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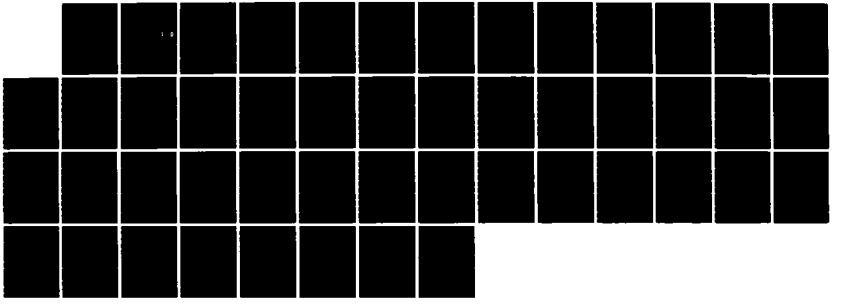

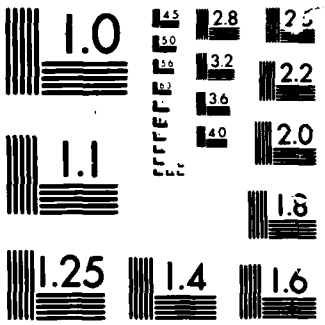

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Will, Technology, and Tactical Command and Control

by

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Fort Leavenworth, Kansas

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The study examines the functions of command and control relative to the tenets of AirLand Battle; historical precedents of battle losses because of technical difficulties in executing the commander's intent; limitations of current and future communications systems; and finally, implications of a dependence on technical communications systems for the execution of AirLand Battle doctrine at the tactical level.

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ABSTRACT

WILL, TECHNOLOGY, AND TACTICAL COMMAND AND CONTROL, by Major Leon H. Rios, USA, 31 pages.

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The study concludes that the Army can not subordinate command and control requirements to technology alone. Only through realistic training can a division's chain of command improve its capability to command and control an AirLand Battle force and execute the intent of the commander.

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INTRODUCTION:

Is the U.S. Army capable of defeating a technically sophisticated and numerically superior enemy? Will recent initiatives to improve doctrine, force structure, weapons, and support systems provide a decisive advantage in battle? Where is a decisive advantage to be gained readily?

A review of numerous improvements in speed, accuracy, and survivability of weapon systems provides an inadequate answer to the question of advantage of one army over another in battle. Equipment by itself is not sufficient to defeat an enemy in battle regardless of the degree of sophistication. As Paddy Griffith states in his book, Forward Into Battle:

> Scientists and their sprawling industrial resources could certainly do much to heighten the intensity of combat; but they could not determine the ultimate victor. That was the responsibility, as it had always been, of the individual fighting man.[1]

The question of relative advantage of an army over another in battle focuses on man. What has been done to improve man's ability to swing the balance of battle toward victory?

There is little or no advantage to be gained by creating an army of specialists or technicians trained in narrow fields with little understanding of battle outside their sphere of concern. An army's advantage over another army in battle is reflected in what Clausewitz refers to as the "determination" of its soldiers. Determination is the strength of a soldier's will, and is evident as soldiers accept responsibility in the most complex and hostile of battlefield situations. Clausewitz describes the role of determination as limiting "the agonies of doubt and the perils of hesitation when the motives for action are

inadequate."[2] The object of military training and education should be to prepare soldiers to make the best decisions possible in the most adverse conditions, and to pursue victory until it is achieved.

Although soldiers are expected to accept responsibility and make decisions in battle, the commander has ultimate responsibility for the outcome of battle. The commander is responsible for focusing the will of the force as he ensures unity of effort through an effective system of command that provides "purpose, direction, and motivation"[3] in battle. The AirLand Battle imperative of "unity of effort" described in FM 100-5 incorporates the principle of unity of command which ensures "all efforts are focused on a common goal."[4] A "common goal" is the focus of will and permeates all efforts in war from the political purpose of the government to a small unit pursuing an objective in a tactical engagement. A "common goal" in battle places the actions of soldiers in context throughout the force. The will of the commander is expressed as his intent and becomes the "common goal" toward which all effort is directed.

After the commander has stated his intent, he uses command and control systems to "direct and coordinate" the "actions of all forces toward a common goal or objective."[5] According to FM 100-5, "the only purpose of command and control is to implement the commander's will in pursuit of the unit's objective."[6] The following definition of command and control is offered in the context of this study as a logical adjunct to the description of command and control provided by FM 100-5. Focusing the will of a force to achieve a desired outcome is the key element of battle and is the function of command; maintaining the proper focus of will throughout the battle is the function of control.[7] These tasks are constant in battle. The effectiveness of these processes creates a

relative advantage of one force over another in battle.

The issue of command and control has perplexed commanders throughout history and is now more complicated than ever. Increased accuracy and lethality of weapons will cause the battlefield to become more fluid, extended, and dispersed. FM 100-5 states "the more fluid the battlefield, the more important and difficult it will be to identify decisive points and focus combat power there."[8] The challenge for the commander in such an environment is to identify the decisive point, define his intent, and then to maintain control of all available forces, focusing them as necessary at the right place and time to achieve the desired end. Implied in this process is a need for a reliable system of communications between the commander and his forces. Communications serve as the nerve network for the commander and his staff to sense and then coordinate varied resources to achieve the will of the commander. Once the intent is described by the commander, maintenance of the commander's will is dependent upon the effectiveness of the communications systems.

Reliable communications have always been an important aspect of battlefield command and control, and communications systems are now dependent on an extensive array of sophisticated technical means. Commanders are the victims of a need for certainty as they attempt to focus limited resources against an enemy in a dynamic battlefield environment. The need for certainty in battle is best described by the commander - historian, Polybios, who states: "So true it is that nature makes a single trivial error sufficient to cause failure in a design, but correctness in every detail is barely enough for success."[9] Technical means for communications promise to improve control effectiveness in battle by reducing uncertainty and difficulty in focusing the force at a

decisive point. The Army is becoming increasingly dependent on technical means although they are vulnerable to failure, interception, or interference. Despite great efforts to provide a technical means for perfect control in battle, the technical means at hand remain imperfect. Hence the dilemma for the commander: focus the force as the instrument of his will, at the right place and time, without the privilege of perfect control.

PURPOSE AND SCOPE OF STUDY:

The intent of this monograph is to examine the capability of U.S. Army tactical units to maintain the focus of the commander's will using available communications systems in the context of the current U.S. Army AirLand Battle doctrine.

This study examines the functions of command and control relative to the tenets of AirLand Battle; historical precedents demonstrating the loss of battle due to difficulties in keeping the focus on a common goal; intended benefits and limitations of current and future communications systems; and finally, implications for the execution of AirLand Battle at the tactical level.

THE FUNCTION OF COMMUNICATIONS IN A TACTICAL AIRLAND BATTLE:

Command and control is described generally by JCS Pub 1 as the exercise of authority and direction of assigned forces by a designated commander in the accomplishment of his mission. Command and control is the arrangement of personnel, equipment, communications, facilities, and procedures by a commander into a system to gather and provide information, direct, plan, synchronize, and control the force in combat to accomplish a

mission in accordance with his intent. To be effective, all elements must function before, during, and after battle.[10]

The following is an interpretation of the command and control process and incorporates the tenets of AirLand Battle. Command and control is communicated through a process which incorporates: a) a credible assessment of a situation including the environment, friendly forces, and enemy forces; b) an objective description of the commander's will to suit several contingencies; c) the development and selection of several courses of action; d) the communication of situation, decision and orders; and e) the focusing of combat power to achieve the commander's will which is the end product in an AirLand Battle.

Command and control is the process that the commander uses to focus the effort of a force before, during, and after battle. It incorporates a minimum of four distinct yet interdependent functions. These functions are assessment, objective decision to focus will, planning, and execution. It is necessary to discuss each in detail for clarification.

Assessment is the process of recognizing the capabilities and limitations of the friendly and enemy force, the setting for battle (i.e., weather, terrain, etc.), and constraints if any. This continuous process has the purpose of identifying options for both friendly and enemy forces, and comparing the reciprocal effects of friendly and enemy force options on each another.

Assessment leads to a decision that describes the efforts of the force to be focused at a decisive point against a major enemy vulnerability. The decision is a statement of the commander's will, an intent that permeates all ensuing efforts in battle. The commander's

intent provides purpose for battle although the decisive point is situation dependent and subject to change.

The planning process synchronizes both maneuver and supporting arms to focus them against the proper objective at the proper place and time. Planning depth is provided by the development of feasible alternatives for potential contingencies throughout the depth of the battlefield. Planning depth is gained by avoiding rigidity and mechanization, and by capitalizing on the abilities of soldiers to exploit limited opportunities throughout the depth of an area of operations.

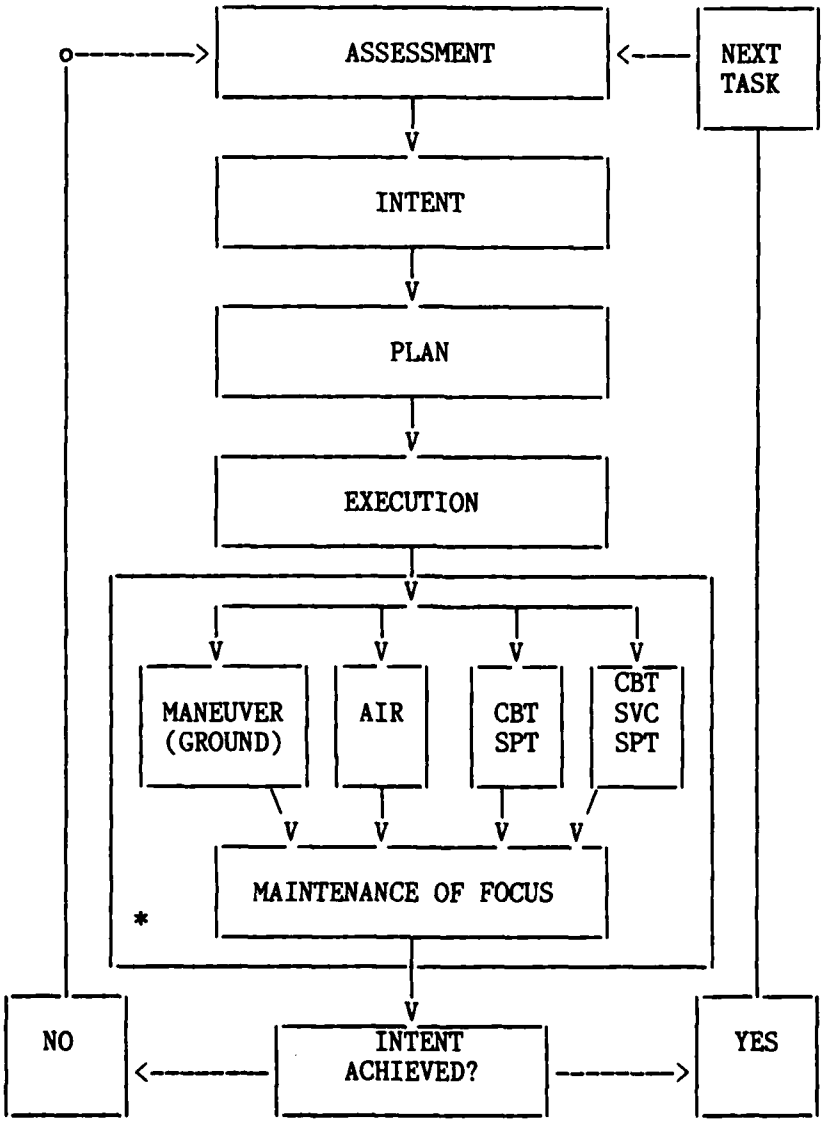
In the execution of a battle, effort is directed toward the decisive point within the constraints of the commander's stated intent. If a unit is not executing the will of the commander or if the situation changes during battle to alter substantially the location or nature of the decisive point, then the focus of effort is adjusted using a control means to achieve the desired intent. Implied is the assumption that the commander is knowledgeable about what is happening on the battlefield and is capable of communicating direction if necessary.

The AirLand Battle tenets of agility and initiative are the essence of what Clausewitz described as "determination." Agility and initiative permeate the entire command hierarchy and result in the unhesitating pursuit of an objective in spite of the uncertainty in battle.

The command and control process described in this study is cyclic and continuous to focus the efforts of the force effectively and efficiently as it executes the commander's will. This process, graphically depicted in figure 1, is dependent on a communications network to link the varied functions of command and control. To be most

effective, command and control cannot be constrained by difficulties of communications system failure, radio frequency interference, or excessive system complexity that would cause the information flow to become slowed or confused.

Fig. 1: Command and Control Model



-----> = Communications links

* = Demonstrates a continuation of execution

If such a perfect communications network were possible, and if it were employed perfectly, then a tactical AirLand Battle force could be expected to focus its resources at their maximum level of capability, resulting in a quick and decisive defeat of an enemy force. However, to paraphrase Clausewitz, it is unreasonable to assume that AirLand Battle forces will be directed against an inanimate enemy lacking a will of its own, making execution of the simplest of tasks difficult even if perfect communications were possible. A perfect communications system cannot multiply the effectiveness of the force beyond its maximum capability, while an imperfect system employed imperfectly reduces the likelihood of achieving the focus required to defeat an enemy force. As a combat performance multiplier, tactical command and control communications systems can only have a value between zero and one.[11] The actual value is a product of the varied difficulties experienced in battle, and can be viewed as a coefficient of command and control communications effectiveness. The greater the degree and number of difficulties with communications, the lower the value.

Communications for command and control in an AirLand Battle environment should approach a combat multiplier value as close to one as possible. The reason is the complexity associated with the simultaneous conduct of numerous diverse tasks in an AirLand Battle. Consider the efficiency required of a commander fighting simultaneous "deep" and "rear" engagements while maintaining the focus of the main effort in "close - in" engagements. The requirement for efficiency is compounded by plans that require surprise as a means to gain battlefield superiority. The commander must be cognizant of Clausewitz's warning that "only the commander who imposes his will can take the enemy by surprise; and in

order to impose his will, he must act correctly."[12] The complexity associated with focusing the combat power of a dispersed AirLand Battle force at a decisive point requires both reliable communications and a highly developed skill in command and control. Without effective communication, limited opportunities to gain the advantage in an AirLand Battle while degrading the enemy's strength will become increasingly difficult to exploit. Causing the multiplier value of the command and control system to approach the value of one is the commander's problem to resolve.

The commander is the indispensable element of a tactical command and control system. Everything else serves the needs of the commander to focus his will in an AirLand Battle. It is essential that commanders establish critical information requirements to maintain the focus of effort throughout battle as they describe their intent. Thereafter, communications staff personnel determine required communications responsiveness based upon threat and mission to identify the best means for critical information flow. Available resources are then organized so that communications are only degraded minimally when there is a loss of any one of the system components. All command and control functions serve the commander's requirements for information as he focuses all efforts on a common goal in the AirLand Battle.[13]

The functions of command and control are easily described. However, the problem to be reconciled remains: <u>how</u> does the commander maintain the focus of effort throughout the duration of battle to achieve a desired end? The absence of a doctrinal guide for command and control leaves solutions to guess work and individual preference resulting in unstructured initiatives, redundancy of effort, or solutions to the wrong

problems. The lure of technical systems which offer perfect control grows more tempting. Problems arise in tactical headquarters as they develop a reliance on vulnerable systems for maintaining control throughout the battle. The effects of such systems are often opposed to their designed intent and result in the creation of more difficulties for the commander to resolve. The commander's ability to maintain the focus of effort to the desired end will be lost through technical difficulties of command and control unless his will is conveyed through other means. Consider the treatment of the problem through history.

HISTORICAL PERSPECTIVE FOR TECHNICAL COMMUNICATIONS IN BATTLE:

Commanders have always sought to conduct two way communications to focus their will and control events on the battlefield. Commanders have always required prompt delivery of information concerning enemy locations and strengths to make decisions, issue commands, and focus their will through a plan to defeat an enemy force. Recent trends for maintaining this focus demonstrate an increasing reliance on sophisticated and complex technical solutions (i.e., computers, data links, position locating devices, etc.). The solutions provide far from perfect means for control and commanders have not been able to resolve the basic issue: maintaining a focused will when only imperfect means for control are available.

Although Napoleon had the technical means to exercise a greater degree of centralized control in battle, he generally did not allow his command and control system to depend upon limited and vulnerable means available at the time. Superior organization and doctrine, not

technology, were the key factors in Napoleonic tactical and operational successes. In his report The Evolution of Military Unit Control, Virgil Ney cites Napoleon's system of decentralized battlefield command and control as a major strength that exploited an enemy's attempts to centralize control in battle.[14] Napoleon's perception that technically centralized battlefield control was neither feasible nor desirable has not been shared by most commanders since. From Napoleon's era to the present, commanders have attempted to focus the efforts of armies in battle using technical means with varying degrees of success.

Dependence on telegraph and wireless technology for World War I battlefield control provided as many disadvantages as advantages. The commander tried to cope with innovative communications systems that told him "what he wanted to hear or what he did not want to hear or worst of all, nothing."[15] German telephone and telegraph wires were cut on the battlefield by saboteurs and the wireless was jammed electrically. Schlieffen's vision of a World War I German commander controlling battle remotely from a safe distance behind the front was thwarted by the failure of vulnerable communications technology. The will of the commander was effectively severed from the fighting force.

The inappropriate use of the wireless by the Russians was credited by the Germans for their World War I victory at Tannenburg. Russian wireless communications were used to pass all key tactical information using either a poor code or no code at all. Knowledge of the Russians' strength and total means available for battle were known by the Germans. The Russians made it a simple matter for the Germans to intercept and then counter their plans.[16]

Although major improvements in communications during the inter-

war period promised to facilitate efficient U.S. battlefield control in World War II, employment of larger mobile armored formations and combined arms operations complicated effective control. The World War II battlefield was more fluid and dispersed than that of World War I. The maximum benefit of increased force capability was not always realized because of deficiencies in communications used for tactical command and control. Tactical headquarters were split into forward tactical, main, and rear command posts in an attempt to resolve communications technical deficiencies with mixed results. The actual effect was an increase in numbers of personnel and communications equipment, not an improvement in tactical command and control capabilities.[17]

Deficiencies inherent in dependence on technically complex tactical command and control systems are exemplified by the Second Infantry Division's actions in Korea on the night of 25 November 1950. The failure of Division units to establish and maintain communications at Kunu-ri was a major contributing factor to their defeat at the hands of the Chinese. A technically sophisticated U.S. Division was beaten by an army which had no great contemporary skill in war but used only primitive means for battlefield control that were not subject to failure. Although the Chinese means of communicating with horns and whistles was primitive by Second Infantry Division standards, it proved to be decisively superior to U.S. technical systems used to control battle. The will of the Chinese commander was known immediately at the lowest level within the formation.

In his book This Kind of War, T.R. Fehrenbach states that the defeat of the Second Infantry Division was due to the 9th Infantry Regiment's front coming apart. "K and L companies were wiped out...but no one knew of it."[18]

S.L.A. Marshall's book The River and the Gauntlet cites communications failures within the 9th Infantry Regiment as a principal reason for the defeat when he states:

> K and L companies [9th regiment] were not in communications with each other, no patrolling was conducted between them, and they had only a vague idea of where the other was...Though at the forefront of the Eighth Army, [K] company remained out of contact with every element to its rear...Distance and terrain silenced the SCR 300 [radio]...A battalion communication sergeant was sent to string wire with the forward companies. He chose to follow the longer low lying route rather than string the wire over hills which would have been a shorter distance, as a result he ran out of wire.[19]

A major lesson of the Second Infantry Division's failure is that although soldiers were taught to operate a communications system, they failed to recognize the importance of the communications system as the means used by the commander to focus his will. Soldiers failed to recognize that communications must continue in spite of technical failures. Soldiers failed to demonstrate what Clausewitz refers to as determination as they did not accept responsibility for reestablishing communications.

More reliable communications means have paradoxically confused and reduced the ability to control battle. Improved communications made a 1960s managerial philosophy of centralized control possible for U.S. military operations in Vietnam. In the book Crisis in Command: Mismanagement in the Army, Richard Gabriel and Paul Savage cite the perceptions of civilian authorities of centralized, remote control as a means to enhance employment flexibility for conventional military combat units to achieve foreign policy objectives during the Vietnam war. Gabriel and Savage further indicate that civilian authorities considered U.S. commanders in Vietnam as analogous to corporate executives with the functions of command perceived as similar to departmental management.

This technically dependent management style affected methods of tactical operation although doctrine was not modified. The inability of a management style to define clearly and then assert the commander's will resulted in confusion rather than cohesion.[20]

Gabriel and Savage further state that scientific administration of conflict management and sophisticated communications for battlefield command and control required commanders to remain in rear command posts during the Vietnam conflict. Gabriel and Savage state the ability to command by a system of remote control created the following dilemma. An illusion was created that a commander's presence was required in a "safe - rear" headquarters, otherwise effective command was lost, while management from the rear was a cause for destabilization of U.S. unit cohesion in Vietnam. U.S. experiences in Vietnam further demonstrated remote control of conventional war produces undesirable side effects. Incompatibility of doctrine and communications capabilities resulted in commanders on the scene losing command prerogatives to a remote headquarters while not giving the remote commander a feel for the battle.[21] The effects, which were not foreseen or planned for, are best described by S.L.A. Marshall who stated in his book Men Against Fire that troops "while obeying mechanically, have no organic, thinking response to the commander's will."[22]

The 1973 Arab - Israeli war demonstrated that a technically sophisticated control system does not confer added flexibility, prevent surprise, or ensure effective control when doctrine and technology are not mutually supportive. The Egyptians were not capable of stopping rapid Israeli offensives because their doctrine of remote control did not allow tactical commanders to take the initiative or independent action. Arab

soldiers were not allowed to accept responsibility or to make decisions to re-orient the focused combat power of the force as battles evolved. In short, the commander's will was not focused through the soldiers but rather at them. Furthermore, disruption of technically sophisticated control means in battle caused confusion and significant reduction of combat effectiveness for both Arabs and Israelis. The Israelis were effective in overcoming this difficulty because the will to overcome the problem permeated the entire command. Israeli soldiers were readily encouraged to make decisions and to pursue victory as long as victory was possible.[23]

Future battles will be intense, devastating, and confused particularly at the point of decisive battle, thereby making the focusing of combat power exceedingly difficult. The need for the focusing of combat power on the battlefield is an old one, stemming from the nature of ground combat. The lessons are clear, yet the Army is slow in applying lessons learned. In a confrontation between a defending U.S. and attacking Warsaw Pact force, a U.S. force would rely heavily on a sophisticated radio communications system to focus its combat power at the right place and time while the Soviet force would likely attack in electronic silence. The Army is not recognizing vulnerabilities associated with the development and dependence on technically sophisticated and centralized tactical command and control systems. U.S. Army commanders will reaffirm past lessons of battlefield command and control unless they use the common sense that is recognized as Napoleon's genius and understand "that no mechanical means of communicating given man can become a substitute for the spoken word and none can amplify thought [or will]."[24]

THE DIFFICULTIES OF COMMAND AND CONTROL:

This section addresses the difficulties associated with the equipment and people organized by the commander to focus combat power in the execution of his will in battle.

The Equipment.

The Army recognizes the complexities and vulnerabilities of technical solutions for focusing the effort in battle, yet tends to pursue the perfect technical solution as if oblivious to Wood's admonition that "we are captives of the forces of gambling and war, always thinking we can beat the odds."[25]

The AirLand Battlefield characteristics of dispersal, highly mobile units, and an increasingly sophisticated threat pose significant challenges for maintaining a focused effort in an AirLand Battle. These challenges are being translated into complicated technical solutions. Each technical solution provides a promise of better responsiveness and reliability to focus better the efforts of a dispersed force. Secure and survivable communications systems are being designed to operate throughout the extended battlefield, to improve information gathering abilities, and to disseminate decisions and targeting information in near real time. The ability of the tactical unit to focus the will of the commander through its combat power on an AirLand Battlefield is becoming synonymous with the promises of complex technical command and control systems.

Army requirements for a survivable, jam - resistant, tactical communications system with low probabilities of intercept resulted in the development of the SINCGARS nodeless, "frequency - hopping," and spread spectrum radio system. VINSON secure equipment was developed to provide a

more reliable and automated secure communications capability. Both SINCGARS and VINSON are now being fielded within the Regular Army. The underlying concept for the development of both systems was to improve the tactical commander's ability to communicate his intent without interference or interception. This same concept was the basis for the development and fielding of the equipment that is being replaced.[26]

Available technology is being used in the fielding of the Distributed Command and Control System (DCCS). DCCS requires several small, light - weight, commercially available, personal computer terminals to provide data access to the division commander wherever he is located on the battlefield. The concept is to facilitate the commander's maintenance of focus by providing updated information where the commander is located rather than having to move the commander to the information. Ultimately, the DCCS will provide data access capability to battalion level. The concept appears to have automated what runners have done throughout history.[27]

Initiatives for command and control in the future are being pursued now. New communications systems required for "Army 21" present a formidable acquisition task. As such, VISTA (Very Intelligence Surveillance and Target Acquisition) and DC^3I (Distributed Command, Control, Communications and Intelligence) initiatives are now programmed to reflect the technical requirements for transforming the AirLand Battle force into an Army 21 force.[28]

VISTA will integrate all advanced electronic command and control systems on the battlefield to allow instantaneous intelligence, analysis, and targeting information for presentation to commanders in useable format. The objective of DC^3I is to provide dispersed, survivable command

and control cells down to small unit level to allow fast, flexible, and wide scale communications under adverse conditions.[29] VISTA, DC^3I, and a "very sophisticated telephone system" to carry "jam - proof data and voice information" are described by LTG Louis Wagner as the "true cornerstone for future battle tactics." Furthermore, he states that "there can be no decisive and independent small unit action" without these sophisticated technical systems.[30]

The Command and Control Subordinate System (CCS^2) is similarly identified by the TRADOC AirLand Battle 2000 concept document as essential for the command and control of future tactical battles. Like VISTA, it is designed to coordinate centrally the five separate functional areas of maneuver, fire support, ADA, intelligence / EW, and combat support. It is proposed for implementation prior to the year 2000 and promises to gather information rapidly, perform analysis, assist in decision making, and then provide shotgun dissemination in near real time.[31]

It is likely that with the advent of sophisticated gathering and dissemination systems, the traditional problem of too little information will be reversed. There may be so much information that the decision making process will be complicated giving rise to yet more technical requirements. This tactical decision - making problem is the focus of such intensive developments as VISTA, DC^3I, and CCS^2; however little effort has been made to match their functions to command and staff relationships. Knowing more in this case will not necessarily reduce uncertainty while it will increase difficulties in focusing the will and combat power of the force.[32]

Focusing the effort of a highly mobile, firepower intensive force in an AirLand Battle will be complicated because of increased force

dispersion caused by extended ranges and improved lethality of modern weapons. However, tactical electronic communications systems designed to facilitate command and control in combat may not work well enough to meet challenges in future war. Complex communications systems are vulnerable to human and technical error. This vulnerability creates a condition of uncertainty as to whether the communications systems are inoperative, operated improperly, or being jammed. This reduces unit combat effectiveness as they are unable to maintain a focused effort for the duration of the battle. Undisciplined systems may allow disorganized or excessive information from too many sources to overwhelm the commander and his staff. The effect of technical sophistication may be an increase in uncertainty in combat to complicate further the commander's ability to control the battle. The command and control system in this case magnifies the effect it is designed to eliminate.

Command and control technical initiatives need to serve the commander's requirements to focus the efforts of the force, otherwise technically dependent command and control systems may become a liability in battle. As depicted in the VISTA, DC^3I and CCS^2 initiatives, a technology conceived imperfectly will likely contribute to a more imperfect command and control system. Technical initiatives for command and control that are unique to the Army will result in a lack of tactical communications interoperability and complicate effective conduct of joint operations or a coalition war. It is likely that the next war will be fought in a joint service or an allied context. However, it should be noted that the initiatives discussed previously are unique to the Army. Development of automatic switching systems will cause interoperability problems with our allies unless they have with the same equipment. We can

not communicate well with our allies now using current tactical communications systems while those being developed will limit tactical communications capabilities all the more. Although the joint services have been working on TRI - TAC fo· an extensive period, tactical command communications systems continue to be developed by the individual services and most are not compatible for multi - service use.[33] The control problems in the Grenada invasion were relatively simple compared to the problems possible during a mid - to high - intensity war with the Warsaw Pact. The U.S. spent 16.7 billion dollars in fiscal year 1984 on communications for command and control, yet it demonstrated that "even in a benign environment, we can't communicate to the troops who need them most a few smidgeons of the billions of dollars worth of intelligence we collect and analyze so painstakingly."[34]

Sophisticated communications systems will likely impose new limitations and vulnerabilities while rapid changes in state of the art technology constantly confront commanders and force designers with new equipment requirements making it nearly impossible to build an equipment or experience base within the force. Communications technology may also impose an interdependency among systems that becomes a vulnerability for U.S. forces and a "war stopper" in a joint or coalition war. The likely result is that when any one variable in a technically dependent equation is lost, all systems fail.

Technically complex equipment systems may contribute to rather than reduce difficulties associated with focusing the effort of the force to achieve a desired end. Consider the following examples.

Armored and Mechanized Infantry Divisions depend primarily on radio communications for command and control of most functions at brigade

and battalion levels during battle. These communications systems are composed primarily of netted FM radios throughout the command hierarchy of the division. FM radios become a liability when operated at extended ranges characteristic of the AirLand Battlefield. The range of FM radios is unacceptable, reducing the effectiveness of communications systems while the extended ranges of maneuver make face to face communication increasingly difficult as units move rapidly through battlefield engagements. Additionally, as more units concentrate at a decisive point there is a higher likelihood that radio nets will cause mutual interference between channels as joint, allied, and enemy forces use the same RF spectrum for tactical communications and EW. There is little choice but to activate new radio nets as communications interference occurs or as new communications requirements are surfaced. The result is a greater crowding of a finite radio frequency spectrum to further complicate tactical communications.

The extent of unit reliance on FM communications in a tactical environment is best described by the U.S. Army Human Engineering Laboratory Communications Survey (HELCOMS). The survey demonstrated that on the average, units training at the National Training Center (NTC) used their FM radio nets for approximately one - third of the total training time. However, what is most critical in the study are the disclosures that depict the quality of FM radio communications. According to the study, almost thirty - five percent of all surveyed FM radio transmissions were lost due to garble, static, and mutual interference. This was caused primarily by too many users trying simultaneously to access the net. Fifty - two percent of successful transmission time was consumed by the use of call signs and related procedures. It is noteworthy that the fifty

- two percent figure would have increased to an estimated figure of almost eighty - five percent if unauthorized radio operator shortcuts had not been used. Although the impact of interference on unit effectiveness has not been researched, it can be hypothesized that unit effectiveness is adversely affected during periods of communications interference. This is likely because the study also points out that sixty - three percent of FM radio communications surveyed at the NTC were used for control, intelligence, or position reporting.[35]

U.S. reliance on FM tactical radios for most communications within the division has been observed by the Soviets. The development of Radio Electronic Combat (REC) doctrine has been high on their list of defense priorities. REC and troop control initiatives cause the Soviets to consider themselves able to control battle successfully in the most complex of environments while they perceive U.S. Army tactical command and control systems as vulnerable.[36]

The current solution for communication problems is overcome theoretically by the maintenance of redundant communications means. However, redundant means are limited by the unreliability of AM RATT communications and the lack of liaison or messenger vehicles. The link from brigade to division, and division to corps depends primarily on VHF multi - channel. The critical link to battalion and below is not affected because there is no VHF multi - channel capability below brigade.

The problem of redundancy is further complicated by the army development and procurement process which causes multiple generation technologies to be maintained over several years of the fielded life of most communications equipment. This will result in an incompatibility of communications systems as combat losses are replaced from war stocks a

generation old. It took the Army 19 years to field the initial required quantity of VRC 12 radios. Assuming ten years for the research and development phase, that means that by the time the Army's needs were met the system was 29 years old. The coincidental effects are premium prices for repair parts, technological obsolescence, and the requirement to maintain multiple generation technologies using separate repair parts stocks. For what ever reason, the situation described will likely be repeated because of the incremental fielding of SINCGARS and VINSON for the total Army. Neither is compatible with the system it is replacing.[37]

The command and control needs of the tactical commander have to be understood before command and control hardware is developed and fielded. This is exemplified by the 1910 experience of Winston Churchill who witnessed the House of Commons rejoicing upon hearing that the telegraph cable to South Africa had been laid. As the cheering subsided, young Churchill rose to say, "I too rejoice in the completion of this cable. Now what shall we say to the Africans?"[38]

Personnel Determination.

Command and control problems associated with reliance on sophisticated technical communications equipment are apparent. As such, a solution to the problem of focusing combat power in the AirLand Battle is effective training to overcome communications problems. However, upon examination of current Army training it becomes evident that acknowledged communications problems are perpetuated through training rather than being resolved. The fluid nature of Army Training Programs (ARTEPs) preclude the use of anything but radios as scenarios rarely allow maneuver units to remain in one location long enough to justify installation of wire. Units themselves do not exercise alternate means of

communications as messengers are seldom ever used in the conduct of ARTEPs or other field exercises.

The Soviets perceive U.S. communications training as a major exploitable weakness. Accordingly, they plan to employ REC to prevent a U.S. force commander from focusing the efforts of the force in battle. Soviet REC is not limited to the employment of electronic means. Soviets combine EW, reconnaissance (reconnaissance troops have the capability to intercept enemy radio transmissions), target acquisition means, and artillery in the conduct of REC to disrupt and physically destroy their enemy's communications control systems. Soviet doctrine requires EW efforts to facilitate surprise, concentrate against the main objective, and to be coordinated under a single REC plan for the destruction of enemy emitters in each major operation. Recent reports indicate Soviet development of intense microwave and millimeter wave sources that can be used as a radio frequency weapon to disrupt or burn out electromagnetic components with a beam of electromagnetic energy.[39] Over - reliance on a tactical radio communications systems will become the single greatest vulnerability to U.S. AirLand Battle effectiveness as command posts are identified and destroyed because of the role they play in focusing effort in battle.

The NTC opposing forces unit (OPFOR) does employ EW to interrupt and disrupt communications of battalion task forces in training. The effects of FM systems shortfalls, poor net discipline, and EW play complicate task force ability to focus combat power at a decisive point during training. Unfortunately, there is no EW play directed at the vital division - brigade - battalion task force communications linkage. The major Soviet REC effort would likely be directed against these higher

headquarters. Lessons of how U.S. brigades and divisions focus combat power effectively in an AirLand Battle while being subjected to similar difficulties in a complex battlefield environment are not likely to be learned as long as they are not exercised.[40]

Brigade and division command and control systems have not been stressed adequately in training although the NTC is now requiring the battalion task force to interface with its parent brigade headquarters during training. However, the absence of a division tactical headquarters at the NTC is a missed training opportunity. There is no guarantee that the division will function properly as the focal point of the tactical AirLand Battle without being realistically trained.

The HELCOMS survey demonstrated that a serious adverse effect caused by communications problems and subsequent control problems in fluid situations leads to operational delay. Units training at the NTC that lost communications demonstrated a tendency to slow down or stop until contact was reestablished. This hesitancy resulted generally in a delay in accomplishing the mission and inhibited the conduct of the AirLand Battle. Problems such as this cannot be anticipated or resolved until they become evident in a training situation.[41]

Direct access to information may cause senior commanders to intervene with subordinate commanders because a perceived better overview. This will cause subordinate initiative to be stifled as subordinate commanders are relegated only to the execution of the superiors' directives. Soldiers who are subject only to the initiative of others will likely lose self confidence when required to act alone. Additionally, "higher" commanders often lack the ability to understand and handle battlefield developments for subordinate units by remote control.

Without a clear perception of the situation, a higher commander may make serious mistakes unwittingly. He may, for example, commit a reserve too early or late. Remote control is not the same as maintaining a focused effort.

Understanding the commander's intent at all levels is important because of the possibility of autonomous operations caused by communications failure. Determination of soldiers prevents communications failures from jeopardizing the accomplishment of the mission. However, the commander's intent must constrain and focus the efforts of individual soldiers and units to the efforts of the force as a whole. The disjointed efforts of a tactical force cannot provide the same effect on a dynamic battlefield as one that remains focused through a central commander. Communications loss at division reduces its fighting capability to that of its basic unit level. Although basic units within a division may understand the commander's intent, the focused effect of several resources required to defeat a numerically superior enemy is not likely to occur in a dynamic battlefield environment, unless the commander is capable of re-orienting the efforts of the force if necessary. Re-orientation of the efforts of the force is the essence of control and remains the responsibility of the commander.

Difficulties of battle are compounded by the loss of communications. If not planned and trained for, communications failures will likely cause a crisis throughout the command hierarchy. A crisis is by definition a situation that allows short decision time with strong pressures to resolve the problem quickly. There is unfortunately, no single study that defines the dynamics of crisis management within units in combat. H.B. Shapiro and M.A. Gilbert's work for the Office of the

Naval Reserve is perhaps the best point of reference from which we are able to generalize likely responses to communications failures.[42]

Shapiro and Gilbert's research indicates that as stress due to crisis increases the ability to resolve problems decreases. Associated with a decrease in the ability to resolve problems is a lower tolerance of ambiguity in the environment. Ambiguity in dynamic and complex environments like combat is further complicated by communications loss. Perceptions of time are distorted in stressful situations. A circular process develops whereby time pressure causes stress which in turn causes distortions of time passage. Increased time pressure and ambiguity in a stressful situation increases the level of perceived crisis. Intolerance of ambiguity by the commander leads to a response to a stimulus before adequate information required for a correct response is available. Unfortunately, "the result is likely to be an incorrect response" because increased time pressure results in the "acceptance of poorer decision alternatives."[43] These observations are substantiated by evidence that units perform at reduced levels of efficiency and effectiveness if they are managed by crisis.[44]

Reliance on the initiative of the small unit commander or individual during communications loss is a limited attempt to maintain a focus of effort on the battlefield. Subordinate initiative does not supplant the commander's responsibility to command and control the force to achieve a desired end. The commander has to understand his limitations for directing and coordinating the efforts of the force in battle. There is no substitute for realistic training to develop an understanding of "what is possible and what is not." As Clausewitz states, "the man [commander] responsible for evaluating the whole must bring to his task

the quality of intuition that pursues the truth at every point. Otherwise a chaos of opinions and considerations would arise, and fatally entangle [his] judgement."[45]

The determination of soldiers is shaped by the maintenance of will by a commander. Maintaining determination to produce a focused will can be complicated by the transitory nature of the Army. As the trends continue toward greater technical solutions for the command and control problem, a major limitation associated with complex hardware is the lack of qualified personnel to operate and maintain the systems. Increasing the amount of sophisticated technical communications equipment will reach the point of diminishing returns unless it can be operated easily and maintained by all soldiers.

Systems developers and strategists must remember that each major war has been fought with a large number of inexperienced soldiers. The complexity of AirLand Battle requires well trained soldiers experienced in the use of sophisticated equipment. It is imperative that the integration of advanced communications systems include simplified operation and maintenance so increased sophistication will not overwhelm soldiers. Communications training has to retain its foundation, otherwise it will become a "paradox" as explained by Roger Beaumont's article "The Tactical Spectrum and C^3 State Variance: Accommodating Uncertainty."

> The paradoxes that abound in analysis of the C^3 revolution resemble the problem that appears when power failures hit modern hospitals, or when earthquakes shatter the underpinnings of modern communities. The cohort of people that could fall back on more primitive, pre-electronic modes, i.e., those in use during their early training and practice are moving out of the system. The more 'modern' cohorts cannot cope as easily when sophisticated systems, which have been taken for granted as the foundation of their operational mileu, are withdrawn. It is also an effect seen in the sciences in general, as the expanding edge of research moves further and further from the first cause and from basic literal experiment.[46]

The central issue in maintaining a credible conventional deterrent to the escalating Warsaw Pact threat is the ability of a U.S. tactical force to focus its collective will and strength in combat to achieve a desired end. The U.S. Army does not now appear to be trained nor equipped at division level to resolve the problem of battle, which is to focus its strength without the privilege of perfect control.

IMPLICATIONS:

The Army can no longer attempt to supplant the requirement for competence of its soldiers with gadgetry. No soldier is exempt from learning to cope with the complexities of battle. Only through training can the command hierarchy of a division learn to focus the will of the commander and then to maintain that focus to defeat a dynamic enemy force. As Clausewitz stated so succinctly, "no soldier, whatever his rank, should wait for war to expose him to those aspects of active service that amaze and confuse him when he first comes across them."[47]

Continuous, reliable communication is important for battlefield control, yet adding more sophisticated systems to an already complex structure is not the answer. Successful battlefield command and control has resulted less from any sophisticated communications means than from the ability to recognize technical limitations, modifying doctrine and organization to overcome technical deficiencies, and then training accordingly.

The solution to the problem of maintaining focus in an AirLand Battle is difficult. The Army has not sufficiently exercised the hierarchical command structure as though in battle to identify all weaknesses. Commanders have not demonstrated the will to pursue the

difficulty of resolving the issue of command and control as the issue has been given to technicians for solution in sterile environments far removed from the training battlefield. Solutions for command and control problems will only become obvious through realistic training.

The art of war can not be easily developed by commanders without an empirical knowledge base. Training at platoon, company, and battalion level is not enough. Brigade and Division commanders need to be trained as if in battle because they are a most critical link in the execution of the tactical AirLand Battle. If not trained, they will be the weak link in the system and cause the force to be unable to focus the commander's will. Only through training can commanders know the difficulties in battle which are sure to complicate the maintenance of his focused will.

The question of advantage of one army over another in battle is answered. "Practice and experience dictate the answer: 'this is possible, that is not,' so he [the commander] rarely makes a serious mistake, such as can, in war, shatter confidence and become extremely dangerous if it occurs often."[48]

CONCLUSION:

Better methods to maintain focus on the battlefield have been sought as lethality and cost of battle have increased. The solution has been sought through technical perfection which hopes to transform a lesser commander to the level of genius in battle. In fact, technically complex command and control communications systems have introduced new possibilities for friction to arise and thus degrade the will of the commander. There is no good rationale to continue to depend on complex technical communications systems that do not facilitate maintenance of

focused will even in mock battle. The Army can overcome this problem if it requires commanders to train continuously as if in battle. Training will ensure that commanders at all levels do not become perplexed by the difficulties of battle and that all soldiers demonstrate the will required to achieve a desired end.

Endnotes

1. Paddy Griffith, Forward Into Battle (Sussex: Anthony Bird Publications LTD, 1981), p. 102.

2. See Carl von Clausewitz, On War (trans. and ed. by Micheal Howard and Peter Paret, Princeton, New Jersey: Princeton University Press, 1976), pp. 102 - 103. Determination as Clausewitz views it is reflected in FM 100-5 when it states, "Superior performance depends on good people — soldiers and leaders with character and determination who will win because they simply do not accept losing." U.S. Department of the Army, Operations, FM 100-5 (Draft, USGPO: Fort Leavenworth, Kansas, July 1985), p. 1-11.

3. U.S. Department of the Army, Operations, FM 100-5 (Draft, USGPO: Fort Leavenworth, Kansas, July 1985), p. 2-25.

4. Ibid., p. B-6.

5. Ibid., p. B-7.

6. Ibid., p. 2-24.

7. The definition of command and control provided parallels that given in USACGSC, Corps and Division Command and Control, FC 101-55 (USGPO: Fort Leavenworth, Kansas, 28 February 1985), pp. 3-1, 3-2. "Command is the process by which the will and the intent of the commander is infused among subordinates. This process is directive; its premise is reliable subordinate behavior. Control is a process by which subordinate behavior inconsistent with the will and intent of the commander is identified and corrected. This process is regulatory; its premise is unreliable subordinate behavior. It [the behavior] will normally be inadvertent, resulting from different perspectives of the battlefield, inattention, or lack of understanding of the mission or the commander's intent — or the fog of battle."

8. Operations, FM 100-5, op. cit., p. 1-6.

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