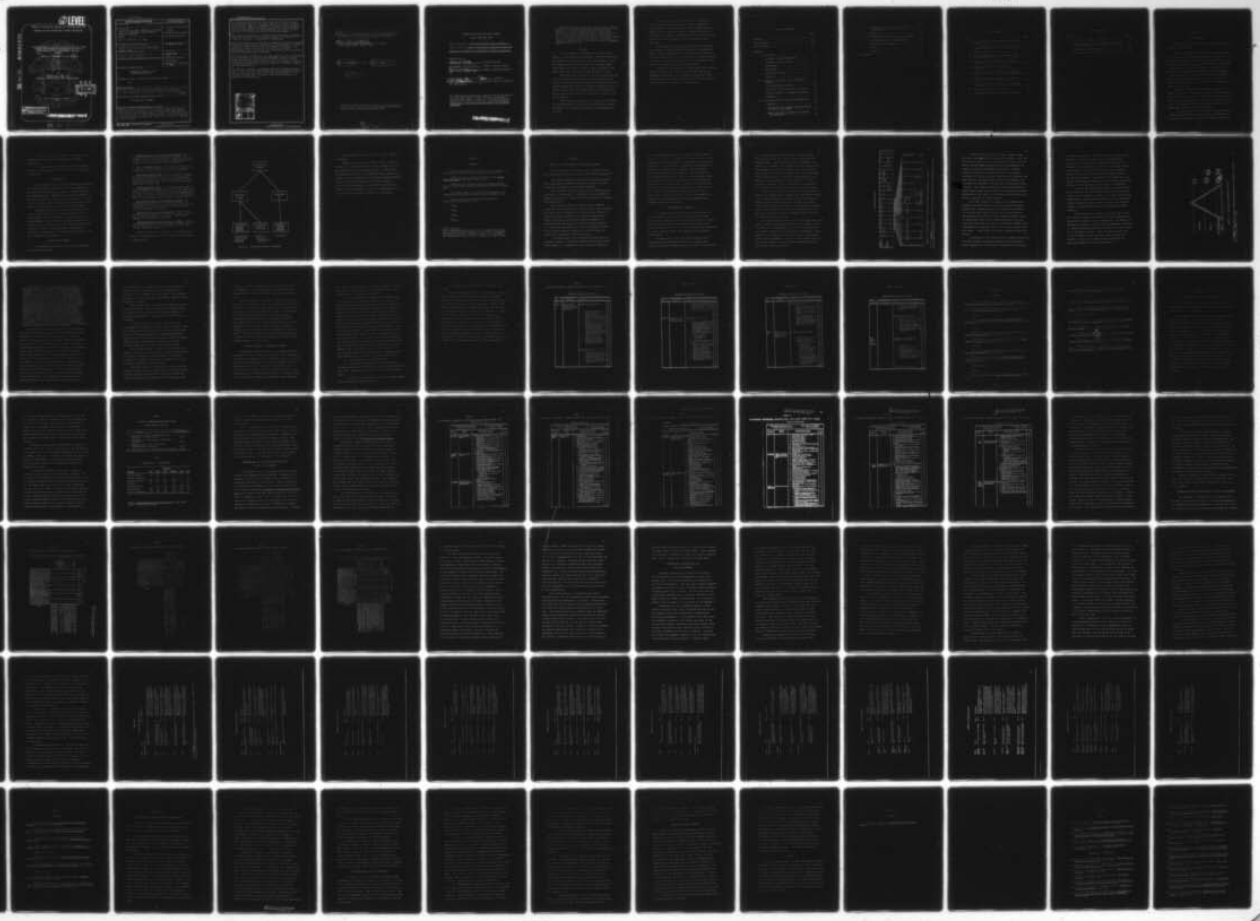
AD-A061 839 ARMY COMMAND AND GENERAL STAFF COLL FORT LEAVENWORTH KANS F/G 17/4
IMPACT OF ELECTRONIC WARFARE ON TACTICAL PLANS AND TRAINING OF --ETC(U)
JUN 78 J M BROGDON

UNCLASSIFIED NL

1 OF 2
AD A061839



LEVEL II

IMPACT OF ELECTRONIC WARFARE ON TACTICAL PLANS AND TRAINING OF THE MECHANIZED INFANTRY BATTALION

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

MASTER OF MILITARY ART AND SCIENCE

by

JIM BROGDON, MAJ, USA
B.F.A., Oklahoma State University, 1964

Fort Leavenworth, Kansas
1978

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) IMPACT OF ELECTRONIC WARFARE ON TACTICAL PLANS AND TRAINING OF THE MECHANIZED INFANTRY BATTALION		5. TYPE OF REPORT & PERIOD COVERED FINAL 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) JAMES M. BROGDON, II., MAJ.		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Student at the U.S. Army Command and General Staff College, Ft. Leavenworth, Kansas 66027		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Command & General Staff College ATTN: ATSW-SE		12. REPORT DATE 9 June 1978 13. NUMBER OF PAGES 95
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release;
distribution unlimited.

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

N/A

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, KS 66027

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

EW PLANS AND TRAINING

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

The next battle is envisioned as a short, violent conflict of unprecedented destruction. The 1973 Middle East War rendered a vivid insight to that battlefield. To meet the challenges of the next battle, the U.S. Army began publishing a new series of "How to Fight" manuals in 1976 which address the doctrine of fighting future battles.

OVER →

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

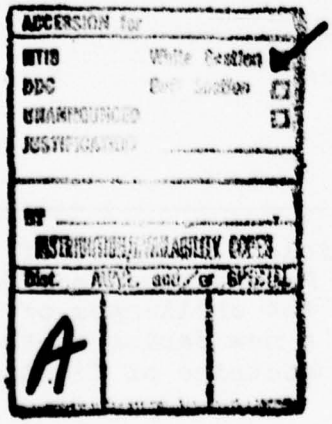
This study was initiated by a perceived shortfall in doctrine; that being a failure to adequately address the impact of electronic warfare (EW) on the maneuver battalion. Threat capabilities have been adequately documented, and the "Battle Captain" has been warned about the EW environment, but he has not been told how to effectively operate in the EW environment.

This thesis was conducted to determine the EW impact on tactical plans and training of the mechanized infantry battalion and to recommend solutions to shortcomings discovered.

Existing literature was examined to establish the present training preparation versus threat capabilities. Field manuals, training circulars, TRADOC publications, and Command and General Staff College materials were used as the basis for research. Additionally, after action reports, field notes, and periodicals provided excellent source material.

The conclusions derived from the study indicate that the EW impact on the battalion is awesome, but manageable. Many of todays problems result from decisions and events of the past decade; still other portions have developed and will continue to develop from actions of the Soviet Union to improve its already significant EW capabilities.

The only units capable of accomplishing their assigned missions will be those who have been trained and led by commanders operating in an environment where EW was fully integrated into the tactical plan and where latitude, trust, and confidence are extended to subordinates.



(6) Impact of Electronic Warfare on Tactical Plans and Training of the Mechanized Infantry Battalion,

(10) James M. Brogdon, MAJ, USA
U.S. Army Command and General Staff College
Fort Leavenworth, Kansas 66027

(9) Final Report, 9 June 1978

(11) 9 Jun 78

(12) 98 p'

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

MASTER OF MILITARY ART AND SCIENCE

THESIS APPROVAL PAGE

Name of candidate James M. Brogdon, Major, Infantry

Title of thesis Impact of Electronic Warfare on Tactical Plans and Training of the Mechanized Infantry Battalion

Approved by:

________________, Research Advisor

________________, Member, Graduate Faculty

________________, Member, Consulting Faculty

Accepted this 1st day of June 1978 by ________________, Director, Master of Military Art and Science.

The opinions and conclusions expressed herein are those of the individual student author and do not necessarily represent the views of either the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

~~78 08 24 017~~

"The high levels of electronic warfare on the modern battlefield will make command and control difficult. The leader's job will be harder because it will be more difficult for him to communicate with those with whom he has to talk to get on with the battle. Good, sound training is the only thing that can keep an outfit moving--doing its job when command and control is difficult. (Source: Donn A. Starry, "Sergeants' Business," Military Review, May 1978, p. 5."

ABSTRACT

The next battle is envisioned as a short, violent conflict of unprecedented destruction. The 1973 Middle East War rendered a vivid insight to that battlefield. To meet the challenges of the next battle, the U.S. Army began publishing a new series of "How to Fight" manuals in 1976 which address the doctrine of fighting future battles.

This study was initiated by a perceived shortfall in doctrine; that being a failure to adequately address the impact of electronic warfare (EW) on the maneuver battalion. Threat capabilities have been adequately documented, and the "Battle Captain" has been warned about the EW environment, but he has not been told how to effectively operate in the EW environment.

This thesis was conducted to determine the EW impact on tactical plans and training of the mechanized infantry battalion and to recommend solutions to shortcomings discovered.

Existing literature was examined to establish the present training preparation versus threat capabilities. Field manuals, training circulars, TRADOC publications, and Command and General Staff College materials were used as the basis for research. Additionally, after action reports, field notes, and periodicals provided excellent source material.

The conclusions derived from the study indicate that the EW impact on the battalion is awesome, but manageable. Many of todays problems result from decisions and events of the past decade; still other portions have developed and will continue to develop from actions of the Soviet Union to improve its already significant EW capabilities.

The only units capable of accomplishing their assigned missions will be those who have been trained and led by commanders operating in an environment where EW was fully integrated into the tactical plan and where latitude, trust, and confidence are extended to subordinates.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

THE PROBLEM

"Congress can make a officer, but only communications can make a commander."[1]

Recent U.S. Army publications have addressed a new basic concept of the Army's primary mission, winning the land battle. Field Manual (FM) 100-5 the capstone manual for the U.S. Army, and numerous other new FMs provide an elaboration of "How to Fight" the next land war. Our success in this war will depend on timely assessments within the dynamics of a violent battlefield, continuous updating of information, and effective command and control of our forces through a positive communications system to effect a successful combined arms operation.

A battle in Central Europe against forces of the Warsaw Pact will be an extremely demanding mission, particularly in view of the impact of enemy EW on command and control. Little preparational doctrine has been established as to how the mechanized infantry battalion commander exercises command and control in the EW environment.

This thesis will identify problems in EW, propose and evaluate alternative solutions, and offer recommendations concerning training and techniques in command, control and

communication(C^3) to enhance the battalion commander's mission accomplishment in the European Theater of Operations.

ELECTRONIC WARFARE BACKGROUND

Training centers of the U.S. Army provide sources of combat development and doctrine to commanders and their staffs to enhance battlefield preparation and awareness. Estimates of the enemy capabilities have become an integral part of this preparation. Army doctrine has addressed all aspects of the Warsaw Pact's radioelectronic combat (REC) capability and its ability to severely degrade our radar and communication links. Estimates of enemy electronic warfare support measures (ESM) and electronic counter measures (ECM) effectiveness vary, but figures as high as 73 percent effectiveness have been projected against our current systems.[2] Army publications and training programs from our training centers address only the enemy threat and approved radio telephone procedures. Current training programs do not demand new operational requirements of the commander and staff nor do they provide clear answers as to how the commander will command and control his unit while operating in this intense EW environment.

Operations on the modern battlefield will be conducted by highly mobile task force organizations carefully developed to provide the optimum in combat effectiveness. This organization will consist of nonorganic elements cross-attached

to capitalize on unique capabilities or as a thickening force. This cross-attachment places an additional training burden on training centers. Standard training techniques and tactics are essential for each combat arm. The Commander and all subordinates must "see the battle" and communicate directives and reports efficiently in this highly complex and rapid environment.

STATEMENT OF THE PROBLEM

This investigation identifies and describes the impact of EW on the mechanized infantry battalion's plans and training in preparation for tactical requirements, and recommends courses of action.

The investigation is limited to the study of the mechanized infantry battalion in the European mid-to-high intensity environment and the EW doctrine available to the commander and his staff. The study will provide documentation to assist the commander by enumerating essential C^3 considerations for unit plans and training.

ASSUMPTIONS

The impact of EW on plans and training is a very complex question. A complete investigation would be beyond the scope of this thesis; therefore, in order to simplify the analysis three assumptions are made:

a. The conflict will be of short duration.

b. Soviet Doctrine is reflected in the writing of contemporary Soviet military scholars and equipment capabilities.

c. Organization and equipment currently available to both friendly and enemy forces will be used throughout the conflict.

METHODOLOGY

Existing EW literature has been examined to establish the present training preparation vs. threat capabilities. Nonclassified field manuals, training circulars, Training and Doctrine Command (TRADOC) publications, and Command and General Staff College publications have been used as a basis for the research. Additionally, afteraction reports, field notes, and periodicals have provided source material.

Informal interviews were also conducted with five allied student officers of the 1978 Command and General Staff College class to determine their perceptions of the EW environment. Three of these five allied officers had combat experience relating directly to EW, and all had considerable training in communications problemsolving. Techniques, tactics, and unique organizations unique to the EW environment were discussed.

DEFINITION OF TERMS

The following definitions of terms are taken from U.S. Army Publications:

Command, Control and Communications (C^3). Term used to express the system within a unit to provide the commander control and coordination integration in which to see the battle, plan, and execute combat missions by communicating decisions and updating reports.[3]

Electromagnetic Energy. That energy pertaining to the combined electric and magnetic fields associated with radiations or with movements of charged particles.[4]

Electronic Warfare (EW). Military action involving the use of electromagnetic energy to determine, exploit, reduce, or prevent hostile use of the electromagnetic spectrum and action which retains friendly use of the electromagnetic spectrum. EW is divided into electronic combat and defensive EW.[5]

Electronic Combat (EC). The primary role of EW is EC. It provides the measures to discover and locate the source of enemy electromagnetic energy and to take action to reduce or deny the enemy's use of the electromagnetic spectrum. Two major subdivisions of EC are Electronic Warfare Support Measures and Electronic Counter Measures.[6]

Electronic Warfare Support Measures (ESM). The actions taken to search for, intercept, locate, and immediately identify radiated electromagnetic energy for the purpose of immediate threat recognition and the tactical employment of forces.[7]

Electronic Counter Measures (ECM). ECM are those actions taken to prevent or reduce the enemy's effective use of the electromagnetic spectrum. ECM includes jamming and electronic deception.[8]

Electronic Counter-Counter Measures (ECCM). ECCM is the defensive aspect of EW and includes actions taken to insure friendly use of the electromagnetic spectrum against electronic warfare.[9]

Figure 1 provides a schematic of the EW functions to enhance the understanding of this phenomenon as an element of combat power.

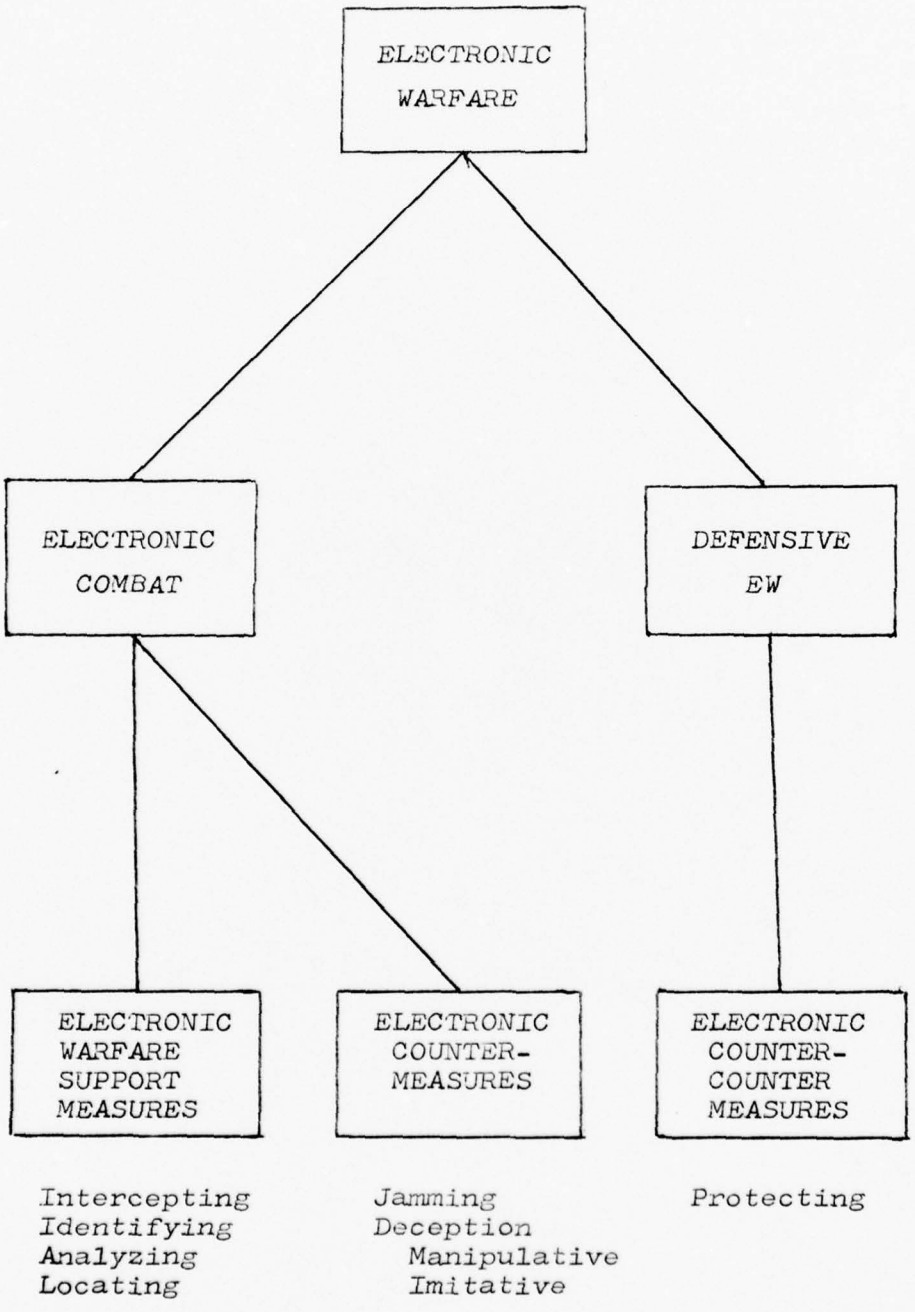


Figure 1. Electronic Warfare Components

The remaining chapters of this thesis are organized as follows:

Chapter II, Review of the EW Literature, traces the current documentation rendering official guidance, tactics and techniques to the battalion commander. Chapter III, Operational Alternatives in an EW Environment, presents the findings of the investigation and identifies shortcomings of present doctrine and alternatives for consideration. Chapter IV, Recommendations for EW Doctrine and Tactics, develops specific measures to reduce the vulnerability of the United States mechanized infantry to EW actions.

CHAPTER I

ENDNOTES

[1]Omar Bradley, (Comment made during guest lecture at the Command and General Staff College), 27 April 1966.

[2]Department of the Army Field Manual 24-1, Combat Communications, 30 September 1976, p. M-1.

[3]Department of the Army Training Circular 100-33, Tactics of Electronic Warfare (Coordinating Draft), December 1977.

[4]U.S. Army Command and General Staff College, the Commander and His Staff, Subcourse P111, 8L7-1773, p. 48.

[5]Department of the Army Field Manual 100-5, Operations, 1 July 1976, p. 9-2.

[6]Ibid.

[7]Ibid.

[8]Ibid.

[9]Ibid.

NOTE: Although grammatically correct, communications and communication are used throughout the thesis. The author has used the terms in a manner to which it is perceived most appropriate in the context in which the term is used.

CHAPTER II

REVIEW OF THE LITERATURE ON ELECTRONIC WARFARE

"Once flexibility is destroyed, or is negated in any way, the successful outcome of the battle becomes endangered."[1]

This chapter examines the potential electronic warfare threat and traces the current literature related to EW and C^3 guidance available to the battalion commander.

John W. Beaver has said, "The nature of combat and the variations in terrain make it difficult for the commander to maintain control, alter plans, and take advantage of a weakened enemy situation."[2]

This control problem has been partially overcome through the use of tactical net (voice) radio. These tactical nets have provided commanders with accurate and concise information on enemy movements, and friendly dispositions. Timely reporting on tactical nets allows commanders to maneuver forces and bring fire to bear on enemy positions with both speed and efficiency. FM radio allows the mechanized infantry battalion commander to control forces in excess of 18 kilometers from his position.

In Vietnam radios were plentiful and operations were performed against a relatively unsophisticated enemy without an EW capability. Commanders at all levels were provided

with excellent communication links allowing them to monitor subordinate operations. Commanders frequently operated from command and control helicopters allowing them to scrutinize minute aspects of the battle. Guidance was quickly given to subordinate commands as the commander observed opposing forces maneuvering on the battlefield. The result was almost a sandtable exercise.[3] This type of battlefield condition fostered high level decisions and rapid deployment of subordinate units working under a guidance rich environment. Tactical and logistical decisions were often shared with, if not removed from subordinate commanders, in an effort to allow them to "fight the battle." In this environment the control of operations depended upon oral communication, primarily tactical voice radios.

ELECTROMAGNETIC SPECTRUM

The interwoven relationship between tactics and the use of electronics on the modern battlefield has become second nature. Almost unnoticed, electronics and our resulting dependence on them have become intrinsic parts of our doctrine and tactics. As the use of electronics has increased, so has our ability to meet the imperatives of the modern battlefield.[4]

The World War II U.S. division was equipped with approximately 1,200 electronic emitters, including both communications and noncommunications equipment.[5] Since World

War II technological improvements have enhanced combat effectiveness through electronic target acquisition and, weapons guidance systems and faster, more reliable, communications equipment. For example, an armor battalion has 149 FM radios and requires 7 FM radio nets for operation under current doctrine. The armored division has 2,691 FM radios, 162 AM radios, 59 VHF multichannel radios, and 54 radars--a total of 2,966 electronic emitters.[6] Figure 2 provides a schematic of the electromagnetic spectrum and the position of tactical radio emitters in the spectrum.

Electronic devices of all types have been devised to provide the commander with communications and target acquisition. Ground surveillance radars, side looking airborne radars, standoff target acquisition systems and counter-mortar radar are but a few examples of intelligence oriented devices. Air defense systems are also powerful sources of electronic emissions. Within the HAWK Battalion there are six distinctive types of radars.

Air space management also has its own unique electronic radars: ground control approach, navigation beam, and area surveillance. Such management is essential in controlling the numerous aircraft in a mid-intensity environment. Since World War II electro-optics have also become an essential part of target engagement: infrared night sighting devices, laser range finders and laser target designators are but a few of these sighting devices.

ELECTROMAGNETIC SPECTRUM

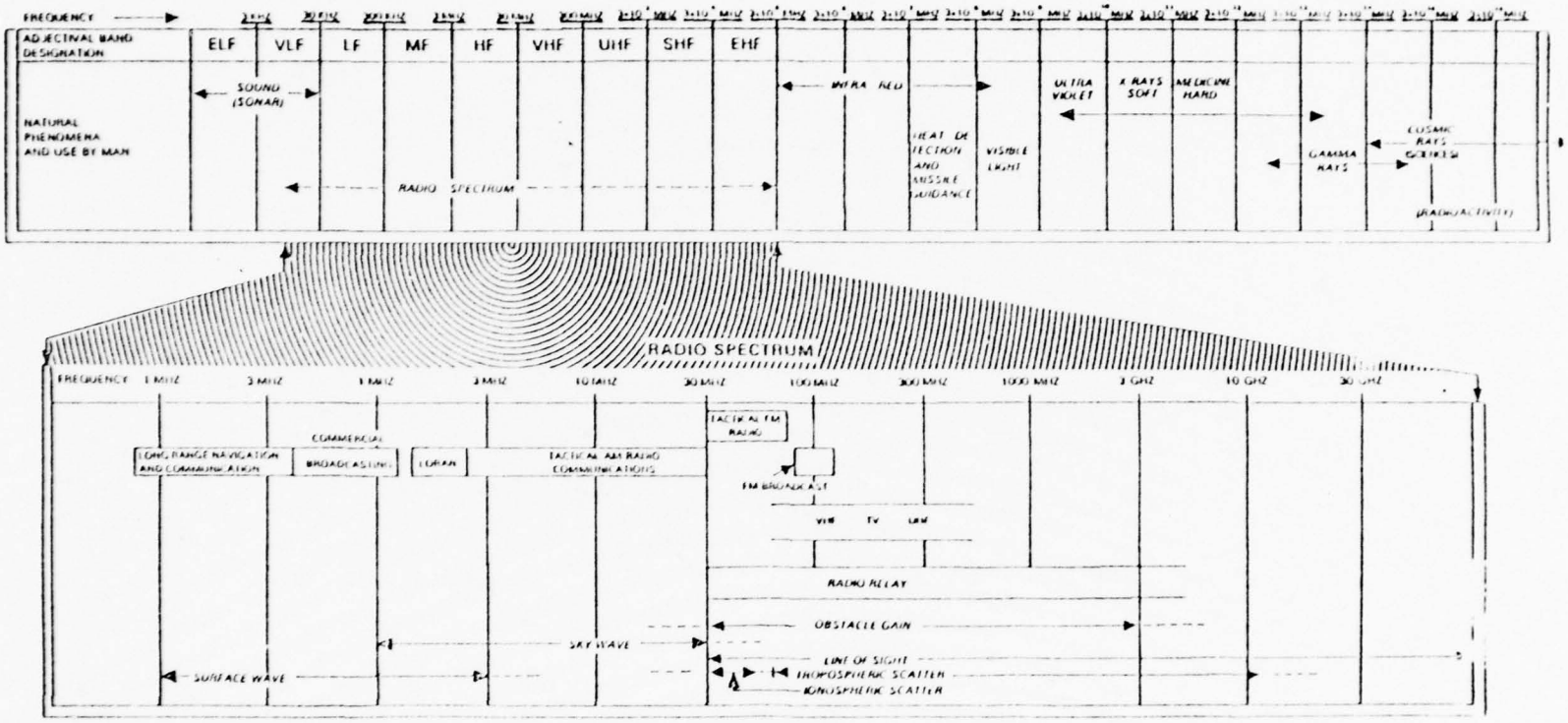


Figure 2. Electromagnetic Spectrum and Army C-E Equipment Interface

SOURCE: Department of the Army Field Manual 24-1, Combat Communications, 30 September 1976, p. R-1.

Dependence on electronics has also created vulnerabilities which are only now being fully realized. Each combat essential emitter is function specific; that is, it has highly distinguishable characteristics discernible by the trained electronics intelligence specialist. Through "finger printing," the trained electronic intelligence specialist can listen to various emissions and determine the type emitter, age, maintenance, method of employment, the attachment of nonorganic emitters, and associations between emitters. This finger printing can confirm information of enemy dispositions, command posts and subordinate locations. Comparison of this data with the enemy order of battle will all but construct the enemy overlay.

The large increase in ground and air communication equipment in combat units in recent years causes concern because only a small portion of the spectrum is suitable for tactical radio communication. The usable portion is further limited because each radio channel occupies a band of frequencies rather than a single frequency, e.g., the continuous wave radio and radio teletypewriter signals occupy approximately 1 kilocycle (KC) of the spectrum, while an AM voice char uses 10 KC, and FM voice channels occupy 50 to 100 KC.

In addition to the spectrum space actually occupied by the radio signal, additional separation between adjacent radio channels must be provided to minimize the possibility

of mutual interference.[7] If all radio sets within a given unit were to attempt to operate on any frequency they desired, radio communication would become extremely impractical if not impossible. When two or more radio transmitters operate at the same time on the same frequency, a jumble of distorted and unintelligible signals occurs at the receiving station.[8] Interference can easily occur, but through the frequency management of a net control monitoring station, this interference can be diluted or eliminated.

To reduce the confusion that would be present without strict controls, the theater Army signal officer exercises control of the frequency spectrum. At division the Division Signal Officer (DSO) assigns frequencies to each mechanized infantry battalion. Care is given to insure that adequate distance is provided between units operating on the same frequency.

The allocation of available frequencies must insure that stations requiring the longest or most dependable communication are granted the best frequencies. In making this assignment propagation charts should be consulted frequently to consider changing atmospheric conditions and their effect on the frequency spectrum. Those frequencies considered the most capable of long range are called discreet frequencies. Shared and non-interfering frequencies are generally assigned as indicated in Figure 3.

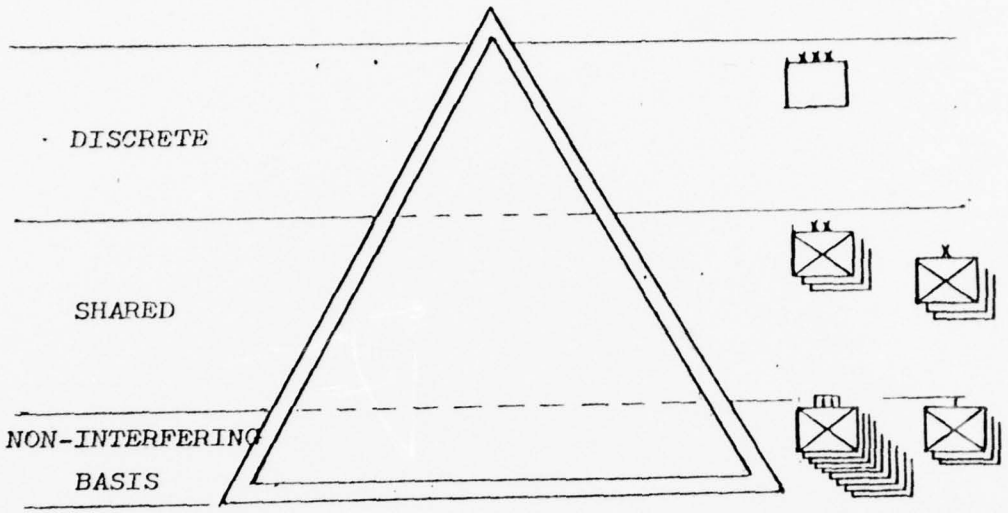


Figure 3. Frequency Assignment Pyramid

SOURCE: HQ TRADOC, Combat Communications (Systems Study), Ft. Monroe, VA., 1 April 1977, p. II-19.

THE SOVIET THREAT AND RELATED ACTIONS

The U.S. Army's concern with electronic warfare has increased greatly since the 1973 Mid-East War where both belligerents made extensive use of electronic warfare.[9] Their experience suggest that U.S. Army units will not have the opportunity to operate as they did during the Vietnam era.

Radioelectronic combat is a term used by Soviet model forces to indicate the integration of signals intelligence, jamming, deception, and suppressive fire to deprive an adversary of command and control in combat.[10] The enemy is aware of our dependence on communication and will target against our fire support and tactical command and control nets. Warsaw Pact doctrine states that jamming or destructive firepower should neutralize or destroy at least 50 percent of enemy command and control capability.[11]

In locating U.S. electronic emitters, the enemy will employ direction finding in conjunction with other information to provide targets for enemy suppressive fires and jamming. Direction finding of radio transmitters is not precise. The enemy's suppressive artillery fires will usually not be fired at locations provided only by direction finding.[12] Figure 4 denotes the impact of threat force direction finding.

The best summary of the Soviet view on electronic warfare is that of Marshal Vasili D. Sokolovskiy:[13]

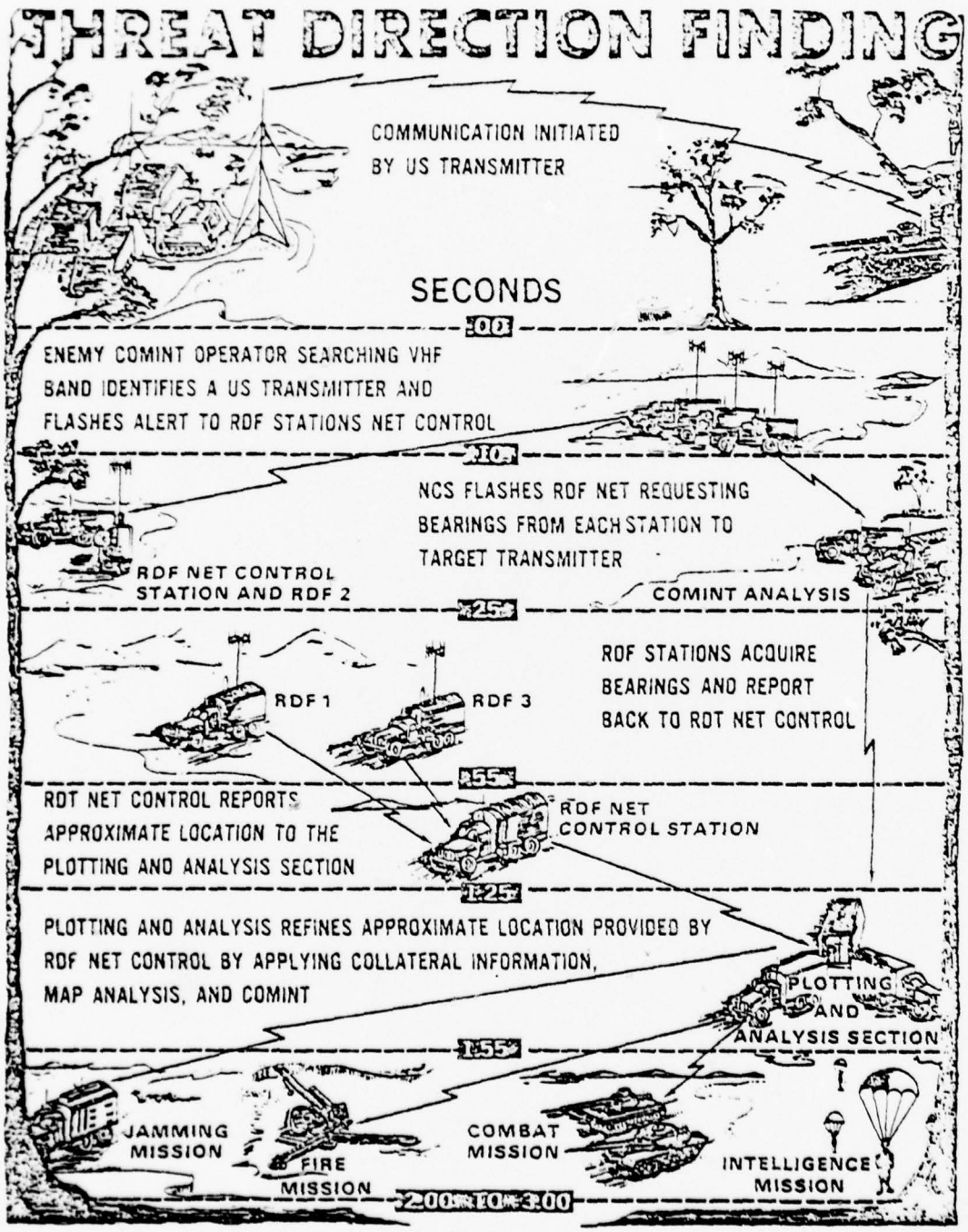


Figure 4. Threat Direction Finding

SOURCE: Department of the Army, TRADOC Threat Handbook, "Battlefield Survival and Radio Electronic Combat," January 1977.

> The widespread use of radio-electronic equipment in all fields poses a difficult problem concerning the (frequency spectrum battle). The problem is how best to prohibit or decrease the effectiveness of the enemy's radio-electronic systems and at the same time, how to insure the successful use of one's own equipment. One of the main aims is to disrupt the enemy's control over his own troops and weapons by active radio interference and the destruction of his most important radio systems. This includes demolishing or interfering with the enemy's electronic equipment installed in aircraft or missiles; preventing the enemy's use of electronic equipment for aerial detection, mavigation, bombing, and missile guidance; and disrupting the operation of the enemy's ground-based electronic apparatus used for commanding troops. This list alone shows the great extent to which electronic counter-measures, and protection from electronic countermeasures of the enemy can be used; it shows how serious their consequences can be. The development of electronics is, at the present time, as significant as the development of nuclear missiles which, incidentally, cannot be used without electronic equipment.

The possibility of being deprived of its electronics has caused the U.S. Army to consider new organizations and equipment in which are now in field tests. If adapted, these new organizations will be fielded during the mid-1980s. The recent how to fight manuals have indicated a number of immediately available survivability techniques for commanders, staffs and individual soldiers in conducting the battle. During sharp fighting the battalion commander operates well forward and positions himself in the most critical area of the battle. He is normally accompanied by a small mobile tactical command group, austere in personnel and equipment.[14] The tactical CP must be prepared to move rapidly whenever necessary, possibly every two or three hours or after long radio transmissions. The commander should impose radio listening silence where appropriate and demand person to

person contact.[15] The commander must see the battle and maintain positive communication with subordinates and superiors through whatever means available. This communication will be the prime factor that solves problems caused by limited resources.

Main command posts must also be carefully positioned to elude detection. Towns, basements, and tunnels should be considered as possible CP sites; all CPs should be adequately camouflaged.[16] The main CP must move daily as a minimum.

To avoid detection the radio should not be the primary means of communication until contact is made. When brief transmissions are required they should use low power settings with terrain masking and directional antennas should be used.[17] For main CPs, antennas should be remoted 1,000 meters or further away to compensate for enemy artillery called by direction finding computations.

All personnel should be trained to efficiently use radios in an EW environment; FM 71-2 states that all personnel should be trained to send and receive five second messages.[18] Redundant communication systems must be used to enhance battlefield survivability.[19]

Alternate methods of communications once considered tedious are now essential considerations in all operations. Detailed planning and preparation before the battle will insure that all means available have been considered and

employed. The use of audio, visual, messenger, wire and electro-optics or their combination will provide positive communications within each inherent capability and limitation.

Who will fight the next battle? FM 100-5 states that within the battalion task force the subordinate leaders will make many of the decisions and carry on the fight as they interpret the battalion commander's guidance. Control will be decentralized with reliance on standing operating procedures and the initiative of subordinate leaders.[20] Subordinates must use initiative and have latitude from the commander to do so. There should be strong feelings of mutual trust and confidence, and a management by exception rule.[21] Standing operating procedures, detailed planning, a checklist habit and command guidance will assist the subordinate leader in his decisions.

CURRENT TRAINING IN COMMAND AND CONTROL

Commanders control their units in training exercises primarily with voice commands over FM radio nets. Characteristically, the commander directs subordinate units by actions and orders, but when given by radio the commander stresses important aspects of the order by the inflection of his voice; there is no doubt as to his intent or desires. This personal touch in communication as well as its inherent speed is the reason why virtually all commanders become dismayed

when communication is lost, even for short periods. Current U.S. Army doctrine reinforces dependence upon voice radio communications for command and control.[22]

The excellent level of communication present within the normal training environment will not be present on a highly mobile battlefield. Mutual interference will be the greatest adversary of effective communication. Studies of FM radio densities on heavy cross-attachment of units in Europe predict that with the current communication electronics operating instructions (CEOI) over 90 percent of the FM nets could experience mutual interference at the time when clear nets are required to fight effectively.[23] This interference presents devasting effects on rapid task force cross-attachment and movement to thickening positions in the active defense. If this same degree of electromagnetic disturbances were active against a mechanized infantry task force undergoing the Army Training and Evaluation Program (ARTEP) 71-2, the commander would be hard pressed to successfully complete the standards of the "Command Group/ Staff Module" which state that the command group must:

a. See and interpret the battlefield.

b. Control and coordinate the battalion and all available combat power multipliers to bring maximum aggressive and violent combat power to bear at the decisive time and place.

c. Maximize the probability of mission accomplishment while minimizing friendly casualties.

d. Control and coordinate with a minimum of confusion.

Operationally, ARTEP 71-2 is a significantly improved document from earlier training and evaluation programs; however, it fails to portray desired training levels to meet the enigma manifested by the EW environment. Table 1 from Chapter IX, Appendix 2 of ARTEP 71-2 depicts the training and evaluation outlines upon which the evaluation is conducted. Evaluation begins when ECM is used against the evaluated unit, and terminates when ECM ceases. However, it only relates to actions of the radar and radio telephone operator when subjected to electromagnetic disturbance; and, does not evaluate the unit's overall proficiency based on staff coordination, planning and unit standing operating procedures. Suggestions for improving the ARTEP are presented in Chapter III, EW Operational and Training Alternatives.

TABLE 1

CURRENT MECHANIZED INFANTRY/TANK TASK FORCE ARTEP 71-2

TRAINING AND EVALUATION OUTLINE

UNIT: TANK AND MECHANIZED INFANTRY MISSION: OPERATE IN AN EW ENVIRONMENT

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
9-2-A Use correct ECCM.	Attempts are being made by the opposing force to intercept and locate by DF a transmitting radio and/or radar station.	Radio operators prevent or reduce opposing force intercept and DF by: (1) Using the lowest power setting needed to communicate with desired station(s). (2) Using correct radiotelephone procedures IAW ACP 125. (3) Keeping all transmissions as short as possible and avoiding excessive operator chatter, such as radio checks. (4) Using directional antenna, when practical. (5) Selecting an antenna which reduces the possibility of transmitting beyond desired range. (6) Positioning radio so that natural or manmade obstacles block transmissions from suspected opposing force locations. (7) Remoting radio away from friendly locations and selecting a remote site that uses natural or manmade obstacles to block transmissions from the opposing force. (8) Correctly using NSA-approved codes. (9) Correctly changing radio frequencies IAW time period instructions for the CEOI. (10) Operating on a random schedule. (11) Using an alternate means of communication when reasonably available and reliable. Radar operators prevent or reduce opposing force intercept and DF by: (1) Turning radar equipment on only when necessary or as directed. (2) Positioning the radar so that side and back lobes can be absorbed or reduced by foliage or terrain. (3) Using dummy antennas during maintenance tuning and testing. (4) Correctly orienting radar antennas away from opposing force areas during maintenance, tuning, and testing.		

TABLE 1 (Cont)

TRAINING AND EVALUATION OUTLINE

UNIT: TANK AND MECHANIZED INFANTRY MISSION: OPERATE IN AN EW ENVIRONMENT

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
		(5) When equipment permits, correctly changing frequency and pulse repetition rate in a random manner or IAW instructions. (6) Changing frequencies only when the radar is turned off. (7) Operating on a random schedule.		
9-2-8 Use correct ECCM.	Attempts are being made by the opposing force to jam a radio and/or radar receiver.	Radio operators reduce the effects of jamming by: (1) Recognizing the difference between opposing force jamming and friendly interference. Disconnect the radio antenna. If interference continues, operator should suspect radio malfunction. If the interference stops, operator should suspect opposing force jamming. (2) Using operator radiotelephone techniques in an attempt to work through the jamming; i.e., by: (a) Saying words twice. (b) Spelling out words. (c) Slowing down your transmission. (3) Increasing power when possible. (4) Not acknowledging jamming in the clear. (5) Repositioning radio/antenna to get natural or manmade obstacles between the receiver and suspected opposing force jammer. (6) Using an alternate means of communication when reasonably available and reliable. (7) Using a directional antenna to concentrate more transmitting power toward a distant receiver. (8) Remoting the radio to mask the antenna from opposing force jamming signals when practical. (9) Operating on a random schedule. (10) Changing frequency as a last resort after other techniques have been ineffective.		

TABLE 1 (Cont)

TRAINING AND EVALUATION OUTLINE

UNIT: TANK AND MECHANIZED INFANTRY MISSION: OPERATE IN AN EW ENVIRONMENT

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
		Radar operators reduce the effects of opposing force jamming by: (1) Continuing to operate on the same frequency, if possible. (2) Changing location of antenna to decrease opposing force jamming attempt. (3) Continuing to watch for targets, especially in the area of the suspected opposing force jamming location. (4) Observing the edge of the jamming sector; targets may appear out-side the jammed area and be visible on the scope. (5) Changing to alternate frequency after other techniques have been ineffective and IAW authorized instructions. (6) Operating on a random schedule.		
9-2-C Use correct ECCM.	Attempts are being made by the opposing force to enter a radio net and/or radar frequency to deceive operators.	Radio operators reduce the effects of opposing force deception attempts by: (1) Not acknowledging communications deception in the clear. (2) Correctly using operations codes/brevity lists. (3) Requesting authentication when: (a) Imitative deception is suspected. (b) Calling station self-authenticates, i.e., sends both the challenge and reply to that callenge. (c) An unknown or new station enters the radio net. (4) Reissuing a challenge when: (a) Answering station gives an incorrect reply to challenge. (b) The answering station is prepared to authenticate but takes more than ten seconds to reply to the challenge. (c) The answering station's reply is correct and you still suspect a fraudulent transmission.		

TABLE 1 (Cont)

TRAINING AND EVALUATION OUTLINE

UNIT: TANK AND MECHANIZED INFANTRY MISSION: OPERATE IN AN EW ENVIRONMENT

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
		(5) Correctly counter-challenging a station who has challenged when you suspect imitative deception. (6) Using secure equipment when possible.		
		Radar operators reduce the effects of opposing force deception attempts by:		
		(1) Recognizing a false pulse on the scope. (2) Using highest possible scan speed in those radars so equipped. (3) Using narrowest possible sector width without reducing coverage. (4) Changing frequency as a last resort after other techniques have been ineffective. (5) Changing the pulse repetition rate in those radars having this capability.		
9-2-9 Report opposing force jamming and deception attempts.		The radio and/or radar operator's report pertaining to jamming and deception should contain as a minimum:		
		(1) Operator's unit. (2) Date and time of jamming and/or deception. (3) Operator's location. (4) Operator's radio or radar frequency affected. (5) Type of jamming/deception signal (in general terms). (6) Effectiveness of jamming signal or deception. (7) Any additional information the operator feels may be essential to further clarify the report.		
		NOTE: TAB A next page contains *suggested* support requirements.		

CHAPTER II

ENDNOTES

[1]B. C. Montgomery, "High Command in War," Brief Notes for Senior Officers on Conduct of Battle, December 1942.

[2]John W. Beaver, "Tactical Radio, Threats and Alternative," The Army Communicator, Fall 1977, p. 37.

[3]Ibid.

[4]C. S. Simerly, The Electronic Warfare System, Command and General Staff Lesson Plan, P111-7/8, April 1977, p. LP 7-21.

[5]Ibid.

[6]Beaver, "Tactical Radio, Threats and Alternative," The Army Communicator, Fall 1977, p. 38.

[7]Department of the Army Field Manual 24-18, Field Radio Techniques, July 1965, p. 123.

[8]Ibid.

[9]Beaver, "Tactical Radio, Threats and Alternative," The Army Communicator, Fall 1977, p. 39.

[10]Department of the Army, TRADOC Threat Handbook, "Battlefield Survival and Radio Electronic Combat," January 1977, p. 9.

[11]Ibid., p. 9.

[12]Ibid.

[13]V. D. Sokolovskiy, Soviet Military Strategy, 1975, p. 244.

[14]Department of the Army Field Manual 71-100, Brigade and Division Operations, May 1977, p. 2-6.

[15]Ibid., p. 2-15.

[16]Department of the Army Field Manual FM 101-5, Command and Control of Combat Operations, July 1977, p. 2-2.

[17]Department of the Army Command and General Staff College, The Tank and Mechanized Infantry Battalion Task Force, 20 June 1977, p. A-6 to A-9.

[18]Ibid., p. 6-17.

[19]Department of the Army Field Manual 101-5, Command and Control of Combat Operations, July 1977, p. 2-3.

[20]Department of the Army Field Manual 24-1, Combat Communications, 30 September 1976, p. 5-21.

[21]Department of the Army Field Manual 101-5, Command and Control of Combat Operations, July 1977, p. 3-3.

[22]Department of the Army Field Manual 11-50, Combat Communications Within the Division, 31 March 1977, p. 1-ii.

[23]Department of the Army Command and General Staff College RB 100-15 (DRAFT), Concept of Control and Coordination of Corps Operations, 10 September 1977, p. 6-4.

CHAPTER III

EW OPERATIONAL AND TRAINING ALTERNATIVES

"The application of electronic technology in radio communications and radar equipment has made EW an essential element of combat operations."[1]

A critical analysis of the existing doctrinal literature has discovered that the current doctrine does not really state "how to communicate" nor do the current ARTEPS provide sufficient evaluation to further training in these areas. The concept of seeing the battlefield, allocating means, directing and sustaining forces, and continually knowing the situation required to win the battle appears to be quite sound but only suggestions and general information are available in Army FMs. We appear to have devised tactics that cannot be supported by present communication means. This chapter discusses the implication of these findings and presents operational and training alternatives open to the U.S. Army. The suggested alternatives are drawn from the literature, the author's personal experience and informal interviews of allied and U.S. officers with related C^3 experience.

FINDINGS

Communication as an integral part of the C^3 system must be well thought-out and considered in each phase of the operation. All personnel should be aware of the methods the battalion commander uses to convey the actions and orders of the command. Units do this in several ways. First, through the commander's guidance, as he sees the battle portrayed in his advanced planning with subordinate commanders and staff. Unique aspects of the operation or special operation dictate that C^3 requirements be established early in the planning. Secondly, units have traditionally prepared unit standing operating procedures (SOPs) which gather previous guidance and conform to higher headquarters directives and SOPs. These procedures greatly assist the planning and conduct of the operations by taking advantage of past experiences and by providing a single source document for wide dissemination. Thirdly, during the battle the commander gives orders and relates his concern about critical aspects of the battle to his subordinates by his personal presence and by radio communications.

If the specific situation has not been experienced, covered by guidance, or considered within the plan it must be discussed or communicated between commanders and/or staff. For the battle captain the FM voice radio has been the most often used means for this essential communication.

The combat experience of Vietnam left an indelible mark in the minds of U.S. combat veterans and in the subsequent training programs. This mark has not always been a good one, particularly in light of the many bad habits and incorrect assumptions drawn from the proliferation of radios available to the ground commanders and the subsequent tactics and techniques devised to capitalize on inherent capabilities of radio technology. By the widespread availability and rapid response of the radio, commanders felt compelled to make necessary adjustments to battle plans, correct mistakes, and provide timely guidance to their subordinates.

The radio message can be intercepted or jammed. After exploiting the station for intelligence purposes the enemy has the option to use radio direction finding (RDF) and/or destruction of the target by indirect fire. Intelligence need not precede destruction. This ability to integrate RDF and destruction was fully realized during the 1973 Middle East War. On October 13, 1973, General Mendler, commander of an Israeli Defense Force division, was killed by Egyptian artillery as he was talking on the radio.[2] The Egyptians had established his location through RDF.

There also exists a vulnerability with current radiotelephone operator procedures. The U.S. Army has the most secure radio transmission in the world, but its procedures hinder operational effectiveness as well as being susceptable to REC.[3] The opening and closing of nets, use of lengthy

call signs, prowords and authentications are far too slow and ponderous. Maneuver commanders and their headquarters, in the thick of battle, will seldom use or have time to employ these procedures. Even if these traditionally valued procedures are employed they will surely bring enemy jamming and destruction. This threat will be present and can be effective against all but discreet and short transmissions.

Confidence in U.S. Army communication is lacking as evidenced by a field survey of 498 officers and 126 enlisted men conducted by the Combat Communications Systems Study Group of TRADOC. Questions were asked to determine the perceived levels of communication preparation U.S. Army personnel were attaining. Some of the percentage responses are summarized in Table 2.

A disparity was also found to exist among the different service schools in communication training. Instruction in the Infantry and Armor schools for officer basic and advanced schools differs greatly even though both officers of combat arms are expected to perform essentially the same mission.[4] Table 3 prepared by the Combat Communications Systems Study Group indicates only one of many disturbing variances between the service schools, that of a widely different number of hours in CEOI instruction. The Signal school has also been criticized because it lacks tactical orientation in its approach to instruction and

TABLE 2

THE COMBAT COMMUNICATIONS SYSTEM STUDY

GROUP QUESTION RESULTS

	SUBJECT	% RESPONSE
1.	Alternate means of communication not emphasized in many units.	56.4%
2.	Communication training not emphasized in units.	68.7%
3.	Personnel felt they needed more communication training.	54.17%
4.	Secure radio voice equipment not reliable.	54.4%

TABLE 3

CEOI HOURS OF INSTRUCTION*

	SCHOOL					
COURSE	ARM	ARTY	ADA	INTELL	SIG	INF
Officer Basic	4	4.2	2	3	1	2
Officer Advanced	1	3.4	1	0	3	3
Warrant Off Adv	N/A	N/A	N/A	N/A	2	N/A
NCO Adv	0	4	1	0	1	2
Master Gunner	3	N/A	N/A	N/A	N/A	N/A
CE Staff Off	N/A	7.5	N/A	N/A	N/A	N/A
Officer Candidate	N/A	N/A	N/A	N/A	N/A	3

*TRADOC, Combat Communication System Study, "C2S2 Final Report," 1 April, p. II-15.

because of its apparent failure to be the senior school in communication matters, coordinating within the service school arena.[5]

After individuals have received basic communication training and are sent to a unit they should begin to receive immediate unit and advanced C^3 instruction. Commanders and staff personnel are not immune to making mistakes. Communication classes should be given to all personnel. All exercises should incorporate C^3 in progressively more detail as the unit develops experience and expertise. Field training, command post and map exercises should stress command post locations as an overall aspect of the operation.

ALTERNATIVES AND COMMAND RESPONSIBILITIES IN THE EW ENVIRONMENT

The culmination of the training program is the Army Training and Evaluation Program (ARTEP). Commanders have prepared their units for the ARTEP and look forward to the challenges presented by the exercise. However, communication aspects of the ARTEP are often taken for granted and in the case of ARTEP 71-2, Mechanized Infantry and Tank Task Force, where only the RTO and radar operator are tested on their performance of duty. This is inconsistent with the value that commanders place on communication and its integration with command and control. An ARTEP must evaluate and train in other than communication procedures. It should

examine at a minimum the commander's guidance to subordinates, staff planning considerations, decisionmaking criteria, placement and use of equipment and personnel and the effectiveness of the entire unit in respect to C^3. A Command and General Staff College student project is submitted in Table 4 as a possible training and evaluation outline to be used in Chapter X of ARTEP 71-2, The Command Group/Staff Module.

Transmission ranges of VHF radio sets are based on ground-wave distance and can vary depending on operating frequency, location of radio station and antenna, type of terrain, method of emission, type of antenna, power output and in the maintenance of the communication system. The operator can increase the ground-wave range of the set by using lower operating frequencies, by changing from voice to continuous-wave operation; or by substituting a long-wire directional antenna. The general rule to follow would be to use only the power and range aspects of the communication system required for the communication link. The commander must realize that by simply conducting the routine frequency change, former communication links may be lost unless additional considerations are examined.

New procedures must be developed in the allocation of frequencies within the communication spectrum. The policy of awarding tactical frequencies and the subsequent skimming of the best discrete frequencies leave the corps and division headquarters with the ideal frequency allocation and the

TABLE 4

RECOMMENDED MECHANIZED INFANTRY/TANK TASK FORCE ARTEP 71-2

TRAINING AND EVALUATION OUTLINE

UNIT: Mechanized Infantry/Tank Task Force MISSION: Operate In EW Environment

ID TASK NO.	CONDITION	TRAINING/EVALUTION STANDARD	S	U
1. Provide EW Guidance	Unit is training to operate in an EW environment.	Commander's EW guidance should: a. reflect awareness of OPFOR EW/REC doctrine and capabilities. b. identify importance of and need for effective communications. c. be integrated with and supportive of current combat doctrine. d. stress the need for defensive EW training, e.g., ECCM/SIGSEC. e. reflect preventive measures that will degrade OPFOR EW/REC capability. f. reflect remedial measures that will permit unit to retain effective communications. g. stress OPSEC to achieve surprise/security. h. direct planning to deal with intentional/mutual interference.		
2. Insure Effective Communications	Unit is training to operate in an EW environment.	The commander should: a. provide or request resources necessary to operate in an EW environment. b. identify probable enemy EW courses of action against operational doctrine. c. identify critical communications points/times for current/planned operations. d. identify need for alternate means of communications (smoke, wire, messengers, etc.). e. utilize ESM assets available. f. request recommendations/alternatives to improve Defensive EW(DEW) posture. g. integrate DEW with command OPSEC program. h. include communications deception planning in overall scheme of fire and maneuver. i. practice SIGSEC procedures: (1) frequent changes in call signs, suffixes, frequencies. (2) use of approval codes, ciphers, and authentication. (3) emission control. j. practice ECCM procedures. k. insure DEW staff/unit responsibilities delineated in SOP's.		
3. React to OPFOR EW/REC	OPFOR is attempting to jam electronic equipment and conduct electronic deception.	The commander should: a. recognize OPFOR jamming activities. b. recognize OPFOR deception. c. continue to operate without revealing effectiveness of jamming activity. d. direct use of alternate means of communications. e. direct destruction of enemy jammers. f. evaluate EW impact on course of action and alter course of action, if necessary. g. correct friendly ECCM weaknesses. h. enforce COMSEC/ELSEC procedures. i. implement deception plan, to include DEW aspects. j. exploit enemy reaction to friendly deception. k. use secure voice equipment. l. impose radio silence, if necessary. m. transmit from different locations.		

TABLE 4

RECOMMENDED MECHANIZED INFANTRY/TANK TASK FORCE ARTEP 71-2 (Cont)

TRAINING AND EVALUATION OUTLINE

UNIT: Mechanized Infantry/Tank Task Force MISSION: Operate In EW Environment

IT TASK NO.	CONDITION	TRAINING/EVALUATION STANDARD	S	U
4. Insure Effective Communications.	Unit is training to operate in an EW environment.	The staff should: a. reflect OPFOR EW/REC capability in operational plans/orders/SOP's. b. include DEW training in training plans/schedules. c. include DEW in OPSEC planning. d. establish REC priorities, e.g., locate/neutralize enemy jammers. e. disseminate ECM authority to subordinate units. f. incorporate DEW in deception planning. g. insure C-E planning/training to deal with intentional/mutual interference: (1) terrain considerations for transmitter locations. (2) line-of-sight transmitters provide for side-lobe absorption and target background. (3) field-expedient antenna modifications considered. (4) unit electromagnetic profile prepared. (5) radio authentication procedures established (to include abbreviations). (6) procedures for frequency/call sign changes established (to include abbreviations). (7) plans for cryptographic equipment utilization established. (8) crypto facilities/materials properly secured. (9) NCS provided with EEFI to monitor nets for ECCM violations. (10) CEOI/OPS Codes provided to units. (11) frequency reallocation procedures established (12) CP electronic signature reduced to a minimum. (13) alternate means of communications identified/directed for critical phases of operation. (14) critical communications times/points identified. (15) MIJI reporting requirements/procedures established and disseminated. (16) protected, guarded, and taboo frequencies considered in C-E planning. (17) Emission control stressed. (18) preplanned messages prepared. (19) highest possible frequencies assigned to VHF nets of forward units. (20) alternate (spare) frequencies allocated to encrypted nets of critical importance. (21) frequencies selected as close as possible to OPFOR frequencies. (22) optimum communications nets established. (23) alternate routes of communications plotted. (24) operators (radio/radar) trained to recognize OPFOR jamming and deception. (25) operators (radio/radar) trained in preventive/remedial techniques. h. integrate electronic surveillance plan with fire and maneuver, and observation: (1) OSR equipment sharing, frequency changes, and coverage while moving planned. (2) OSR planning considers shift in location to avoid detection/destruction. i. identify alternative methods of surveillance.		

TABLE 4

RECOMMENDED MECHANIZED INFANTRY/TANK TASK FORCE ARTEP 71-2 (Cont)

TRAINING AND EVALUATION DETAILS

UNIT: Mechanized Infantry/Tank Task Force		MISSION: Operate in an EW Environment		
ID TASK NO.	CONDITIONS	TRAINING/EVALUATION STANDARD	S -	U -
5. React to OPFOR EW/REC	OPFOR is attempting to jam/destroy electronic equipment and/or conduct electronic deception.	The staff should: a. recognize OPFOR jamming activities. b. recognize OPFOR deception attempts. c. evaluate OPFOR EW/REC impact on friendly course of action. d. resolve OPFOR EW/REC problems (locate, jam, destroy). e. recommend alternate courses of action, if required. f. correct ECCM deficiencies. g. request ECM support from higher HQ. h. not reveal effectiveness of jamming. i. implement DEW aspects of deception planning. j. reposition key communications sites to take advantage of terrain masking. k. direct use of directional antennas. l. insure NCS monitors nets to insure compliance with ECCM/SIGSEC instructions. m. reallocate frequencies, if necessary and practical. n. implement alternative means of communication. o. evaluate interference and forward MIJI reports to higher HQ. p. target intelligence assets against OPFOR EW positions/locations. q. use secure voice equipment. r. impose radio silence. s. use preplanned messages. t. direct alternate surveillance methods. u. direct relocation of surveillance devices.		
6. Use Correct ECCM Procedures	Unit is training to operate in an EW environment.	The unit should: a. reflect OPFOR EW/REC capabilities/doctrine in unit SOP's. b. reflect importance of communications for command and control in unit SOP's. c. insure ECCM training is reflected in unit training schedules/plans. d. evaluate ECCM procedures. e. correct ECCM weaknesses. f. insure organization for combat reflects DEW considerations. g. establish MIJI reporting procedures. h. insure ECCM training materials available. i. assign EW personnel to EW designated positions. j. integrate DEW in unit OPSEC program. k. be aware of TF deception plan (DEW aspects), if required. l. insure deployment reflects DEW considerations, e.g., terrain, line-of-sight, distances, directional antennas, power, etc. m. insure communications netting reflects DEW procedures. n. insure ECCM procedures are established/disseminated. o. use abbreviated authentication procedures correctly. p. use abbreviated call signs correctly. q. change frequencies as directed. r. use approved OPS codes. s. minimize communications transmission times.		

TABLE 4

RECOMMENDED MECHANIZED INFANTRY/TANK TASK FORCE ARTEP 71-2 (Cont)

TRAINING AND EVALUATION GUIDE

UNIT: Mechanized Infantry/Tank Task Force MISSION: Operate in EW Environment

TD TASK NO.	CONDITION	TRAINING/EVALUATION STANDARD	S	U
		t. communicate only when necessary, (EMCON).		
		u. enforce COMSEC procedures.		
		v. practice radio silence.		
		w. use secure voice equipment.		
		x. use preplanned messages.		
		y. rotate emitter operators.		
		z. provide MCS a copy of EEFI.		
		aa. insure MCS monitors nets for OPFOR jamming/deception attempts.		
		bb. rotate transmitter sites.		
		cc. insure all equipment is operating properly.		
		dd. train operators (radio/radar) to recognize OPFOR jamming attempts.		
		ee. train operators (radio/radar) to recognize OPFOR deception attempts.		
7. React to OPFOR EW/ESM	OPFOR is attempting to jam/destroy electronic equipment and/or conduct electronic deception.	The unit should:		
		a. recognize OPFOR jamming activities.		
		b. recognize OPFOR deception activities.		
		c. identify EMCON deficiencies.		
		d. correct EMCON weaknesses.		
		e. continue to operate without revealing effectiveness of jamming activity.		
		f. evaluate EW/ESM impact on course of action.		
		g. alter course of action, if necessary.		
		h. utilize alternate means of communication, if required.		
		i. minimize emitter transmission times.		
		j. minimize emitter use.		
		k. change frequencies as directed.		
		l. repeat ion comms/non-comms devices, as required.		
		m. use terrain to best advantage.		
		n. issue interference (MIJI) reports to higher HQ.		
		o. impose radio silence, if practical.		
		p. use secure voice equipment.		
		q. use preplanned messages.		
		r. rotate emitter operators.		
		s. have MCS monitor nets for jamming/deception.		
		t. insure operators assume to decrease effectiveness of spot jamming.		
		u. insure operators use low power until jamming experienced.		
8. Use Command Provided EEFI	During training exercise	a. Radio operators prevent or reduce OPFOR intercept and DF by:		
		(1) using the lowest power setting needed to communicate with desired station(s).		
		(2) using correct radiotelephone procedures ZAU ACP 125.		
		(3) keeping all transmissions as short as possible and avoiding excessive operator chatter, such as radio checks.		
		(4) using directional antenna, when practical.		
		(5) selecting an antenna which reduces the possibility of transmitting beyond desired range.		
		(6) positioning radio so that natural or manmade obstacles block transmissions from suspected opposing force locations.		
		(7) remoting radio away from friendly locations and selecting a remote site that uses natural or manmade obstacles to block transmissions from the opposing force.		

TABLE 4

RECOMMENDED MECHANIZED INFANTRY/TANK TASK FORCE ARTEP 71-2 (Cont)

TRAINING AND EVALUATION OUTLINE

UNIT: Mechanized Infantry/Tank Task Force MISSION: Operate In EW Environment

ID TASK NO.	CONDITION	TRAINING/EVALUATION STANDARD	S	T
		(8) correctly using NSA-approved codes. (9) correctly changing radio frequencies IAW time period instructions for the CEOI. (10) operating on a random schedule. (11) using an alternate means of communication when reasonably available and reliable. b. Radar operators prevent or reduce OPFOR intercept and DF by: (1) turning radar equipment on only when necessary or as directed. (2) positioning the radar so that side and back lobes can be absorbed or reduced by foliage or terrain. (3) using dummy antennas during maintenance tuning and testing. (4) correctly orienting radar antennas away from opposing force areas during maintenance, tuning, and testing. (5) when equipment permits, correctly changing frequency and pulse repetition rate in a random manner or IAW instructions. (6) changing frequencies only when the radar is turned off. (7) operating on a random schedule. (8) using only essential radiating power.		
9. Use Correct Remedial ECCM	Attempts are being made by OPFOR to jam a radio and/or radar receiver.	a. Radio operators reduce the effects of OPFOR jamming by: (1) recognizing the difference between opposing force jamming and friendly interference. Disconnect the radio antenna. If interference continues, operator should suspect radio malfunction. If the interference stops, operator should suspect opposing force jamming. (2) using operator radiotelephone techniques in an attempt to work through the jamming; i.e., by: (a) saying words twice. (b) spelling out words. (c) slowing down your transmission. (3) increasing power when possible. (4) not acknowledging jamming in the clear. (5) repositioning radio/antenna to get natural or manmade obstacles between the receiver and suspected opposing force jammer. (6) using an alternate means of communication when reasonably available and reliable. (7) using a directional antenna to concentrate more transmitting power toward a distant receiver. (8) remoting the radio to mask the antenna from opposing force jamming signals when practical. (9) operating on a random schedule. (10) changing frequency as a last resort after other techniques have been ineffective. (11) detuning. b. Radar operators reduce effects of OPFOR jamming by: (1) continuing to operate on the same frequency, if possible. (2) changing location of antenna to decrease opposing force jamming attempt. (3) continuing to watch for targets, especially in the area of the suspected opposing force jamming location. (4) observing the edge of the jamming sector; targets may appear out-side the jammed area and be visible on the scope.		

TABLE 4

RECOMMENDED MECHANIZED INFANTRY/TANK TASK FORCE ARTEP 71-2 (Cont)

TRAINING AND EVALUATION OUTLINE

UNIT: Mechanized Infantry/Tank Task Force MISSION: Operate In EW Environment

ID TASK NO.	CONDITION	TRAINING/EVALUATION STANDARD	S	U
		(5) changing to alternate frequency after other techniques have been ineffective and IAW authorized instructions. (6) operating on a random schedule.		
10. Use Correct ECCM	Attempts are being made by the OPFOR to conduct electronic deception.	a. Radio operators can reduce the effects of OPFOR deception attempts by: (1) not acknowledging communications deception in the clear. (2) correctly using operations codes/brevity lists. (3) requesting authentication when: (a) imitative deception is suspected. (b) calling station self-authenticates, i.e., sends both the challenge and reply to that challenge. (c) an unknown or new station enters the radio net. (4) reissuing a challenge when: (a) answering station gives an incorrect reply to challenge. (b) the answering station is prepared to authenticate but takes more than ten seconds to reply to the challenge. (c) the answering station's reply is correct and you still suspect a fraudulent transmission. (5) correctly counter-challenging a station who has challenged when you suspect imitative deception. (6) using secure equipment when possible. (7) recognizing deception attempts. b. Radar operators can reduce the effects of OPFOR deception attempts by: (1) recognizing a false pulse on the scope. (2) using highest possible scan speed in those radars so equipped. (3) using narrowest possible sector width without reducing coverage. (4) changing frequency as a last resort after other techniques have been ineffective. (5) changing the pulse repetition rate in those radars having this capability.		
11. Report OPFOR Jamming And Deception Attempts	Attempts are being made by OPFOR to jam radio/radar receivers and deceive operators.	The radio and/or radar operator's report pertaining to jamming and deception should contain as a minimum: (1) operator's unit. (2) date and time of jamming and/or deception. (3) operator's location. (4) operator's radio or radar frequency effected. (5) type of jamming/deception signal (in general terms). (6) effectiveness of jamming signal or deception. (7) any additional information the operator feels may be essential to further clarify the report.		

battle captains with the leavings. Higher headquarters may be required to communicate over greater distances than that of the brigade or battalion, but they also have greater redundancy and alternate communication means to conduct that communication. The tactical scheme must be taken into account when allocating frequencies. Corps operations personnel should provide tactical input to the Theater Army Signal Officer to insure due consideration is granted in the frequency allocation process.

The use of nuclear weapons on the modern battlefield presents many adverse effects on communications. The three well known conditions of blast, heat and radiation will destroy communication sites within the detonation capabilities of a specific nuclear weapon. However, another nuclear destruction capability to communication equipment is in the form of electromagnetic pulse (EMP). The EMP threat in a nuclear environment may destroy all radio communication equipment over great distances unless timely actions are implemented and communications equipment are properly shielded. It is insignificant who detonates a weapon insofar as EMP is concerned; destruction depends on the size of the weapon, height of burst, and alert notification procedures. Detonation could conceiveably damage equipment at ranges of 3,000 miles.[6] EMP is a burst of electromagnetic energy traveling outward from detonation in terms of nanoseconds (1 billionth of a second). The extremely high amplitude and speed defeats

all circuit breakers and overloads equipment resulting in the destruction of all unprotected equipment. There is no protective device capable of preventing damage to operating equipment.

In an effort to dilute EMP destruction potential several techniques may be employed. First, only minimum essential equipment should be used for communication. The remaining equipment should be removed from radio mounts, disconnected from antennas and power cables, wrapped in the factory packaging or metal foil, stored below the surface of the ground and away from electrical equipment and antennas. Secondly, RTOs must be aware of timely and essential procedures to follow when notified of the immediate detonation of a nuclear weapon. Lastly, alert procedures must be streamlined to provide immediate notification and appropriate instructions for all levels of command.

Further credence to the EMP threat potential may be derived by noting the increased Soviet radio silence and their stated belief that nuclear weapons will be used in future combat.

COMMAND AND STAFF RESPONSIBILITY IN AN EW ENVIRONMENT

The commander is important for he establishes the guidance, issues the orders and is the most knowledgeable of the overall operational environment. He must see the battle and converse with his staff and liaison personnel to determine

the most decisive course of action. He must be free to employ all assets at his disposal and guide his units to their required positions through electronic communication, personal contact, messengers, and guides.

Commanders traditionally have wanted better long range, reliable communication. They must be reminded that the greater the distance they are able to transmit the greater the chances of effective enemy interception, target acquisition and REC. The commander must weigh the importance of his perceived need to communicate long distances and its total impact on the tactical situation. The situation may warrant the necessary exposure of his CP because of the great need to communicate an order.

The commander must establish the priority and method of communication within his command. Radio listening silence is an extremely valuable technique provided unit training and SOPs support alternate methods of communications.

Communication requirements to support the ground tactical plan vary greatly. When one considers the numerous special operations and unique environments in which the battle captain is required to operate without established doctrine each commander is required to establish his own C^3 plan. The communication matrices recommended at Tables 5 through 9, should be used by the commander to assist the development of his C^3 plan. Communication considerations within the tables are matched with operational and

TABLE 5

MOBILE OPERATIONAL COMMUNICATION PLANNING MATRIX

COMMUNICATION MEANS	TYPE OPERATION					
	Hasty Attack	Deliberate Attack	Exploitation & Pursuit	Special Opns.	Active Defense	
FM VOICE	X	X	X	X	X	Limited at breakthrough point by RDF jamming and mutual interference. Use of radio listening silence and alternate means essential.
MULTI-CHANNEL		X		X	X	Less susceptible to jamming and mutual interference: time, size and mobility limitations to employ.
AM	X	X	X	X	X	Good long-range commo, hard to jam; skip phenomenon and susceptible to atmospheric conditions, cannot be secured.
CW				X	X	Excellent long-range commo, but few personnel trained to employ effectively.
CABLE		X		X	X	Most reliable but time consuming to establish however, can be employed by inf units while moving.
RWI		X		X	X	Flexible system but subject to jamming. Must be well planned and allow for time to emplace.
MESSENGER	X	X	X	X	X	Most reliable means if time permits, regular routes should be established and secured if possible.
	X	X	X	X	X	Good as backup for major change in opns or fire control, should be used often but too easily to observe and duplicate by enemy.

NOTES:

Conducted while on the move allowing little time to develop commo if not already planned for.

Time allows for additional assets to be displaced forward to assist in C3.

Rapid moving situation, little opportunity for enemy to establish DF, intercept or jam stations.

See special opns on table 8

All means can be employed since detailed planning is essential for mission accomplishment and will be accomplished.

TABLE 6

OPERATIONAL COMMUNICATION PLANNING MATRIX

	TYPE OPERATION					COMMUNICATION MEANS
	Static Defense	Retirement	Withdrawal Under Pressure	Withdrawal Not Under Pressure	Relief in Place	
Least important means until units are required to displace. Detailed planning and antenna placement is essential.	X	X	X	X	X	FM VOICE
Requires time to implace and may not be used during phases of the operations due to displacement.	X				X	MULTI-CHANNEL
Good long-range communication possibly with CARS, A/L nets and special opns.	X			X	X	AM
Slow but reliable means, few personnel trained but can be effective long-range commo. Difficult for enemy to jam.	X			X	X	CW
Most important commo means however, lines must be patrolled to insure security.	X	X	X	X	X	CABLE
Good flexible system linking various elements of combined arms teams combining both radio and wire	X	X	X	X	X	RWI
Reliable and standard means for bulk, routine and lengthy commo. Any means of transportation can be used; slow means.	X	X	X	X	X	MESSENGER
Fast and effective when well planned and briefed to all personnel. Should be used for major changes in opns. and fire control.	X	X	X	X	X	SIGNALS

NOTES:

Allows maximum time for preparation of battlefield, all means may be used; however, messenger, wire and multi-channel most important.

Detailed planning allows minimum use of communication if deception plan is incorporated. Normal use of radio required; radios may be left in place until retirement complete.

Difficult operations requiring all available communication to be used, fire control and maneuver channels are vital.

Detailed planning essentially similar to retirement.

Difficult to conduct but deception is essential, some antennas in place may be exchanged to allow continuity of operations, frequencies and call signs, radios, and RIOs may be exchanged initially. Guides essential.

TABLE 7

AUXILIARY OPERATIONS COMMUNICATION PLANNING MATRIX

COMMUNICATION MEANS	Passage of Lines	River Crossing	Link-up
FM VOICE	X	X	X
MULTI-CHANNEL	X		
AM	X	X	X
CW			
CABLE	X	X	
ANT	X	X	
MESSEN-GER	X	X	X
SIGNALS	X	X	X

NOTES:

Radio listening silence initially due to enemy SIGINT threat.

Limited use while on the move, but can be very effective when time and location permits.

Seldom used except for deception or long range requirements.

Good reliable long range communication, few personnel trained to use effectively.

Limited use in fast moving situation, however, reliable and secure means.

Normally too time consuming and requires fixed transmission locations.

Reliable secure means but limited use over unsecure ground and long distances until link-up on consolidation is made.

Good method for recognition and signals can be most effective.

Deliberate ops where long range signals and recognition essential. Good liaison personnel are vital to the ops to eliminate confusion and unnecessary communications.

Critical Ops: guides important to reduce confusion and communication requirements. Liaison personnel essential. Fire can be taken across early to provide security, communication and coordination links. Def to the enemy electronic emissions.

TABLE 8

SPECIAL OPERATIONS COMMUNICATION PLANNING MATRIX

	Amphibious	Air Assault	Airborne	Night	Counter-guerrilla	Denial and Barriers	Deception	COMMUNICATION MEANS
Many special opns. Limit radio as primary means initially; radio listening silence normally employed when possible.	x	x	x	x	x	x	x	FM VOICE
Essential system, but requires time to emplace and move; may not be used except on deep or long duration opns.	x	x	x	x	x	x	x	MULTI-CHANNEL
Reliable long range commo, antenna construction time consuming and stationary.	x	x	x	x	x		x	AM
Reliable long range commo, antenna construction time consuming and stationary.	x	x	x	x	x		x	CW
Should be employed as soon as possible, however, security of wire essential and time consuming to employ.	x	x	x	x	x	x	x	CABLE
Should be employed as soon as possible, however, security of wire essential and time consuming to employ. Good flexible system.	x	x	x	x	x	x	x	WIRE
Slow but excellent means; security considerations must be carefully considered.	x	x	x	x	x	x	x	MESSENGER
Excellent but must be changed frequently so that enemy cannot duplicate or understand.	x	x	x	x	x	x	x	SIGNALS
NOTES:	Detailed plans required; prearranged signals and commo well developed in plan.	Detailed plans critical, flight lead must notify personnel of use of alternate LZ, signals important initially, generally same considerations as airborne.	Detailed plans essential, changes and assembly procedures must be known by all; normal commo establish ASAP.	Detailed plans and use of guides eliminates confusion which might lead to greater dependence on the radio.	All means will be used, radio primary means of commo, communication security is vital.	This operation requires time and detailed planning to accomplish. Cable is best secure means for commo.	All commo means normally employed should be continued with no change; redundant commo equipment is essential.	

TABLE 9

SPECIAL ENVIRONMENT COMMUNICATIONS PLANNING MATRIX

COMMUNICATION MEANS	SPECIAL ENVIRONMENT							
	Northern Warfare	Desert	Jungle	Mountains	Nuclear	Bio-chemical	Built-up Areas
FM VOICE	X	X	X	X		X	X
MULTI-CHANNEL	X	X	X	X		X	
AM	X	X	X	X		X	X
CW	X	X	X	X		X	
CABLE	X	X	X	X	X	X	X
RWI	X	X	X	X		X	X
MESSEN-GER	X	X	X		X	X	X
SIGNALS	X	X	X	X	X	X	X

NOTES:

Difficult environment, northern atmosphere makes communication unpredictable and difficult to maintain.

Generally good communication, changes in temperature and dust creates problems in maintenance; long-range communication is good.

Communication difficult, range limited and high ground essential for positive communication.

Line-of-Sight communication means is limited, masking of antennas can work for benefit if well planned.

EMP will destroy all transistors not shielded and backed up, gear must be stored and shielded, and issued as required.

No special problems for operations and maintenance provided troops are well-trained; otherwise major problem, decontamination essential.

Limited Line-of-Sight communication due to masking effect of buildings, existing civilian wire communication may be excellent method.

environmental aspects and are provided as an aid in developing tactical plans.

The required coordination perceived by all staff planners has been accomplished easily in the past through the use of the radio. When this is denied because of enemy EW, planning and coordination will be strained. Liaison officers and messengers have become vital for the maintenance of the dialogue essential to all military operations. The staff must accomplish the following functions: gather information, conduct appraisals, anticipate actions and orders, inform other staff members and the commander, make recommended actions, write orders based on the commander's guidance and assist the commander by supervising.[7] Each item listed above is dependent on a good communications environment to allow the free flow of information on which recommendations and decisions are made. Changes must be rapidly interjected into staff planning to insure a continuity between events on the battlefield. In this respect there is no substitute for the radio and no alternate method of communications has been suggested other than a good initial plan with a viable message center and numerous liaison officers. Strangely enough the majority of current tables of organization and equipment have reduced the authorized number of messengers and have relegated the liaison positions to wartime augmentation. This reduction is the result of streamlining manpower spaces produced by

several studies. When shortages occur within the various organizations these are the positions normally left vacant due to the perceived shortage in other important areas, such as radio communication, the type of positions which EW may all but eliminate. Training Circular 101-5's stated purpose is to describe an organizational and operational concept that makes U.S. Army division CP's systems less vulnerable to a threat of highly sophisticated, numerically superior, mobile, and armored forces and at the same time, more efficient and more responsive to the commander.[8] Operating from the tactical CP and main CP only two messengers are recommended and no liaison officers are provided in this organization.

Unit liaison officers if properly used provide valuable service for the conveyance of orders and operational materials from one headquarters to another. Liaison officers should be used in conjunction with normal message flow and should not replace message distribution as is often done. The liaison officer will normally know the commander's concept and rationale for important decisions not conveyed through normal courier service. Few units still carry the liaison officer position on their TOEs but rather select personnel as the need arises. Trained or talented personnel are rarely picked because the losing unit will not get a replacement and does not want to give up an individual in a key position. Battalion task force units participating in

Reforger 1976 often were required to dispatch three liaison personnel; none existed on the local MTOEs. These valuable positions must be filled; they alone can greatly reduce FM radio traffic required for coordination between units.

ALTERNATIVE CONSIDERATIONS FOR THE EW ENVIRONMENT

Informal interviews were conducted with allied officer students of the 1978 Command and General Staff College class to gain an appreciation of alternative C^3 doctrine and methodology. All such class officers supported an expanded doctrinal approach to communications, including standardization at all echelons. The U.S. Army uses the decentralized approach whereby each unit develops its own unique concept of combat communications. The strength or weakness of each concept is a reflection on the commander.

Interviews with the Israeli and Egyptian allied officers indicated that during the Middle East War of 1973 both country's units used standardized communications doctrine and equipment. In the mechanized and armor units the commanders remained on the radios constantly as contrasted with infantry, airmobile and airborne units, which because of man packing radio equipment, had a tendency to use radio telephone operators more frequently. In those units where the commander remained on the air transmitting directions, units reacted rapidly to changing combat

situations particularly after the detailed plan had been superseded by enemy action. Their reliance on the radio was undeniable, but signals were also used for close-in communication to supplement the radio. Radio listening silence was often used and when timely communication was required the commander would talk directly to his subordinate commanders. RDF was used and effective indirect fire could be placed on an enemy target within three minutes, consequently transmissions were deliberately short and made while on the move. Often a central meeting place for all commanders was the best arrangement because there was no better way to give guidance to subordinate commanders, but obviously time and circumstances did not permit this to occur on a regular basis.

Wire communication was not often used by mechanized and armor units except during defensive operations; however, infantry units used wire often. It was found that wire could be placed easily in the desert and could be laid immediately behind advancing units to permit continuous wire nets. Wire lines were constructed across the Suez Canal and provided the primary means of communication for the Egyptian forces on the East Bank. U.S. Army doctrine was changed in FM 24-1 in 1976 to reflect wire as the primary means of communication during river crossing operations.

Motorized messengers were not used to any great extent initially but the ensuing battle required that

messengers be used by both sources. They served a vital function for both routine and priority traffic when radio communication was congested or denied electrically. During the battle, orders were never written by the Israelis and messengers were only used to carry routine messages. Verbal orders were given from commander to commander and in person if possible. Prior to the war motorcycles were used by the Egyptians as convoy guides, connecting files and in the role of traffic control but not in the communication missions which they later conducted in the war. Following the war, some Egyptian commanders submitted changes to the table of organization and equipment of their combat units requesting the inclusion of motorcycle messengers with forward units.

The commander's location during the battle was not unlike that of U.S. Army doctrine, that is positioned well forward. It was felt that by positioning near the forward critical battle on the spot decisions could be made and communication was really not a problem because of the extremely short distance to the subordinate commanders. If communication was lost with the subordinate commander, the initiating commander would bypass the headquarters and speak directly to the bypassed commander's subordinates. This ability to "skip echelon" was used often in the 1973 Middle East War and is a standard communication technique of the Soviet Union armed forces.

The allied officers from Austria, England and Germany perceived the EW threat as a serious one and agreed that radio transmission would be denied in the initial stages of the first battle. Radio listening silence would be used and radio transmission, when used, would be brief and would be considered an exception to the rule. The radio is not considered of primary importance to communication in these countries but rather as a luxury that may not be available.

Detailed plans are considered essential with simple signals to get units notified and in defensive position without delay. Units are to have received guidance as to their actions and initial positions and to have rehearsed the operations plan. Civilian telephone systems will be important in the command and control of these units. The telephone system is controlled by the government in Austria and territorial forces will man the entire system during times of national emergency. This control is easily implemented since many of the telephone employees are also members of the territorial army. Military land line communication has been fully integrated into the existing civilian circuitry allowing for redundancy and flexibility of communication. Through coordinating this communication system with existing battle plans, a highly dependable command and control technique has been developed.

Message centers of most NATO countries appear to mirror those of U.S. concepts somehow now forgotten in recent years. The message center and its integration with

other communication means have become pas se in the U.S. Army because the commander has been fortunate to have the FM voice radio. European countries have taken a more realistic approach to this phenomenon since they have fewer radios and assume FM communication will not be available due to EW actions. This perspective has created a strong desire to preserve the message center organization and function. A novel approach by the Austrians is to hand all message traffic to the senior signal officer and charge him with the responsibility of delivering the message. The signal officer examining the message priority and knowing what reliable and functioning system to use will then efficiently dispatch the message. Routine traffic may go by motorcycle messengers at established times and along prescribed routes while orders may go by any secure but direct means. If the enemy force has employed jamming, deception or direction finding recently the unit signal officer will recognize this and take necessary precautions; an option lost with everyone communicating his own message as is now the case in the U.S. Army.

Blind transmissions are still considered valuable in several European countries. The concept, as devised in Austria, is to establish a daily transmission time for a coded message and use the local AM radio station to broadcast this message. The wattage of most AM stations is sufficient to override any attempts by the enemy to jam and

also possesses great range capabilities. Anyone having knowledge of the station frequency and possessing an inexpensive civilian radio can receive the message. Each coded message can provide data so as to vary transmission time and codes. Such messages are an excellent means of transmitting alert notices to support centralized controlled operations.

Allied countries give much greater latitude to subordinates than does the U.S. Army. Initial operation orders are extremely detailed and guidance rich to allow subordinates to grasp the entire operation as the commander visualizes its conduct. Responsibilities are spelled-out and subordinates are charged to use initiative and flexibility to complete their respective or coordinated mission. If communication is temporarily lost commanders have done all they can do to influence the outcome of the battle but feel confident that subordinates will continue as directed.

Some U.S. units have already perceived the threat to communication and have attempted to experiment with different techniques to overcome communications shortfall.

The 1st Brigade of the 9th U.S. Infantry Division in May 1976, began a comprehensive training program to limit radio transmission by using messengers for routine traffic. Only short radio transmissions were utilized. At first, great difficulty was experienced because of previous reliance on the radio but after a relatively short time units

became familiar and comfortable with the new procedure.[9] This unit trained personnel in a number of supplemental Army communication techniques: signal flags, morse code, light-guns, tactical wire, heliborne couriers and runners. Success was limited in establishing an operational doctrine, but was valuable in making personnel aware of the threat and instilling an innovative spirit throughout the brigade.

Motorcycles have been used time and time again by virtually every country as messenger carriers. These countries have employed motorcyclists as guides, means of connection files, and as light reconnaissance forces and one U.S. Army unit has employed motorcycles as communications platforms. In the early spring of 1975, the 2d Battalion, 503d Infantry, of the 101st Airborne Division (AASLT), received six motorcycles previously tested at Fort Hood, Texas, to conduct further tests as to the adaptability of this light vehicle to the air assault division. A number of tests were conducted including one of involving the application of motorcycles as a mobile communication platform. The concept devised by the operations officer was to employ several motorcyclists as a part of the communication platoon and to afix the PRC-77 FM radio to the motorcycle. Due to the expense and time lag to develop this concept it was found beneficial to allow the driver to wear the radio on his back and employ a locally fabricated cable system joining the radio to an aviation helmet. The

importance of this endeavor was essential to the overall concept of transmitting while on the move. Messages to be transmitted were given to the motorcyclists, who were also well trained radio operators; they would proceed several kilometers away to high terrain where they would transmit the message, receive an acknowledgement and return to await the next required transmission. Numerous transmission locations were used to transmit timely messages of high priority but not to disclose the command post location. The motorcycle technique was field testing during the Solid Shield Operation in 1975 with excellent results. This concept is quite flexible by additionally providing radio relay sites throughout the operational area.[10]

The well established radio telephone operator (RTO) procedures are no longer valid to the extent they once were. Prowords, prefixes and call signs as well as lengthy authentication requirements have an inverse effect on communication in an EW environment. Each of these traditional aspects of communication security (COMSEC) requires additional transmission time to perform. The 1973 Middle East War proved that Soviet technology had achieved a rapid and accurate means of direction finding, subsequent jamming, and destruction. Artillery was accurately placed on the target in three minutes or less. U.S. units must be proficient and transmission techniques refined to allow twenty second transmissions. Radio listening silence must

be the rule and transmissions only when no other means will satisfy the tactical requirement. Another technique is to record a brief message on a tape recorder on a slow speed, say 1-7/8 rpm, but transmit it on $7\frac{1}{2}$ rpm to speed the transmission time. The receiving station, when alerted, would record on $7\frac{1}{2}$ rpm but play on 1-7/8 rpm to receive the message. This procedure would reduce time considerably and be an inexpensive method to employ since portable cassette tape recorders could be used.

Countless other examples of initiative and innovative techniques undoubtedly exist that have been devised by commanders and their staffs to offset a threat. Nonetheless, most of these techniques will have to be "reinvented" by others. Standardized communications doctrine and prescribed procedures must be devised and distributed to all units and our allies. For one unit to possess good communication techniques is not enough when considering the vital interoperability between not only our allies but between other U.S. Army units.

A publications reference list has been developed by Forces Command and is presented in Table 10, to assist the commander in developing a training program. The thesis author has added several new references to update the list, many of which used have been in previous chapters. A recommended EW reference library checklist has been enclosed as Table 11 to assist unit staff personnel in establishing

TABLE 10

EW Publications Reference List

Number	Title	Date	Description
1. Army Regulations (ARs):			
105-2	(C) Electronic Counter-Countermeasures (ECCM) (U)	Sep 76	Promulgates policy, provides guidance, prescribes procedures, and defines responsibilities for achieving US Army objectives in the ECCM field, and for promoting effective operations in a hostile EW environment.
105-3 Ch 1	(C) Reporting Meaconing, Intrusion Jamming, and Interference of Electromagnetic Systems (MIJI) (U)	Mar 72	Provides procedures for reporting MIJI incidents which effect US military electromagnetic equipment or systems.
105-5	(C) Electromagnetic Cover & Deception (EC&D) (U)	Jul 73	Covers policy, guidance, procedures, and responsibilities for EC&D. (Under Revision)
105-7	Quick Reaction Capability for Electronic Warfare	Sep 75	Policy, procedures, guidance and responsibilities for establishing and maintaining a quick reaction capability to meet urgent operational requirements for EW. (Note: designed to meet new threats as they appear in the field.)
105-64	US Army Communication-Electronic Operation Instructions (CEOI)	Jun 76	This regulation provides policy for Army users, both AC and RC, of the automated CEOI. Included are specific procedures for release of CEOI data to be used for production of the SIGINT/EW Data base for exercises.
105-86	Performing Electronic Countermeasures in the United States and Canada	Oct 64	Policy and procedures for performance of ECM in the US and Canada. 1964 edition of this regulation is valid and not under revision.

SOURCE: (C)FORSCOM Training Notes Number 5(U), 9 January 1978 (Updated by thesis author.)

TABLE 10 (continued)

Number	Title	Date	Description
105-87 FORSCOM Sup 1 to AR 105-87	(C) Electronic Warfare (U)	Aug 76 Jan 77	Establishes and EW policy that provides for effective use of EW and its integration into military operations.
380-35	(S) Security, Use and Dissemination of Communications Intelligence (COMINT) (U)	Mar 73	Army implementation of DOD Dir 5200.17.(M2) Covers use of COMINT within Army channels.
381-3	(S) Signals Intelligence (SIGINT) (U)	Dec 73	Policy, procedures and guidance on the production and use of SIGINT.
530-1	(C) Operations Security (OPSEC) (U)	May 76	Covers the entire OPSEC program including SIGSEC, ECCM AND Counter-Intelligence (CI). Purpose of OPSEC is to deny enemy knowledge of planned, ongoing, and completed operations.
530-2	(C) Communications Security (COMSEC) (U)	Mar 76	Policy and procedures to implement COMSEC
530-3	(C) Electronic Security (ELSEC) (U)	Jun 71	Policy and procedures to conduct Army ELSEC activities.
530-4	(C) Control of Compromising Emanations (U)	Jun 71	Covers TEMPEST threat, testing, and policies.
2. Field Manuals (FM):			
11-50	Combat Communication Within the Division	Mar 77	Expanded planner/user Manual for all C-E operations. EW/ECCM/threat is covered in an unclassified form.

TABLE 10 (continued)

Number	Title	Date	Description
24-1	Combat Communications	Sep 76	Users Manual for C-E officers and NCO's. General explanation of C-E operations MIJI reporting, and how to use EW in general.
24-18	Field Radio Techniques	Jul 65	Excellent coverage of field radio operations. Includes expedient antennas and other ECCM techniques.
30-476	Radio Direction Finding	Apr 77	Manual for Radio Direction Finding users and operators.
31-40	(C) Tactical Cover and Deception (TC&D) (U)	Sep 67	Guidance for commanders and staff at all levels of command (EAC to Platoon) for planning and conducting tactical cover and deception operations. Includes doctrine and fundamentals.
32-1	(S) Signals Intelligence (SIGINT) (U)	Aug 75	Doctrine and technical guidance for EW unit commanders and staff concerning production and use of SIGINT. Also serves as a reference to other Army commanders and staff in the planning and conduct of military operations.
32-5	(C) Signal Security (SIGSEC)(U)	Jun 74	Guidance and general information for commanders and staff concerning SIGSEC.
32-6	SIGSEC Techniques	Feb 77	Guidance and general information relative to the application of SIGSEC aids and how to achieve the security objectives set forth in AR's 530-1,2,3, & 4. Contains a detailed chapter on ELSEC which is valuable to units with GSR or other RADARS.

TABLE 10 (continued)

Number	Title	Date	Description
100-32 (T)	Tactical Electronic Warfare	Jun 75	A non-technical manual which provides guidance to commanders and staff in the tactical aspects of EW employment in combat operations.

3. Training Circulars (TC):

24-2	CEOI Operating Instructions	Dec 75	TC describes the automated CEOI and shows how to use it for maximum results.
30-1	Tactical Cover and Deception	Sep 69	Guidance on the conduct of TC&D training Co to Div level.
30-6	Deploying for Man-Portable operations	Mar 77	A "how-to" manual for the individual soldier and junior NCO. Provides a logical sequence of planning for low level man-portable SIGINT/ EW operation.
30-19	Division Intelligence System	Jan 76	An explanation of the Division Intelligence system with coverage of the ATSE and all-Source Intelligence Centers.
100-32-1	EW- A Weapons Qualification Course	Sep 77	TC is an excellent information document using the programmed text concept with practical exercises.
30-20	Signals Intelligence	May 76	Unclassified explanation of what Signals Intelligence is, how it works & how to use it.
32-95-2PT	Communications-Electronics Counter-Countermeasures Procedures	Sep 74	Self-teaching aid to prepare RTO/users to cope with electromagnetic interference. Written for non-technical personnel with a basic understanding of radio terms.

TABLE 10 (continued)

Number	Title	Date	Description
32-10	(C) USASA in Support of Tactical Operations (U)	Aug 76	Provides guidance for employment of ASA tactical operations. Describes mission, functions, organization, assignments, training, etc., of ASA units.
32-15	(S) Broadcase Countermeasures (U)	Jun 66	Concepts, doctrine and procedures for planning and execution of broadcase countermeasures operations.
32-16	(C) Electronic Warfare, ECM Handbook (U)	Jun 75	A very technical manual which presents operational and technical methods which affect the planning of ECM operations. Designed for ASA ECM operators and managers.
32-20	(C) Electronic Warfare (U)	Jun 75	A basic but detailed manual covering doctrine and other necessary information for commanders and staff who will be using or be supported by EW operations.
32-30	Electronic Warfare, Tactics of Defense	Aug 76	A basic ECCM manual written for the layman.
90-2	Tactical Deception	TBP	This FM provides guidance for using tactical deception in modern warfare. It suggests ways to increase survivability on the modern battlefield.
100-5	Operations	Jul 76	Capstone FM with EW covered in chapter 9.
100-5A	Electronic Warfare	Draft Oct 76	Secret supplement to chapter 9, FM 100-t. Covers EW operations from a management view in detail.

TABLE 10 (continued)

Number	Title	Date	Description
32-8	(C) Compromising Emanations (U)	Jun 75	A basic reference document on compromising emanations for commanders and staff at all levels. Mainly for those units with fixed communications facilities.
32-10	How to Train a Combat Battalion to Fight in an Electronic Warfare Environment	Jul 75	Training information for soldiers/communicators who will be expected to operate in an EW environment. Techniques and training guidelines.
32-11	How to Get Out of a Jam	Apr 75	User oriented booklet on how to identify and overcome hostile ECM directed against the individual communicator.
32-20	Electronic arfare Training	Mar 74	Outlines individual and unit training procedures for EW operations. Guide to G5/S2, G3/S3, C-E personnel engaged in planning, conducting, and evaluating EW training and play during exercises.
101-5	Control and Coordination of Division Operations	Apr 76	Full breakout of Division Staff, its organization, function, and recommended CP configuration. EW aspects of Intelligence and Operations are covered.
4. Army Training Test (ATT):			
32-400	Electronic Warfare (EW, Army Type Divisions, Brigades, Battalions, and other Units and Teams	Sep 70	Test evaluates status of EW training in the listed units equipped with communications or non-communications emmiters under simulated combat conditions. (Note: provides an excellent check list for EW Evaluators.)

TABLE 10 (continued)

	Number	Title	Dates	Description
5.	Army Subject Schedule:			
	32-1	Electronic Warfare for Ground Surveillance and Target Acquisition Radars	May 72	A subject listing for training in EW operations for GSR and TA Radar operator
6.	DA Pamphlet:			
	380-2	(C) SIGSEC: Defense Against SIGINT (U)	Jun 75	General information and guidance to assist commanders and staff in planning and decision making relative to SIGSEC activities. It discusses the use of SIGSEC as counter-SIGINT and is designed for personnel responsible for establishing SIGSEC requirements, plans, or evaluations.
	381-13	(C) USSR and US Equipment Handbood (U)	Oct 73	A compact source of ready reference of similar US and USSR ground forces wquipment. Included is information on USSR Communications and non-communications equipment.
7.	Miscellaneous:			
	------	(C) Concept for Tactical SIGINT/EW Support (U)	Apr 75	A complete concept for tactical SIGINT/EW operations with the Army. Includes a breakout and description of ASA units, their functions, organization, missions, and capabilities to support the Army.
	------	(C) Army Electronic Warfare Master Plan (U) (S) Appendix A and B (U)	Sep 75	Specifies US Army objectives and provides guidance and direction for achieving these objectives. Specific tasks and associated target dates are limited to short term (FY76-77). Includes detailed breakout of equipment development and fill.

TABLE 10 (continued)

Number	Title	Date	Description
------	US Army Electronic Warfare Concept	Mar 78	Establishes general guidelines for the employment of EW, and a basis for further development of EW doctrine, tactics, procedures and material.
FORSCOM REG 135-6	COMSEC Readiness in Army Reserve Component Units	Aug 75	FORSCOM policy for attaining/maintaining COMSEC Readiness in Army National Guard and US Army Reserve Units.
FORSCOM REG 350-1	Active Army Training	Nov 76	Supplements DA policies, objectives, responsibilities, & guidance contained in AR 350-1 for the military training of AC units FORSCOM guidance for EW training of AC units is contained in Chapter 4, FORSCOM Reg 350-3.
Chapter 4, FORSCOM REG 350-3 Ch 2,3	Specialized training in FORSCOM Active Duty and Reserve Component Units	Sep 75	Chapter 4, FORSCOM Reg 350-3 provides specific EW training guidance to all FORSCOM units, AC and RC.
FORSCOM REG 525-1	(C) Army Electronic Warfare Master Plan (AEWMP) (U)	Dec 76	FORSCOM instructions for implementation of the AEWMP. Includes reporting requirements for FORSCOM units.
DOD Dir 5200.17 (M2)	(TS-SI)	Jun 76	DOD policy and procedures for the security, use and dissemination of COMINT.
DI 1-76	(S) Electronic Warfare Reports Index (U)	Jan 77	Index of publications and reports distributed by the Air Force Electronic Warfare Center. The COMFY COAT series of publications are produced by the AFEWC.

TABLE 10 (continued)

Number	Title	Date	Description
USREDCOM Dir 525-1	(C) Electronic Warfare (EW)(U)	Jun 77	Assigns responsibilities and establishes procedures for the conduct of EW by forces assigned to USREDCOM.
AST-17315 102-77	(S) The Soviet Radioelectronic Combat Capability	Sep 77	An ACSI document, prepared by the Foreign Science & Technology Center, which gives the Soviet view of EW (Their term: Radio-electronic Combat)and the latest intelligence information of the REC threat to US Forces. A TS-SI version is also available to limited distribution.
SM-431-75	(S) Annex H to JCSP FY 1976 (EW) (U)	Aug 75	Identifies existing Service EW resources, assigns tasks, and provides guidance to the commanders of Unified and Specified Commands for the conduct of EW operations under all conditions of warfare.
JCS MPO 95	(S) Memorandum of Policy on Electronic Warfare (U)	Jul 74	The basic JCS policy document for EW within DOC. (Under Revision).
TRADOC Threat Handbook	Battlefield Survival and Radio-electronic Combat, The Radio Direction Finding Threat	Jan 77	An unclassified explanation of the Radio-electronic Combat threat. The Radio Direction Finding portion of the threat is covered in detail. Also how US forces can overcome the threat through protective techniques. An excellent "How-to" type manual.
TRADOC Threat Monograph	Electronic Warfare: The 4th Dimension of Combat Power	Jul 76	How US Army Electronic Warfare tactics can beat enemy Radioelectronic Combat.
TRADOC Threat Monograph	(S) Soviet Radio Net and Radar Emitter Analysis-Tank Army (U)	Mar 77	Graphic display of radio nets which could typically be encountered by a US Army Division fighting in Europe, and US Systems which can be employed to counter these nets.

TABLE 10 (continued)

Number	Title	Date	Description
TRADOC Threat Monograph	(C) A major COMSEC Challenge: Secure Voice (U)	Oct 75	Concise summary of past, present and future secure voice equipment, its problems and potential.
TRADOC Threat Monograph	(S) The R-330A Soviet Division Tactical VHF Jammer (U)	Sep 76	Description of the R330A, its effects and tactical employment.
TRADOC Threat Monograph	How to build a Step-Tone Jammer for less than $15.00	Jul 76	Direction on how to build a jammer for standard UHF airborne receiver/transmitters.
TRADOC Threat Monograph	(S) The Jamming Weapon (U)	Apr 77	A primer on "How to understand a little about a lot of jamming."
TRADOC Threat Monograph	(S) R-834 / -tO-Air and Air-to ground T tical Communications Jammer, VHF-UHF (U)	Aug 76	Characteristics and tactical employment of the R-834.
Signal Bulletin	(S) Jamming Combat Net Radios (UP	Aug 77	Brief summary of what the enemy can do and how we can combat it.
TRADOC Workbook	(S) Electronic Warfare Threat Workbook (U)	Jul 76	Working tool for personnel performing duties in the area of combat development, training, intelligence analysis, military instruction, and EW management/operations.
TRADOC Poster	"Direction Finding Surprise"	Jan 77	Highlights the threat and provides ECCM Techniques.
USACGSC	(S) Program for Staff Officers in Electronic Warfare (U)	2 May 77	ASI 5M Course to be conducted by units. Three volumes, ASI awarding. Includes lesson plans, visual aids and suggestions on how to conduct the course.

TABLE 10 (continued)

Number	Title	Date	Description
TRADOC	(C) Joint EW Procedures Manual (Draft) (U)		Procedures for coordination/employment of in Joint Operations.
1st Cav Div	(C) Electronic Warfare: Evaluation of "Enemy" Jamming during JRX GALLANT CREW 77. (U)	Mar 77	Describes the training and procedures used to mass ECM in support of the OPFOR in JRX GALLANT CREW 77. Numerous innovative ideas and valuable lessons learned.
Sig School	Communicating on the Anti-Armor Battlefield	Sep 76*	An excellent ECCM Manual for communicators, Operators, and tactical Signal Planners.

TABLE 11

RECOMMENDED EW REFERENCE LIBRARY CHECK LIST

	CO	SEP CO/BN	BDE	SEP BDE/Div	CORPS	EAC	EW UNIT
AR 105-2		X	X	X	X	X	X
105-3		X	X	X	X	X	X
105-5			X	X	X	X	X
105-7				X	X	X	X
105-64			X	X	X	X	X
105-86		X	X	X	X	X	X
105-87		X	X	X	X	X	X
FORSCOM SUP 1		X	X	X	X	X	X
380-35				X	X	X	X
381-3				X	X	X	X
530-1		X	X	X	X	X	X
530-2		X	X	X	X	X	X
530-3		X	X	X	X	X	X
530-4				X	X	X	X
FM 11-50		X	X	X	X	X	X
24-1	X	X	X	X	X	X	X
24-18	X	X	X	X	X	X	X
30-476				X	X		X
31-40	X	X	X	X	X	X	X
32-1				X	X	X	X
32-5		X	X	X	X	X	X
32-6			X	X	X	X	X
32-10				X	X	X	X
32-15				X	X	X	X
32-16							X
32-20			X	X	X	X	X
32-30	X	X	X	X	X	X	X
90-2	X	X	X	X	X	X	X
100-5		X	X	X	X	X	X
100-5A				X	X	X	X
100-32(T)	X	X	X	X	X	X	X
TC 24-2		X	X	X	X	X	X
30-1	X	X	X	X	X	X	X
30-6							X
30-19			X	X	X	X	X
30-20			X	X	X	X	X
32-05-2PT	X	X	X	X	X	X	X
32-8				X	X	X	X
32-10	X	X	X	X	X	X	X
32-11	X	X	X	X	X	X	X
32-20	X	X	X	X	X	X	X
105-5							
ATT 32-400			X	X	X		
ASUB SCH 32-1		X	X	X	X		
DA PAM 380-2			X	X	X	X	X
381-13	X	X	X	X	X	X	X

SOURCE: (C)FORSCOM Training Notes Number 5(U) 9 January 1978.

the necessary publications for an effective EW training program.

Chapter IV, Recommendation For EW Doctrine and Tactics, will present specific measures to reduce the vulnerability of the U.S. mechanized infantry to threat EW actions.

CHAPTER III

ENDNOTES

[1]Bernard W. Rogers, U.S. Army Electronic Warfare Concept, 6 March 1978, (FORWARD).

[2]Department of the Army, Command and General Staff College RB 100-2, Vol. 1, Selected Reading in Tactics, August 1976, p. 4-10.

[3]Department of the Army, Office of the Chief of Staff, Special Analysis of Net Radios, SPANNER Final Report, August 1974.

[4]Combat Communications Systems Study, C2S2 Final Report, (HQ, TRADOC, Ft. Monroe, VA, 1 April 1977), p. II-15.

[5]Ibid., p. II-15.

[6]Department of the Army, Electronic Warfare Concept, 6 March 1978.

[7]U.S. Department of the Army, Training Circular 101-5, Control and Coordination of Division Operations, April 1976, p. 7.

[8]Ibid., p. 1.

[9]Bernard Loeffke, "Leave the Radio Home," Infantry November-December 1977, p. 11-13.

[10]After Action Report on the employment of Motorcycles in the Air Assault Division, 2d Battalion, 503 Infantry (ABN), 101st Airborne Division (AASLT), 15 July 1975.

CHAPTER IV

RECOMMENDATIONS FOR EW DOCTRINE AND TACTICS

"Without the command-control-communications (C^3) permitted by modern technology, military resources could not be used in the most efficient possible fashion."[1]

The net assessment of the impact of electronic warfare on the mechanized infantry battalion clearly indicates that the battalion would face a number of difficult, but manageable, C^3 problems if required to fight on the European battlefield.

The battle captain confronted with the EW threat does not possess an adequate C^3 system to effectively command the resources at his disposal. His unit does not presently understand the threat nor the numerous methods of diluting the EW impact. Basic EW awareness problems commence at the basic schooling level and increase as the soldier progresses in rank and education. Electronic Warfare training has not been standardized within the U.S. Army and, therefore, there is no education focus toward the EW problem. Good communication equipment has always been available to the commander and has never before been challenged by the EW threat. Reliance on the effective communication system has created a state of animation toward new technology and its potential impact.

There currently exists a lack of appreciation of the vulnerability of FM voice radio and its consequent impact on the C^3 aspects of the modern battlefield. The threat to friendly forces has been discussed in closed circles but not to the detail and level required within the service schools. Units and personnel have not been given the necessary training to provide essential information to fully understand the threat to C^3, methods to be employed to dilute this impact, and alternate methods of communication. More importantly, the chain of command has not recognized the requirements nor provided units with the organization not only to survive, but also to win the first battle.

Training in general is poor because the soldier receives his basic communications training and is shipped to his unit where emphasis is directed at his primary military occupational specialty (MOS). He does not receive continuity training unless he is assigned in a communications MOS. Tactical communications have always taken a subordinate role to required administrative traffic and considerations. Often units are denied good terrain during field training exercises (FTX) because of the requirement to establish wirelines or range drops for administrative reporting. Soldiers quickly learn the unit's requirements and adapt to the system without knowing the reasons. Certainly, safety during peacetime training is essential and may be the driving force behind positioning and communication activities,

but unless this is clearly understood by the soldier and how it would really be done in combat, negative training occurs.

Transmission procedures are not enforced to the degree required to provide proficient radio telephone operations. Net control stations seldom correct procedures which would provide instant training feedback to the RTO. The fact that an RTO thinks someone is listening is sufficient to produce excellent procedures and signal training.

Tactical units lacking C^3 Army wide doctrine have developed techniques to overcome their perceived threat. Much emphasis have been given to interoperatability among NATO countries; but, we fail to see our own lack of standardization within the U.S. Army in communications matters. If units are rapidly deployed to forward defense areas or flown in from CONUS, well developed unit techniques may have the opposite effect for which they were intended.

RECOMMENDATIONS FOR C^3 IMPROVEMENT

1. Training and Doctrine Command (TRADOC) should consolidate, evaluate and establish C^3 doctrine. A central agency should be established to process feedback from units as the new concepts are field tested and are refined into solid tactical doctrine. TRADOC should insure that C^3 subjects are standardized within the service schools and should monitor and assist unit training by providing doctrine and lesson plans.

2. An Army level publication should be written to provide guidance for survivability and more specifically for C^3 interoperability. This publication should be oriented to the battle captain level and be a part of the How to Fight manuals currently being fielded. The principle aim of the FM would be to standardize responsibilities and techniques to enable new units and replacement personnel to rapidly reach combat effectiveness.

3. Threat briefings should be conducted among all ranks providing general information concerning C^3 vulnerabilities in order to establish a common awareness of the seriousness of the problem. An examination should be conducted into the possibility of declassifying some of the available training material to extend this vital information down to the troop level, where many of the C^3 problems originate. Those classified films and documents that remain at the present classification level should be available in sufficient number to present training to all officers and NCOs. The degree of secrecy traditionally attached to EW subjects must be removed to the extent possible to provide the widest dissemination of valuable information.

4. Communication procedures should be taught to all users, officers as well as RTOs; all RTOs must be licensed to insure a satisfactory degree of proficiency has been attained. Training should be continuous with periodic validation tests for all licensed personnel in C^3 subjects.

5. It is recommended that the revision to the current ARTEP submitted in Table 4, p. 36 to p. 41 be adopted for field use immediately, to insure units are examined to the degree demanded by our C^3 vulnerabilities. Present training levels will be indicated as units are tested with a detailed EW training and evaluation outline.

6. A new procedure must be developed for the allocation of radio frequencies within the communication spectrum. Battle captains must have sufficient discrete frequencies to enable their C^3 the best probability of success. Two discrete frequencies for each unit would provide excellent C^3 links for the command and the operations and intelligence (OI) nets.

7. The table of organization and equipment for the mechanized infantry battalion should be changed to provide a C^3 essential organization. Both messengers and liaison personnel should continue to be carried as combat essential. A messenger section of six messengers and an NCO should be established with their own organic transportation and standby aircraft available for priority missions. Two liaison officers should be assigned to the operations section of the battalion headquarters. Their mission would be to coordinate between their parent unit and higher, lower and adjacent units.

8. Motorcycles should be used in infantry units as primary transportation for both messengers and mobile transmission techniques. Fast reliable transportation is

essential for messenger employment. Initial costs outlay and maintenance are inexpensive for motorcycles; additionally, these motorcycles will not adversely affect deployment loading plans and vehicle density.

AREAS FOR FUTURE RESEARCH

Command, control, and communication (C^3) is a complex multifaceted subject worthy of additional study and research in order to formulate the best possible courses of action. One such topic closely related to this thesis is that of the military estimate and decision process. The method in which the commander renders his guidance, the staff coordinates between units, and decisions are made and orders given, are the life blood of the unit. Future decisions will be made under conditions of limited communication. Commanders at all levels must be prepared to continue the fight devoid of communications with their superiors. The implication of isolation on the battlefield presents a new dimension in decisionmaking of the subordinate. A number of possibilities come to mind: decision matrices, time decision continuum, and risk analysis; all of which depend on decisions based on estimates and momentary isolation from communication links. Communication isolation is a distinct possibility due to the EMP created by nuclear detonation.

Research into decision processes and alternate means of communication is essential.

Another important aspect for possible future investigation is that of changes to the standard five paragraph field order. Would it be more advantageous, granting the present threat, to expound on paragraph three, execution, by rendering detail of the commanders guidance? Another neglected portion is paragraph five, Command and Signal, which may now require more detailed information as to all headquarters locations and details of CEOI changes. Certainly, messenger overlays should include sufficient detail to function as the primary communication link, if required. Possibly a C^3 annex would be appropriate thus removing redundancy throughout the order but rendering necessary detail as required.

SUMMARY

A war in Europe would be a short and violent conflict demanding the best C^3 system available to fight outnumbered and win. It can be done, but only through a new and vigorous training and organizational program. The recommendations in this chapter are not all inclusive, but if followed, would prevent many of the glaring errors in Command, Control, and Communication. An aggressive pursuit to arrest these adverse trends will quickly pay dividends as the U.S. Army prepares to fight the first battle.

CHAPTER IV

ENDNOTES

[1]Donald H. Rumsfeld, Annual Defense Department Report, FY 1978, January 17, 1977, p. 103.

BIBLIOGRAPHY

BIBLIOGRAPHY

BOOKS

Campbell, William G. Form and Style in Thesis Writing. 3d ed. Boston: Houghton Mifflin Co., 1969.

Savkin, J. YE. The Basic Principles of Operational Art and Tactics. Moscow, 1972.

Selltiz, Claire, Lawrence S. Wrightsman, and Stuart W. Cook. Research Methods in Social Relations. 3d ed. New York: Holt, Rinehart and Winston, Inc., 1976.

Wandelt, Mabel. Guide for the Beginning Researcher. New York: Appleton-Century-Crofts, Meredith Corps, 1970.

Woods, David L. A History of Tactical Communication Techniques. New York: Armo Press, 1974.

GOVERNMENT PUBLICATIONS

Department of the Army Field Manual 6-20. Fire Support in Combined Arms Operations. May 1977.

Department of the Army Field Manual 11-50. Combat Communication Within the Division, 31 March 1977.

Department of the Army Field Manual 24-1. Combat Communications. 30 September 1976.

Department of the Army Field Manual 32-30. Electronic Warfare. 31 August 1976.

Department of the Army Field Manual 71-2. The Tank and Mechanized Infantry Battalion Task Force. 30 June 1977.

Department of the Army Field Manual 71-100. Brigade and Division Operations. May 1977.

Department of the Army Field Manual 90-1. Employment of Army Aviation Units in a High Threat Environment. 20 May 1977.

Department of the Army Field Manual 90-6. Mountain Operations (Coordination Draft). June 1977.

Department of the Army Field Manual 90-10. Military Operations in Built-Up Areas (Revised Draft). December 1977.

Department of the Army Field Manual 100-5. Operations. 1 July 1976.

Department of the Army Field Manual 100-5. Operations (Chapter 6, unpublished draft). "The Military Estimate and Decision Process." 1 July 1976.

Department of the Army Field Manual 100-32. Tactical Electronic Warfare. June 1975.

Department of the Army Field Manual 101-5. Command and Control of Combat Operations. July 1977.

Department of the Army Training Circular 30-20. Signal Intelligence. 28 May 1976.

Department of the Army Training Circular 32-05-2. Communications-Electronics Counter-Countermeasures Procedures. September 1974.

Department of the Army Training Circular 32-10 (Test). How to Train a Combat Battalion to Fight in an EW Environment. December 1974.

Department of the Army Training Circular 32-11. How to Get Out of a Jam. 18 April 1975.

Department of the Army Training Circular 32-20. Electronic Warfare Training. March 1974.

Department of the Army Training Circular 100-32-1. EW-A Weapons Qualification Course. 30 September 1977.

Department of the Army Training Circular 100-33. Tactics of Electronic Warfare (Coordinating Draft). December 1977.

Department of the Army ARTEP 71-2. Army Training and Evaluation Program for Mechanized Infantry/Tank Task Force. 17 June 1977.

Department of the Army ARTEP 71-2. Special Report of Net Radios. Spanner Final Report, Office of the Chief of Staff, 2 August 1974.

AD-A061 839 ARMY COMMAND AND GENERAL STAFF COLL FORT LEAVENWORTH KANS F/6 17/4
IMPACT OF ELECTRONIC WARFARE ON TACTICAL PLANS AND TRAINING OF --ETC(U)
JUN 78 J M BROGDON

UNCLASSIFIED

NL

2 OF 2
AD
A061839

END
DATE
FILMED
2-79
DDC

Department of the Army, TRADOC Combat Communications Systems Study. "C2S2 Final Report," 1 April 1977.

Department of the Army, Intelligence Threat Analysis Detachment, Military Operations of the Soviet Army, 25 May 1976.

Department of the Army, TRADOC Threat Handbook. "Battlefield Survival and Radio Electronic Combat." January 1977.

Department of the Army, TRADOC Threat Monograph. "Jamming of FM Tactical Communications." April 1977.

War Department. Forward Inter-Communication in Battle. 1917.

United States Army Infantry School. The Tank and Mechanized Infantry Battalion Task Force. 20 June 1977.

United States Army, Electronic Warfare Concept. 6 March 1978.

First Infantry Division(M) After Action Report. "Reforger 1976." 10 November 1977.

Ninth Infantry Division After Action Report. "JTX Boldfire 3-74." 20-24 May 1974.

US ARMY COMMAND AND GENERAL STAFF COLLEGE PUBLICATIONS

Department of the Army, CGSC PT 100-1. Self-Paced Text for Training Managers. 1 August 1977.

Department of the Army, CGSC PT 100-2. Terrain Analysis and Allocation of Combat Power. July 1977.

Department of the Army, CGSC RB 100-2, Vol. 1. Selected Readings in Tactics, The 1973 Middle East War. August 1976.

Department of the Army, CGSC RB 100-2, Vol. VI. Selected Readings in Tactics. June 1977.

Department of the Army, CGSC RB 100-15 Draft. Concepts of Control and Coordination of Corps Operation. 30 September 1977.

Department of the Army, CGSC, "Electronic Warfare System," CGSC Lesson Plan for P111 Commander and Staff, LTC C. S. Simerly, April 1977.

Department of the Army, CGSC, The Commander and His Staff, Subcourse P111, 8L7-1773, p. 48.

Masion, William L., A Review of Command and Control Shortcomings Within the Air Assault Division, Student Study Project, March 1978.

Morgan, James E., Jr., EW ARTEP, Student Study Project, May 1978.

PERIODICALS

Beaver, John W. "Threats and Alternatives," The Army Communicator (Fall 1977), 37-41.

Elcomb, A. C. "Command and Control Systems," The Army Quarterly and Defense Journal, 102 (January 1972), 159-172.

Heffernan, Walter B., Jr. "The Voice of Command-Maybe," The Army Communicator (Summer 1976), 52-55.

Kalinin, Col. V. "Classroom and Field Radio Training," Soviet Military Review (August 1977), 22-23.

Kondakov, G., LTC, "Communication in Troop Control," Soviet Military Review, March 1976, 19.

Loeffke, Bernard, COL., "Leave the Radios Home," Infantry, November/December 1977, 11-13.

Runsfeld, Donald H., Annual Defense Department Report FY 1978, 17 January 1977.

"Manpack Radio Tactical Satellite Communication Demonstrated," Army Research and Development (May-July 1977), 21.

"Military Lessons Learned," Electronic Warfare (January-February 1974), 36.

FIELD NOTES

Montgomery, B.C. "High Command in War." Brief notes for Senior Officers on Conduct of Battle, December 1942.