracted civilian instructors, operational units serving in Desert Shield and Desert Storm saw an unprecedented amount of civilian augmentation in training and deployed support. The highly technical requirements of MSE, the increased use of satellite and tropospheric systems, and limitations of unit TOEs necessitated this move (Snook 1998, 20). Contracting support for the most technical tasks allowed for Soldiers instead to focus on the military functions.

Lessons Learned

Operations Desert Shield and Desert Storm yielded two crucial lessons.

1. The first lesson is the challenge of transitioning between critical systems within a unit. During significant transitions like the MSE rollout, which required both changes in equipment and personnel, units must be nondeployable. Placing these units in an unavailable pool and designating available units to fill needed roles during the transition prevents this from occurring in the future. Sending the 141st Signal Battalion to the Middle East unequipped and untrained did them and the supported units an extreme disservice and should not be repeated. Units must remain unavailable until all fielding and training certifications are complete. Contingencies for other units to provide coverage for them must be planned, resourced, and trained before beginning total equipment transitions.

2. The next lesson to learn is the value of contracting for technical training support and deployment augmentation. Contracting these technical roles effectively and rapidly filled gaps and needs within the Signal Corps, especially as focus shifted to wartime responsibilities. However, the use of civilian contractors resulted in lost opportunities to develop junior leaders and Soldiers. Continuing to contract this type of support over extended periods leads to significant institution-wide training gaps that are difficult to overcome. Leaders must understand the potential impacts of Soldier development when selecting contract responsibilities and intervals.

Global War on Terrorism

The Global War on Terrorism (GWOT) brought many changes to the U.S. Army's operating concept. The most significant change was the introduction of the Brigade Combat Team (BCT) as the Army's Unit of Action. Previously, the Army fought tactically at the corps and division levels. The corps and division each had associated Signal formations to manage the training, maintenance, and readiness of the signalers and systems assigned to the unit. This new modular structure assigned signal companies to their supported brigades, giving the BCT S6 the flexibility to organize signal support to match their assigned mission (Martin 2006, 3).

With the new BCT structure, MSE with corps level Network Operations (NETOPS) requirements was no longer practical. The modular network structure of Warfighter Information Network-Tactical (WIN-T) provided the solution. WIN-T consisted mainly of the Joint Network Node (JNN) as the central node to support brigade and above level headquarters and the smaller Command Post Node (CPN) to support Battalion and below headquarters (Martin 2006, 6). The systems placed in tactical

vehicles and cases were much smaller than previous MSE equipment and consisted mostly of upgradable commercial-off-the-shelf (COTS) components. This modularity gave the Army the flexibility to upgrade and replace individual parts of the system to keep pace with current technology (Martin 2006, 7).

The BCT model created efficiencies for combat units to form and rapidly deploy to the combat theater. However, the modular brigades stunted leader development and reduced training oversight for signal Soldiers in BCTs (Brinkman 2017). Modularity broke previous relationships between division and corps level Signal oversight and brigade-level signal companies, over time eroding readiness.

As the GWOT conflicts progressed, the use of tactical networking equipment such as WIN-T reduced due to slow and congested SATCOM data rates. Communications transitioned to hardened terrestrial infrastructure such as fiberoptic cables, microwave repeater towers, and COTS networking equipment. These far superior data rates allowed command posts to see and hear in real-time across their entire assigned battlespace. Additional network bandwidth-heavy Mission Command Information Systems (MCIS) were added to these locations to improve the overall common operational picture. This increased use of COTS drove the near-exclusive use of logistics assistance representatives (LAR) and contracted support for network operations.

The GWOT created several challenges as the Army now shifts focus towards LSCO. The base-centric warfare and uncontested electromagnetic spectrum of GWOT allowed the expansion of non-tactical communications infrastructure. The increased capabilities and situational awareness provided to maneuver commanders through MCIS became the expectation. As command posts shift back to tactical transmission methods,

the reduced bandwidth capability of SATCOM and WIN-T can no longer support these systems effectively. Increasing the use of LARs and contractors was efficient during the conflict but reduced the experience gained by countless signalers. More autonomous command posts force signalers to rediscover how to do a job that the Signal Corps organizationally lost over time.

Lessons Learned

1. The biggest lesson learned from GWOT is personnel development. Two significant factors impacted the development of signalers during the GWOT. The first was the modular brigade structure. Without the previous developmental leadership provided from the division and corps level, many Signal leaders have underdeveloped in key-developmental roles in Brigade Combat Teams. Reestablishing and formalizing these relationships with senior signal supervision is critical for long term success. The other factor that impacted signaler development was contract support. Contracted support is an excellent tool available to the military over brief periods to fill gaps in capability. During GWOT, the long duration of conflict and failure to develop military capabilities to fill gaps left a generation of signalers who failed to experience many of the technical requirements of their job. These Soldiers are now mid-grade and senior NCOs of the Signal Regiment, and many lack the technical understanding vital to training new Soldiers required to perform those jobs. The following section of this paper further analyzes the impact and solutions the Army is testing for this problem.

2. Another important lesson to take from GWOT is the importance of expectation management. Maneuver forces uncontested access to communications capabilities across the battlefield set lofty expectations. Carrying these expectations into LSCO potentially

sets the Signal Corps up to fail from the start. Forcing units to use only their assigned equipment, even though it is not as fast or effective as hardened commercial means, sets the realistic expectation for how their equipment and units will perform if called upon during LSCO.

Current Organizational Training Strategies

The Army's transition to Brigade Combat Teams between 2003 and 2008 "severed the habitual relationship of organic corps and division level Signal formations with supported commands . . . created training readiness oversight challenges, including Communications and Electronic (C&E) maintenance management" and "challenged network operations planning, integration, and cybersecurity functions" (Twohig 2019, 1). In 2015, the Chief of Staff of the Army directed testing of three different strategies to reorganize the Signal Corps and address these issues. The first was to establish a new Division Signal Battalion, the second, to enhance existing G/S6 within formations, and third, improving the capability of an existing Expeditionary Signal Battalion.

123rd Division Signal Battalion

The first strategy tested the reestablishment of the Division Signal Battalion in the 3rd Infantry Division as 123rd Division Signal Battalion. This pilot-program was to better train, certify, mentor, and develop Signal leaders inside of Brigade Combat Team Signal companies (Brinkman 2017). It closely mirrors the concept of the recent return of Division Artillery across the Army.

The challenges Brigade Signal Companies face are mainly due to modularity and the creation of the Brigade Combat Teams in 2003. Before the creation of BCTs, the

Signal Companies to support brigades resided in a Division Signal Battalion under the division headquarters. When operational requirements arrived, these companies task-organized under brigade headquarters for the execution of the mission (Brinkman 2017, 28). The Division Signal Battalion trained and certified under the guidance of the Division Signal Battalion Commander and Division G6 (Snook 1998, 15). The senior Signal leadership within the division provided the requisite expertise and experience to certify mission readiness and develop Soldiers within the battalion.

After modularity, this dynamic changed. The Division G6 maintained responsibility for synchronizing Signal mission requirements but no longer had direct responsibility for training these units. That responsibility now fell to the Signal Company's new battalion commander in the Brigade Special Troops Battalion. Initially, the battalion commander, executive officer, and S3 positions coded as O1A positions, meaning they were branch immaterial. When coded as O1A, it likely meant that at least one of those three was a Signal Officer and had requisite experience training Signal organizations. In 2014, this subtlety disappeared when the Special Troops Battalions converted to Brigade Engineer Battalions, and the leadership positions recoded to 12A or Engineer Officers (Brinkman 2017, 32). No longer did the battalion leadership understand the technical requirements for training Signal Soldiers and developing them in their career field.

The transition to Brigade Engineer Battalions created a complex and confusing dynamic between the key leadership. The Signal Company Commander is responsible for training its Soldiers. The Brigade Engineer Battalion Commander is responsible for certifying and tasking of the Signal Company's Soldiers. Finally, the Brigade S6 is

responsible for the network operations conducted by the Soldiers in the Company (Brinkman 2017, 34). Unclear relationships between the Signal leaders, coupled with the lack of knowledge and familiarity from the Brigade Engineer Battalion Commander, led to underprepared formations, and leaders who received insufficient development during key development windows.

To improve Signal support at the division level and below, Headquarters Department of the Army designated the 3rd Infantry Division as the pilot to establish 123rd Division Signal Battalion in 2016. The 3rd Infantry Division Commander granted COL Osvaldo Ortiz, the 123rd Commander, administrative control of all Signal companies in the division. COL Ortiz approved all training calendars, assigned all Signal Soldiers in the division, and had tasking authority for all Signal Soldiers and communications systems in the battalion (Brinkman 2017, 125-126).

COL Ortiz described this refreshing new authority as finally “wrap[ping] my hands around the signal companies and [training] them” (Brinkman 2017, 128). COL Ortiz recognized the needs of the battalion and now, as a commander, had the operational flexibility to modify training calendars, appropriate resources, and place emphasis as required. Previously, as a division or brigade staff officer, he simply did not have the authority to drive training for other Commanders’ Soldiers. Additionally, placing all the Signal Companies under a single command built efficiencies in training resources and leveled training readiness across all companies in the division.

A final decision on whether to reestablish Division Signal Battalions across the rest of the divisions deferred until Total Army Analysis (TAA) 23-27. However, submitted for approval in TAA 22-26 is reorganizing battalion tactical networking

equipment and personnel to Brigade Signal Companies to centralize training within the brigades (Twohig 2019, 2). The realignment appears to be a step in the direction of eventually reestablishing the Division Signal Battalions.

4th Infantry Division G/S6 Enhancement

The second strategy to improve Signal readiness within divisions was an enhancement of Division G6 and Brigade S6s by adding additional personnel. In total, the 4th Infantry Division received 30 additional Signal Soldiers to test if increasing the number of Soldiers assisted productivity. While the division received the additional Soldiers, the flaw in the test is that the division was still below MTOE authorized strength even after receiving the extra signalers. As expected, the division did see a performance improvement when Soldiers available on-hand neared the organization's authorization. However, because the units still operated below MTOE strength, it was difficult to draw meaningful conclusions from the evaluation (author participated in the assessment while assigned to 4ID).

50th Expeditionary Signal Battalion – Enhanced (ESB-E)

The third assessment to redesign tactical signal support was the transition of 50th ESB-E. The ESB-E exchanged its bulky WIN-T equipment for lighter, more flexible communications packages in line with what Joint Communications Support Element (JCSE) or Special Operations Forces use. The new unit design increased the total number of communications points-of-presence from 30 to 48 nodes. Also, the smaller packages require smaller teams to operate and take up less volume when being shipped inter and intra theater (USACCoE 2019, 10).

The new equipment consists primarily of commercial-off-the-shelf (COTS) components. The Soldiers in 50th ESB-E received new equipment training (NET) as they fielded equipment. This training, in conjunction with multiple mission readiness exercises, certified the initial capability for 50th ESB-E. As Soldiers left the unit and new Soldiers reported, 50th ESB-E established the “Sentinel Communicator Course.” This seven-week course filled gaps between Soldiers’ previous institutional and operational experience and the latest equipment used in the ESB-E (Iammartino 2019, 20). The ESB-E concept anticipates approval for application to all ESBs across the Army in TAA 22-26 (USACCoE 2019, 10).

112th Signal Battalion (Special Operations)

112th Signal Battalion (Special Operations) is a unique organization providing communications support across 1st Special Forces Command (Airborne). U.S. Army Special Forces use the Special Operations Forces Tactical Assured Communications System (SOFTACS) program for tactical communications. This program consists mainly of COTS and gives Special Forces the flexibility and continuous updates they require for their specific mission sets. The 112th Signal Battalion recognizes these unique requirements and runs the Shadow Warrior University out of Fort Bragg, NC.

Shadow Warrior University is similar in concept to 50th ESB-E’s Sentinel Communicator Course. It consists of similar training for newly assigned Soldiers to quickly fill the gaps between the institutional training of the Signal School and the operational requirements of Special Forces. Shadow Warrior University teaches further a la carte classes on specific systems peculiar to Special Forces organizations, as well as advanced IT certifications such as Cisco Certified Network Associate (CCNA) and Cisco

Information Systems Security Professional (CISSP). Shadow Warrior University trains not only signalers assigned to 112th Signal Battalion but also Soldiers across the United States Army Special Operations Command (USASOC) whose jobs permit travel to Fort Bragg (author previously served in USASOC).

Best Practices

Current specialized units in the Army provide two essential best practices.

1. The first is the role of senior signal leaders in training oversight and leader development. The lack of oversight and development of Signal Soldiers inside of BCTs eroded much of the efficiency gained by moving to the modular construct. Looking at the recent return of Division Artillery as an example, the performance of the 123rd Division Signal Battalion addressed these issues. Having a senior signal officer to provide signal specific training guidance, oversight, and development was a resounding success.

2. The other lesson to learn from current units is the additional training programs observed in the 50th ESB-E and 112th Signal Battalion. These programs developed to augment the institutional training received by Signal Soldiers to prepare them for success with new equipment fielding. As WIN-T phases out across the Army and more systems will closely resemble the equipment in the 50th ESB-E and 112th Signal Battalion, the Signal School can centralize these requirements. Central control reduces the burden on units to provide the necessary training requirements and improve the Signal proponent's ability to reach and influence the regiment.

Current Signal Training Strategies

Signal Corps 2019 Training Strategy

The keystone doctrinal document is *The United States Army Signal Corps 2019 Training Strategy (TC 6-02.1)*. The Signal Corps first published this document in 2017 and has released updates for this manual for the third consecutive year. This document continues growing and provides consolidated training guidance to Signal and non-Signal leaders on how to train their formations. It creates a framework for certification that assists non-Signal commanders in understanding the unique and challenging training requirements that their Signal Soldiers need.

The manual has five different chapters. The first, titled “The Operational Challenge,” provides a concise but insightful snapshot of the current challenges facing the Signal Corps. This chapter details the complexity of simultaneous competition in multiple domains, including space and cyber-space, congestion in the electromagnetic spectrum, and threats from a peer level with near or full parity (HQDA 2019e, 1-1). The description of the operational environment nests effectively with the TRADOC G2s *The Operational Environment and the Changing Character of Future Warfare* (2017).

The next chapter is titled “Foundations.” It begins by defining three readiness precepts: leadership as the keystone of readiness, built on the foundation of the other precepts, training and maintenance. Referencing ADP 6-22 for all things Army leadership, it dictates chapter three of TC 6-02.1 to focus on signal training and chapter four on signal maintenance. Next, the manual describes three essential qualities of the signal Soldier. Signal Soldiers must be leaders to face the uncertainty and challenges within the operational environment. They need to be teammates to integrate and support

operations for warfighting commanders. Finally, Signal Soldiers must be communicators, understanding fundamental signal principles, and how communications support operations.

The following chapter, titled “Signal Training,” provides the framework for how the Signal School expects signalers to train. It defines a Triad of Signal Support as the balance between network, radio, and transmission training, all surrounding core maintenance requirements. Figure 3 below is the visual depiction of the Triad of Signal Support.

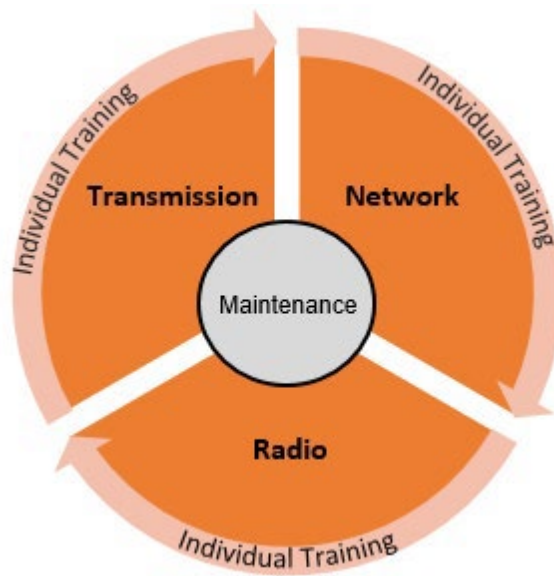


Figure 3. Triad of Signal Support

Source: HQDA 2019, 3-2.

The Signal Training chapter then proceeds to describe the Signal Assessment Tables (SATs) in detail. These tables mirror maneuver section certification terminology to represent the certification for Signal systems and sections. By using this language, it

assists non-Signal commanders to understand the basics and expectations for how these certifications should occur. SATs are broken into seven tables, progressing from individual training and testing through section certification and validation (HQDA 2019e, 3-5 to 3-6). The SATs are the best value the document provides to training Signal Soldiers.

The SATs are an excellent frame of reference that maneuver commanders can understand and assist in training requirements. The biggest issue with SATs is that they are no longer in line with the most current Army training management doctrine, TC 3-20.0 (HQDA 2019d). The newest update to this manual uses a six-table structure for weapon certification at all levels. The SATs, with its current seven table structure, can be scaled to fit into the six-table model and nest better with other Army training processes. Additionally, the SATs do not address certification or validation above the Node level. Expanding certification standards and expectations to the platoon or company level, aligned with the tables in TC 3-20.0, will round out Signal training and make for better standardization across formations.

The fourth chapter discusses the unique signal maintenance requirements. Signal maintenance drives unusual processes due to the dual military and commercial components of the equipment. The text urges the importance of stressing equipment in training, performing routine services, and incorporating field service representatives (FSR) and logistics assistance representatives (LAR). Performing maintenance to standard and developing systems for repair and replacement parts best prepares signal Soldiers and systems for success during combat operations (HQDA 2019, 4-1).

Notably absent from TC 6-02.1 is the role of the Division G6 in signal training and certifications within the division. The manual briefly describes the relationship and duties of the Brigade S6, the Signal Company Commander, and the Brigade Engineer Battalion commander but makes no description of the G6. Formalizing the role and expectations of the G6 allows for better training support expertise, focus, and consistency across all brigades in the division. It also reduces risk if one of the BDE S6s, Signal Company Commanders, or Brigade Engineer Battalion Commanders fails to perform.

DoDD 8140.01 and DoDM 8570.01 Requirements

Several Department of Defense (DoD) policies drive training requirements placed on the Signal Corps. The keystone document is the Department of Defense Directive (DoDD) 8140.01, Cyberspace Workforce Management, originally published on August 11, 2015, with subsequent changes in 2017. The purpose of the directive is “to update and expand established policies and assigned responsibilities for managing the DoD cyberspace workforce” (DoD 2017, 1). Further, it established the DoD cyberspace workforce council chaired by the DoD Chief Information Officer (CIO). Finally, it unified the overall cyberspace workforce by standardizing baseline qualifications and training requirements (DoD 2017, 1).

Department of Defense Manual (DoDM) 8570.01, Information Assurance (IA) Workforce Improvement Program, provides the “guidance and procedures for the training, certification, and management of the DoD [IA] workforce” (DoD 2015, 2). This manual establishes three Information Assurance Technical (IAT) levels and three Information Assurance Management (IAM) levels. Each level is separated based on the roles, specialties, and access levels required by the individual IA workforce member

(DoD 2015, 19). As levels increase, additional requirements for experience and higher-level baseline certifications arise. The baseline certifications require DoD cyber and IA workforce to reach and maintain commercial industry practices and specifications. The DoD Cyber Exchange, formerly the DISA Information Assurance Support Environment (IASE), provides lists of approved IA baseline certifications (DoD 2015, 89). The following table shows baseline certifications for each IAT and IAM level.

Table 1. IAT and IAM Approved Baseline Certifications		
IAT Level I	IAT Level II	IAT Level III
A+ CE	CCNA-Security	CASP+ CE
CCNA-Security	CySA+	CCNP Security
CND	GICSP	CISA
Network+ CE	GSEC	CISSP (or Associate)
SSCP	Security+ CE	GCED
	CND	GCIH
	SSCP	
IAM Level I	IAM Level II	IAT Level III
CAP	CAP	CISM
CND	CASP+ CE	CISSP
Cloud+	CISM	GSLC
GSLC	CISSP (or Associate)	CCISO
Security+ CE	GSLC	
	CCISO	

All acronyms defined in the ACRONYM section of this document (pg. viii).

Source: DoD 2020.

The majority of signalers work in IAT Level I or II and IAM Level I categories. Soldiers typically have six months from appointment to earn the associated baseline

certification (HQDoD 2015). The Computer Technology Industry Association (CompTIA) provides the most common baseline certifications for Soldiers to obtain and maintain, including A+, Network+, and Security+. These certifications create multiple challenges for Signal Soldiers and their supported organizations.

The biggest problem is time. These certifications follow IT industry standards and are far more complicated than most tests these Soldiers have taken previously. To pass these tests, Soldiers must spend countless hours of reading and self-study to learn the terminology and prepare to apply knowledge. These time requirements, placed on top of a full work schedule, are cumbersome to even the most diligent learners. Many units schedule dedicated training for two weeks before taking these exams, which is particularly challenging for operational units at the tactical level to find that much “white” space consecutively. Many organizations also lack the resident expertise to teach the concepts of these exams to junior Soldiers effectively. These units often need to contract that requirement out to a third-party vendor, which leads to the next challenge.

Resources are a significant challenge for certifications. CompTIA exam vouchers currently cost as much as \$349 and require an annual \$50 Continuing Education fee to maintain (CompTIA.org, accessed March 23, 2020). If a unit also contracts an instructor to train these Soldiers before the exam, it typically brings the total cost per Soldier to over \$1000. Applying these costs across all signalers in a tactical unit can quickly create budgetary issues because organizations often fail to forecast these expenses when developing their training budgets.

Understanding the impact DoDD 8140.01 and DoDM 8570.01 has on certification requirements shape current training priorities for the Signal Corps. These certifications

are appropriate at the enterprise level of the DoD and Signal Regiment, where experience assists in acquiring and maintaining these rigorous certifications. However, at the tactical unit level, it creates several dilemmas that impact time and monetary resources with Soldiers often lacking the experience to succeed. Finding ways to reduce these burdens on tactical units while maximizing training signalers in their assigned jobs is critical to the success of the regiment in the future.

Regional Signal Training Sites

In 2005, the U.S. Army Communications-Electronics Command (CECOM) established the Training Support Division. This division consisted of Logistics Assistance Representatives (LAR) to provide forward training support for Signal equipment. Over the following four years, the concept expanded to 11 total locations across the force and renamed Signal University. These sites consisted of a Department of the Army Civilian (DAC) and several contracted instructors to provide training on CompTIA baseline certifications and signal equipment from across the force (Eimers 2017).

In 2019, the U.S. Army Signal School assumed control of the Signal Universities from CECOM and renamed them Regional Signal Training Sites (RSTS). RSTS are a valuable tool for the Signal Corps to reach a more significant portion of the regiment as new technology and updates continue to arrive. The sites increase the reach of the Signal School as the Army's Signal proponent to provide further training concepts as well as specified training on new equipment. Additionally, the training provided at these sites can tailor to the specific equipment sets possessed by tenant units at the location, allowing for greater relevance and specialization. These sites continue to provide funded training for CompTIA courses, reducing the burden on operational units. However, the offerings of

these courses are limited to available instructors and typically are unable to match the demand for this training that a division-sized element requires. Figure 4 shows the current locations and dispersion of these sites supporting the entire force.

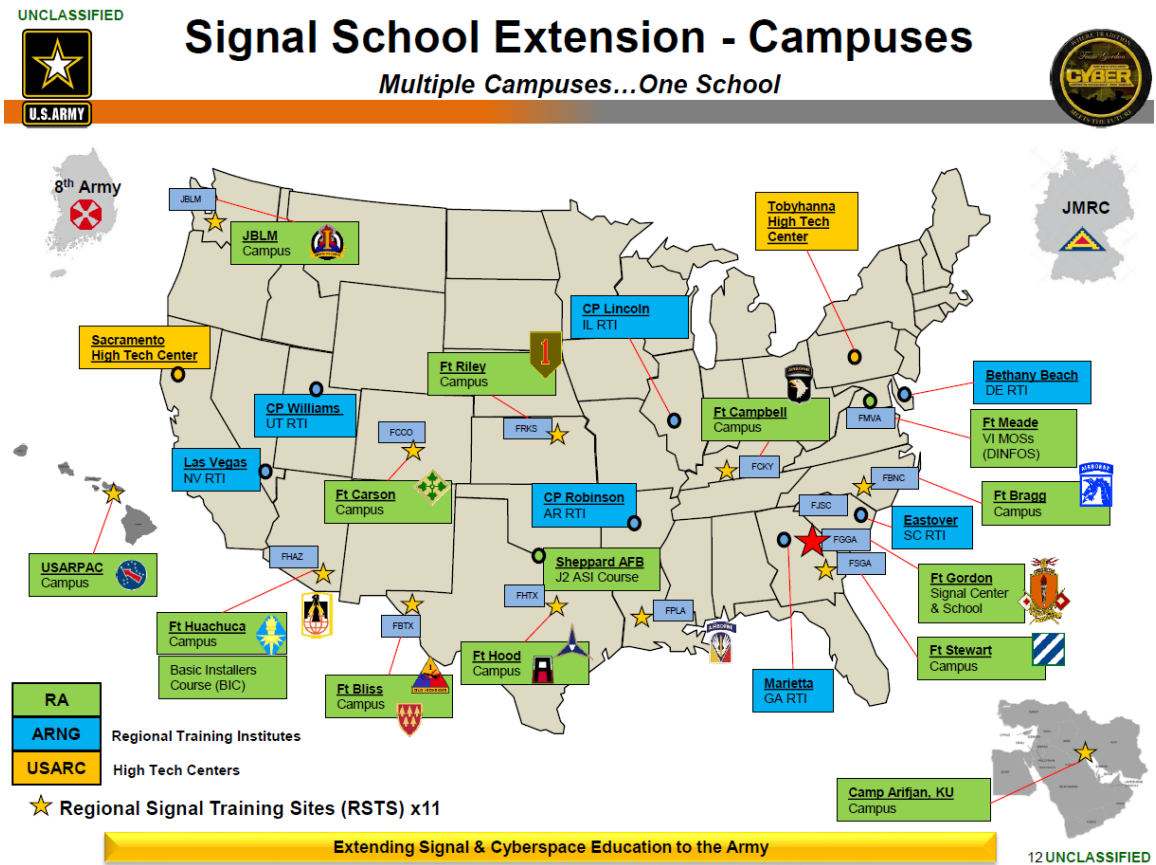


Figure 4. Regional Signal Training Site Locations

Source: Eubank 2019, 12.

Looking into the future, these RSTS may be the key solution to how the Signal School can stay current on training remotely. The RSTS could expand their roles slightly and take some of the burden that the current Sentinel Communicator Course in 50th ESB-E and Shadow Warrior University in 112th Signal Battalion place on their organizations.

Expanding these concepts to additional units on post will increase the training across the whole force and reduce requirements placed on just these specialized units. It will level the training available to all signal Soldiers, particularly those in BCTs, have access to training that currently is otherwise unavailable.

MOS Consolidation

MOS consolidation and realignment is currently a significant priority for the Signal Corps. Currently, there are 17 different CMF 25 enlisted specialties (HQDA 2018). With 17 distinct MOS, it allowed for highly specialized and technical training for these Soldiers. This quantity created issues with many MOSs being too specialized and cannot perform essential functions within the core Signal responsibilities. Other MOSs are too similar without clear distinctions between their roles, creating redundancy and inefficiency. Specialization is critical to success in the Signal Corps mission, but over time, the regiment became overspecialized.

The current trajectory, already in progress, reduces CMF 25 to 13 specialties over the next several years. The 25C (Radio Operator) MOS is collapsing into the 25U (Signal Support System Specialist) MOS to reduce redundancy. The 25P (Microwave System Operator) and 25T (SATCOM Systems Chief) MOSs are consolidating into the 25S (SATCOM Systems Operator) MOS to again reduce redundancy. Finally, the 25M (Multimedia Illustrator) MOS will converge into the 25V (Combat Camera) MOS. These modifications reduce resource requirements to train and field the removed MOS and allow for the reprioritization of resources and Soldiers to more critical areas. Figure 5 provides a visual depiction of the first phase of Signal MOS Convergence.

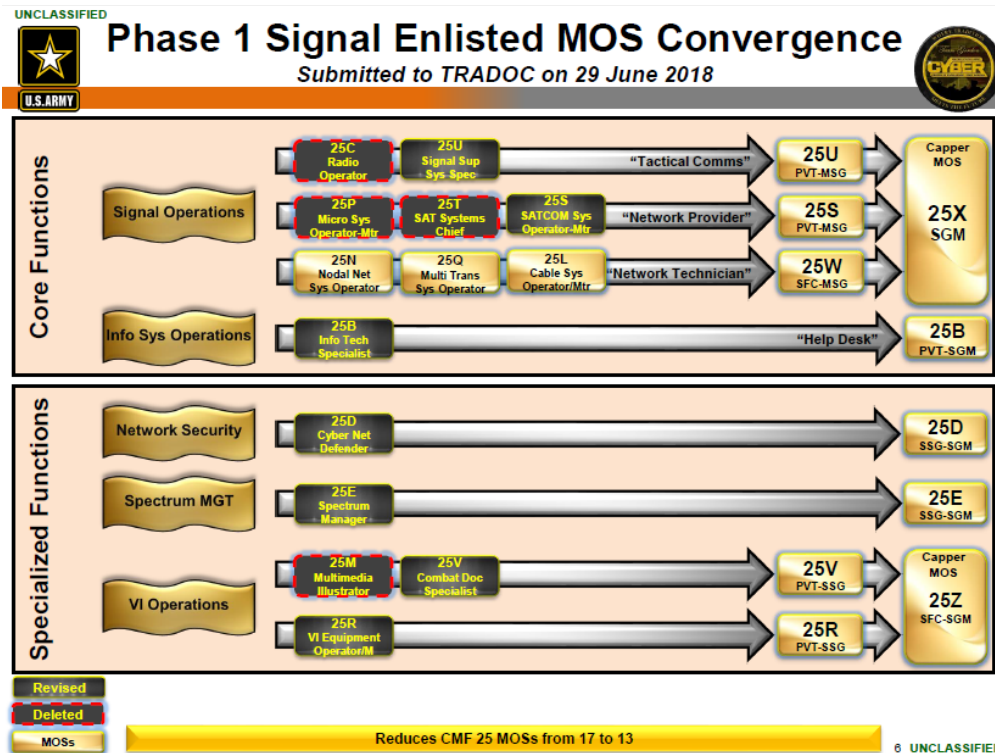


Figure 5. Phase 1 Signal Enlisted MOS Convergence

Source: Eubank 2019, 6.

After completion of the first phase, the Signal Corps plans to advance on to the second phase of MOS convergence, reducing the total enlisted MOS in CMF 25 to seven. Currently, the 25N (Nodal Network Systems Operator), 25Q (Multiple Transmission Systems Operator), and 25L (Cable Systems Operator) MOSs consolidate as 25W (Telecommunications Chief) MOS upon promotion to SFC. These diverse and specialized MOSs create inconsistent results as 25Ws through vastly different experiences at the PVT-SSG level. 25N, 25Q, 25L, and 25W MOSs will consolidate into the new 25H MOS to reduce overspecialization at the PVT-SSG level and produce more consistent results at the SFC and MSG ranks. Finally, the 25V (Combat Camera), 25R (Visual Information Equipment Operator), and 25Z MOS will transfer to management

under the Public Affairs CMF. Figure 6 provides a visual depiction of the second phase of Signal MOS Convergence.

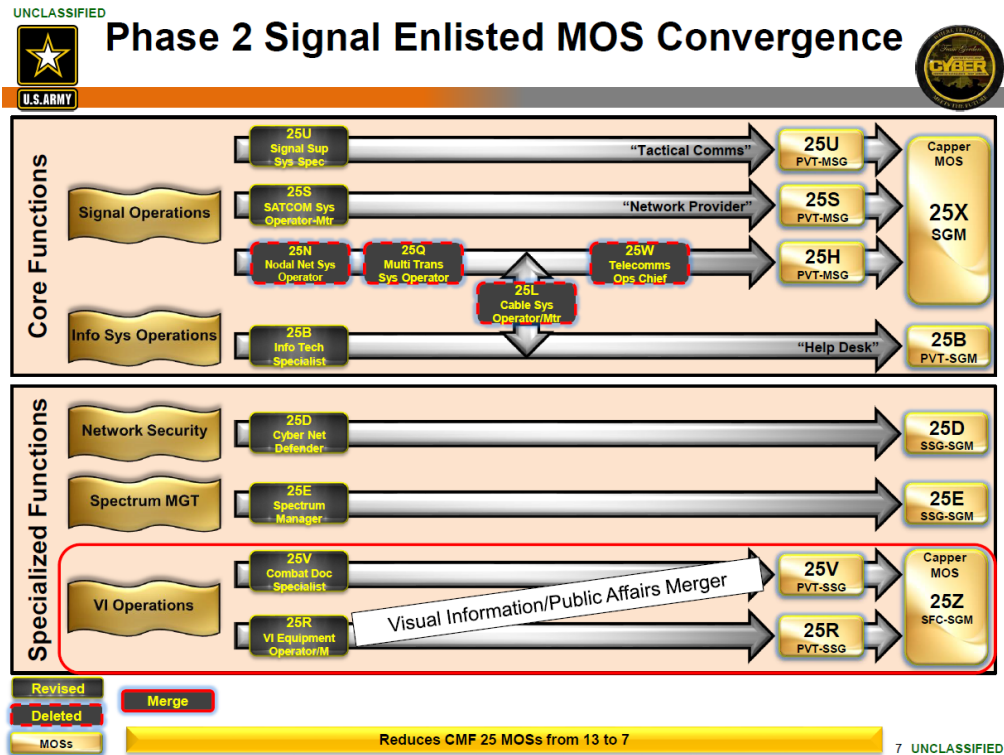


Figure 6. Phase 2 Signal Enlisted MOS Convergence

Source: Eubank 2019, 7.

MOS Convergence is a critical action for the Signal Corps to streamline future training requirements. Reducing CMF 25 from 17 to 7 enlisted MOS reduces capability redundancies and increases training and resource efficiencies. This change allows the Signal Regiment to grow a leaner, more capable force.

Summary

The history of the Signal Corps paints a clear picture of how communications progressed and grew over nearly 160 years. Tracing the actions taken by the regiment to adapt training strategies informs researchers how the Signal Corps succeeded previously. These successes led to lessons learned but must be placed in historical context and considered if they still hold the same value. Researching methods of current units and their training strategies demonstrates the application of many historical lessons learned and also emerging best practices. The intersection of the past lessons learned and emerging best practices is the key to build the Signal Corps toward future training readiness and mission success.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The Army and Signal Corps are at a crossroads. After nearly a generation conducting limited contingency operations, the President's National Security Strategy and Secretary of Defense's National Defense Strategy called for new technology and faster acquisition cycles in preparation for LSCO. These faster cycles intersecting with Moore's Law, predicting the doubling of transistor capacity every 18-24 months, creates a unique challenge for the Army and Signal Corps. The Army established Army Futures Command (AFC) and eight cross-functional teams to develop new systems and prepare for LSCO.

The Signal Corps faces the challenge of conducting institutional training and staying current with new material continuously fielding to the force. Coupled with ongoing operations and providing uninterrupted communications support to the Army, this is a daunting task. This identified challenge raised the thesis question: Are current Signal Corps training strategies enough to prepare the Army's information technology workforce for agile technology acquisition cycles? Subordinate research questions to this thesis were: How did the Signal Corps train Soldiers historically during other periods of rapid change? How do current military units with unique missions and peculiar tactical network equipment train Soldiers to be prepared for change? The research and analysis conducted in conjunction with this thesis successfully answered these questions and developed recommendations for future actions.

Findings

Based on the evidence and information provided during this research, the Signal Corps training strategies prepare a ready and agile information technology workforce. The Signal Corps applied lessons learned from previous LSCO and continues to develop and share new best practices from current organizations. However, based on these best practices and lessons learned, several focus areas exist for continued improvement. APPENDIX A of this thesis contains a complete cross-walk for additional lessons learned, best practices, and signal training strategies. The following findings compare the most relevant historically derived lessons learned and current best practices to applications across the force.

1. Senior signal leaders are critical to provide training oversight and leader development. During the Global War on Terrorism, the lack of oversight and development of Signal Soldiers inside of BCTs eroded much of the efficiency gained by moving to the modular construct. Looking at the recent return of Division Artillery as an example, the performance of the 123rd Division Signal Battalion addressed these issues. Having a senior signal officer to provide signal specific training guidance, oversight, and development was a resounding success. Applying this construct to the rest of the Army's Divisions improves the Signal training and development across the force.

2. Regional and theater training centers are essential for reaching the entire force, especially during combat operations. Regional and theater training centers executed admirably during World War II. The U.S.-based regional and theater-based training centers further projected influence forward and gave field commanders the flexibility to train their Soldiers on the critical tasks and requirements their operational environment

required. The current Regional Signal Training Sites (RSTS) fit perfectly into this mold. Now, under full control of the Signal School, these sites can effectively project forward the training priorities and resources of the Signal Proponent. RSTS is one of the most significant areas that the Signal Corps can capitalize on to improve the quality and quantity of institutional training received by signalers across the regiment.

The Vietnam War highlighted the challenge of training new equipment at the Signal School. There must be a balance between fielding the best and newest equipment to forces in combat and providing it to the institutions required to train it. Training conducted before deployment reduces the burden on units in combat and needs to be a priority effort. Currently, new equipment training (NET) accompanies any new equipment fielding (NEF). Generally, the equipment fields to the majority of the force with associated NET before the Signal School receives it. Fielding the Signal School first and then incorporating the RSTS into the NET program will get the needed training to the force at a much faster rate.

The current signal organizations 50th ESB-E and 112th Signal Battalion both run in-house training programs to prepare Signal Soldiers for their unique equipment sets and faster fielding cycles. These programs developed to augment the institutional training received by Signal Soldiers to prepare them for success with new equipment fielding. As WIN-T phases out across the Army and more systems closely resemble the equipment in the 50th ESB-E and 112th Signal Battalion, the Signal School can centralize these requirements. Centralized training reduces the burden on operational units to provide the initial training requirements and improve the Signal proponent's ability to reach and

influence the regiment. Again, the RSTS is the best avenue to extend the Signal School's reach for providing this needed training and reducing the impact on operating units.

3. Albert J. Myer, founder of the Signal Corps, taught the importance of codifying doctrine and embedding into institutional training. The doctrinal foundation is displayed today in the abundance of Signal doctrine available. FM 6-02, Signal Support to Operations, is the keystone manual with an entire series of 6-02 Army Techniques Publications (ATP) to provide further details and techniques to the regiment. These documents, maintained by the Signal School, provide regular updates and changes to stay current with the Army's training priorities. The Signal School needs to ensure these manuals republish about every two years to keep pace with the commercial industry and Moore's Law.

Recommendations

The Signal Corps is already accounting for many of the identified Lessons Learned and Best Practices. The following recommendations address three critical areas that the Signal Corps can capitalize on to make a considerable impact in training readiness and, ultimately, the support provided to the Army.

1. The Army must reestablish the Division Signal Battalions. MAJ Adam Brinkman wrote an incredibly thorough paper analyzing this topic in 2017 titled *The Modular Need for the Division Signal Battalion*. The modular BCT broke the Signal Corps previous training oversight and leader development processes. Returning this senior Signal Officer responsible for training and developing the BCT Signal Companies will vastly improve the signal support provided. Over time, reestablishing this

relationship will have an exponential impact as developed Soldiers continue to teach and develop in signal formations in the future.

2. The Signal Corps must expand the roles and responsibilities of the Regional Signal Training Sites (RSTS). These sites are now under the control of the Signal School and can execute far more than currently being used. The Signal School can expand the capability to assist in NETs, provide additional CompTIA training, and be the forward arm of the Signal School to provide on-demand training for supported units. The level of support and resources these potentially could provide to operational units is incredible. RSTS is the largest area for massive training improvement currently available to the Signal Corps.

3. The Signal Corps must continue to update and revise the Signal Training Strategy. The training circular is currently in its third iteration and continues to improve. A simple area requiring changes is aligning the seven Signal Assessment Tables with the six gunnery table design from TC 3-20.0. A space for further expansion is to continue the tables to progress beyond section validation and include platoon and company requirements. The final recommended update is to define the roles and responsibilities of the Brigade S6 and Division G6 in Signal certifications. Currently, they have no identified role, and in the absence of a Division Signal Battalion, they are the best resource to maneuver commanders to train and certify their assigned signalers.

Areas for Further Study

1. Civilian IT best practices are an area this thesis initially wanted to cover but did not have the time or resources to research adequately. That may produce many additional

best practices for the training and management of technical personnel. Additionally, it may develop further justification for programs like TWI and direct commissioning.

2. Impacts of DoDM 8570.01 on unit readiness and capability is another topic area for research. Specific areas of research may include the percentage of uncertified personnel, retention rates, total costs paying for certifications, and other statistics. This quantitative analysis may produce some great recommendations to not only the Army but the entire DoD on how to reduce costs, both human and fiscal, of these requirements.

Summary

Faster IT acquisition cycles challenge the Signal Corps' ability to train and prepare Soldiers for LSCO. Current signal training strategies prepare a capable IT workforce for the Army with areas recommended for future growth. Historical analysis for lessons learned showed the value provided by the former division signal battalions, the effectiveness of regional and theater training sites, and the importance of doctrine to unify and synchronize the regiment. Continuing to push for reestablishment of division signal battalions, expanding the capabilities of Regional Signal Training Sites, and providing continued updates to doctrine is critical to the continued success of the Signal Corps and the U.S. Army.

Conclusion

Senior leaders across the Army and Signal Corps recognized the challenges that the current GWOT-era Army has while shifting the training priority along the spectrum of conflict towards LSCO. Given that new organizations such as AFC and the N-CFT look to renew the Army's competitive technological advantage over peer competitors, all

units must prepare for change. The Signal Corps leaned forward by piloting three concepts to improve the communications support available to maneuver divisions. The Expeditionary Signal Battalion – Enhanced concept showed the most promising, and the Signal Corps expects approval in Total Army Analysis (TAA) 22-26. The Division Signal Battalion concept also showed positive results and is currently tabled for reconsideration in a future TAA. The Signal School recently received control of the Regional Signal Training Sites (RSTS). These sites are critical to extending the reach and influence of the Signal School to a more significant portion of the regiment and at more times in their career than just Professional Military Education (PME). Finally, the Signal School published a training circular explicitly designed to assist maneuver commanders in training and certifying their Signal Soldiers.

These Signal Corps training strategies are preparing a ready and agile information technology workforce. Placing additional focus on reestablishing Division Signal Battalions, resourcing and leveraging Regional Signal Training Sites, and continuing to refine and improve TC 6-02.1 and Signal Assessment Tables furthers this advantage. Training and preparing before the onset of future wars are essential to the success of the Signal Corps to provide communications support to the Army.

APPENDIX A

CONSOLIDATED FINDINGS

The following table consolidates lessons learned and best practices with existing applications. The shaded considerations drove this thesis' recommendations.

Table 2. Consolidated Findings			
Era	Lesson Learned or Best Practice	Current Application	Additional Considerations
Civil War	Testing and Admission Standards	GT Scores and MOS specific requirements	Additional use of Soldiers previous experiences
	Combined Arms Training Requirements	AR 350-1; TC 6-02.1 Signal Assessment Table I	Maintain
	Codified Doctrine	6-02 Series Manuals	Keep updating biannually
World War I	Civilian Education Systems	Tuition Assistance, Advanced Civil Schooling, DoD 8570.01	Maintain and expand when budgets allow
	Direct Commissioning of Technical Experts	None; new legislation allows	Continue to pursue
World War II	Training Specialization	MOS Consolidation	Continue current glide path
	Regional and Theater Training Centers	Regional Signal Training Sites	Expand capability and drive training for new systems
	Direct Commissioning of Technical Experts	None; new legislation allows	Continue to pursue; Repeated from WWI
Korean War	Balance between lecture and practical exercise	Signal School Training Development	Continue to Emphasize
	Training with Industry	Training with Industry	Maintain and expand
	Combined Arms Training Requirements	AR 350-1; TC 6-02.1 Signal Assessment Table I	Maintain; Repeated from Civil War
Vietnam War	Balance between training new equipment from the Signal School and deployed units	New Equipment Training	Leverage RSTS and unit assigned equipment
	Multiple shift training	Signal School	Maintain as needed to reduce student to equipment ratio
Gulf War	Unit availability while changing major equipment systems	Unit Status Reporting	Units need to be placed in unavailable pool with other units assigned to cover down
	Technical Contract Support	Across the Signal Corps	Consider impacts to Soldier development or remove responsibility from Soldiers
GWOT	Personnel Development	123rd Signal Battalion; technical contract support	Return DIV SIG BN to all DIVs; RSTS to fill gaps
	Expectation Management	Across the Signal Corps	Train only with MTOE items and prepare for degradation
Current Units	Role of Senior signal officers in training oversight and leader development	123rd Signal Battalion	Consider reestablishing Division SIG BN in all DIVs
	Unit-led technical training programs	Sentinel Communicator Course; Shadow Warrior U	Transfer common training requirements to RSTS

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