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COMMAND CONTROL, COMMUNICATIONS (C3) AS A TACTICAL FORCE MULTIP--ETC(U)
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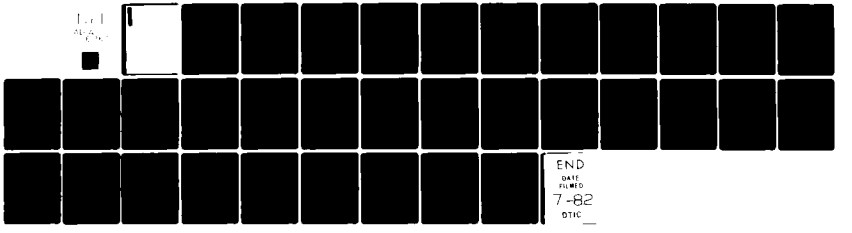

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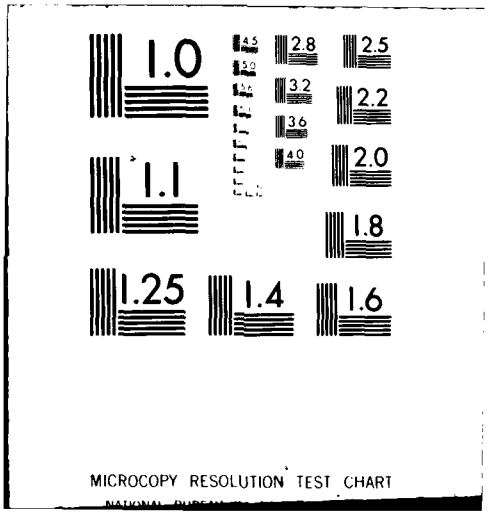
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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A116267	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Command, Control, Communications(C3) as a Tactical Force Multiplier-Myth or Reality		5. TYPE OF REPORT & PERIOD COVERED Student Essay
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) LTC Victor R. Shavers		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army War College Carlisle Barracks, PA 17013		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Same		12. REPORT DATE 19 April 1982
		13. NUMBER OF PAGES 31
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

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)*

18. SUPPLEMENTARY NOTES

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

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

The essay begins with an analysis of specific aspects of an effective C^3 system. It focuses upon the division in combat but recognizes that many of the principles, procedures and techniques that are addressed also apply to echelons above division. The vital role and responsibilities of the commander are stressed; Management of C^3 with a view toward Command Post organization and reducing and controlling information flow are discussed; and a preview of the future tactical communications system and the anticipated improvements in reliable and survivable communications are presented. The

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reality of C^3 as a tactical force multiplier from a historical, present and future perspective is analyzed. Finally, conclusions are drawn.

US ARMY WAR COLLEGE

INDIVIDUAL RESEARCH BASED ESSAY

COMMAND CONTROL, COMMUNICATIONS (C^3) AS A TACTICAL FORCE MULTIPLIER - MYTH OR REALITY

BY

VICTOR R. SHAVERS

19 APRIL 1982

I. INTRODUCTION

There is a strong and growing impression among commanders that Command, Control and Communication is more than a supporting function. It is apparent to many that an effective C^3 system is, in itself, a weapon which is a key element that will contribute to winning the battle. Obviously, the Soviet Union is aware of the importance of C^3 by its emphasis on electronic warfare.[1] The thrust of Soviet planning and training is to deny the United States and its allies use of the electromagnetic spectrum. If an armed conflict between the United States and the Soviet Union ever occurs, C^3 or the lack of C^3 will be a key function in determining the winning side. The U. S. and Allied Forces must continue to emphasize planning and training in electronic counter-countermeasures and other techniques of survival if we are to win the battle.

U. S. and Allied forces are faced with the challenge of fighting and winning outnumbered in Europe. The threat in Europe outnumber the NATO Allies by approximately 5 to 1 in tanks, 4 to 1 in SAMS, 4 to 1 in Artillery, 2 to 1 in Aircraft and 2 to 1 in Manpower.[2] The few assets available to the allies must be employed up to their optimum effectiveness. Tactical doctrine of allied forces has focused on enhancing the employment of our forces, while inflicting maximum destruction on the enemy first and follow-on echelons. The active

defense, the extended battlefield and the more recent airland battle concepts are indicative of these doctrinal trends. The common thread that runs through these doctrinal trends is the need for the commander to have timely and accurate information about enemy and friendly forces. The implied requirement is that the commander must be provided an effective C^3 system that will allow him to see, assess, direct, order and employ combat power at the decisive time and place. If an effective C^3 system is not there at the decisive time and place, the commander can not execute the tactics and win. Effective C^3 is especially important in the airland battle where units will attempt to meet requirements in excess of their available assets. The key concept of the airland battle is to fight simultaneously close-in and deep. The commander's ability to see, assess, direct, order and employ forces deep is essential to winning the battle.[2] An effective C^3 system can be an important function in winning that battle.

My discussion will begin with an analysis of specific aspects of an effective C^3 system. The focus of the discussion is limited to the tactical arena with emphasis on the division echelon of command. However, many of the principles, procedures and techniques surfaced apply equally to echelons above division. The commander's role in the proper management of C^2 is crucial to a successful C^3 system. I will discuss the management of C^3 with a view toward Command Post organization, reducing and controlling information flow, and communications as a third dimension of the process. A preview of the future tactical communications system and the anticipated improvements in reliable and survivable communications are presented. The reality of C^3 as a tactical force multiplier from a historical, present and future perspective is analyzed. Finally, conclusions are drawn from available evidence.

II. MANAGEMENT OF C^3

A. Command Post Organization

The first two letters of C^3 represent command and control and become C^2 when not used with the third dimension, communications. I have paused to explain what might appear to be obvious because there are many who confuse and interchange these terms repeatedly. Command and Control is defined as:

> The exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures which are employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission.[3]

Implicitly it means acquiring data through a reliable and survivable electronic communications system; and the display, retrieval, processing and storage of data through some type of computer system that will permit a commander to employ maximum combat power at the decisive time and place.[4] The means to do this are as difficult as it is to separate command and control from communications. C^2 must include all functional areas of the organization. It must be noted that communications is a subfunction of C^2. The Dictionary of Army Terms, AR 310-25 and JCS Pub. 1 do not define Command, Control, Communications (C^3). However, the term C^3 is widely used in the Army and it is often misunderstood. Sometimes C^3 is used in connection with intelligence and has become

known as C^3I. Othertimes, C^3 is raised to the 4th power (C^4) to represent computers. Restricting the C^3 process to specific functional areas sometimes implies that other functions are eliminated. A senior speaker asked during a recent speech to the 1982 AWC class: Why is logistics left out of C^3I? Certainly a C^3 system for logistics is as much of a requirement as a C^3 system is for intelligence. The implication is why not, C^3IL. I am sure the Field Artillerymen, the Air Defenders and the Tactical Air Supporters felt equally slighted. Tactical C^3 must be an integrated system that includes Intelligence, Operations, Fire support to include close air support, logistics and personnel. The C^3 system referred to in this paper applies to all functional areas. Communications is viewed as the third dimension of the C^2 process.

The organization of a tactical Command Post (CP) is a function of the commander's philosophy of leadership, personality and experience. The organization of the CP has a tremendous impact on the effectiveness of C^2, the efficiency of information flow, and the total integration of the C^3 system. Today, most U. S. Army command Posts at division level and higher echelons of command are vulnerable to destruction. This vulnerability stems from the fact that these CPs are massed in small areas with many oversized vehicles, electronic emitters, and a high concentration of vital personnel. As a result, these CPs are relatively easy to find through SIGINT and other electronic means. After locating the CP, destruction by conventional ordnance is easy because of the massed configurations. This vulnerability is not limited to the European threat, but applies equally to relatively unsophisticated potential enemies in other parts of the world. We can not accept the loss of our CPs and still expect to exercise positive C^2 and win the

battle. The U. S. Army operational concepts and tactical doctrine rely on far-sighted central planning and decentralized execution in order to overcome the advantages of a numerically superior force. The airland battle concept increases this reliance on an integrated well-trained staff to assist the commander in carrying the battle to the enemy follow-on echelons in ways which lead to his ultimate collapse. Consequently, survival of the CP is a prerequisite for winning.

The Army has used several methods through the years to protect CPs from detection and destruction. The methods used to protect CPs include location of CPs out of weapons range, hardening, size reduction, signature reduction, frequent displacement, deception, duplication, and dispersion. However, these methods must be reexamined due to improved sensor technology, weapons capabilities and the threat of nuclear and chemical weapons use.[5]

The location of CPs out of weapons range has consisted of choosing sites beyond the range of enemy tube artillery or multiple rocket launchers. Avoiding the range of these weapons is important, however, the threat of aircraft and the FROG/SCUD missiles can be expected to be directed against CPs. Locating beyond the range of these weapons is impractical for division and corps CPs.

The hardening of CPs can be done in several ways. Armored Command Vehicles provide protection from conventional weapons and long range effects of nuclear weapons. Moving the CP into villages with structural sound buildings affords excellent protection and deception. Digging in the CP below surface level, if practical, affords protection against conventional fires, distant nuclear blast and ground attack.

Reducing the number of people and equipment at CPs is the most

frequently attempted survivability approach in recent years. The goals of reducing the size of CPs are to achieve signature reduction, facilitate the capability for frequent displacements, and achieve deception. It must be recognized that large size CPs do not necessarily mean that they contain nonessential people or equipment. Significant size reduction is not, easily achieved without loss in effectiveness.

Signature reduction is an attempt to baffle the enemy's detection and identification of the CP. It must address all the methods the enemy has available for sensing our existence, location, and identity. These methods include visual, infrared, thermal, and signal sensors as well as radars and covert observers. Every prudent measure must be taken to reduce or limit signatures. However, signature can not be totally eliminated and the potential exists for some sensor to detect them. It must also be noted that this approach avoids detection only and is of no benefit in preventing destruction once found.[6]

Frequent displacement of CPs is also an often used approach. The basic idea is to move the CP before the enemy has time to detect, identify, accurately locate, target and deliver fires against it. There are some pitfalls to this approach. The enemy's reaction time may be shorter than the setup time for our CPs and future automation of the enemy's intelligence, target acquisition, and fire control systems will only aggravate this imbalance. Trying to keep ahead of the enemy's reaction times is risky. A CP displacing almost constantly cannot effectively do its job and it fully extends an already fragile communications system. But, more importantly, a frequently displacing CP is vulnerable to detection by moving target indicator radar, just as an immobile CP is vulnerable to SIGINT and imagery sensors.[7]

Deception has the potential for significant effectiveness as an approach to CP survivability. The deception objective is to convince the enemy that the CP is located at an unoccupied site well away from the true location or that many locations could be the actual CP. The second alternative is especially valuable if the number of potential targets exceeds enemy engagement capability.[8] During my assignment to the 3d Armored Division (3AD), some effective results were achieved by making tactical (TAC) CPs similar in signature to brigade and battalion CPs. The 3AD used two TAC CPs and a scaled down Division CP during the 1979 Reforger Exercise. The command group was located at the "HOT" TAC CP while the "COLD" TAC CP moved and prepared for operations in a new location. The electronic emitters at the TAC CPs were limited to those normally found at a Brigade CP. The planning for future division operations was conducted at the scaled down Division Main CP. The electronic emitters in support of the Division Main CP were remoted from 1 to 1 1/2 Kilometers (KMS). This approach insured continuous communication to the command and worked very well. However, more refinement needs to be done in this area to fully exploit its potential. This approach is especially interesting since it seeks to cause problems for the enemy even after he has detected our location.

Duplication is an important element of any survivability concept. The two TAC CP concept discussed above was an effort in duplication as well as deception and dispersion. Duplication can cover the full range from designating subordinate CPs as alternates to fully replicating personnel and equipment of the CP. This is an expensive process in terms of personnel turbulence and material accountability. Future force structures of tactical organizations should contain the capability for

duplications.

Dispersion is the essential ingredient to survival of the CP. The key is to disperse widely enough so that the enemy attack and destruction of one CP element does not result in the destruction of other elements not detected. The amount of dispersion is dependent upon the assumption made regarding type enemy weapons to be used against detected CPs. For instance, if it is assumed the enemy would attack with a multiple rocket launcher battery, the impact pattern dictates a 500 meter dispersion distance. The result is a requirement for the enemy to invest much more effort in finding the whole CP and many more attack resources in killing it. The effects of the dispersion technique can be significantly enhanced by combining it with duplication and deception approaches. If this is done, the enemy is less able to disable the CP by killing a small number of critical elements.[9]

There is a clear need for increased survivability of Command Posts. The application of all the techniques and approaches discussed above would contribute to more survivable CPs. The adoption of a modular Command Post structure would be an important initiative in the direction of achieving more survivable CPs. A modular CP structure offers a combination of all the approaches previously discussed and emphasizes CP size reduction, signature reduction, dispersion and duplication.[10]

The modular CP concept is based on the following principles:

- o The CP is organized into small modules.
- o The space between modules should be a minimum of 1.5 km, but greater depending on the threat capabilities.
- o The module CP must be hardened against conventional attack and nuclear effects by a combination of armor protected vehicles and dug-in positions where feasible.

- o Every module of the CP is duplicated. There will be at least two of each type module and they are separated to preclude simultaneous destruction. The two modules represent the day and night shifts. When personnel of a module are relieved at the shift change they can do one of two things. One course of action is to displace to a new location. The other course of action is to remain in place. When a module displaces to a new location, it would not transmit on the radio until the end of the next cycle. In this way the enemy signal direction finding capability could be avoided. Remaining in place certainly increases the vulnerability of the module to the enemy SIGINT capabilities.

The individual displacement of each module would present a smaller signature than the present mass displacement of whole CPs. The signature could be further decreased by staggering the interval between module shifts. The movement of a single module at odd times with no immediate radio emissions at the new site should complicate the enemy's identification problem.

There is no doubt that a modular CP will make great demands on the Communications-Electronics officer and the headquarters commandant. It is absolutely imperative that all of the modules of the CP be tied together by a reliable communications systems. This system must provide secure voice, record, data and graphic communications. The transmission medium should be via Radio and Cable Communications Systems. Emphasis should be placed on cable where feasible. These systems should be designed to provide redundancy and enhanced

reliability.

The headquarters commandant is required to:

- o Maintain status of module locations.
- o Select new locations.
- o Guide modules to new locations.
- o Coordinate logistic support.
- o Provide local security support.[11]

Local security of modules will require a combination of operations security (OPSEC) reaction forces and anti-intrusion sensors.

An appreciation of the modular command post contribution to enhanced survivability is best illustrated through the assumed thought process of the enemy targeting officer. The targeting officer is tasked to disable the U. S. Command Control System. The present U. S. massed CP structure affords the enemy targeting officer to economically target and destroy our CPs. Even when detections are doubtful, the targeting officer can justify large expenditures of weapons or loss of aircraft to Air Defense Weapons Systems because a successful attack on a single location promises total loss of a Corps or Division Command Control System.

The modular CP makes this targeting process more difficult. The enemy targeting officer must now invest more sensor assets in finding and identifying all the modules of the CP. The enemy must also be prepared to pay a higher price in attack assets to kill the whole CP.[12]

The goal is to field enough modules to drive the cost of destruction above the enemy conventional capability. If our goal is achieved, the enemy will be forced to consider a nuclear approach. Once again, the modular concept deprives the enemy of an easy course of action.

Against massed command posts, the enemy targeting officer is able to succeed with a small number of nuclear weapons. The targeting officer is probably willing to accept the limited scale of obstacles to maneuver and collateral damage as a reasonable price for CP destruction.

A well dispersed modular CP is still vulnerable to nuclear attack, but requires the enemy to use more and/or larger weapons to eliminate all modules. The result would be creation of obstacles and collateral damage throughout the entire division and corps area.

If all divisions, corps, and echelons above corps dispersed their command posts, the enemy would be forced to use so many weapons that the effect would exceed the outcome of a strategic strike. The enemy may be willing to do that, but destruction of the entire theater may exceed the price that the enemy can afford and is probably inconsistent with his aims and interests. The enemy no longer has a cheap nuclear solution. Therefore, the modular CP frustrates the enemy in both his conventional and nuclear approaches to attack on U. S. Command Control Systems.[13]

In addition to the positive effects of dispersion and duplication that is gained from the modular CP concept, survivability is enhanced through hardening, signature reduction and frequent displacement. Hardening is more practical due to phased displacements that facilitate continuous preparation of dug-in positions. It is also easier to find physical structures to accommodate small modules rather than for whole CPs.

Signature reduction is facilitated by the small module size and phased displacement. The information flow requirements and the number of electronic emitters from each module will be reduced. Since the modules

now more closely resemble other groups of vehicles, the enemy is less likely to attack on single detections without verification. Finally, frequent displacement may be less essential in a modular CP, however when required, it can be done as a phased process without interruption of control.

The effectiveness of the modular CP concept is dependent upon the personnel composition of each module. A conscious effort must be made to keep the number of personnel at each module to the minimum required to performed the assign task.

A second criteria for module composition is to insure that module membership consist of those staff personnel who most require face-to-face interaction. Staff members not in the same module must be able to interact effectively using voice, record, data and graphic communications. Face-to-face interaction appears to be essential where two or more staff sections are involved in accomplishing tasks such as assessing a situation, formulating a solution and planning for future operations.[14] If this belief is true then the module should consist of a combination of staff officers from several staff sections who coordinate a particular portion of the battle. Under this concept, the division Command Posts might be established as follows:

A. Command Operations Modules #1. The center of decision making. This module is charged with command and control of the immediate direct fire battle. It excludes all staff members except those who must interact with the commander directly. Included in this module are the Commander, G2, G3, Fire Support Coordinator, Air Force Representative and Aviation officer. This module equates to the present TAC CP and is referred to as the "HOT" TAC CP when command is executed from that location.

B. Command Operations Module #2. This module is a back-up CP for Command Operations Module #1 and is located as far away from it as possible. This module includes one of the Assistant Division Commanders and representatives from the same staff elements represented at Module #1. These staff element representatives are the second shifts of the staffs at Module #1. Communications systems and circuits are duplicated at command Operations Module #1 and #2 without losing command and control of the immediate direct fire battle.

C. Two Operations Support Modules. These modules supplement the command operations modules by executing tasks of a less immediate nature. These modules are a part of the division main CP, but keep in mind that all modules are spread out a minimum of 1.5 km. The chief of staff is located at one of the modules along with representatives from G1, G2, G3, G4, Fire SPT, C-E, Engineer, Air Defense, Aviation, and Air Force. The second shift is located at the other operations support module. Information on current operations are shared between the two modules. These modules exercise command and control over the following:

- o Execution of the attack of enemy follow-on echelons;
- o Coordination of support for the direct fire battle by the engineers, logisticians, fire support, military police, EW, intelligence collection, and C-E.

D. All-Source Intelligence Module. This module performs the function of intelligence analysis and collection management in support of the commander. It supports him both directly and through the other modules.

E. Plans Module. This module focuses on the concepts and plans for winning future battles. This module does not exercise direct

control or direction. They monitor the current situation and develop longer-term proposals for achieving the commander's goals. The module includes representatives on maneuver operations, intelligence, EW, fire support, air support, air defense, logistics and communications.

F. Specialized Elements Modules. Combat Support and Combat Service Support Modules concerned with command and control of specialized elements are separately organized as follows.

1. Combat Support Module
    a. Communications-Electronics
    b. Engineer
    c. Airspace Management
    d. Aviation
2. Combat Service Support Module
    a. HQ Commandant
    b. Maintenance
    c. Supply
    d. Personnel
    e. Rear Area Operations

It is noted at this point that the organizational structure of the Main Signal Center Platoons from the Division Signal Battalion must be altered to support the echelons of the Division headquarters under this concept. Extensive use of wire and cable will enable implementation without significant increases in other Signal Battalion equipment. Communications will be discussed in more detail at a later point.

Additionally, adoption of this modular concept requires some modifications to proposals for Division and Corps 86 in terms of armored vehcile[(M577 or V150) for modules and TAC CPs.

There are advantages and disadvantages to this modular concept.

The disadvantages represent a cost that must be balanced against gains in survivability and enhanced expectations of exercising positive command and control. The disadvantages associated with this concept are:

- o Deficiencies in local security and defense of modules;
- o Large cost in additional armored C^2 vehicles and organic communications equipment;
- o Increased responsiblities for HQ Commandant in module support and real estate management.

The advantages of the modular concept are:

- o The whole CP is difficult and expensive to find and to kill.
- o Loss of one CP element does not entail the loss of all.
- o Incremental displacement presents a constantly changing target.[15]

The modular CP concept offers the opportunity to significantly increase the survivability of the Division Command and Control System. The Command and Control problems at corps level are of a larger magnitude and too complex for total application of this concept as discussed herein. However, specific changes to the corps structure would allow for better dispersion, duplication, and enhanced survivability. Concurrent with these changes must come appropriate changes to the Corps Signal brigade. The changes in the Corps structure should facilitate the following:

- o Two identical main CPs to provide redundancy and ease of displacement. Each main should also have a

two-shift capability and the number of personnel should be limited to those required to interact with the commander or that portion of the battle that is being managed.

- o The Corps TOE for equipment and personnel should have the capability to provide the commander with a small mobile tactical CP for use in extending command and control to critical sectors of the corps area.
- o The Corps rear CP and the COSCOM CP should have the capability to shift functions from one CP to another in event of destruction of one of the CPs.

The modular concept cannot be fully implemented by the Division today, but it is not essential to completely implement the concept to achieve partial enhancement of survivability. Only minor adjustments are required to initiate partial implementation. There are shortfalls in communications reliability and local security of modules. However, the benefits to be gained from enhanced survivability offset to some degree these shortfalls. There are on-going communications modernization programs that will satisfy the requirements for reliable voice, data, record, and graphic communications. These programs will be discussed later in this paper.

B. Reducing and Controlling Information Flow

The amount of information flowing into today's Tactical Command Posts and ultimately to the commander is phenomenal. Our commanders are not confronted with a lack of information, rather they lack validated, assessed and timely information. It also appears that not all informa-

tion flowing to the CP is required by the commander for the decision process. Commanders want timely, accurate, analyzed information for tactical decision making. Most of what the staff provides the commander today is outdated information on what has happened with little analysis. The commander must take action to reduce the volume of information flow. The high volume of traffic overloads a fragile communications system which contributes to the misuse of the message precedence system. When the communications system becomes overloaded and messages are delayed, the tendency of the user is to increase the message precedence. Additionally, the high volume of traffic in most cases translates into more emitters at CPs, which exacerbates the electronic signature problem.

The commander is the key player in reducing the volume of information flowing to the Command Post. The commander must clearly state what are the elements of information required to fight the battle. Then, the commander must task his principle staff officers and his communications system to deliver that information in a timely manner.[16]

Inherent in the process of determining the elements of information required to fight the battle are the problems each commander faces of:

- o What is important?
- o How to validate it?
- o How to condense and organize data coming in?

The commander's knowledge, experience and personality generally serve as the basis for the answers to these questions. The commander will establish a system with which he feels comfortable. Which facts are important and how a commander determines his confidence in those facts are a function of the individual's personality, experience and knowledge.

In addition to identifying the important elements of information

and reducing the volume of information flow, standard command and control procedures must be established by the commander. Efficient use of available communications assets must be emphasized. Commanders must insist that electrically transmitted messages (voice, data, or record) are clear, concise and brief. Releasers of messages must insure that the proper precedence is assigned to messages in accordance with the importance of the information content. The telecommunications center must be located as close as possible to the decision maker. Administrative and message center procedures must not be allowed to become more important than the message itself.[17] The immediate delivery of the message to the decision maker must be the first objective of telecommunications personnel. Adherence to these standards and procedures will contribute to overcoming what is sometimes referred to as "the tyranny of the message center."[18]

So, the point is that command and control is not just a problem for communicators alone. I submit that the commander has a major role to play in establishing an effective command and control system. The commander's greatest contribution to this system is the way he organizes the command posts, controls the flow of information and establishes C^2 procedures for the command. But, by no means is the communications community off the hook. Today's tactical communications system is not without its problems, and it is this third dimension of the command and control equation that will be examined next.

C. Communications Dimension

Our current tactical communication system employs the following communications means:

o FM Radio (SECURE Down to BN level).

- o HF/Radio Teletype (RATT secure).
- o AM SSB Voice (UNSECURE).
- o Multichannel (PCM SECURE) Voice and Record.
- o Air and Motor Messengers.
- o Wire and Cable.

There is some built in redundancy and flexibility to the communications system, but it is also a fragile system. The communications system is not fragile because of the amount of communications provided, but rather in terms of system reliability, maintainability, and survivability. In fact, one can argue that the amount of communications provided is excessive and contributes to the flow of irrelevant information to command posts. The enemy threat to all types of electronic communications is expected to include physical damage, the effects of Electromagnetic pulse (EMP), Electronic Countermeasures (ECM), and Signal intercept activities. Our tactical communications system is vulnerable to each of these potential threats.

The tactical communications system of the future must provide reliable communications links between echelons of tactical headquarters and subordinate units. The communications system must be characterized by:

- o Ease of Installation.
- o Ease of Operation.
- o Ease of Maintenance.
- o Reduced Electronic Signature.
- o Electromagnetic Pulse Protection (EMP).
- o Hardened Facilities.
- o Electronic Counter - Countermeasures.

o Interoperable.

We must have communications systems that are easy to install, operate and maintain. We must reduce the complexity of tuning, adjusting and aligning equipment for installation and operation. We must have communications equipment that contains self-testing and diagnostic features which allow the operator to rapidly determine the problem or failure, pull-out the bad component and immediately replace it. We need to reduce the training time necessary to operate and to maintain our communications system. The bottom line is we need simplicity in our communications system. We need a communications system that will enhance combat operations, not restrain or restrict operations. Future communications equipment must contain ECCM features and protection against the effects of EMP. Without proper EMP protection of our equipment there is little hope for successful electronic communications in a nuclear environment. Finally, every effort must be made to harden our communications facilities. Physical protection of our communications facilities from the effects of conventional and nuclear explosions is critical in keeping our command and control survivable.

There is a new generation of modern tactical communications equipment at various stages of development, procurement and fielding. What we can expect in tactical communications improvements will be discussed next.

III. THE FUTURE COMMUNICATIONS SYSTEMS

The procurement of communications equipment is generally different from procurement of other systems because of its evolutionary process.[19] New communications equipment normally is a product of the application of new technology to an item already in existence. For a variety of reasons, the existing equipment and procedures cannot be totally replaced when new technology is applied. Consequently, the new advanced equipment or systems must work within the total communications network even as it enhances some aspect of the overall communications system. One of many examples of this evolutionary process is the new Automatic Telephone Switchboard SB3614, currently being fielded in Army divisions. The SB3614 is designed to replace the manual switchboard SB86 and SB-3082. The SB3614 is also designed to be compatible with both of these manual switchboards and the corps automatic voice switch TTC-38. These items of new communications-electronics equipment represent the leading edge of a new tactical communications system that will support the Army in the field from the mid-1980s through mid-1990s.

The Single Channel Ground and Airborne Radio System (SINCGARS) is a family of new lightweight, small, highly reliable VHF-FM radios in manpack, vehicular and aircraft configurations that will replace the present AN/VRC-12 series of radios. At battalion and lower echelons, the SINCGARS Radios will be a welcome replacement for the VRC-12 series radios. SINCGARS will provide the following improved capabilities:

- o Antijam protection using frequency hopping techniques, multiple power settings, and offset tuning.
- o Built-in text capability.
- o 100% security. (built-in encryption device.)
- o Increased reliability.
- o Commonality of components.
- o Interoperability with close air support aircraft, NATO and Allied Systems, and future C^2 and data systems.[20]

The SINCGARS family provides greater range and reduced weight. The introduction of high-speed facimile used in conjunction with the SINCGARS radio at the battalion echelon will provide an improvement in record traffic. This will result in the elimination of the unreliable high frequency (HF) radio teletypewriter terminals. Wire and manual switch-boards will continue to meet internal battalion communications requirements. Operator-Assisted interface with the automatic network at higher echelons will be available.

At brigade level, present FM radios used both down to battalion and up to division are replaced by the SINCGARS Radios with 100% security. Present HF radios for secure record traffic to battalion and to division will be eliminated. Fascimile will replace radio teletype for transmission to battalions over SINCGARS Radios. Record traffic communications between the brigade and division will be via modular record traffic terminal (MRTT). Transmission speed over MRTT will be about 12 seconds per 240 word page and can be sent over either the brigade single channel tactical satellite terminal or the SINCGARS Radio network. All record traffic will be prepared and transmitted by clerical personnel in staff and command sections with no requirement for signal trained personnel.[21]

It is also at brigade level that the Mobile Subscriber Access (MSA) system is introduced and presents major changes in the tactical communications system. The MSA along with single channel tactical satellite terminals will replace the present multichannel links from brigade to division main, division alternate, and to the forward area signal center. The MSA integrates the functions of telephones, telephone switching, radio transmission, communications security and radio wire integration into one system. This integration of functions permits reduction in C-E personnel and equipment. The MSA will make frequent command post relocations with continuous and reliable radio voice communications more of a reality.[22]

Complementing the MSA system within the division will be tactical satellite communications (TACSATCOM) terminals. TACSATCOM terminals will provide rapid and reliable communications links within the division and to the corps. The employment of MSA and TACSATCOM terminals within the division will provide an integrated communications systems that is far superior to the present system.[23]

The new communications equipment and systems projected for employment at corps and theater Army echelons are under the Joint Tactical Communications (TRI-TAC) Program. The TRI-TAC Program is primarily concerned with the design, development and acquisition of switched tactical communication systems. TRI-TAC multi-channel equipment is the primary means to interconnect the corps communications nodes within the corps sector. All voice and message switching will be performed automatically using TRI-TAC developed equipment located at communications nodes within the corps sector.[24]

Present FM radio equipment will be replaced by secure SINCGARS

radios within the corps sector. All HF radio teletypewriter and voice radios will be eliminated. This capability will be replaced by single channel TACSATCOM terminals for communications with division and with Theater Army. Units attached to or in support of the corps will be equipped with single channel TACSATCOM terminals that will facilitate communications with corps and division.

The single most important improvement reflected in the new communications equipment and systems is record traffic communications. The employment of TRI-TAC automatic message switches and high speed, simple to use facsimile terminals have the potential to provide error free, fast record communications from Theater Army to the battalion. High speed terminals are placed at the user locations. The user will compose and edit the message, after which the user will press a button and the message will be automatically routed through the message switch network to the addressee.[25] Elimination of administrative and message center procedures along with telecommunications personnel, time delays, and errors induced by teletype operators may in fact overcome "the tyranny of the message center."[26]

IV. THE POTENTIAL ØF C^3 AS A TACTICAL FORCE MULTIPLIER.

There is historical evidence where a force multiplier of some type has enabled a smaller combat force to emerge victorious over a larger combat force. History tells us that the force multiplier may be a new method, technology, device or weapon that enhances the effectiveness of one combat force over another. One of the best examples where a inferior force won over a superior one is the Air Battle of Britain from September - November 1940. Few instances more readily dramatize the impact of an effective C^3 system. The British historian, B. H. Liddell Hart gave the resources available at the start of the Air Battle: Britain 650 fighters; Germany 2,120 aircraft.[27] The British won because they came up with a system or force multiplier that enabled them to maximize the use of their combat power at the decisive time and place. A new technology named "Radar" enabled the British to detect incoming German aircraft earlier than did the visual or acoustical methods that were used prior to radar. Additionally, high-frequency radio was used to immediately pass information to control centers where timely decisions were made on the best use of fighters and anti-aircraft assets near the enemy flight path.[28] The Air Battle of Britain is one of the outstanding examples of utilizing the technology of radar and communications, and applying it to the decision process.

There is little doubt that C^3 has the potential to serve as a force multiplier. The measure of C^3 effectiveness in combat is difficult to

quantify, but our ability to look deep, see deep and fight deep during the Airland Battle will depend on an effective C^3 system. The effectiveness of C^3 on the high intensity battlefield will depend on its survivability and reliability.

The "synchronization", as stated by a recent speaker to the 1982 AWC Class, of combat power during the Airland Battle can equate to battle annihilation. An effective C^3 system is the function that will allow synchronization to occur on the high intensity Airland Battlefield.

V. CONCLUSION

Since command and control (C^2) was expanded to include command, control and communications (C^3), there has been a tendency by many to equate the entire function and its problems with communications. The solutions to these problems have for the most part been left for communicators to solve. The communicators response has essentially been more communications and automation.

The reality may be that we need a new C^2 system. Command and control is a command function. Commanders must become directly involved in its process. Communications is a means through which the commander exercises command and control. The commander exercises command and control. The commander must task the communications system and his staff, to provide the timely information required to arrive at a sound decision.

The reality is that we cannot fight out-numbered and win with our current tactical C^3 system. Considerable work and effort is required to improve the current system. Commanders must clearly state requirements, and the strengths of the current system must be assessed and applied to new procedures for the future. There is promise for improvement in the survivability and reliability of the future tactical communications system. If we expect to use C^3 as a tactical force multiplier, we need a "full court press" on improving tactical C^2 procedures, organization, training and command involvement.

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