AD NUMBER

ADB006688

LIMITATION CHANGES

TO:

Approved for public release; distribution is unlimited.

FROM:

Distribution authorized to U.S. Gov't. agencies only; Proprietary Information; 29 SEP 1975. Other requests shall be referred to Army Command and General Staff College, Attn: ATSW-DD, Fort Leavenworth, KS 66027.

AUTHORITY

ODDR&E ltr, 20 Jan 1976

An Examination of the Command and Control Communications at Brigade

Gene R. Farmelo, CPT, USA
U.S. Army Command and General Staff College
Fort Leavenworth, Kansas 66027

Final report 6 June 1975

A thesis presented to the faculty of the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): An Examination of the Command and Control Communications at Brigade	5. TYPE OF REPORT & PERIOD COVERED: Final report 6 Jun 75
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Farmelo, Gene R., CPT, USA	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Student at the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: US Army Command and General Staff College ATTN: ATSW-DD Fort Leavenworth, Kansas 66027	12. REPORT DATE: 6 Jun 75 13. NUMBER OF PAGES: 58
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE: 29 SEP 1975

16. DISTRIBUTION STATEMENT (of this Report)

Distribution limited to U.S. Government agencies only: Proprietary Information. Other requests for this document must be referred to U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Master of Military Art and Science (MMAS) Thesis prepared at CGSC in partial fulfillment of the Masters Program requirements, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

See reverse.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

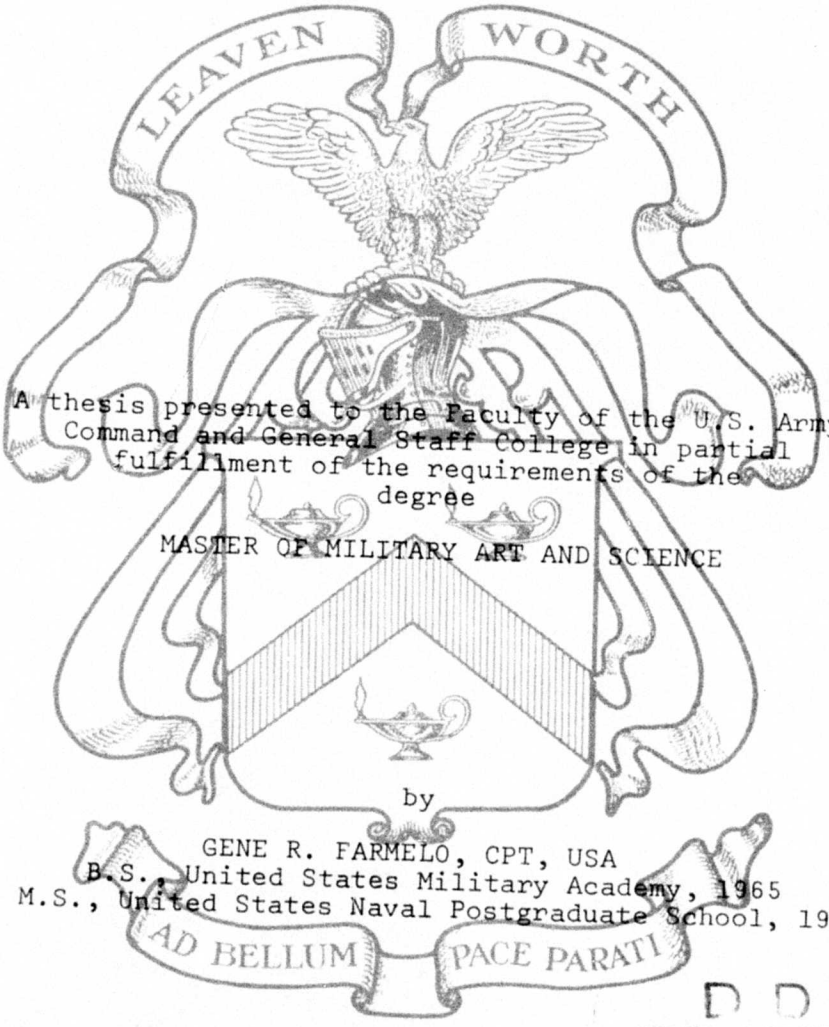
Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

This research examines the communications system of a mechanized infantry brigade. At brigade, the primary means of communications is the tactical FM radio. However, on a modern battlefield there is a clear and present threat to the use of FM radio. The threat stems from electronic warfare techniques which an enemy can employ; and, electromagnetic pulse, a phenomenon associated with nuclear detonations. If a brigade commander loses the use of FM radio, he will be forced to employ an alternate means of communications for command and control communications. Consequently a primary focus of this research was to determine if there are shortcomings in the use of an alternate means of communications and to recommend ways to rectify the shortcomings discovered.

Another important facet of this research involved the designing and administering of a test which determines the awareness and preferences of combat officers for an alternate means of communications. The test is explained as well as the results of administering the tests to selected combat arms officers of the CGSC class of 1974-75.

AN EXAMINATION OF THE COMMAND AND CONTROL COMMUNICATIONS OF A BRIGADE



A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements of the degree

MASTER OF MILITARY ART AND SCIENCE

by

GENE R. FARMELO, CPT, USA
B.S., United States Military Academy, 1965
M.S., United States Naval Postgraduate School, 1970

Fort Leavenworth, Kansas
1975

5L5-3150

MAPS AND OVERLAYS WITH ORIGINAL COPY ONLY.

AVAILABLE UPON REQUEST.

ABSTRACT

This research examines the communications system of a mechanized infantry brigade. At brigade, the primary means of communications is the tactical FM radio. However, on a modern battlefield there is a clear and present threat to the use of FM radio. The threat stems from electronic warfare techniques which an enemy can employ; and, electromagnetic pulse, a phenomenon associated with nuclear detonations. If a brigade commander loses the use of FM radio, he will be forced to employ an alternate means of communications for command and control communications. Consequently a primary focus of this research was to determine if there are shortcomings in the use of an alternate means of communications and to recommend ways to rectify the shortcomings discovered.

The evaluation of the alternate means of communications at brigade included a detailed review of applicable field manuals to determine what guidance is provided by current tactical communications doctrine. Likewise the brigade's training programs, tests and exercises were reviewed to determine if the necessary emphasis is being placed on being able to function on a modern battlefield when employing an alternate means of communications. Also the military education which is provided the combat arms officers who will be using this system was reviewed.

Another important facet of this research involved the designing and administering of a test which determines the awareness and preferences of combat officers for an alternate means of communications. The test is explained as well as the results of administering the tests to selected combat arms officers of the CGSC class of 1974-75.

TABLE OF CONTENTS

CHAPTER I

INTRODUCTION

The communications system of a mechanized infantry brigade must be responsive to the momentum of the brigade's operations. This requires that the commander have the capability to control the actions of his subordinate units by transmitting and receiving orders and intelligence in a timely manner. Coordination of supporting fires and logistical matters must also be accomplished by the system.[1]

Currently the brigade's* system uses frequency modulated (FM) tactical radio as its primary means of communications. Because FM radio is vulnerable,+ current doctrine recommends that commanders be prepared to use an alternate means of communications. In the brigade, wire and messenger communications can be used for this purpose.[2]

The use of alternate means of communications for command and control of the brigade may be problematical. A potential problem is whether wire and messengers can be

---

[1] U.S. Army, The Infantry Brigades, Field Manual No. 7-30 (Headquarters, Department of the Army, Washington, D.C., March 1969), p. 2-4.

*Throughout the paper, reference to a brigade will mean a mechanized infantry brigade unless otherwise stated.

+Vulnerable will refer to the degradation of FM radio characteristics when exposed to electronic or nuclear interference.

[2] Ibid.

responsive to the momentum of the brigade's operations on a fluid battlefield. Secondly, there may be a deficiency in the doctrine which guides the brigade in its use of alternate communications. Finally, the education and training programs may not be emphasizing the need to be proficient in the use of an alternate means of communication. These problems are further discussed in the Problem section of this chapter.

BACKGROUND

Evolution of Command and Control Communications

The principle of command and control is as old as warfare. That principle, simply stated, is to coordinate the most effective use of resources against the enemy.[3] In a tactical unit, command and control communications support the commander by providing information in a timely manner to assist in decisionmaking; communicating the decision to subordinate elements; and supplying necessary feedback to sustain operations.

In the American Civil War, units at echelons comparable to modern day brigades utilized non-electronic communications means. Use of flags to transmit coded messages over great distances was common. The flags were operated by signal troops at relay stations which were usually located on high terrain features; and telescopes were used to observe the

---

[3]"Command Control History," Signal, April 1966, p. 56.

signalmen as they relayed their messages. At regimental, battalion and company levels, the drum was used for signalling command and combat orders. The distance that the drums could be heard was limited. However, drummers were able to relay messages by taking up the proper beat in turn. In mounted service, the bugle was employed rather than the drum.[4]

The use of electronic equipment by American commanders had its genesis in the Civil War when the telegraph came into play. The instantaneous telegraph response allowed disposition and movement of troops by a headquarters that was removed from the battlefield. Generally, the telegraph was not employed at echelons below corps.[5]

The static warfare which was characteristic of World War I (in the West) greatly influenced unit command and control. Mobility of forward infantry units was limited to advancing a few yards at a time. As the infantry progressed, they would lay wire and this allowed telephone communications to be established with their respective headquarters and supporting artillery units.[6] A headquarters was not considered operational until it was "wired in" and telephone communications were established.[7]

---

[4]Virgil Ney, Combat Operations Research Group, The Evolution of Military Unit Control (Sponsored by U.S. Army Combat Developments Command), 10 September 1965, p. 68.

[5]Ibid., pp. 69-72. [6]Ibid., p. 82. [7]Ibid., p. 87.

Above the regimental echelon, headquarters were connected by "wireless" networks. This represented the first use of tactical radios by U.S. forces. Voice wireless, however, was not perfected for field use until after World War I.[8]

In addition to electronic means, communications in World War I made extensive use of carrier pigeons. Units going into combat were provided baskets of pigeons from army or corps; and these birds were vital when all other communications failed.[9]

In World War II, there were significant improvements to the radios of World War I. Radios were used for voice communications at regiment and below.[10] Wire was used as backup and employed when necessary; however, some commanders used wire as the primary means of communications. In his book War As I Knew It, General George S. Patton tells how he advocated maximum use of wire because radio was not reliable and should be considered a secondary measure. He goes on to tell how he launched a large tank attack at the end of seventeen miles of wire.[11] However, use of wire as the primary means of communications was the exception rather than the rule.

In the Korean conflict, communications were virtually the same as in World War II.[12]

---

[8] Ibid. [9] Ibid. [10] Ibid., p. 111.

[11] General George S. Patton, Jr., War As I Knew It (Boston: Houghton, Mifflin Co., 1947), p. 347.

[12] Virgil Ney, op. cit., p. 130.

Since World War II, technology has had a significant impact on command and control. Advances in weaponry and mobility have made the time factor of decisions extremely critical. In order to assist in valid decisionmaking, there is a need for commanders at all echelons to handle more and more information on a timely basis. On current or future battlefields, important decisions will be made in a relatively short period of time as compared to World War II.[13] Once a decision is made, it must be rapidly disseminated to all subordinate units.

At the brigade echelon, FM radio has evolved as the primary means of communications for assisting the commander. Currently the Army utilizes the VRC-12 series FM radio in its tactical units. This radio, which was provided to the army in the 1960's, offers many advantages over earlier tactical radios. The voice quality and reliability are greatly improved. In addition, messages can be automatically encrypted so that the possibility of interception by an enemy is greatly reduced.

This instrument allows the commander to talk to his subordinates while he is in a vehicle, be it track or helicopter; and no special personnel are required to operate the radio. However, FM radio is vulnerable.

---

[13] MG David P. Gibbs, "Communications: The Vital Element in Army Command and Control," Data, Volume II (January 1966), p. 29.

Vulnerability of FM Radio

The threat to the use of FM radio stems from electronic warfare (EW) measures which the enemy can employ to disrupt or deny our use of radios. Also, electromagnetic pulse, a phenomenon associated with nuclear detonations, is a threat to the use of FM radio.

An EW technique that concerns a brigade is one in which the enemy can deny us the use of our radios. This is done by jamming radio sets at critical times during the battle. Secondly, enemy signal intelligence units are constantly conducting search and monitor operations of our radio emissions. These units gather such information as type of equipment, frequency range, primary and alternate frequencies, operation schedules and patterns. This information supports his jamming and deception* against us.[14]

In addition, the brigade must contend with the enemy's direction-finding capability. He has the means to fix a brigade's position by locating the source of power given off by the radio transmitters. Once a brigade is located, employment of enemy artillery barrages can be expected.[15]

The use of FM radio is also vulnerable to a phenomenon called electromagnetic pulse (EMP). Under proper circumstances,

---

*Deception refers to enemy measures to mislead us by presenting distorted or false evidence.

[14]U.S. Army Command and General Staff College, Electronic Warfare, Reference Book 32-20 (Fort Leavenworth, Kansas, July 1974), p. 41.

[15]Ibid.

a significant portion of the energy of a nuclear detonation appears as EMP. Because of the high energy in EMP, it has a detrimental effect on all communications to include FM radio.[16] Large metallic objects (e.g., tanks, jeeps, personnel carriers) act as collectors of the electromagnetic energy, and this large amount of energy is gathered and impressed on the sensitive components of a radio which, in turn, can cause a burnout.[17]

A unique property of EMP, which concerns tactical commanders, is that it can disrupt electronic components up to 3,000 miles from the site of a nuclear detonation when the blast occurs above the atmosphere.[18] EMP is also present whenever a nuclear detonation occurs on the battlefield. The range for disrupting communications is diminished for an atmospheric blast. Nevertheless, this harmful phenomenon can be expected miles from each explosion.

These factors, coupled with the fact that enemy FM radios are relatively safe from EMP, presents an undesirable situation. Soviet radios are safe from EMP because they are primarily vacuum type radios; and laboratory tests have shown that vacuum tube systems are many times more resistant to EMP than the solid state circuitry of our FM radios.[19]

---

[16] IIT Research Institute, Defense Nuclear Agency's Electromagnetic Pulse Awareness Course, Notes (Sponsored by DNA, Washington, D.C., code #2772T) August 1971, p. 1.

[17] Ibid., p. 3. [18] Ibid., p. 1. [19] Ibid., p. 5.

THE PROBLEM

The problems which are addressed in this research result directly from the loss of FM radio communications during a battle. This loss, which is probable, will necessarily alter the communications system, and, could result in the battle being lost, because, a brigade forced to function without FM radio may discover that it is not adequately prepared for such an eventuality. This lack of preparedness can result from several factors which are considered in the following questions:

a. Does Army doctrine, training and education adequately explain the need for a brigade to be able to operate in combat without the use of FM radio?

b. Is there an acceptable alternate means of communications for the brigade?

c. Are combat officers aware of what communications are available at brigade if the use of FM radio is denied?

Negative responses to these questions indicate a situation which needs to be corrected promptly so that future battles will not be lost because the use of FM radio was denied by the enemy.

THE PURPOSE

The purpose of this research is to determine if there are shortcomings in the alternate means of communications for a mechanized infantry brigade and if there are, suggest ways for their correction.

OBJECTIVES

a. Determine whether doctrine, as currently stated, adequately discusses command and control of a brigade when the use of FM radio is denied.

b. Evaluate the Army's training program, as it applies to a mechanized infantry brigade, to determine whether operations utilizing alternate communications are stressed, and, if so, to what extent.

c. Determine whether training for command and control of a brigade while using the alternate means of communications is being accomplished.

d. Evaluate the awareness and preferences of Army officers concerning alternate communications at the brigade echelon.

e. Determine what U.S. Army schools are teaching officers about command and control of brigades.

RESEARCH APPROACH

The approach for accomplishing the purpose and objectives of this research involves two primary efforts. The first includes a detailed review of Army doctrine, training and education as they apply to the brigade and its key personnel. This review is addressed in Chapter II. The second effort involves evaluating the awareness and preferences of the combat arms officers who will soon be manning key positions in the brigade. The methodology for this

approach is explained in Chapter III. The findings of the research are explained in Chapter IV; Chapter V contains the conclusions and recommendations of the study.

DEFINITIONS

a. Command and Control. The exercise of authority and direction by a duly designated commander over assigned forces in the accomplishment of his mission.[20]

b. Command and Control System. The facilities, equipment, communications procedures and personnel essential to a commander for planning, directing and controlling operations of assigned forces pursuant to the mission assigned.[21]

c. Vulnerable. The degradation of FM radio characteristics when exposed to electronic or nuclear interference.

---

[20]Department of Defense, Dictionary of Military and Associated Terms, JCS Pub. 1 (The Joint Chiefs of Staffs, Washington, D.C., 3 January 1972), p. 66.

[21]Ibid.

CHAPTER II

REVIEW OF RELATED LITERATURE

INTRODUCTION

The review of literature relevant to this approach encompasses three areas which impact on the operations of a brigade. They are doctrine; education; and training. Each area is discussed individually and a summary is provided.

An examination of tactical communications doctrine is required to determine the guidance that is provided concerning the communications system at brigade. The examination specifically determines the guidance given to a brigade about alternate communications for FM radio. Applicable field manuals are the primary source of literature for tactical communications doctrine.

Education involves an examination of the military education that is given to combat arms officers who will be leading the brigade. To accomplish this, it is necessary to review what is presented at the combat arms branches advanced courses. These courses, which are attended by officers in their fourth to eighth year of commissioned service, are designed to "prepare officers for command and staff duties at battalion through brigade levels . . ."[1]

---

[1]U.S. Army Infantry School, Program of Instruction, Infantry Advanced Course, Class 2-7-C22, August 1973, p. i.

The next level of military education for officers is attendance at Command and General Staff College (CGSC). Selected officers attend this college between their eighth and sixteenth year of commissioned service. The purpose of this school is "To prepare selected officers for duty as commanders and as principal staff officers with the army in the field . . ."[2] The program of this college is also examined.

The evaluation of the brigade's training program as it applies to communications necessarily involves two efforts. First, a review of army training literature is required to determine the brigade's recommended training program. Secondly, after action reports were examined to determine what training is actually being accomplished.

DOCTRINE

The communications doctrine that is promulgated in Army field manuals is designed to be a guide to commanders and staffs for development of their communications system. Responsibility for adequacy and proper utilization of communications within the brigade lies with the commander.[3]

Several field manuals describe the communications network that is recommended for the brigade. The most

---

[2]U.S. Army Command and General Staff College, Catalog of Resident Courses Academic Year 1974-1975, May 1974, p. II-1.

[3]U.S. Army, Tactical Communications Doctrine, Field Manual 24-1 (Headquarters, Department of Army, Washington, D.C., January 1970), p. 22.

extensive description is in Field Manual 24-1 Tactical Communications Doctrine, which states the following:[4]

> (1) FM radio is the principal means of communications within the brigade. The FM command net is used for management of the brigade headquarters and attached elements.
>
> (2) Ground and air messengers are utilized for the delivery of routine matters and bulk items.
>
> (3) Wire is used primarily between brigade staff members and attached or supporting units in the brigade base. Generally wire is not installed to maneuver battalions because of the distance involved, changing tactical situation and limited wire assets.

The above guidance is supplemented by doctrine contained in FM 11-50, Communications in Armored Infantry and Infantry (Mechanized) Divisions. This manual states that wire is to be used for circuits internal to the brigade headquarters, and, wire may be utilized as determined by the tactical situation, time available and desires of the commander. Messenger service, both special and scheduled, is provided as supplemental communications.[5]

FM 24-1 and 11-50 are developed and written at the U.S. Army Signal School, Fort Gordon, Georgia. In addition, the U.S. Army Infantry School, Fort Benning, Georgia provides tactical communications doctrine for maneuvering infantry units. This doctrine explains the type communications that

---

[4] Ibid., pp. 37-38.

[5] U.S. Army, Communications in Armored Infantry and Infantry (Mechanized) Divisions (Headquarters, Department of the Army, Washington, D.C.: October 1972), p. 9-6.

should be used during various tactical operations. The doctrine also provides guidance to the brigade staff covering which type communications to use for discharging staff duties. The two infantry manuals that deal with tactical communications are FM 11-30, The Infantry Brigades and FM 11-20, The Infantry Battalions.

Field Manual 7-30 states that FM radio is the principal means of communications within the brigade. However, it warns that radio is vulnerable; consequently, wire and messengers are to be used when the tactical situation allows.[6] Unfortunately, there is no guidance on what to do if the use of FM radio is denied and the tactical situation does not allow the laying of wire.

FM 7-30 advises key members of the brigade to execute their duties over the FM radio. No instructions are provided on what to do if the use of the radio is denied. This omission is critical for the brigade S-2, who is to rapidly disseminate intelligence to all staff sections and units which are higher, lower, and adjacent to the brigade.[7] Also, all close air support and fire support are coordinated over FM radio and no contingencies are allowed for the loss of radio.[8]

---

[6]U.S. Army, The Infantry Brigades, Field Manual 7-30 (Headquarters, Department of Army, Washington, D.C.: March 1969), p. 2-4.

[7]Ibid., p. 4-11.

[8]Ibid., pp. 4-1 to 4-8.

Field Manual 7-20 recommends the type of communications for each tactical operation that the unit may encounter. It states that in the attack radio is the principal means of communications, because wire is difficult to maintain.[9] Movement to contact is controlled by radio and messengers.[10] For the defense, communications is dictated by time available. However, where possible more elaborate communications should be used and wire is to be the primary means of communications.[11]

FM 7-20 omits guidance on what alternate means of communications for tactical operations are to be used if FM radio is denied. For describing the attack, movement to contact, penetration and exploitation, this omission is critical because using wire and messenger instead of FM radio may alter the tactics of the operations.

EDUCATION

When researching the military education that the Army provides its officers, particular attention was given to the instruction presented at the advanced courses of the combat arms service schools. In these courses, brigade and battalion operations are addressed. In addition to the combat arms advanced courses, the Signal School Advanced Course and the

---

[9] U.S. Army, The Infantry Battalions, Field Manual 7-20 (Headquarters, Department of the Army, Washington, D.C.: December 1969), p. F-7.

[10] Ibid., p. F-8.

[11] Ibid., p. F-6.

Command and General Staff College program were examined.

Officers attending the Infantry Advanced Course receive 466 classroom hours of combined arms tactics.[12] It is during this block of instruction that brigade tactical operations are taught. These operations include the brigade in the attack, defense, delay, withdrawal, penetration and exploitation. Each tactical operation is taught in the classroom and then students participate in classroom practical exercises These exercises require the student to analyze the situation and develop fragmentary orders to be issued.[13] No emphasis is placed on how the orders are to be disseminated.

Student familiarization with the communications in a brigade is accomplished during a eight-hour classroom practical exercise, and a two-hour classroom presentation which emphasize deploying the communications equipment that is authorized in a brigade.[14]

A separate block of instruction is presented on electronic warfare. Four hours of instruction highlight the history of EW, as well as the staff procedures and responsibilities that apply to EW.[15] The class is not designed to instruct a method for operating FM radios in an EW environment.

---

[12] U.S. Army Infantry School, Program of Instruction, Infantry Advanced Course, Class 2-7-C22, August 1973, p. 2A01.

[13] Ibid., p. 4A05. [14] Ibid., p. 4D05.

[15] Ibid.

The communications system at division and echelons above division is presented in a twenty-hour block of instruction.[16] This instruction, together with the communications instruction mentioned above, is the sum and substance of what infantry officers are taught about communications at the advanced course.

Student officers at the Armor, Artillery and Air Defense Artillery advance courses receive instruction which is similar to that presented at the Infantry School.*

There is more instruction about the brigade communications system at the combat arms advanced courses than there is at the Signal School Advanced Course. Signal officers are instructed primarily in the division and echelons above division communications system. Courses on brigade operations are given, however, the purpose of this instruction is to teach tactics rather than the communications support required.[17]

After the advanced courses, the Command and General Staff College is the next level of military education provided for selected Army officers. A review of the courses at CGSC shows that there are ten hours of instruction presented on communications. This instruction covers all tactical communications employed in a theater, and, a detailed look at future

---

[16] Ibid., p. 2A01.

*This statement is made as a result of reviewing the programs of instruction for each school mentioned.

[17] U.S. Army Signal Center and School, Program of Instruction, Signal Advanced Course, Class 4-11-C23, May 1971, pp. 81-82.

communication equipments is provided.

The phenomenon of EMP is presented during instruction on nuclear operations. It is during this class that most officer students are exposed to this threat to radio for the first time.

Electronic warfare is presented to all students in a four-hour block of instruction. Principles of EW are taught as well as the staff procedures and responsibilities associated with EW. Two elective courses are presented to students who desire to learn more about EW. However, less than nine percent of the students selected this elective (109 students). Of the students selecting the elective, less than three percent are combat arms officers (33 students).[18]

Numerous courses are presented at CGSC which involve brigade operations. Review of the course synopsis reveals that although considerable emphasis is placed on command and control, there is no instruction on the communications associated with command and control.[19]

TRAINING

In order to properly evaluate the training of a brigade, it is necessary to examine the training programs

---

[18] Class Roster for Elective 1601 at CGSC.

[19] U.S. Army Command and General Staff College, op. cit., Section IV.

outlined in applicable Army publications. In addition to the programs recommended, the results of actual training practices are analyzed.

Army guidance for training is contained in Army Regulation 350-1. This regulation affixes responsibility for training Army units with the commanders. The Training and Doctrine Command of the Army (TRADOC) is responsible for outlining the Army's training objectives. TRADOC's supplement one to AR 350-1 provides guidance and direction for the conduct of training.[20]

This supplement states that for electronic warfare, commanders are responsible for training their units and staffs. This includes developing the capability to operate signal equipment in the presence of enemy jamming by employing anti-jam techniques or using an alternate means of communication.[21] The objectives of EW training cited in TRADOC supplement one to AR 350-1 include teaching the actions required to operate signal equipment in spite of enemy EW techniques, and to have alternate communications and standard operating procedures available for employment if required.[22]

Specific unit training programs are contained in Army Training Program publications. For a mechanized infantry

---

[20] U.S. Army Training and Doctrine Command, Supplement 1 to AR 350-1, 1 August 1973, Annex J, p. 1.

[21] Ibid.

[22] Ibid., p. 3.

brigade, the training program emphasizes the type of tactical operations either offensive and defensive, that the brigade may perform on the battlefield. For the offense, the brigade trains to conduct an attack, penetration and exploitation. For the defense, the brigade conducts a delay, withdrawal and a position defense. The training program culminates in a field exercise which requires the brigade to perform the tactical operations for which they trained.[23] The program does not require the brigade to train without FM radio.[24]

Associated with the brigade's training program is Army Training Test 7-15. This test is written for mechanized battalions specifically, but it also applies to mechanized brigades. The document describes the test to evaluate the ability of a unit to perform its assigned mission under simulated combat conditions.[25] What the test emphasizes is reflected in the checklist which the umpires use to grade the unit. For communications, emphasis is placed on promptly establishing, adequately extending and continuously maintaining communications throughout the exercise. No emphasis is placed on the use of alternate means of communications for command and control.[26]

---

[23]U.S. Army, Infantry, Mechanized Infantry Battalions and Brigades, ATP 7-15, 8 April 1968, p. 9.

[24]Ibid., pp. 1-30.

[25]U.S. Army, Infantry Battalions, ATT 7-15, 8 September 1966, p. 2.

[26]Ibid., p. 20.

Certain training exercises have been accomplished which offer an evaluation of a brigade's training. Each year the Army conducts "Exercise Reforger," which includes deployment of two mechanized brigades to Europe where a training exercise is accomplished. The training is realistic and very beneficial.[27] However, there are limitations in the area of electronic warfare. Specifically, a shortage of radio frequencies does not allow free-play of techniques for countering jamming.[28] Also, in order to jam a particular frequency, high power is required. This is problematical because commercial German television is on the same FM band as tactical radio. Consequently, very few nets are allowed to be jammed because of interference with German television.[29]

During Exercise Reforger, there is no record of the use of FM radio being denied to a tactical unit.

SUMMARY

Tactical communications doctrine does not go beyond recognizing that FM radio is vulnerable and that wire and messenger should be used as alternatives. The serious

---

[27]Headquarters 1st Infantry Division, Exercise Reforger V, After Action Report, 28 January 1974.

[28]Headquarters, VII Corps, Exercise Reforger V, After Action Report, 15 January 1974, Tab X.

[29]Ibid., Tab W.

omissions are how should wire and messenger be employed to command and control a unit; and, what are the ramifications of using wire and messengers. For example, what is the impact on the tactics of a coordinated brigade attack if the mobility is constrained by having to use messengers and wire? Furthermore, how are key brigade members to discharge their duties without radio? Receiving and disseminating intelligence, and coordinating fire support and close air support are examples of brigade functions which are radio dependent.

The military education provided combat arms officers offers no preparation on how to command and control without FM radio, despite the fact that student officers are instructed that FM radio is vulnerable.

Training program objectives, as stated in TRADOC regulations, state that brigades should train to operate utilizing alternate means and standard operating procedures. However, the specific training program for the brigade, as outlined in ATP 7-15, does not require training when the use of FM radio is denied. Also, the test checklist used to evaluate the communications training does not emphasize operating without FM radio.

CHAPTER III

METHODOLOGY FOR TESTING

A review of the objectives in the research related in Chapter I suggests a methodology for testing which draws upon the experience and preferences of the combat arms officers. These officers are directly involved with leading tactical unit operations, and, for this reason they were used as subjects in the testing. The methodology placed each subject in the role of a brigade commander as a realistic battle scenario was played. This approach provided a standard environment for asking questions dealing with the brigade's communications systems. A controller was used to explain the scenario. He insured that each subject had complete understanding of questions presented. The questions asked related to the scenario, and, each was designed to gather opinions about brigade communications from the combat arms officers.

TESTING PROCEDURES

The testing was accomplished at the U.S. Army Command and General Staff College's simulated tactical operations center. The facility contains an actual size mockup of a mechanized brigade's command post. As a subject arrived for testing, he was given an introduction. (See

Appendix A). After the introduction, subjects were taken to the simulated tactical command post and were briefed on the tactical situation. Then, by utilizing a script, the controller related the key events of the scenario to the brigade commander. Once the events were understood, questions were asked. Each question was read verbatim by the controller to insure that all subjects received the same wording. Standardized answer sheets were used. (See Appendix B). At the conclusion of the scenario, subjects were asked to complete an additional questionnaire. (See Appendix C).

Prior to the test in which actual data was recorded, a pilot test was given. This test, which was administered to three subjects, provided valuable feedback concerning the subject's ability to understand the scenario presented and the questions asked. As a result of this feedback information, the scenario was rewritten and simplified so that subjects could rapidly comprehend the situation presented. Also questions were rewritten to eliminate potential ambiquities in the original wording.

THE SCENARIO

The scenario used for the test involved a mechanized infantry brigade in the attack. (The text of the scenario is at Appendix D.) The events of the scenario portrayed an eight-hour battle that commenced as the lead elements of the brigade crossed the line of departure and continued until the

brigade's mission was accomplished. This scenario was explained to the subjects with the aid of charts and a map with overlays. (Appendix E, F, and G.) Examples of highlights of the battle that were presented are:

a. An enemy counterattack in the vicinity of the brigade's objective;

b. The brigade commander's decisions to commit the reserve; and

c. An enemy airstrike on a friendly battalion's command post.

All events presented to the subjects were selected because each required communications to, or from, the brigade commander or his primary staff.

The scenario was played twice. The first time the events of the battle were presented with no mention of communications. The intent was to familiarize the subject with the scenario. During the second playing, the subject was told to assume the loss of all radio communications with his subordinate units. It was during the second playing of the scenario that subjects were asked to respond in writing to the questions presented by the controller.

SUBJECTS

The test was designed to sample the population of 533 combat arms officers attending CGSC in school year 1974-75.[1]

---

[1]United States Army Command and General Staff College, Class Roster, Academic Year 1974-75, 30 August 1974, p. ii.

This population represents a cross-section of the Army officers who will be key staff members and future brigade commanders. In addition, these officers have attended the advanced courses of their respective branches. Consequently, the population is also a source of information concerning the military education which is presented to combat arms officers.

The sample size for the test was determined by the desired degree of accuracy of the results. The results of the testing will be in the form of percentages. Therefore, the degree of accuracy is influenced by two factors: (1) a confidence level; and (2) a margin of error. For this test a 95 percent confidence level and a 15 percent margin of error were utilized. With those parameters defined, a sample size could be determined by using the formula below which was derived for a confidence level of 95 percent.[2]

$$n = \frac{N}{1 + Ne^2}$$

where n=sample size; N=total population; e=margin of error. Continuing:

$$n = \frac{533}{1 + 533(.15)^2} \approx 41$$

Hence, by utilizing the results of testing 41 officers from the CGSC class, it is possible to make predictions about the total population of 533 officers.

---

[2]Taro Yamane, Statistics: An Introductory Analysis (New York: Harper and Row Publishers, 1967), p. 528.

An example test result could be: "80 percent of the combat arms officers prefer blonds."

If a sample size of 41 officers were used to determine the above result, then the following can be said about the total population of combat officers:

a. The best estimate of the real percentage is 80 percent;

b. The actual percentage of all combat arms officers who prefer blondes is not <u>exactly</u> known; but,

c. It can be said with 95 percent confidence that the actual percentage is neither lower than 65 percent nor higher than 95 percent.

CHAPTER IV

DISCUSSION OF FINDINGS

INTRODUCTION

The findings of this research were generated from two sources: a review of the literature; and the test given to combat arms officers. It was during the literature review that the threat to the use of FM radio was examined. The doctrine, education and training associated with tactical communications were also examined to determine what guidance is provided for the brigade to assist in the operation of the communications system. The second category of research findings resulted from the test which was given to selected combat arms officers. This test, which is fully explained in Chapter III, generated valuable data about the brigade's communications system, because the officers who participated represent a cross-section of the principal users of the brigade's communications system.

DISCUSSION

The threat to the use of FM radio is clear and present. This threat results from the EW techniques which can be employed against us by an enemy force. In this regard, the enemy has a full range of techniques which he

may employ. Those which the brigade can expect include jamming and direction finding. The jamming of our FM radio nets at critical times during a battle will curtail FM radio's use. Also, the enemy's ability to locate a brigade's location by detecting the FM radio transmissions, may cause a commander to curtail voluntarily the brigade's use of FM radio.

In addition to EW, the use of FM radio will be impaired, if not eliminated, in a nuclear environment because of the detrimental effects of EMP which are associated with a nuclear detonation. The energy associated with EMP can damage the sensitive components of FM radio; and, the range of damage from the detonation can be as high as 3000 miles from a high altitude blast.

Tactical communications doctrine, as promulgated in Army field manuals, warns that FM radio is vulnerable and advises commanders to use alternate means. At brigade, wire and messenger communications are available for use as an alternate to FM radio. A shortcoming of doctrine is that it offers no guidance on how the wire and messengers can be best employed to assist the commander in managing his brigade assets in battle. The omission is critical because it is not obvious that all staff functions can be adequately accomplished without the use of radio. Examples of this are the rapid coordination required in providing close air and fire support. Also the S2 function of rapidly collecting and disseminating intelligence will be difficult to execute without the use of

radio. FM 7-30, The Infantry Brigades, provides guidance to the staff for executing their functions, however, this guidance is given under the assumption that radio use is available.

A second omission of tactical communications doctrine is that it provides no forewarning of the ramifications of having to command and control without the use of radio. Combat arms officers consider the loss of FM radio critical to the outcome of a battle. When asked "There would be some time delay if radio communications are lost and alternate means are employed. Do you feel that this delay is significant enough to change the outcome of the battle?" Sixty-nine percent answered "yes." This opinion, combined with the threat to the use of FM radio, substantiates that doctrine should address the changes to command and control communications which a commander can expect when the use of FM radio is denied.

The fact that 69 percent answered yes to the above question reflects that combat arms officers have doubts about the adequacy of the alternate means of communications at brigade. This result could also show that the use of wire and messenger communications is not practiced for command and control; consequently, officers would tend to be critical of its use. The fact that use of alternate means is not commonplace was substantiated when 49 percent of the officers answered "no" to the question: "Do you remember serving in a brigade or battalion size unit that had a contingency SOP to be used if radio communications were denied for a period of

time (say 30 minutes)?"

A review of the brigade's training program and training tests shows that operating without radio is not being emphasized, in fact the opposite is stressed. "Promptly establishing, adequately extending and continuously maintaining"[1] are checkpoints in the training test. By using FM radio, it is easy for the brigade to pass this portion of the test. Consequently, there is little incentive to train without the use of FM radio as the unit prepares for the test.

There are peacetime restrictions which impact on the training of a brigade in the area of EW. First, there is a lack of frequencies to support all the necessary requirements of the tactical units. By not having all the frequencies required, there is difficulty in allowing the freeplay of radio operations which is necessary in an EW environment. This shortcoming is acute in Germany where the FM radio frequency band is the same as the German commercial television. Secondly, EW training is restricted in peacetime, because the amount of power required to jam a net causes interference to all communications, both military and commercial.

Perhaps there is still another factor which influences training. This factor is the unit's desire to attain high results when evaluated. The instantaneous communications

---

[1]U.S. Army, Infantry Battalions, ATT 7-15, 8 September 1966, p. 20.

afforded by FM radio are a valuable asset in managing a brigade. In addition, its use has become commonplace. Consequently, there may be a reluctance to train without radio because it is more difficult to command and control a unit when a slower form of communications has to be used.

Interestingly enough, when combat arms officers were asked: "If you were a brigade S3, would you recommend to the commander that he conduct training without the use of radio while your unit is in the field?" One hundred percent said yes. This result could reflect that the vulnerability of FM radio is becoming better known to the combat arms officers and as the trend continues, more and more units will train without the use of radios.

A review of the formal education provided to combat arms officers revealed that they are not sufficiently educated about the vulnerability of FM radio until they attend the CGSC. An examination of the instruction in the area of EW showed that only four hours of instruction were given during the advanced course, and this concentrated on the history and staff procedures of EW. When asked "Were you familiar with the phenomenon of EMP and its damage to tactical radios prior to attending CGSC?", 68 percent of the officers answered in the negative.

TEST FINDINGS

The general purpose of the test was to gain information

from the combat arms officers about the communications system at brigade. In particular an evaluation of system's alternate means of communications was required. Consequently, during testing subjects were to assume there was no use of FM radio. In this manner, it was possible to gain information on the use of wire and messenger communications. In the following paragraphs, the test's questions and associated responses are explained.

The question "What means of communications, other than radio, are provided to the brigade for command and control?" was designed to measure the officers' awareness of what is available as alternatives to FM radio. Seventy percent correctly responded that both wire and messenger communications are available. Eighteen percent said messenger only; and 12 percent said wire only. The significant result is that all subjects said either wire or messenger communications. This reflects a high awareness by the combat arms officers of what is provided as alternate means at brigade.

The question "What means of communications would you employ for command and control if you were denied the use of your radio?" was intended to gain the officer's preferences for an alternate means. The answer sheet provided space for write-in answers, and multiple answers were received. Ninety-seven percent selected messenger communications. Thirty-four percent opted for both wire and messenger, whereas no officers preferred only wire. These results reflect a preference for

messenger service.

An interesting result occurred when the following question was asked: "As a brigade CO or S3 in a combat situation where messengers have to be employed, would you use personnel from your staff or the message center to deliver the message?" Sixty-eight percent answered "staff." It is felt that there is a preferences for staff personnel to deliver key messages because this affords the commander and staff the opportunity to coordinate with subordinate units on matters other than the delivered message.

There were questions asked during the scenario which were associated with specific events in the battle. Concerning the use of wire, subjects were advised that their brigade assets included wire teams and they were asked: "Would you maintain wire communications to all three task forces as they are proceeding to their objectives?" Sixty-three percent said yes. This can be interpreted as a contradiction to the fact that only 34 percent prefer wire communications; however, it is postulated that a higher percentage elected to use wire communications because it was an available asset to be used in the battle. Also a closer examination of the question shows that the way the question is worded may cause a bias toward a "yes" answer.

SUMMARY OF KEY TEST RESULTS

ITEM	PERCENT
Officers who are aware that either wire or messenger communications are available at brigade for alterate means.	100
Officers who prefer only wire communications as an alternate means.	0
Officers who prefer only messenger communications as an alternative means.	63
Officers who prefer both wire and messenger communications as alternate means.	34
Officers who feel that loss of the use of FM radio would affect the outcome of a battle.	69
Officers who, as a brigade S3, would recommend field training without the use of radio.	100
Officers who preferred to use a staff member instead of a message center messenger, to deliver a message during the battle.	68
Officers who were aware of EMP prior to attending CGSC.	32

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

INTRODUCTION

This chapter states and supports the conclusions which are drawn from the findings of the research. As stated in Chapter I, one of the purposes of this research was to determine if there are shortcomings associated with employing the system's alternate means of communications. Recommendations which will improve the shortcomings discovered are also listed in this chapter.

CONCLUSIONS

a. <u>At brigade, an alternate means of communications will have to be employed during battle.</u> This conclusion is supported because on a future battlefield the use of FM radio is clearly threatened. This threat stems from the enemy EW techniques that can be expected to be employed against the brigade; and, from the EMP of a nuclear environment which will restrict, if not eliminate, the use of FM radio. These findings are not new; in fact, doctrine contained in FM 7-30, <u>The Infantry Brigade</u>, advises that an alternate means of communications will have to be considered because FM radio is vulnerable. However, there are shortcomings in the doctrine

and training associated with employing the alternate means of communication.

b. Doctrine governing the brigade's employment of an alternate means of communications is not adequate. The extensive review of tactical communications doctrine revealed that no guidance is provided on how messenger and wire communications should be employed when FM radio is not available. This is a critical omission of doctrine because it is likely that wire and messenger communications will have to be employed by the brigade. In Chapters II and IV it was pointed out that loss of radio communications will be problematical because certain staff functions require the rapid response that radio offers. The collection and dissemination of intelligence by the S-2 and coordination of close air and fire support were cited as examples of staff functions which will be difficult to accomplish without the use of radio.

Doctrine does not forewarn commanders of the significant changes that may result when required to command and control a brigade without FM radio. While it is recognized that these changes cannot be exactly predicted, it would be beneficial to the commander, for contingency planning, to have estimates of the additional time required to send and receive messages to his subordinate units. The tactics of an operation will necessarily change because the fire and maneuver of units will be affected when FM radio cannot be employed and wire or messenger communications, which is slower, has to be used.

c. Brigade training programs and training tests do not emphasize the use of an alternate means of communications. A review of the training program for the brigade and its subordinate units revealed that the use of FM radio is assumed during training for all types of offensive and defensive maneuvers. Therefore, training in the use of an alternate means of communications is not being accomplished. The training tests which evaluates the brigade and its subordinate units emphasizes "rapidly installing and continuously maintaining"[1] communications. The result is that units can easily pass this portion of the test by using FM radio, consequently for test purposes, there is no incentive for the brigade to train without FM radio.

d. To effectively employ an alternate means of communications for command and control, procedures need to be defined. Results of the test given to the combat arms officers showed that less than half of the officers that have served in a tactical unit had a contingency to deal with loss of radio communications. Also the test established that messenger communications is the most likely to be used when use of FM radio is lost, and the messengers will likely be members of the brigade staff. A SOP which designates the specific personnel and vehicles to be used can be developed before the battle so that when messenger communications have to be employed, its use will be more effective.

---

[1] U.S. Army, Infantry Battalions, ATT 7-15, 8 September 1966, p. 20.

e. Combat arms officers should receive more education concerning command and control communications. The threat to the use of FM radio is not taught at the advanced courses. Advanced course students are not taught about the EW techniques which an enemy can employ to limit our use of radio communications. Also the detrimental effects of EMP are not taught at the advanced courses. There are indications that many officers are not formally educated concerning EMP until they attend CGSC and normally this does not occur until after more than ten years of commissioned service. This fact was supported when the combat arms officers at CGSC were tested. Only 32 percent of those questioned had ever heard of EMP before attending CGSC.

Because the threat to FM radio is clear and present, student officers at the advanced courses should be taught that they may have to command and control a brigade or battalion without using radio communications. Consequently they should concern themselves with learning how the tactics of a maneuver may change when a slower form of command and control communications has to be employed.

f. At brigade, messenger communications is the preferred alternative to FM radio. This conclusion is strongly supported by the results of the test given to the combat arms officers. Ninety-seven percent preferred messenger or communications, whereas only 34 percent indicated a preference for wire communications.

When employing messenger communications, 68 percent of the combat officers indicated that they would use members of their staff rather than the messenger from the brigade's message center.

g. The above conclusions are not limited to a mechanized infantry brigade. The findings and conclusions of this research can be applied to any tactical unit which uses FM radio as its primary means of communications.

RECOMMENDATIONS

The findings and conclusions of this research concern the training and doctrine associated with the communications system at brigade, and, the military education of the officers who employ the system. Consequently, the recommendations for improvement in the areas of training, doctrine and education are directed toward the Training and Doctrine Command of the U.S. Army. It is this command that can initiate the necessary corrective action as they deem appropriate.

The following specific recommendations are offered:

a. In the area of tactical communications doctrine as it applies to the brigade, it is recommended that these additions be included to FM 7-30, The Infantry Brigades and FM 7-20, The Infantry Battalions:

1. Messenger communications be designated as the alternate means of communications and recommend that tactical units take necessary prior action in order to establish a

messenger communications system for command and control purposes.

2. Advice to the commander concerning how the control of tactical maneuvers will be altered if his communications consist of messengers instead of FM radio.

3. Advice to the staff members on how they can best execute their staff duties when the use of FM radio is denied.

4. Estimates of changes in delivery times for messages when messenger service is used rather than FM radio.

b. In the area of officer military education, it is recommended that the combat arms advanced courses add instruction on the following:

1. The fundamentals of command and control of a brigade and battalion using both a primary and alternate means of communications.

2. The phenomenon of EMP and its properties and their impact on tactical communications systems.

3. The vulnerability of FM radio to enemy EW techniques and EMP; and, the resultant requirement for tactical units to be able to communicate without FM radio.

4. The difference in the execution of tactical maneuvers (e.g., attack, exploitation, etc.) when messenger communications is employed rather than FM radio.

c. For unit training, it is recommended that the Army Training and Evaluation programs include the following:

1. Mandatory unit training without the use of FM radio so that units can develop procedures and familiarity in utilizing the alternate communications.

2. When a unit is evaluated, insure that their ability to function while using an alternate to FM radio communications is emphasized.

APPENDIXES

APPENDIX A

COMMUNICATIONS COMMAND POST EXERCISE

INTRODUCTION

You are going to participate in an experiment which is designed to evaluate the command and control communications of a mechanized infantry brigade. Your impressions and opinions will be used to evaluate the brigade's current communications system. A simplified version of the Jayhawk Scenario will be used in this exercise. Your role will be that of the 3d Brigade commander, and you will be asked to respond to several questions during the scenario.

INSTRUCTIONS

a. Please complete the heading of the answer sheet.

b. After the scenario exercise, please complete the short questionnaire which will be issued to you.

Thank you for your time.

APPENDIX B

ANSWER SHEET

Rank _____ Branch _____

Total years commissioned service _____

Years served in tactical unit _____

Number of months in combat zone _____

A1. _____

_____(If not sure, state this.)

A2. _____

_____

A3. Yes No (Circle One)

A4. Yes No (Circle One)

A5. Yes No (Circle One)

A6. Lay Wire Messenger Combination Other (Specify)

_____(Select only one)

A7. Lay Wire Messenger Combination Other (Specify)

_____(Select only one)

APPENDIX C

SUMMARY QUESTIONNAIRE

Rank _____ Branch _____

Q1. There would be some time delay if radio communications are lost and alternate means are employed. Do you feel this delay would be significant enough to change the outcome of a battle?

A1. Yes No (Circle One)

Q2. If your unit were trained in operations without the use of radio, do you feel that loss of radio in a combat situation would change the outcome of the battle?

A2. Yes No (Circle One)

Q3. If you were a brigade S3, would you recommend to the commander that he conduct training without radio communications while your unit is in the field?

A3. Yes No (Circle One)

Q4. Have you ever been in a unit (company or higher) that used wire in the attack?

A4. Yes No (Circle One)

If yes, briefly explain _____

_____

Q5. Have you ever been in a combat situation where you have lost radio communication?

A5. Yes No (Circle One)

Q6. As a brigade CO or S3 in a combat situation where messengers have to be employed, would you use personnel from your staff or personnel from the message center to deliver the messages?

A6. Staff Message Center (Circle One)

Q7. Were you familiar with the phenomenon of electromagnetic pulse and its damage to tactical radios prior to attending CGSC?

A7. Yes No (Circle One)

APPENDIX D

SCENARIO SCRIPT

Your brigade, the 3d Brigade, is in the 52d Division (Mech), which is part of the I (US) Corps. I Corps is currently involved in an offensive operation to secure the Kansas City area from the Aggressor force, which consists of an estimated Combined Arms Army.

The division has been given the following mission. (Refer to Appendix E and Appendix H.) The division operations order has been issued and the concept of execution is as shown. (Refer tp Appendix E.) Your brigade is task-organized into four battalion sized task forces as shown on Chart 2. (Refer to Appendix F.) The concept of operation is as shown. (Refer to Appendix F.) At this time, we will now review the events of the battle. It is not necessary that you know all the details, rather an appreciation of the brigade's role is enough to adequately answer the questions that we will be asking during the scenario. (Refer to Appendix G, explain scenario.)

The battle took approximately eight hours. As you can see from the listing of significant events (Appendix G), you were required to make and execute some key decisions.

It is estimated that you used the frequency modulation (FM) command net for a minimum of 20 messages that were either transmitted or received by you or your primary staff. Examples are messages committing Task Force D, the report on the enemy counterattack against Task Force A, and the enemy air strike on Task Force D.

Questions

Q1. What means of communications would you employ for command and control if you were denied the use of your radio?

I will now review the scenario once more. This time there will be no radio communications and you will have to use the brigade's alternate means of communication.

Q2. What means of communications, other than radio, are provided to the brigade for command and control?

Q3. Do you remember serving in a battalion or brigade size unit that had a contingency SOP to be used if radio communications were denied for a period of time (say 30 minutes)?

The time is now 050530 (H-30 min.). Your unit has just arrived in the assembly area and is making final preparations for the attack. You are aware that you have three wire teams that can lay wire at the rate of 3km/hour.

Q4. Would you employ these teams to lay wire from your CP to each task force as it proceeds to battle?

The attack is continuing after overcoming the moderate resistance at St. Joseph's Church. You now have three task forces in the attack.

Q5. Would you maintain wire communications to all three task forces as they are proceeding to their objectives?

We are now at the point in the scenario where Task Force A and Task Force B are reporting heavy resistance north of CR at UP 225514. (Refer to map at Appendix H.) You decide to commit your reserve.

Q6. What communications means would you employ to transmit your decision to commit the brigade reserve?

The attack has lost its momentum and you have reported to division. Division responds by issuing a frag order with overlay which changes your objectives and boundaries. You have to disseminate this frag order and copies of the overlay.

Q7. What communications means would you employ to disseminate this order and overlay?

APPENDIX E

DIVISION MISSION AND EXECUTION

DIVISION MISSION

Division attacks 050600 November, secures high ground from Hill 1151 to Hill 1132 (Objective 1), the high ground vic Hill 1130 (Objective 2), and southern portion of Pilot Knob Ridge (Objective 3), protects Corps west flank; and prepares to continue attack to south.

EXECUTION

Division attacks with two brigades abreast. Third Brigade makes main attack in west, 1st Brigade in east. Second Brigade, Division Reserve, follows 3d Brigade. Priority of air and artillery fires to 3d Brigade.

APPENDIX F

3D BRIGADE ORGANIZATION AND CONCEPT OF OPERATION

3d Brigade Task Organization

Task Force A

2 Rifle Co (Mech)
1 Tank Co

Task Force B

2 Tank Co
1 Rifle Co (Mech)

Task Force C

2 Tank Co
1 Rifle Co (Mech)

Task Force D

2 Rifle Co (Mech)
1 Tank Co

3d Brigade Concept of Operation

Brigade attacks at 050600 with TF A and TF B abreast to secure OBJ 1. TF C attacks to secure OBJ 2; TF D, brigade reserve, follows TF A. A 30-min conventional artillery preparation will commence at 050535.

APPENDIX G

SIGNIFICANT EVENTS

0600 - Lead elements cross line of departure.

0700 - TF A and TF B report moderate resistance vic St. Joseph Church. Momentum is maintained.

1000 - TF A and TF B encounter stiff enemy resistance at OBJ 1. TF D, Bde reserve, committed.

1005 - TF C, in east, reports enemy retreating from OBJ 2. TF C is in pursuit.

1015 - TF D receives enemy air strike, 20% casualties.

1035 - Enemy catk at OBJ 1 by est two Bn force.

1100 - Catk contained; however, momentum of atk is stopped. Estimated two or three hours before Bde can secure OBJ 1.

1130 - Div decides to commit reserve in 3d Bde zone.

1200 - 3d Bde receives div frag order which changes boundaries and mission.

1400 - 3d Bde accomplishes new mission and reverts to div reserve.

APPENDIX H

NOTE: See attached envelope for maps and overlays.

BIBLIOGRAPHY

BIBLIOGRAPHY

BOOKS

Freud, John E. Modern Elementary Statistics. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 3rd ed., 1967.

Hillier, Fredrick S., and Gerald J. Lieberman. Introduction to Operations Research. San Francisco: Holden-Day Inc., 1967.

Howard, Michael. The Theory and Practice of War. New York: Fredrick A. Praeger, 1967.

Patton, General George S. War As I Knew It. Boston: Houghton, Mifflin Co., 1947.

Yamane, Taro. Statistics, An Introductory Analysis. New York: Harper and Row Publishers, 1967.

PERIODICALS

Arnold, Emmett, "Tactical Communications," Military Review, 28: 86-92, December, 1968.

"Command and Control History," Signal, 20: 55-57, April, 1966.

Gibbs, MG David, "Communications: The Vital Element in Army Command and Control," Data, 11: 29-31, January, 1966.

Kendall, M. W., "Tactics: The Art and Science," Infantry, July-August, 1965, pp. 11-20.

Mellor, James, "The Outlook for Tactical Command and Control," Signal, 22: 26-31, January, 1968.

Owens, Robert G., "Tactical Command and Control Systems," Marine Corps Gazette, October, 1968, pp. 27-32.

Paone, Joseph, "Computerized Automation and The Combat Leader," Infantry, 62: 52-54, May-June, 1972.

Pickett, MG George, "Command and Control and Communications," Signal, 23: 16-19, January, 1969.

Rienzi, MG Thomas M., "Steps to Provide Adequate Command and Control for the 1980's," Signal, 28: 9-10 September, 1973.

Sadler, Charles, "Command and Control, Then, Now, and Later," Tactical Air Warfare Center QTR Rpt. Number 2, March, 1970, pp. 4-13.

Westmoreland, General William, "Communications and Today's Army," Signal, 27: 6-9 September, 1972.

OFFICIAL PUBLICATIONS

Department of Defense, Dictionary of Military and Associated Terms, JCS Publication 1 (The Joint Chiefs of Staff, Washington, D.C.), January, 1972.

Headquarters, 1st Infantry Division (Mech), Exercise Reforger V, After Action Report, Ft. Riley, Ks., 28 January 1974.

Headquarters, VII Corps, Reforger V Final After Action Report, APO 09107, 15 January 1974.

IIT Research Institute, Defense Nuclear Agency's Electromagnetic Pulse Awareness, Notes, (Sponsored by DNA, Washington, D.C., code #2772t), August, 1971.

Ney, Virgil, The Evolution of Military Unit Control, 500BC-1965AD, Combat Operations Research Group, (Sponsored by U.S. Army Combat Developments Command, DA contract no. DA-19-020-AMC-00525X), Technical Operations Incorp., September, 1971.

U.S. Army Command and General Staff College, Catalog of Resident Courses Academic Year 1974-1975., Ft. Leavenworth, Ks., May, 1974.

U.S. Army Command and General Staff College, Electronic Warfare, Reference Book 32-20, Ft. Leavenworth, Ks., July, 1974.

U.S. Army Command and General Staff College, Selected Readings in Tactics, RB 100-2, Volume I, Chapter 1, Ft. Leavenworth, Ks., change 1, June, 1974.

U.S. Army Command and General Staff College, Selected Readings in Tactics, RB 100-2. Volume I, Chapter 15, Ft. Leavenworth, Ks., change 1, July, 1974.

U.S. Army Infantry School, Program of Instruction, Infantry Officers Advanced Course, Fort Benning, Ga., August, 1973.

U.S. Army Signal Center and School, Program of Instruction for Signal Officer Advanced Course., Fort Monmouth, N.J., May, 1971.

U.S. Army, Communications in Armored Infantry and Infantry (Mechanized Division) Field Manual number FM 11-50, Headquarters, Department of Army, Washington, D.C., October, 1972.

U.S. Army, HHC, Infantry Division (Mech) Brigade, Table of Organization and Equipment, TOE 37-42H, November, 1970.

U.S. Army, The Infantry Battalion, Army Training Test no. ATP 7-15, Headquarters Department of Army, Washington, D.C., September, 1966.

U.S. Army, The Infantry Battalions, Field Manual no. FM 7-20, Headquarters, Department of Army, Washington, D.C., March, 1969.

U.S. Army, Infantry, Mechanized Infantry Battalions and Brigades, Army Training Program no. ATP 7-15, Headquarters Department of Army, Washington, D.C., April, 1968.

U.S. Army, Tactical Communications Doctrine, Field Manual no. FM 24-1, Headquarters, Department of Army, Washington, D.C., April, 1968.