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**RAPID PLANNING AND QUICK
DECISION MAKING DURING TACTICAL OPERATIONS**

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

MASTER OF MILITARY ART AND SCIENCE

BY

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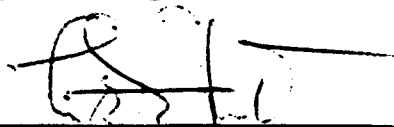
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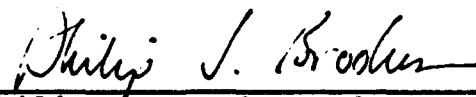
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should include the foregoing statement.)

ABSTRACT

RAPID PLANNING AND QUICK DECISION MAKING DURING TACTICAL OPERATIONS by CPT(P) C. William Robinson, USA, 75 pages.

This study analyzes the U.S. Army's emerging doctrine for command and control as expressed in the coordinating draft of FM 101-5 dated July 1992. This thesis examines the suitability, feasibility, and completeness of the doctrine.

Suitability is expressed in terms of FM 100-5, Operations, requirements for command and control. Feasibility is analyzed based on the battlefield environment and its effect on the command and control system. Completeness was based on a modeling of the system and process.

This study concludes that the doctrine must provide specific measures for supporting commanders visualization of the situation in time and space to be suitable. The thesis concludes that the doctrine must address the effects of the environment on the human part of the system to be feasible. The analysis shows that the doctrine must address all types of major decision types and all elements of the command and control system to be complete. Based on these conclusions, the draft of FM 101-5 dated July 1992 is not sound enough for effective use.

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CHAPTER ONE

INTRODUCTION

This thesis is a critical analysis of emerging U.S. Army command and control doctrine. Specifically, this thesis examines the doctrine for rapidly planning and reaching decisions in response to changing battlefield conditions. In that light, the research ultimately focuses on constrained time and stress. After considering those factors which affect decision makers during tactical operations, the thesis will assess the effectiveness of the doctrinal process for providing quick, precise military decision making under battlefield conditions. Ultimately, the thesis seeks to assess the value of the new doctrine for commanders making battlefield decisions which can be implemented as successful tactical operations.

The Research Question

Specifically, this thesis should determine whether or not the U.S. Army's new command and control system doctrine, as expressed in FM 101-5, Command and Control for Commanders and Staff (Coordinating Draft), is sound during operations under battlefield conditions. Ultimately, this thesis will determine if the doctrine meets three criteria. First, is the doctrine suitable? Second, is the doctrine

feasible? Third, is the doctrine complete? By evaluating the doctrine for decision making against these criteria the thesis should support, or question, the soundness of the doctrine. A fourth criteria, acceptability, will be discussed in the general implications of the conclusion, but will not be considered within the context of this analysis.

Before the doctrine can be evaluated for suitability, its purpose must be clearly identified. The first line of questioning must determine whether the U.S. Army has a clear mission for the tactical command and control system. This research includes a review of U.S Army doctrine for command and control in general, and specifically delineates doctrine for military decision making under battlefield conditions. This analysis must determine the purpose, objectives, specified tasks or functions, implied tasks or functions, and associated performance measures. Having answered these questions, the thesis will judge whether or not the doctrine is clear.

Having determined if the U.S. Army has a clear mission for the command and control system, the research must next examine the practical qualities of the doctrine.

This is an examination of feasibility. Feasibility is determined by an analysis of the situation in which the doctrine must be applied.

The second line of questions ask whether or not the decision making doctrine is sound for operating in battlefield conditions. These include time constrained situations and high stress situations. More importantly, the thesis asks how decision making under these conditions must be accomplished to provide successful command and control. Specifically, the study will identify the battlefield situations, limitations and constraints in terms of decision requirements, situation requirements, and effects of the situation on soldiers. Ultimately, the study will determine if the current doctrine is feasible under battlefield conditions.

Having examined an abstract ideal and parameters of effectiveness, the next step is to identify specific qualities the doctrine must include to solve the problems commanders will face. To answer this question, the research must identify the specific elements of a complete system for command and control.

The fourth, and final line of questioning should answer whether or not the new doctrine specifically meets the doctrinal mission requirements, the battlefield

situational requirements, and the elemental system requirements. In other words, is the doctrine suitable, feasible, and complete.

The Nature of the Problem

The decision making process is central to the command and control problem. Army leaders have always recognized the need to balance timely decisions with considered ones. The 1939 classic, Infantry in Battle states:

Decisions in war are difficult. More often than not they must be made in obscure and uncertain situations. Frequently the time at which a decision should be made presents a greater problem than the decision itself.¹

Likewise, the most current doctrine recognizes the need for rapid decisions. In the U.S. Army's "keystone"² warfighting manual, FM 100-5, Operations, the quality of agility is emphasized as a tenet of AirLand Battle doctrine.³ The doctrine emphasizes the "soldiers' ability to 'think on their feet' and to see and react rapidly to changing circumstances."⁴ The same section states that "leaders must continuously 'read the battlefield,' decide quickly, and act without hesitation."⁵ Obviously, if commanders are to "think on their feet," the doctrinal process must allow for rapid decision making.

A basic element of the decision making process is the estimate of the situation. The U.S. Army's use of the estimate has a very clear historical precedent. The decision making process, based on the estimate of the situation, has been a key aspect of command since the early 19th century. According to Major T. R. Phillips, American leaders have been using the estimate since the Civil War.⁶ The basic procedures used in preparing estimates remained relatively unchanged until the middle of the 20th century.

Since the Second World War, theories and techniques for military decision making have been heavily influenced by the emerging fields of Operations Research, Management Science, Command and Control, Behavioral Science, and Organizational Psychology. In fact, the roots of modern decision science lay in the Second World War. As Herbert Simon points out, "World War II brought large numbers of scientists trained in the use of mathematical tools into contact for the first time with operational and managerial problems."⁷ The dilemma has been that improved decision design has created increased demands on the commander and his staff as they apply these tools. Unfortunately, applying these tools takes time, and the enemy may not provide extra time.

This dilemma is reflected in many current perspectives on the proper methodology for decision making and problem solving. Some analysts at the Center for Army

Lessons Learned (CALL) are of the opinion that the Army's doctrine is not sufficient.⁸ This call for a more detailed process solution must be also balanced by statements such as this by General Gordon R. Sullivan, the Army Chief of Staff:

This approach leads us to taking on a problem step by step, focusing on the process itself rather than the objective. We can become more concerned with completing the process than focusing on how the task contributes to the overall objective.⁹

Even this cursory overview of the question shows that the issue is quite open to debate. The need for this thesis is highlighted by the fact that before the debate is settled, many within the Army are proceeding with steps to change the doctrine.

The most significant initiatives for changing Army command and control doctrine are taking place at Fort Leavenworth, Kansas. The Combined Arms Command has proposed a new methodology for commanders to reach decisions in conditions of constrained time.¹⁰ This model, titled the Abbreviated Command Estimate,¹¹ emphasizes more of what Klien has called a "recognition primed decision strategy."¹² In the latest editions of ST 100-9, a student pamphlet published for use by students in the staff college, this has been a truncated version of the traditional command estimate, in previous versions it involved a reordering of the traditional process.

Assumptions

Certain assumptions must be accepted in order to proceed in this project with a view towards a practical solution.

The basic methodology for the research assumes that the command and control process is in fact observable. Qualitative descriptions of performance toward mission accomplishment, made by trained observers in Army programs, will be considered accurate.

Due to the limited time available to complete this study, certain assumptions had to be made concerning the available data. The TRADOC Analysis Command (TRAC) Command and Control Responsiveness Analysis¹³ will be considered sound and accepted as reflecting the general situation in the field. The CALL collection of Battle Command Training Program and Combat Training Center contains observations which are individually accurate and to that extent, the collection reflects the situation in the field.

The overriding assumption is that U.S. Army tactical commanders will be required to make decisions under battlefield conditions, and this means every measure to improve human performance is needed, regardless of other developments in the Command and Control system. With that in mind, the doctrinal goals for decision making are considered sound, despite other initiatives in hardware and software which might offset human limitations.

Having established the basic assumptions of the research, it is also important to set forward some clear operating terms so that the reader is not caught in a semantic web.

Definitions

Every field has a language of its own and the study of command and control is no exception. Likewise, every field's language has its share of semantic debate. Some of these semantic debates will be considered. However, to focus the study, doctrinal definitions will be used as often as possible. The following terms will be used as defined.

Command: FM 101-5 defines command as:

Command is the authority that a commander in the military service lawfully exercises over subordinates by virtue of rank or assignment. Command includes the authority and responsibility for effectively using available resources and for planning the employment of, organizing, directing, coordinating, and controlling military forces to accomplish assigned missions.¹⁴

Command and Control: For the purpose of this study command and control is defined as the process by which the commander exercises his authority and responsibility toward his unit and the accomplishment of assigned missions. FM 101-5 defines command and control¹⁵, however the definition differs slightly from that in FM 101-5-1. FM 101-5-1 focuses the definition of command and control by stating that command and control is "The exercise of command that is the process," then includes the definition of command and control from FM 101-5.¹⁶ This concept of the exercise of

command emphasizes the subordinate nature of all other parts of the command and control system to the role played by the commander. This idea is in line with the opinion expressed by Martin van Crevald in his work, Command in War, where he uses the term "command" to describe "all the manifold activities" the process involves.¹⁷

Command and Control System: The system will be defined in accordance with the text of FM 101-5-1, Operational Terms and Graphics, to include:

the personnel, equipment, communications, facilities, and procedures necessary to gather and analyze information, to plan for what is to be done, and to supervise execution of operations.¹⁸

Limitations

As the commander considers the constraints in seeking a decision towards accomplishing his mission, so does the researcher in investigating his subject. To proceed with a reasonable probability of solving the problem, certain limitations must be imposed.

There is a lack of depth in objective statistical analysis on organizational performance during constrained time. Research has tended to be subjective rather than empirical. Kahan, et al, noted the extent of this problem as it applied to command and control in a 1989 study.¹⁹ This shortcoming will require direct study of the data in the CALL and TRAC data bases. Likewise, the CALL data base observations are made at the discretion of the observer, so

individual accuracy does not ensure collective accuracy. This limitation demands that the TRAC analysis be used to offset the potential shortcomings of the CALL data. Even there, the basic data of the TRAC analysis is based on subject matter expert data rather than empirical observation.

Most of the previous research is based on experiential or analogous data. Additionally, many experts rely on intuitive evaluations of problems related to constrained time. Kahan, et al, notes these problems of methodology as well.²⁰ This will require a rigorous approach to the review of literature to avoid fallacies of analogy.

There is no accepted model for decision making. This is recognized by Allard,²¹ as well as by others. This debate over models will be discussed in the review of literature. To overcome this shortfall, the study will model the Army's command and control system against the doctrinal system objectives.

Delimitations

Once the parameters of the available knowledge and data have been acknowledged, certain delimitations are necessary to keep the research focused on a significant and attainable objective.

This study will not consider echelons above corps as their decisions are so closely linked to political decisions that they cannot be considered purely military nor can they be considered tactical. Likewise, echelons above corps tend to use joint, rather than purely U.S. Army command and control doctrine.

In the same vein, this study will not consider echelons below battalion as these units do not have staffs, nor do they typically deal with problem solving in situations of extreme complexity. There is some debate on the applicability of the current doctrine for various echelons as well. This question will not be considered during the investigation.

This study will not consider the targeting process or supporting commanders estimates in the analysis of the decision making process. Although these are both elements of the decision making process, solutions to problems in these areas are developing as separate command and control issues bordering more on what William Reitzel has called "puzzle solving" rather than tactical problem solving.²²

This study will not examine perceptions of the doctrine in the field through survey or interview, but will consider perceptions as stated in official and unofficial literature. One of the key problems observed in the review of literature is that most of the debate is fueled by the

"jury of executive decision," rather than more analytical methods. This study will focus on determining the adequacy of the doctrine through research methodology.

Significance

This research seeks to determine if the doctrine for decision making is sound. So far this paper has established a focus of the research on the command and control process at the corps down to battalion levels. The discussion has identified the limitations of the available information and the means to overcome them. The historical and current context problem was established. But having stated the research question and all its parameters, the reader might ask, "so what?"

Any author has an obligation to identify the significance of his study. This study is significant because of both the great impact of a change in doctrine and the need for sound doctrine.

On one hand, a major change in doctrine requires a significant institutional investment. Confusion, institutional resistance, and collateral change come with any change in doctrine. Confusion results because different readers will interpret the new doctrine in different ways, or fail to learn the new doctrine at all. Institutional resistance occurs because people are generally disposed to stick with what they know and feel comfortable with.

Collateral change occurs because other related doctrinal publications, and the doctrines of other services, must be synchronized with the new doctrine.

Before the U.S. Army inflicts the trauma of change on the institution, the need for that change should be clearly identified.

Second, once the change process begins, the changes made should be correct and complete. This minimizes the period of turmoil. Change is never easy, but the process should be done as quickly and as smoothly as possible.

Finally, the manual has a key role in the body of doctrine. As mentioned earlier, FM 100-5 is the "keystone" manual for warfighting, so therefore, all other warfighting doctrine must nest with it. If FM 100-5, Operations, "is the Army's primary warfighting manual,"²³ then FM 101-5, Tactical Command and Control for Commanders and Staffs is the primary guide for commanders and staffs to plan the ways they will direct the means of their units to achieve the ends of their missions. The preface of the coordinating draft states:

This publication is the Army's capstone command and control (C2) publication for AirLand Battle Doctrine. It describes the roles, relationships, organization, and responsibilities of the commander and staff. It defines the Army C2 system and explains each of the C2 functions and processes.²⁴

If this is the case, like the warfighting manual, FM 101-5 must provide a base on which all other command and control system doctrine guides. Secondly, this emphasizes the

importance of completeness in covering the system. This will help insure the decision making doctrine for the system is clear, comprehensive, usable, and sound. Perhaps the description of the doctrinal imperative in FM 100-5 sums up the significance of quality doctrine:

It must be definitive enough to guide operations, yet versatile enough to accommodate a wide variety of worldwide situations. Finally, to be useful, doctrine must be uniformly known and understood.²⁵

Therefore, this study should show if the doctrine expressed in FM 101-5 (Coordinating Draft) is sound enough to provide the guidance necessary to guide command and control operations in a wide variety of situations on the modern battlefield.

ENDNOTES

¹Infantry Journal Inc., Infantry In Battle, 2nd ed. (Fort Leavenworth: Reprinted by th USACGSC with the permission of the AUSA, 1939), 122.

²United States Army, FM 100-5, Operations (Washington, DC: Department of the Army, May 1986), preface.

³Ibid, 16.

⁴Ibid.

⁵Ibid.

⁶T. R. Phillips, "Solving the Tactical Equation," in the Quarterly Review of Military Literature, Vol. XVII, n.s. 66 (3rd Qtr. 1937): 6.

⁷Herbert Simon, The New Science of Management Decision (New York: Harper and Row, 1960), 14.

⁸CALL Newsletter No. 92-X (Draft), "The Battalion and Brigade Staff," (Fort Leavenworth: Center for Army Lessons Learned, October 1992), In the forward, iv.

⁹Gordon R. Sullivan, "Delivering Decisive Victory: Improving Synchronization," Military Review LXXII, n.s. 9 (September 1992): 9.

¹⁰United States Army, FM 101-5 (Coordinating Draft), "Command and Control for Commanders and Staff" (U.S. Army Command and General Staff College, July 1992), 4-1 to 4-79. Hereafter, FM 101-5 (Draft).

¹¹Ibid.

¹²Gary Klien and Beth Crandall, Recognition-Primed Decision Strategies: First Year Interim Report (Yellow Springs: Klien Associates Inc. for U.S. Army Research Institute for the Behavioral Sciences, August 1990).

¹³Thomas J. Pawlowski and David A Rameden, Command and Control Responsiveness Analysis (Fort Leavenworth: TRADOC Analysis Command-Operations Analysis Center, December 1991). Heareafter, C2RA.

¹⁴United States Army, FM 101-5, Staff Organizations and Operations (Washington, D.C.: Department of the Army, May 1984), 1-1.

¹⁵Ibid.

¹⁶United States Army, FM 101-5-1, Operational Terms and Symbols (Washington, D.C.: Department of the Army, October 1985), 1-16,17.

¹⁷Martin van Crevald, Command in War (Cambridge: Harvard University Press, 1985), 1.

¹⁸FM 101-5-1, 1-17.

¹⁹James P. Kahan, Robert Worley, and Cathleen Stasz, Understanding Commanders' Information Needs (Santa Monica: RAND, June 1989), 2-4.

²⁰Kahan, Worley, and Statz, 2-3.

²¹C. Kenneth Allard, Command Control and the Common Defense (New Haven: Yale University Press, 1990), 149-154.

²²William A. Reitzel, "Background to Decision Making" (United States Naval War College, June 1958), 39-42.

²³FM 100-5, 1.

²⁴FM 101-5 (Draft), 1.

²⁵FM 100-5, 6.

CHAPTER TWO

LITERATURE REVIEW

There is a great deal of literature related to decision making. Even the most cursory study shows that a study of command and control requires an interdisciplinary approach. For the purposes of this study, key literature can be categorized as studies of general problem solving and decision making, studies of command and control, studies of problem solving applied under time constraints, and military publications. These works will be used as the basis for exploratory research on doctrine, command and control, and decision making. The works discussed in this review are cited in the bibliography, which also contains other relevant works.

Current Doctrine

The current source for U.S. Army problem solving doctrine is FM 101-5, Staff Organization and Operations, published in 1984. This manual includes chapters on both decision making and planning. The basis for decision making expounded in this manual is based on an interactive model using the classic estimate of the situation. An initial examination shows the manual does address actions for decision making under constrained time but does not address

specific actions to ameliorate the effects of stress. This manual is supplemented by discussions of command and control process in several other manuals.

The doctrinal manual for defining terms is the 1985 version of FM 101-5-1, Operational Terms and Symbols. As was noted in the chapter on definitions, there are some semantic differences between this manual and others, in particular FM 101-5 and FM 100-5. Like FM 101-5, FM 101-5-1 is in revision.

FM 100-5, Operations, published in 1986, is the Army's "keystone" warfighting manual. This manual, also under revision, outlines the qualities the Army desires in a command and control system. Although it does not directly analyze the concept of a decision cycle, this manual continually emphasizes the need for quick, decisive command and control.

Along with FM 100-5, which defines the Army philosophy for fighting, FM 22-103, Leadership and Command at Senior Levels, published in 1987, is important because it defines the Army philosophy for commanding. This manual places command and control in the context of senior leadership. It is significant as it causes one to consider the psychological elements of the decision process as well as the logical aspects. This helps identify some of the qualities a decision must have if the commander is to impose his will on his subordinates without destroying their

confidence or motivation. This manual also contributes towards the understanding that leadership must be inherent in the C2 process.

For specifics FM 100-5 directs the reader to FM 101-5, but the section on tactical planning does emphasize the idea of a "continuous cycle," which is as thorough as time allows.¹

FM 101-5 is, according to FM 100-5, the source document for the planning process. In opening discussion of the estimate, FM 101-5 states:

The purpose of the estimate of the situation is to collect and analyze relevant information for developing, within the time limits and available information, the most effective solution to the problem.²

The same passage echo's FM 100-5 with the statement, "The estimate is as thorough as time and circumstances permit."³ The same passage concludes with an imperative for constant revision. Chapter five, "Decision Making," describes the military decision making process. This chapter identifies specific adaptations of the formal process to situations where time is critical:

Often, time becomes the most critical factor facing the commander and the staff in a decision-making process. ...the commander may have to proceed through the decision-making process and issue oral orders based on his own knowledge of the situation without taking the time required to formally include the staff in the process.⁴

In a related passage, the manual establishes the need to condense the normal decision making process. The manual also introduces the "1/3 to 2/3 rule."

When time does not allow formal adherence to procedure, the commander must take action to ensure timely decisions. To ensure that subordinate commanders and staff have sufficient time for planning, subordinate units should have at least two-thirds of available time to develop their plans. The chief of staff supervises adherence to time suspended actions.⁵

The manual describes this abbreviation in flow chart form, indicating that the commander should conduct the information available brief with his staff, then prepare a personnel estimate.⁶ The information exchange the diagram describes includes an overview of the "factors of METT-T" (mission, enemy, own troops, terrain and weather, and time) and, significantly, the initial analysis of relative combat power presented by the operations officer. In concluding the passage on the process, these specific instructions are given to commanders and staff officers:

The staff should serve the commander by analyzing details and communicating the essential information, conclusions, and recommendations as often as necessary to keep up with the developing situation. Commanders cannot allow their contact with their staff to be limited to scheduled briefings if they are to keep up with the pace of modern combat. If the commander is kept constantly informed by the staff, prompt decisions can be made when necessary.⁷

This analysis of the developing situation has come to be referred to as "battle tracking" and analysis, which will be discussed in the examination of army command and control training efforts.

In addition to the previous guidance, chapter six, "Plans and Planning," also emphasizes speed as it refines the planning portion of the decision-making process. In particular, the introduction to planning echo's back to FM 100-5's emphasis on anticipation by stating that:

Planning makes future operations easier by permitting subsequent, rapid, and coordinated action by the staff and by other elements of the command. It also keeps subordinate elements of the command informed of possible requirements and keeps the command in a better position to respond to rapidly-changing situations.⁸

Having considered some doctrinal sources for command and control fundamentals and characteristics of sound decision making, the next doctrinal issue is identifying details of the competing and complementary doctrine which apply to decision making under battlefield conditions.

Beyond the doctrine in FM 101-5, the Army has numerous doctrinal manuals which address the command and control process, decision making, and commander-staff interaction. Each type of maneuver unit has, or should have, a manual on operations. These manuals have sometimes been referred to as "How to fight manuals." In other cases, the manuals have been split out to cover doctrine, tactics, techniques and procedures, with various levels of redundancy.

Two manuals which specifically apply to the command and control process and decision making are FM 34-130, Intelligence Preparation of the Battlefield, published in 1989, and FM 24-1, Signal Support in the AirLand Battle, dated 1990.

FM 34-130, Intelligence Preparation of the Battlefield, must be considered a key part of the Army's current approach to solving tactical problems. The methodologies and products called for in this publication are now used as an inherent element of most unit decision making and problem solving procedures. This fact is reflected in the echelon specific manuals. Problems with this manual include a failure to address the relative combat power analysis the 1984 version of FM 101-5 calls for in the brief of information available.⁹ Likewise, the discussion of the event templates and decision support templates does not address relative combat power analysis.¹⁰

FM 24-1 is critical in that it defines "signal support" as "implementation of the Information Mission Area (IMA) at the operational through tactical levels of war."¹¹ Signal support and the IMA are, together, the communication in "C3." Specifically, this manual describes the signal support disciplines of "communications, automation, visual information, records management, printing/publications."¹² The signal support informational systems are described as being used by commanders to "direct, coordinate, and support" their forces.¹³ In other words, this manual

describes how the commander will use his signal systems to perform command and control. This is the communications and equipment (technology and automation) portion of the concept for the command and control system. If the doctrine is coordinated, there will be a clear, hierarchical, compatibility between FM 100-5, FM 101-5, and FM 24-1.

Although it is not a doctrinal publication in the sense of FM 24-1, the "operational requirements document" for the Family of Army Tactical Command and Control Systems has as much influence on acquisition as the FMs have on practice. The Army Tactical Command and Control System (ATCCS) is an architecture for the C2 system. The current draft of this document, dated April 1993, introduces a term, Force Level Command (FLC). According to the draft:

FLC is defined as the process by which the combined arms commander and staff integrate and synchronize the efforts of the five BFAs to support attainment of the unit mission. Integration and synchronization are effected primarily through the management, manipulation and assessment of information from across the five BFAs to support development of tactical plans and orders. Common data is stored in the force level database, accessible by all BFAs.¹⁴

This is nearly synonymous with the mission of the signal support system and disciplines described in FM 24-1. FM 24-1 should, in theory, address employment of the Army Tactical Command and Control System, but it does not.

There are operations manuals for each echelon from corps down to battalion. Each of these manuals addresses issues of command and control in general. Some manuals

address problems unique to that level. The manuals vary in level of depth and are not completely consistent with FM 101-5. The manuals published under the proponentcy of the Infantry and Armor centers tend to be very detailed. The references are also somewhat contradictory. Each offers a different model for decision making when time is constrained.

Some manuals, such as FM 71-100, Division Operations, assume that the reader understands the doctrine in FM-101-5. These manuals focus on describing the command and control system for the unit, and explaining how the system works to provide C2 that meets the objectives established in FM 100-5.

Another group of manuals, such as FM 100-15, Corps Operations, give more detailed coverage to the decision making process. Further study of the manuals shows that some not only expand on FM 101-5, in some cases there are contradictions. In a perfect world, every officer might be expected to study and synthesize over 25 manuals. It is intuitively obvious that time available and human nature will combine to cause the average officer to avoid reading the body of doctrine.

FM 100-15, in particular, specifies a particular technique for the estimate process. This estimate process is based on a force ratio methodology.¹⁵ FM 100-15 also states that planners should analyze the Soviet troop control cycle to determine timing for their own decisions. Finally,

FM 100-15 provides a two dimensional process model which traces the cycle down to the execution level. Unfortunately, the dimensions of the model are confused, with the model seemingly incorporating information flow, actions, and products in both categorical and time environments.

Although the diagram is a step towards a process model, it is not supported by textual explanation and is not self-explanatory.

The models for command and control in the service school authored manuals are somewhat influenced by a semi-official publication. The Command and General Staff College publishes a student text, "The Command Estimate Process," which, although not a doctrinal publication, represents the only technique for applying the doctrine taught at the school. As the principal interpretation of the doctrine, this publication must be given due consideration. ST 100-9 offers a format for decision making under constrained time. This "Abbreviated Command Estimate" is under revision in conjunction with the FM 101-5 rewrite.

Just as a semi-official publication influences Army doctrine, so does the doctrine of other services. The doctrine of other services also offers insights which Army doctrine may not. FMFM 1-3, Tactics, is the Marine Corps expression of tactical warfare. This manual specifically cites the need for a decision cycle which is more rapid than the enemies. In the same light, Background to Decision Making, published by the Navy War College in 1958, offers

classic insight into the competing factors the military decision maker faces. Additionally, there is no finer discussion on the military decision process than Sound Military Decision, which was written for the Naval War College in 1942. This reference still serves to guide a reader through both the philosophical and practical aspects of the process. Interestingly enough, these manual emphasize relative combat power analysis, in terms of capabilities open, as the key to determining courses of action open.

Theoretical Works

Although the Army decision maker faces certain unique problems, there is a great deal of useful information in theoretical and practical studies of problem solving and decision making.

A key work on problem solving is W. Edger Moore's Creative and Critical Thinking. This work identifies the necessary elements for a sound system of problem solving. Moore indicates a need for a process which allows both intuitive, creative thought and critical, logical analysis. Because the basis of the military decision process is synthetic thought and logical analysis, Moore's book helps the reader identify the elements which must be part of any complete system of reasoning. One drawback of Moore's approach is that he does not consider the impact of time or stress on decision makers.

Another useful work is A Basic Approach to Executive Decision Making, by Dickenson, Miller, and Oxenfeldt. This book, like FM 22-103, puts decision making in the context of leaders of larger organization. Unlike Moore's work, this book does identify process and psychological problems which may lead to indecision.

A more recent study of the same ideas raised by Moore and Dickenson, et al, is Elyse Tanouye's 1989 article, "Why Smart Managers Make Bad Decisions." This short piece identifies pitfalls decision makers must avoid. This supplements the work of Moore by establishing criteria with which a decision, and the method used to reach it, may be evaluated for reasonableness. This work is particularly useful in that it, like A Basic Approach . . ., identifies some of the psychological effects that may lead to poor decisions.

Edward Glassman's article, "Creative Problem Solving," examines the issue from a perspective opposite Tanouye's. This article identifies the elements necessary to insure a problem solving approach promotes creativity and innovation. As logical philosophy opened the door to the science of decision making, Glassman reminds the reader of the "artistic" aspect of decision making.

Tudor Rickard's research into innovation and creativity continues this consideration of the abstract side of decision making. His theory is explained in his paper titled "Innovation and Creativity: Woods, Trees and

Pathways." This paper shows how an over reliance on methodology can stifle the personal nature of the creative process. In particular, Rickards builds on the work of Irving Janis and others by examining the effect of a satisficing approach on creativity. Rickards demonstrates the importance of creativity in a complete problem solving process.

Although artistry has great appeal to some, the positive role of the scientific influence on decision theory cannot be ignored. In this light, Derek Gjertsen identifies the historical conflict between the scientist and the philosopher. His book, Science and Philosophy (Past and Present), traces the evolution of the scientific and philosophical methods for problem solving. He points out the strengths and weakness of both approaches, the contradictions between the two, and the utility of each for the other.

Herbert Simon's slim volume, The New Science of Management Decision, is one of the classic calls for scientific decision making. What is most important about this work is the emphasis on the idea that good decisions may not happen unless positive steps are made to insure they will. Secondly, he emphasizes how executive decision makers can use scientific and quantitative methods to provide reasonably reliable recommendations.

Some more specific studies of decision science methodologies are also useful. Martin Shubik's The Uses and Methods of Gaming provides an understanding of game theory. Gaming has become a critical component of the military decision making process. Research-Based Decisions, edited by Charles Fay, et al, offers a detailed look at the use of decision making methodology in a variety of conditions of relative uncertainty. This work is particularly useful in identifying common elements for quality decision making.

Command and Control

Both philosophical theories and scientific approaches to problem solving have strong influences within the new discipline of Command and Control.

Martin van Creveld's Command in War places the overall concept of command and control in the perspective of a commander driven system rather than a linear organizational process. Command in War emphasizes the increasing complexity and uncertainty facing the military commander as he attempts to combine ways and means to attain his mission. This work is possibly the most influential study of military philosophy since On War.

Karl von Clausewitz classic work, On War, is particularly useful in addressing the primary and secondary functions of the decision making process. His discussion of the mental characteristics of genius and his analysis of the philosophical nature of military study are critical to an

understanding of the role of the commander in decision making. In addition to his clear analysis of the decision making environment, he also causes the reader to realize a commander must be unencumbered by unnecessary constraints on his creative abilities.

In the same vein as Clausewitz, Sun Tzu offers a guide for the intellectual aspect of war and tactics. Contemplation of the situation lies at the heart of Sun Tzu's approach to war. Estimating the situation is his key to employing all other aspects of war. The first chapter is devoted to appreciating the situation and all of the other chapters support this concept. In particular, chapters two through four give a thorough explanation of the art of war as viewed from an estimate, while chapters five to eight enhance and reiterate previous discussions. This systematic estimation lies at the heart of his system of war, which says to calculate the odds of relative strength and base strategy and tactics on this knowledge. The general should, according to Sun Tzu, measure space, estimate quantities of forces needed to operate in the space, calculate the opportunities for attack, and then identify the time and place to strike with irresistible force. This careful calculation of capabilities and vulnerabilities is the ultimate test of the general's abilities, for from it derives the tactical system Sun Tzu describes in chapters five and six, then details in the rest of the work.

Chief of Staff of the Army, General Gordon R. Sullivan addresses the mental challenges facing Army leaders. His article, "Delivering Decisive Victory: Improving Synchronization," helps place the importance of doctrine and procedure in context. General Sullivan identifies the goals for the command and control process which he feels must not be sacrificed for the sake of procedures.

Richard Simpkin provides an excellent overview of command and control in mechanized warfare. His work, Human Factors in Mechanized Warfare, addresses the evolving needs of the command and control process. Like General Sullivan, he identifies key qualities future C2 systems must have. In particular, he addresses the nature of orders. This discussion will help identify characteristics of complete decisions.

If the previous authors offer a philosophical analysis of command, there are many who take a more scientific approach.

Lieutenant Colonel Kenneth C. Allard discusses tactical command and control in chapter six of his book, Command, Control and the Common Defense. As previously mentioned, he offers a critique of the more popular models of decision making. In particular, he criticizes the cyclical approach popular with many military theorist. LTC

Allard also addresses the problems associated with the complexity of tactical operations, especially those of ground forces.

Stuart Johnson and Alexander Levis have edited a series of anthologies broadly titled The Science of Command and Control. The first of these, sub-titled Coping With Uncertainty, contains two key works for understanding how decision making fits into command and control. The first work, "The Quest for a C3 Theory," by Levis and Michael Athans, examines the lack of an accepted theory or model of command and control. Another key piece, by Israel Mayk and Isak Rubin, is "Paradigms for Understanding C3, Anyone?" This work supports Allard's contention that the models for command and control are flawed. Mayk and Rubin add a further critique that much of the debate over command and control paradigms is purely semantic. A third piece of note is Dr. A. E. R. Woodcock's "Indications and Warnings as an Input to the C3 Process." This work provides a game model of the C2 process which addresses the enemy's "input" and then applies the catastrophe theory to the command and control process in determining relative combat power.

The second volume of Johnson and Levis' series is sub-titled Coping With Complexity. This collection is particularly useful because it deals with the role of the decision maker in the command and control process. Several articles continue the critique of previous studies for over-reliance on two dimensional, linear, decomposable models.

This contribution to understanding how the various elements of the command and control process fit together helps identify the products the decision must provide to the system. These works also help to identify the sub-components, as well as the component relationships, within the decision making process.

In a similar anthology, Principles of Command and Control, also published under the auspices of the Armed Forces Communications and Electronics Association. The works in this collection consider the effects of the battlefield and examine how systems technology can be applied to command and control. In particular, Anthony G. Bohannon's article, "C3I in Support of the Land Commander," is focused on the effects of the battlefield environment on the command and control problem.

An excellent contextual model of command and control is given in Kenyon De Greene's The Adaptive Organization. De Greene takes catastrophe theory one step further and applies it to a general ability to adapt to a changing environment. Although this work is not specifically about military command and control, the model De Geene presents avoids the simplifications of the models criticized in the previous works. This model will be useful in developing a contextual model of the command and control process and the role of the decision making process within that context.

Although this study will not evaluate the decision making methodologies used by other nations, an examination of Soviet theory is very useful as they have taken a very scientific approach to problem solving. Prior to the breakup, the Soviets put much effort into a detailed analysis of command and control. In particular, the Soviets placed great emphasis on determining the time available for the commander to reach a decision. Three works provide insight into the Soviet theories: Robert Hall's Soviet Military Art in Times of Change; John Hemsley's Soviet Troop Control; Ivanov, Savel'yev, and Shmanskiy's Fundamentals of Tactical Command and Control. Ivanov, et al, in particular offers a very precise approach to estimating the time available for a decision.

In addition to general studies of military command and control, there is a good deal of research on the specifics of U.S. Army command and control.

The Army Research Institute Field Unit at Fort Leavenworth has published Tactical Command and Control Process by Jon Fallesen, et al. This work is a search for an accurate description of the Command and Control process as practiced by commanders and staffs of the U.S. Army. The study reevaluates the relative importance of seeking the best course of action versus finding an acceptable solution. This work is hindered by a lack of citations and specific evidence. It is also limited by a schism between

naturalistic, satisficing and optimal seeking models. In this vein it is useful for an analysis of the proper level of optimality in solutions to tactical situations.

On a similar track, ARI has also published the report, Home Station Determinants of Unit Effectiveness. This report analyzed ratings of the correlation of training with the ability to perform successfully at the National Training Center (NTC). In particular, this report details the examined units' abilities to apply the doctrine in a simulated battlefield environment.

In addition to these published works on command and control, several unpublished works from the U.S. Army Command and General Staff College's advanced degree programs deal with problem solving under time constraints and related decision topics.

Major Timothy Lynch's monograph, "Problem Solving Under Time Constraints," is significant as it proposes alternative abbreviated procedures. Major Lynch deals with the nature of problem solving in constrained time and offers several ideas for increasing the speed at which decisions are made and implemented. There are two significant problems with his monograph. First, he states that the 1984 manual does not offer specific procedures for rapid decision making. This literature review has already shown that to be false. Secondly, he does not take the human element into account.

In a similar study, Edward Shirron examines an accelerated wargame methodology. His work, short titled "An Optimum Method of Wargaming in a Time-Compressed Environment," offers a means of reducing the overall time required to complete the estimate. As with Major Lynch's work, the human factor is not addressed.

Although both works are sound in terms of methodology, they accept without question that the current methodology described in doctrine will not work in constrained time.

At this point it is appropriate to examine the work of Colonel (Ret) Trevor N. Dupuy. Although he deals with the development of a deterministic theory of combat, Col. Dupuy has had a striking influence on the Army's approach to wargaming as a part of decision making. His book, Understanding War, outlines his position on combat models. His work has had a strong influence on the modeling approach used in ST 100-9.

Maj. James Muhl considers the utility and necessity for applying game theory in his monograph, "In search of a Combat Theory: The Tactical Utility of TMCI's Military Combat Theory." If Army commanders, or their staffs, need to wargame as a part of course of action analysis, his work offers considerations on which methodology is appropriate.

The primary aspects of decision making, command and control, and estimates were considered in the previous works. This study must also examine works bearing on the

issue of collateral or ancillary roles for the decision making process. In addition to the requirement for supporting the commander's estimate, what other functions are provided?

Preparation for decision making is detailed in Joseph Drelling's monograph, "AirLand Battle and the Operational Commander's Information Requirements." Although this work deals mainly with the issue of focusing the information flow, it does help identify the role of the commander in managing his own command and control process. Additionally, he identifies key information exchanges between the commander and his staff which may not be provided by the current doctrine.

The most useful study of the information and idea exchange process is in Understanding Commander's Information Needs by James P. Kahan, et al. This book seeks to fill a void in the body of knowledge on how commander's interpret information, share information, reach decisions, and guide staff operations. This work centers on the idea that the commander is the essential player in the decision making process. Understanding the Commander's Information Needs identifies specific shortfalls that occur when the commander and his staff do not share ideas, information and interpretations of the situation.

Theoretical studies of command and control may help establish ideals for the process, but utility is determined as an aspect of applied problem solving.

Kahan is also the leading author of Testing the Effects of Confidence- and Security-Building Measures in a Crisis. Although this book deals with strategic decision making, it contains analogies relating to the ancillary effects of decision making procedures. In particular, this book examines whether constraints imposed by a problem solving methodology can actually hinder reaching a solution.

The usefulness of the crisis management process as an analogy for understanding applied decision making under time and psychological stress is clear in Gabriella Heichal's "Decision Making During Crisis: The Korean War and the Yom Kippur War." Dr. Heichal's work tracks well as a case study example of leaders making the mistakes that the theorist warn of. This work raises concerns that must be addressed before a simple satisficing approach, or a naturalistic approach is accepted.

The TRADOC Analysis Command-Operational Analysis Center in the C3I Studies Directorate of the U.S. Army Combined Arms Command reports its findings on the nature of command and control responsiveness in a detailed model. This model, The Command and Control Responsiveness Analysis, details the statistically demonstrated norms required for staffs and individuals to complete sub-routines of the command and control process. This data is particularly important as it uses observations of soldiers doing the specific tasks required in the command and control process, rather than relying on potentially fallacious analogies.

The Center for Army Lessons Learned draft newsletter (tentative release in the winter of 1992) deals with observations of and recommendations for the commander and staff in the command and control process. Although this is a draft and does not reflect the final position of the center, it is reflective of opinions shared by members of the cadres of the Battle Command Training Program and the Combat Training Centers. A comparison of the authors' contention with the database should indicate broader perception problems with command and control. It must also be remembered, as was mentioned in the introduction, that observer controller discretion plays a key role in determining which problems are brought to light.

In addition to studies of U.S. Army applied command and control, there has been a great deal of analysis on simulation and analogy analysis.

Arthur J. Athens' thesis, "A Simulation Study of Organizational Decision Making Under Conditions of Uncertainty and Ambiguity," offers an alternative view of decision making by taking a non-linear perspective. Athens' thesis finds that decision makers must have the alternative to sift through the process in a somewhat random fashion rather than stick to a methodical approach.

Elliot Entin and Daniel Serfaty study the effects of stress, including time stress, on decision makers in their report, Information Gathering and Decision Making Under Stress. This work is significant for two reasons. First,

it simulates the effects of stress on the decision maker. Second, it identifies the errors in judgment that occur when decision makers are to follow purely natural methodologies.

Three studies of similar focus may be considered together. The first of these, Effects of Expertise and Cognitive Style on Information Use In Tactical Decision Making, by Rex R. Michel and Sharon Riedel of the Army Research Institute, examines the different approaches taken by experienced and inexperienced decision makers. The other two studies are primarily by Gary Klien. Both deal with the "Recognition-Primed Decision Model" used by experienced decision makers. The studies are Investigations of Naturalistic Decision Making and the Recognition-Primed Decision Model and Recognition-Primed Decision Strategies: First-Year Interim Report. Although the cases Klien studies are small unit actions, the conclusions he draws have application for learning how commanders actually decide. These studies also help identify the collateral functions of decision making systems.

This review of literature has, by necessity, been very broad. It is critical that the research consider opposing views on decision making. These literary works will be a key source of data for much of the research. It is imperative that the research cover a broad base of work rather than focusing on military specific studies. By considering both the philosophical, somewhat artistic approaches to command and control, problem solving and

decision making certain abstract qualities may be identified. Likewise, examination of the more scientific works can help identify the more concrete requirements for decision making methodologies.

ENDNOTES

¹United States Army, FM 100-5, Operations (Washington, DC: Department of the Army, May 1986), 33.

²U.S. Army, FM 101-5, Staff Organization and Operations (Washington: Department of the Army, 1984), 5-2.

³Ibid.

⁴Ibid, 5-5.

⁵Ibid.

⁶Ibid, 5-6 and 5-7 foldout.

⁷Ibid.

⁸Ibid, 6-1.

⁹U.S. Army, FM 34-130, Intelligence Preparation of the Battlefield (Washington, DC: Department of the Army, May 1989), 3-3.

¹⁰Ibid, 4-72.

¹¹U.S. Army, FM 24-1, Signal Support in the AirLand Battle (Washington, DC: Department of the Army, October 1990), 1-1.

¹²Ibid.

¹³Ibid.

¹⁴"General Description of Operational Capabilities" (DRAFT) (Fort Leavenworth: Combined Arms Center, TRADOC System Manager for the Army Command and Control System, April 1993), 2. Hereafter Operational Capabilities Document.

¹⁵U.S. Army, FM 100-15, Corps Operations (Washington D.C.: September 1989), 4-15 to 4-19.

CHAPTER THREE

RESEARCH DESIGN

The basic design of this research aims toward an associative analysis of the new Army doctrine expressed in FM 101-5 (Coordinating Draft) against a set of qualitative standards. To reach that point, this research will have four components. Each of these components will be directed first towards answering very specific, observable questions, then finally, the supporting secondary questions. Using these answers in association will solve the primary research question. The first phase will be exploratory, the second will be taxonomic, the third, descriptive, and the fourth, associative.

Every research endeavor involves some form of induction. The exploratory phase, which will be based on a literature study, will seek information on several questions. From the answers to these questions, inductions will provide conclusions on the nature of doctrine, unit performance, human performance, and the battlefield environment.

First, the research will seek to discover the U.S. Army's mission for the command and control system. Second, it will seek to identify the nature of the battlefield. Finally, the research must find information on system capabilities under battlefield conditions. In particular, the research must consider the effect of battlefield conditions on the human factors of decision making. The research must answer these questions:

1. What is the Army's doctrinal mission for the tactical command and control system? The facts concerning U.S. doctrine will be drawn directly from the appropriate publications which were indicated in the literature review.

2. Are there any tasks, functions, or standards imposed by the environment? These answers will come from the analysis of literature and actual unit performance.

3. What is the Army's new doctrinal command and control process? Does the doctrine establish specific principles? What specific procedures are laid out in the doctrine? What latitude does the doctrine offer? Are the fundamental principles consistent throughout the doctrine? Does the doctrine call for different procedures at different echelons?

In addition to determining the nature of the doctrine, the research must also explore the nature of decision making and problem solving in general. In particular, the investigation must identify general characteristics of sound decision making which can be used

to evaluate the doctrine logic of the doctrine.

Specifically, this will consist of a study of common problems with logic that decision makers must consider. This analysis will also examine whether or not these problems increase under battlefield conditions.

The nature of decision making and problem solving will be analyzed using general literature from many disciplines. The research must place decision making in its place in the command and control process. The major sources of information for this phase will be the works identified in the section of the literature review titled "command and control theory." This research will answer the following questions:

1. What is sound decision making? This research must identify qualities of suitability, feasibility, and completeness which can be used to identify essential elements the doctrine must contain in order to be considered logically and doctrinally sound. This question will be answered through analysis of logical philosophy, Army tactical doctrine, command and control theory, and management science.

2. What is the nature of decision making when under time constraints and stress? This research must identify both the concept of constrained time and the concept of timeliness. This leads to one more question. What factors, which are not part of pre-operational planning, must be satisfied when time is constrained? Some possibilities, such as stress reduction or panic reduction, come to mind. The reports of studies by Athens, McMullins, Lynch, Klien, Kahan, Heichal, and Entin and Serfaty offer sources of information on the psychological and cognitive needs when making decisions under time stress.

Once the ideals for performance have been identified, the next step is to examine the performance of units under simulated battlefield conditions. The patterns of unit performance can be compared against the doctrinal standards and the ideal standards. This phase will be descriptive.

This research will focus on statistical analysis of after action reports in the CALL data bases. These data bases contain reports from BCTP and CTC controllers. These controllers are trained to objectively observe decision making under constrained time. The BCTP data will help identify trends and cause - effect relationships.

One caveat will be kept in mind as the data is examined. The observations included in the data base are made on the judgment of the observer, but are not mandatory. This means that any trends noted must be judged in the light that they reflect problems deemed worthy of note, but may not reflect other problems which did not strike the observers as critical. This highlight emphasizes the importance of the TRAC study as a counter-balance to the human nature of the observers at BCTP and the CTCs.

The first portion of the unit performance analysis will study evaluations of the C2 process to determine if the units were successful. The C2 reports identify C2 failures in terms of achieving the characteristics described by the AirLand Battle tenets from FM 100-5. By identifying reported causes of failures to achieve the Army's success criteria and correlating the causes against the tenets, the common causes of failure can be identified. The observations will be categorized according to the standards developed in phase two.

Specifically, these standards will be used to judge how well units are performing decision making under constrained time. First it will determine how the observers rated the units C2 performance. Then it will note what kinds of problems the observers identified. Having

identified the problems, it will determine which are the most common. Specific results should show the trends addressing the following questions:

1. How likely are units to make a timely decision?
2. What is the probability that the decision will result in sound tactics as defined by the Army's doctrine?
3. What are the most common causes of the problems?
 - a. What are the most common problems?
 - b. What part of the problems are specifically doctrinal in nature?
 - c. When units applied the doctrine, were they more, or less, likely to be successful?

The CALL data will be supplemented by the ARI Home Station Study and the RAND study of commanders information needs.

Once the research has identified the nature of the actual doctrine, actual unit problems, and the qualities of ideal decision making, the next step is to identify the role of the gear in the machine. Specifically, the research should determine the role of the decision making process within the command and control process. These conclusions will be critical in developing the models of decision making in constrained time. The ARI study by Falleson, et al, has some utility, but most of the information will come from Kahan, de Greene, Johnson and Levis, von Crevald, von Clausewitz, and Allard. In order to evaluate the quality of the actual doctrine in meeting the commander's needs in a

command and control system, there must be an ideal for comparison. This ideal should show the primary and collateral products required in any decision making in terms of the mission of the command and control system.

At this point the research will have identified the doctrinal system, some qualities any system must have, the general and ideal patterns of decision making under battle conditions, and the role of decision making in the command and control process. At this point the only conclusions that can be drawn would be comparison and contrast between the actual and ideal systems.

To move beyond simple comparison and contrast, the second research phase will be taxonomic and attempt to show the specific qualities which can be derived from the exploration done in phase one. The results of other research must be analyzed to determine if the qualities of decisions, specifically their timeliness and accuracy can be described.

The first step seeks to specifically model the basic elements of decision making process and the decision environment. A model will identify the measure of completeness. This research must go beyond simple decision loops and flow charts and describe how the process occurs in

the overall command and control system, what types of decisions must be made, and what the measures of performance are.

The answers to these questions will be useful for hypothesizing the utility of the doctrine. But because the data base may emphasize negative performance, a second utility analysis is appropriate. The TRAC analysis will be used as a counter balance to the shortfalls identified in the CALL database.

Once the doctrine, ideals, and performance have been analyzed, the body of conclusions must be drawn together to form the overall answer to the research question, is the doctrine adequate?

Next, the doctrine's soundness will be analyzed in relation to the ideals for decision making identified in phases one and two. This correlation will determine if the doctrine is complete. This associative analysis will study the relationship between ideals for suitability, feasibility, and completeness and the realities of doctrine discovered in the previous research. By comparing these basic elements and those elements of the doctrinal process designed to insure soundness, the research will show whether or not the doctrine provides the tools necessary for sound decisions.

Analysis of the data should demonstrate clearly the qualities of the doctrine. In order for the doctrine identified in the first phase to be considered suitable, it

must have observable means of accomplishing the mission. In order for the doctrine to be called feasible, it must provide the essential elements practicality within the context of the battlefield. Finally, to prove completeness, the analysis must show that the doctrinal process provides the specific, identifiable, functions which meet the all commander's needs for interaction with his staff in order to have a responsive command and control process. Once these relationships have been positively demonstrated, then the doctrine can be considered sound.

CHAPTER FOUR

ANALYSIS

This chapter will critically analyze the emerging doctrine for the Army Tactical Command and Control System as it applies to reaching decisions, issuing directions, and supervising execution during tactical operations. This analysis will be multidimensional, yet it must have a constant focus. This focus will be the mission of the command and control system.

This research must analyze the factors relevant to command and control and relate them to the purpose of the command and control system and determine if the new doctrine will allow the system to accomplish the C2 mission. Once this is done, the mission factors can be compared to determine if the course of action selected, FM 101-5 (Coordinating Draft), is sound.

A cursory examination of the table of contents shows evidence that the new doctrine expressed in FM 101-5, (Coordinating Draft), is sound for exercising responsive command and control during tactical operations on the modern battlefield.¹ However, until the details of the doctrine are scrutinized, the doctrine cannot be called sound.

Before the empirical evidence can be analyzed, the mission for the command and control system must be clearly articulated, for this is the basis for suitability.

The Command and Control Mission

What is the Army's mission for the command and control system during tactical operations? To a certain extent this was articulated in the problem statement for this thesis. A suitability analysis must have more specific measures.

FM 100-5 establishes the U.S Army's objectives for command and control system performance. This manual states goals, objectives and tasks for the command and control system during operations, especially when time is limited. An analysis of the purpose, objectives and functions of the system is the basis for the suitability analysis.

The first step is analyzing the purpose of the command and control system. The basis of the mission is the purpose behind the operation. FM 100-5 states that, "the only purpose of the command and control is to implement the commander's will in pursuit of the unit's objective."² Thinking one level up, FM 100-5 also states that, "The object of all operations is to impose our will upon the enemy -- to achieve our purposes."³ This is key, the system has no other purpose besides allowing the commander to

command. Knowing this purpose, the next step is determining the mission essential tasks of the command and control system.

Tasks

Are there doctrinally stated functions or tasks for the command and control system, and if so, which are essential for the commander trying to impose his will on the unit? The doctrine has a clear emphasis on what the command and control system must do. FM 100-5 makes several key action statements concerning the command and control system:

optimize the use of time through the routine use of warning orders, situation updates, and anticipatory planning and positioning of forces."⁴

stress standardized training in operations and staff practices to assure mutual understanding between leaders and units."⁵

secure cooperation between forces without imposing unnecessary restriction on the freedom of junior leaders."⁶

But there are other functions the system must provide in order to be effective. Some of these may be stated, others will have to be derived from the situation.

Measurements

This thesis examines the soundness of the doctrine, this implies a certain degree of effectiveness. Are there doctrinally stated measures of effectiveness? Operations states, "The ultimate measure of command and control effectiveness is whether the force functions more

effectively and more quickly than the enemy."⁷ In a sense this is the beginning of the command and control system mission: Provide a means for the commander to impose his will on his unit so that the unit functions more effectively and quickly than the enemy in accomplishing the mission. In order to accomplish this task, the manual provides further guidance:

The command and control system which supports the execution of AirLand Battle doctrine must facilitate freedom to operate, delegation of authority, and leadership from any critical point on the battlefield.⁸

This guidance is followed by several key points which cover the essential elements for planning directing and controlling.

Planning should be done with a view towards flexibility. In the same sense, the manual emphasizes "solid staff work and strongly developed skills of tactical anticipation."⁹ Anticipation is an imperative, "critical to turning inside the enemy's decision cycle and maintaining the initiative."¹⁰

FM 100-5 also addresses the how this relates to the directing sub-function. Planning sets the stage for mission orders which allow subordinates to adapt to an evolving situation within the commander's concept and intent without the delay of seeking further orders.¹¹ According to Operations, "mission orders that specify what must be done without prescribing how it must be done should be used in

most cases."¹² This emphasis on shared vision encourages "face to face" orders, freedom of action, and great emphasis on subordinate leader initiative.¹³ Perhaps this last idea best sums up the FM 100-5 system of direction, it must establish a control system which is initiative based. This idea is achieved by flexibility, clear missions, implicit coordination, and leadership.¹⁴

FM 100-5 makes it clear that "implicite coordination" is the result of shared vision, which is the conerstone of synchronization. Under the AirLand Battle tenet, Initiative, FM 100-5 states:

If subordinates are to excercise initiative without endagering the overall success of the force, they must thoroughly understand the commander's intent and the situational assumptions on which it was based.¹⁵

This concept of situational vision is clarified in the tenet synchronization which is described in FM 100-5:

coordination is no guarantee of synchronization, unless the commander first visualizes the condsequences to be produced and how activites must be sequenced to produce them. Synchronization first takes place in the mind of the commander¹⁶

Therefore, in examining the specified elements of command and control, the system supports coordination and synchronizaton. This coordination is first established by a system which gives the commander and his subordinate chain of command a common vision of the situation and the commanders intent. This also implies supporting the commander as he develops his mental image of the situation. This also leads to a consideration of other implied tasks.

This analysis has focused on specified functions. The next step is to determine implied functions. These are derived from the tactical decision making and planning situation. This step of the analysis looks at the mission in the context of the battlefield environment.

The Modern Battlefield

Much of the emphasis FM 100-5 places on decentralized command and control comes from a recognition that the modern battlefield during open war, and operations other than war, will require independent thinking. At this point, the analysis must focus on the decision making situation. Specifically, the command and control system must perform in the environment of modern combat. This analysis seeks to identify the battlefield factors which must be dealt with.

There has been a great deal of research into the future of war. Some of this is speculative, some deductive, and some inductive. One thing that is certain, the battlefield will be fast, fuzzy, and furious. More specifically, the battlefield will have the combined effects of speed resulting from rapidity and mobility, confusion resulting from uncertainty and complexity, and strain resulting from lethality and intensity. Clausewitz says, "Four elements make up the climate of war: danger, exertion, uncertainty, and chance."¹⁷

The speed at which events occur on the battlefield can be measured in seconds. Some events, such as missile attacks, occur so rapidly there is a temptation to take men out of the loop altogether, capitalizing on automation to respond in a predetermined fashion. Tactical decision makers do not have this course of action open for ground maneuver. In order to determine the speed at which the command and control system must operate, the analysis must examine the response times required for the tactical decision maker.

Speed and Precision

The U.S. Army examines the future of war in FM 100-5, Operations. This manual states:

Speed has always been important to combat operations, but it will be even more important on the next battlefield because of the increasing sophistication of sensors and the increasing lethality of conventional, nuclear, and chemical fires.¹⁸

This emphasis on speed is reflected by van Crevald who states, "the speed and range of weapons have reduced the time in which to exercise coordination and control to a fraction of what it was only a few decades ago."¹⁹ This requirement for speed is further reflected in the U.S. Marine Corps' use of a passage from Infantry in Battle, "Open warfare demands elastic tactics, quick decisions, and swift maneuvers."²⁰ Anthony G. Bohannon includes responsiveness as a critical requirement for a command and control

system, defining responsiveness as, "The ability of the system to respond to a constantly changing situation, and thereby changing requirements."²¹

Richard Simpkin goes so far as to say that modern maneuver war requires the visualization of the effect of speed on operations as one of giving momentum to the mass of forces.²² This impetus for coupling speed with mass is nothing new, Sun Tzu is quoted as saying:

When torrential water tosses boulders, it is because of its momentum. When the strike of the hawk breaks the body of its prey, it is because of its timing.²³

In considering these ideas, velocity and timing, the concept of responsiveness becomes even stronger. It was the idea of quick and timely decision on a fluid battlefield which lead the U.S.Army to direct the TRADOC Research and Analysis Command (TRAC) to conduct the "Command and Control Responsiveness Analysis." This study was driven by a belief that:

a smaller future Army fighting on a non-linear battlefield over extended distances with mobile forces, will require a responsive system of C2 to successfully prosecute the battle.²⁴

For the moment, the first task implied by the situation is the same as the primary specified task, the tactical command and control system must provide responsive planning, direction, and control. The primary measures of success for responsiveness stated is acting more rapidly and with more precision than the enemy.

The rapidity portion seems easy enough, the Army has many officers trained to perform systems analysis and reduce the time necessary to improve response times. But what of the requirement for precision and timing? The investigation will show that the environment does not favor either of these.

Chaos and Confusion

Confusion is a part of warfare. Modern writers have consistently identified the problems the commander will have in trying to sort out the situation. Infantry in Battle states, "In war obscurity and confusion are normal. Late, exaggerated or misleading information, surprise situations, and counterorders are to be expected."²⁵

It often seems as if the commander must see the world "through a glass darkly." This idea of confusion is reinforced by Clausewitz, who sees uncertainty as leading to indecision.²⁶ The works of Clausewitz and others add another element of confusion to this fog of uncertainty, that is the friction of trying to execute operations in a real environment. This friction increases with the complexity of war.

Complexity

C. Kenneth Allard refers to this problem by referring to a presentation by General Paul Gorman. General Gorman noted that a three-star commander (corps commander) for a ground force controls around $10^4 - 10^5$ subordinate elements, which Allard calls, "moveable subordinate entities."²⁷ Added to this complexity is the natural environment. Allard notes the effect of these factors as "the additional limitation on long range surveillance imposed by surface terrain features."²⁸ In Allard's opinion, "the laws of physics make this operational environment far more difficult to monitor than others."²⁹ Coupled to this high number of moving parts is the information overload that faces the commander. Communications and information processing systems have increased dramatically the amount of information that can be transmitted to the commander. As Arthur J. Athens points out:

The machines and systems that do this look impressive, with colorful lights and fascinating functions. However, they have been unable to establish a critical path for a commander to follow through the volumes of information that create a clear mental vision of the battlefield and illuminate what is important to that vision.³⁰

This lack of useful information, whether it arises from complexity or uncertainty creates confusion. Indecision or poor decision results from uncertainty, and

in military operations, either is disastrous. In Command in War, van Crevald uses the problem of gathering information on the situation to criticize the cyclical view of decision making:

in practice, the incoming information is of inconsistent value; 99 percent of it is likely to disappear without a trace, whereas the remaining 1 percent may have a profound effect on operations -- though whether this means that the 1 percent would be of value even without the 99 percent is a different question altogether.³¹

This is the next implied task to the command and control system, to allow the commander to peer through the confusion and perceive the information critical to the situation. This difficulty in peering through the smoke and the dust is compounded by a final collection of factors related to the enemy. Clausewitz says, "War has a way of masking the stage with scenery crudely daubed with fearsome apparitions."³² This is the fearsome side of war. This has caused both Harry Van Trees³³ and Dr. A. E. R. Woodcock³⁴ to propose two-sided command and control models. This implies that the system should give the commander accurate information on the enemy situation in terms of options open in time and space if he is to understand his own options.

Lethality and Danger

The battlefield is a dangerous place, it has always been that way. But in past wars, that danger was primarily limited to those soldiers serving in the line. With the proliferation of weapons which can strike more deeply, with

greater precision, and massive destruction, the soldier in the command post has at least a perceivable threat. Even if the enemy does not have deep fires or air interdiction, he may resort to the use of raids, ambushes, sniping, and even agents, such as guerrillas. Bohannon notes this unique problem of land force commanders, "Once battle is joined, the air and naval commanders are more divorced from the individual combat units than the land commander."³⁵ To Bohannon, this means that:

The land battle, on the other hand, is commanded from a highly mobile base well within the battle area under direct enemy air and ground fire and close to the enemy's Electronic countermeasures.³⁶

This ability of forces to disrupt and destroy one another's command and control systems has caused the creation of two "new" battlefield functions, not to mention supporting doctrine. These are "command, control, and communications countermeasures," and the counter-countermeasures necessary to defend against these threats. Although the means available to the enemy to threaten the friendly command and control system are highly situational, the threat is apparent in any type of conflict. In the final analysis, this means that the command and control system must be protected against the specific threats to its efficient operation.

The answers to the question of environmental effects on the system are not completely external, some are internal, human by-products of operating in the battlefield environment. In other words, the system must be designed around the human factor. The greatest of these is stress.

Battle Crisis

Stress is the natural reaction to the battlefield that has just been described. Danger, confusion, uncertainty, complexity, and the fact that every key decision leads to victory or defeat, survival or failure, puts the tactical decision maker in a classic crisis situation. Military doctrine refers to crisis as emergency or time-sensitive situations.³⁷ Certainly tactical operations have clearly been shown to be both.

Crisis response has a myriad of emotional effect on soldiers that will cause their performance to suffer. Gabriella Heichal gives this analysis of the difference between routine and crisis decision:

Decision making during crisis is different from routine decision making because it is, in most cases, almost impossible to act in an incremental way. The difference is due to the constraints created by a situation in which action has to be undertaken in an uncertain environment, in a timely fashion, with insufficient information.³⁸

Further study of crisis response is important. Heichal emphasizes that a decision maker in a crisis situation is often surprised, or at least has lost the initiative. She notes that:

This means that uncertainty and risk involved in the situation are high. In a situation like this, it is very likely that the stress involved in the situation may become higher.³⁹

This idea that military decision making during combat operations is a high stress, crisis type environment is supported by Entin and Serfanti's analysis of the effects of stress on the decision maker. They define decision stress as being caused by overload, conflict, and uncontrollability.⁴⁰ Taking an interactive approach, they add that "the amount of stress experienced in any situation will depend on the balance between stressor demand and coping skills."⁴¹

There are specific cognitive results that occur in high stress environments. Entin and Serfanti identify distraction by irrelevant stimuli, memory impairment, and finally, simplistic thinking.⁴² In particular, they report tendencies to fall for all of the pitfalls of clouded judgment previously identified. Building on research by Janis and Mann, they state that when individuals are under stress:

People fail to recognize all the options open to them and fail to use remaining resources to evaluate adequately those alternatives of which they are unaware. Under stress people are likely to search frantically for a solution, persevere in their thinking about a limited number of options, and then stick tightly to a hastily contrived solution that appears to promise immediate relief.⁴³

This examination of McMullin, Heichal, Athens, and Entin and Serfanti indicate that under stress decision makers may be prone to what are known as classical fallacies

in logic. This implies that the command and control system must protect the decision makers from the traps created by the stress common to the battlefield.

Traps for the Decision Maker

One key aspect of classical logic is that it helps leaders avoid pitfalls which lead to bad judgment. In a tactical operation, operating with little time and information, bad judgment leads to defeat. Traps for decision makers result from the fallibilities of both individuals and groups.

Eleyse Tanouye identifies three types of psychological pitfalls which inhibit sound judgment and logical thinking: entrapment, heuristics, and groupthink.⁴⁴

Entrapment, according to Tanouye, is the temptation to "protect your investment and avoid embarrassment by staying the course."⁴⁵ The solution she offers is to set a limit in advance on what can be invested and lost. She adds:

When you reach the limit, reevaluate the situation. Just because something hasn't worked out as you planned doesn't mean you should abandon it. But if you decide to continue, you should do so with your eyes open to how much more you'll have to invest to make it work.⁴⁶

This shows that the system must provide the commander with timely, accurate information on whether or not the operation is falling within his parameters of acceptability.

After entrapment, Tanouye defines heuristics as the tendency to "assume the knowledge you already have is correct."⁴⁷ She further breaks this pitfall into four subcategories: first is the availability heuristic, giving extra weight to information we have heard more often; next, the representative heuristic, which is the use of stereotypes to avoid critical thinking; third is the anchoring heuristic which "tricks people into making comparisons based on an unfair or irrelevant reference point;" fourth is the fixed-pie "assumption," which is making a decision before one has "taken the time to find out the full dimensions of the problem."⁴⁸ This means the system must give the commander a valid reference point on the situation in a timely and accurate fashion.

The final trap, groupthink, is much more well known. Groupthink is, for all practical purposes, a willingness to suppress personal disagreement as a reaction to social pressure and group dynamics. Tanouye identifies five causes of groupthink:

Overconfidence in the group.

Outside pressure to appear unanimous.

Failure to Consult with experts.

Failure to explore alternatives.

Rejection of contradictions.⁴⁹

McMullin notes that groupthink is more common in highly cohesive groups.⁵⁰ This implies that the teamwork necessary for effective operations may also lead to problems. The system must include a solution to groupthink.

Entin and Serfanti's study includes a comparison of military decision makers to civilians in a time sensitive decision environment. Their study indicates that, under moderate stress, when given the choice to probe the situation or consult with an expert, military officers were more likely to consult, while civilians were more likely to probe.⁵¹ Specifically, Entin and Serfanti found that the civilians asked for probes 21 percent more often.⁵² Additionally, military officers tended to use individual sources of information more efficiently, but resisted increasing their overall search for information through probing or seeking analysis through consulting as the situation became more stressful. Civilians showed an increase in consulting as the situation became more stressful. The greater tendency of military officers to consult was hypothesized to stem from greater experience at team decision making.⁵³ Overall, civilians tended to have a better pattern of success at decision making. When

considered in light of the information on human tendencies to make poor decisions, this also indicates that the military decision maker may be more prone to heuristics and the problems associated with group decision making.

Another factor of group dynamics is the role of the individual as an influence on the group. In comparing problems of groups, Professor Reitzel notes that individuals may determine if their group becomes timid or imprudent:

The "timid" man and the over-elaborate rigid organization find comfort and safety in systems, books of rules, and standard operating procedures. The "bold man" and the pliable organization are inclined to leave more -- even though they risk more -- to the creative response and to the short-cut problem solving "strategies" of professional judgment.⁵⁴

All this leads to the responsibility for decision quality coming to rest on the shoulders of the individual leading the group. This makes it imperative that the doctrine provide the tools necessary for decision leaders to overcome these decision making problems as he attempts to develop, expand, analyze and disseminate his intent and concept. The doctrine must give him means of driving the system to respond in a timely fashion, without unintentionally giving in to the psychological temptations identified up to this point. In the same manner, there are cognitive, or logical, traps which must be dealt with as well.

Logic and Illogical Behavior

Sharing the same realm as socio-psychological traps are the classical fallacies of logic. W. Edger Moore identifies two classes of fallacy, fallacies of irrelevance and fallacies of neglected aspect.⁵⁵ These fallacies represent common mistakes made in reasoning out problems. As each is examined, the overlaps with Tanouye's pitfalls are apparent.

Moore notes several fallacies of logic which, often without anyone realizing it, divert the group from addressing the true issue or from considering a possible solution. These fallacies fall into two broad categories. The first is fallacies of irrelevance, the second, fallacies of neglected aspect.⁵⁶

Fallacies of diversion are those that cause thinkers to lose sight of the nature of the problem. These fallacies are diversion, extension, pettifogging, argumentum ad hominem, prejudicing the issue, argumentum ad baculum.⁵⁷ Diversion is a digression from the main issue, getting sidetracked. Extension is exaggeration of a position to make less acceptable, twisting words. Pettifogging is concentration on petty issues, making mountains out of molehills. Argumentum ad hominem is attacking the proposer, not the proposition. Prejudicing the issue is redefining the debate to make a choice emotionally unacceptable, the

proverbial "red-herring." The final irrelevance is Argumentum ad baculum, using intimidation to win the argument.

Fallacies of neglected aspect are "sins of omission." Athens notes that this fallacy is a particular trap for the modern commander:

One barrier is that the key decision maker or commander in a group may have a distorted perception of the situation caused by having to rely on reports of others.⁵⁸

According to Moore a decision maker commits the general fallacy of neglected aspect whenever he fails to consider evidence or factors that are both relevant and significant to the issue at hand.⁵⁹ The fallacies of neglected aspect include oversimplification, the "black or white" fallacy, the "argument of the beard," misuse of the mean, half-truths, and decision by indecision.⁶⁰ As with fallacies of irrelevance, each seems familiar once described.

Oversimplification is modeling the situation or problem with inaccurately limited variables or factors. According to Moore, oversimplification is caused by an inadequate frame of reference, a feeling of being overwhelmed by the complexities of the situation, passionate attachment to one aspect, or a need for conciseness.⁶¹

Oversimplification goes hand in hand with two of Tanouye's psychological pitfalls: entrapment, based on passionate attachment; heuristics, based on limited reference. In a different vein, the feeling of being overwhelmed and the

need for conciseness are more directly applicable to the crisis situations. Entin and Serfanti's research is again appropriate as they specifically noted simplistic thinking, difficulty with multi-category concepts, and failure to recognize options open.⁶²

This means the commander, who is often required to make decisions on limited information and judgment, may have difficulty reaching a sound decision if he allows emotions to interfere. The analysis of group dynamics means that the group may be disinclined to raise issues with the commander unless specific action is taken to insure alternative views are presented. This may lead the commander to make an optimal prime decision.

Gut Reactions

Klien's study of fire-ground commanders using the optimal prime method has been critiqued. This idea does have intuitive appeal to decisive leaders. In effect, Klien encourages the leader to "go with his gut." James D. McMullin points out some key problems with the recognition decision making:

Recognition decision making also has a weakness. Experience may not apply. Rarely will a decision maker foresee every possible situation. Almost any situation, as it develops, will have slight differences which require changes to the solution.⁶³

This situation leads back to the heuristics previously identified as a pitfall. As heuristics can be coupled with fallacies of irrelevance and neglected aspect,

there are dangers in disregarding Tanouye's and Moore's cautions. All of these temptations can lead to a limited, skewed, or distorted frame of reference. So one critical aspect of sound decision making is having an accurate frame of reference, a good situation assessment. The other critical aspect is to provide key steps towards negating the traps. This is a key aspect of situational feasibility, ensuring accurate situation assessment. This is a critical aspect of the emerging role of system architecture as defined by the Army Tactical Command and Control System requirement. This element of "Force Level Control" is called the "common picture," which consolidates friendly force information with intelligence on the enemy.⁶⁴ Key information is referred to as either "Force Level Control Information," or "Commander's Critical Information Requirements."⁶⁵ It is almost intuitively obvious that the new FM 101-5 and the Force Level Control System must be harmonious.

A key component of understanding the situation is realizing which data is relevant and then identifying the available options. The problems associated with failing to make an accurate situation assessment before selecting a course of action are summed up by McMullin:

The success of the recognitional decision making approach relies on the ability to distinguish things that apply to the present problem from those merely similar. Almost any combat situation will have similarities with another, but the similarity may not matter in the current problem.⁶⁶

All of this means that the system must identify multiple options for the commander before he makes his decision.

This danger may be broadened by the fact that every decision maker begins his crisis response with preconceived notions. As Heichal reports, "Every decision maker is constrained by his beliefs, stereotypes and institutions."⁶⁷ She writes that existing images are blended with "information which was previously digested and assimilated," to form the image of the situation with which the decision maker must work. Accordingly, she states that, "The existence of an antecedent image enlarges the danger that the decision maker will make a wrong estimate."⁶⁸ This all means that the command and control system must have a means of excluding irrelevant information while identifying problems with the commander's preconceived notions.

Indecision

Of Moore's fallacies of neglected aspect, one deserves particular consideration during time sensitive operations, the decision by indecision. According to Moore, this is "permitting time and events to make decisions for us."⁶⁹ Moore goes on to add, "For as long as we hesitate to act on a tentative conclusion because it seems insufficiently reliable, we are acting as though we believe

the tentative conclusion to be false." This is the dilemma facing the commander who must make a rapid decision, when does consideration become hesitation? Moore recognizes this and cautions, "Many people try to avoid decision by indecision by acting on impulse and then seeking evidence to convince themselves that the decision was sound."⁷⁰ In any event, to be feasible in an environment which promotes indecision, the doctrine must provide measures to insure the decision point is identified and met.

All of these tendencies may combine to cause, what McMullin refers to as a "confirmation bias."⁷¹ McMullin states:

A confirmation bias occur {sic} when a decision maker fails to change a decision or recommendation despite receiving new, conflicting information. Decision makers generally have a tendency to stick with the initial estimate. If conflicting data are received, the data may be interpreted to confirm the original hypothesis or completely ignored.⁷²

This research has shown that in a high stress, crisis environment, most of the neglected aspect fallacies become possible: oversimplification of the situation; black or white option choice; decision by indecision. Likewise, in a conformist organization, group dynamics and authority may combine to cause groupthink and the associated fallacies of irrelevance. Finally, in the high stress environment, the leader is prone to the pitfall of heuristics, and may fall victim to the confirmation bias. The potential for confirmation bias makes him more prone to pitfall of entrapment within the selected course of action or choosing

availability heuristics within a seemingly manageable level of awareness of the situation. To be feasible, a rapid decision system must provide safeguard against these problems.

This research has identified specific problems individuals and groups may have in making decisions under the stress associated with the rapidly changing conditions which are prevalent on the battlefield. The next step is to examine actual unit performance and determine if there are patterns which reflect these problems. If so, these are specific trends which must be dealt with by an effective command and control system.

Unit Performance

This section describes the performance trends of units operating under the doctrine. This analysis indicates that the current doctrine does have a great deal of practical utility for units which are well trained. On the other hand, many of the units experienced difficulties. This analysis will show that the problems were often training related, and show a tendency to fall into the pitfalls of logic discussed above.

This research examines after action reports in the CALL data bases. These data bases contain reports from BCTP and CTC controllers. In the methodology, it was noted that the observations included in the data base are made on the

judgment of the observer, but are not mandatory. This means that any trends noted must be judged in that light. Even so, the patterns reported offer at least a worse case view.

Battle Command Training

The BCTP C2 reports under the broad heading "C2, Achieve Tenets of AirLand Battle" identify failures in terms of problems achieving the characteristics described by the AirLand Battle tenets from FM 100-5. Many of the problems units experienced were due to training deficiencies, but there are also problems that have doctrinal implications as well. Out of 177 reports on planning during operations, 64 percent (114/177) were identified as failing to achieve the Army's success criteria and correlating the causes against the tenets, the common causes of failure are failures to update estimates (26/114), incomplete plans and orders (28/114), poor battle staff drill (39/114), poor execution control (12/114), failure to establish a main effort (7/114), and failure to use doctrinal terms and graphics (2/114). It is significant that the battle staff drill was the most common cause, occurring about a third more often than incomplete plans and orders. The failure is even more significant when poor drill is lumped with failure to update estimates as both are staff operation defects. This shows that at least 65 of 114 reported failures were the result of inadequately battlestaff performance, in other words, 57 percent had a problem with battlestaff operations. There is

no clear indication whether the other problems were related to staff operations, but there is a probability that was a component of the problem. So far the analysis indicates the doctrine must promote battlestaff procedure to update estimates and issue orders within the time factors of the battlefield.

In a similar vein, an analysis of 20 reports on "Perform the C2 process" shows eight rated as unsuccessful and twelve rated as successful. That means 40 percent of the units reported were characterized as being unsuccessful at performing the C2 process during operations. The breakout of causes includes poor battle tracking and analysis (2/8), poor staff process and integration (4/8), no parallel planning (1/8), and refusal to displace (1/8). In particular, three of four observations of poor staff process indicate that no time schedule was prepared. This means that a minimum of 25 percent of the failures included a breach of the simplest doctrinal guidance. This analysis indicates that the battlestaffs must have a procedure to track the battle in order to gain the information necessary to update the estimate.

This analysis is not without precedence. In the RAND Corporation study of echelons above brigade, "Understanding Commanders Information Needs," by Kahan, et al, identified poor critical information management procedures as a flaw in many units. The study's recommendations include insuring the subordinates understand

the commander's guidance (back-brief), placing greater emphasis on process instruction in the estimate (practice), greater emphasis on rapid decision exercises (training), improve command control information systems (management). This last observation, improved information management, is of particular concern to an analysis of doctrine, and will be addressed later. For the moment, the analysis that battle commanders and staffs need to improve execution of the C2 process during operations is supported.

Combat Training Centers

The analysis now turns to reports on file for indications that the unit at echelons below division tried and failed, or succeeded, at decision making during operations. The sources of these observations are the CALL database containing end of rotation summaries, or "take home packets," from the Joint Readiness Training Center and the National Training Center. A simple analysis easily notes the problems units tend to demonstrate when performing under time pressure. These results show clear trends.

At the Joint Readiness Training center, units were not rated as succesful or unsuccessful for overall command and control. In every case, however, the observers noted some critical areas. On every mission of every text-based "take-home" packet, time management was noted. Of seven brigade rotations on file, there were six cases of consistently poor battletracking. In five of seven reports,

staff integration was not achieved. In every report except one, the staffs began the rotation with problems in field planning. Of significance, in three cases, units were criticized for skipping steps in the decision making process. In one case, the observer specifically noted that the commander pre-selected a single course of action without considering alternatives. On the positive side, all the units showed improvement after practice. This indicates that much of the problem was due to training shortcomings. This is corroborated by a specific report on four of seven units that staff procedure had not been drilled to the point that it was automatic. This information indicates two things, first, that the units are setting themselves up for the pitfalls of logic, and second, that the units are not trained in the time management techniques in the current doctrine.

The JRTC tends to focus on light units. An analysis of the "take home packets" from the NTC should show trends in both the heavy and light forces.

One important consideration is that comments were not mutually exclusive, in other words, a unit may be counted under more than one problem. Out of 100 take home packets examined, 91 contained specific references to planning process problems during operations.

The most common cause of problems indicated was a failure to use, or correctly use, the military decision making process found in the 1984 FM 101-5. This failure was

noted in 51 of 91 incidents of commander and staff planning problems. In other words, 56 percent of the planning problems were attributed, at least in part, to not following doctrine. This figure becomes more revealing as 30 of the 91 problem reports specifically identified a need to conduct more battle staff training directly related to applying the military decision making process.

The second most common error noted was poor staff integration, where key members of the coordinating and special staff were not included in the planning process. This was noted in 28 of 91, or 31 percent, of incidents recorded. In particular, the task force engineer, the S2, and the logisticians were not consulted or were consulted after an unsupportable plan had been developed. Once the plan had been issued, the commander and staff had difficulty reissuing a new plan in a timely fashion. This seems to indicate that the groups that are used to working together may be excluding members who are not part of the standard group. This leads to group think, heuristics, and confirmation bias.

Poor time management was the third most common observation, occurring in 25 reports, or 27 percent. In most of these observers noted that the staffs failed to make an adequate time line. The reciprocal is also apparent as there were reports of posted timelines increasing staff performance towards time objectives. One after action report is indicative of those for units which performed time

management well, stating, "The TF continually met the requirements of the 1/3 - 2/3 rule."⁷³ Another report identifies the keys to success used by a brigade:

The brigade had a recently updated SOP. The SOP covered both staff functions and procedures for subordinate units. The brigade also had a staff planning guide as a separate document. This guide was a bullet-checklist of staff actions in support of the command estimate. It included a time line for the command estimate⁷⁴

The previous comments can be contrasted with those made about a unit which did not manage time:

The squadron battle staff's very hasty planning process and incomplete estimate resulted in an inadequate plan for the battle.⁷⁵

The staff did not develop an adequate time line to manage the planning and battle prep.⁷⁶

These examples of what the statistical analysis showed, that training in units, as well as doctrine, must emphasize management of the planning and decision making process. This management must insure efficient use of time and proper staff and unit integration. In particular, the training aspect is as important as the doctrine itself. But the emerging doctrine must at least equal, if not improve upon the 1984 doctrine.

The final major problem was poor battle tracking and analysis, which caused delays in the commander and staff acquiring needed information. This problem was noted in 19 of 91 observations, or 21 percent. Typical observations include failure to maintain the situation map, failure to maintain communications, and failure to echelon the command

posts. This leads to either high uncertainty stress, and possible indecision, or a neglected aspect decision, which could include confirmation bias. The doctrine must promote situational awareness through battle tracking.

This data reinforces the findings from BCTP and JRTC. Units are experiencing problems with battletracking, estimate updates (battle data analysis), time management, and staff integration. The information also indicates that poor training was a major cause of the problems. However, the doctrine must provide means to deal with these problems and the judgment effects which may result.

Home Station Preparation

The NTC findings should not be surprising if one considers the "Home Station Determinants of Unit Combat Readiness" conducted by ARI in 1989 and 1990⁷⁷. This report found that, "Units that apply the principles of training and follow the training management cycle in FM 25-100 are more successful at NTC. But the report also notes, "However: The training management cycle, as described in FM 25-100, is rarely implemented properly."⁷⁸ The report also stated that, "Most units do not apply the principles of training."⁷⁹ This indicates that the doctrine must provide a clear basis for battle staff training.

The ARI study found a correlation between battle staff integration and unit performance. Specifically, the report cites a 70 percent correlation between high staff

integration, to include "slice" elements, and success.⁸⁰ The study also identified a strong correlation between staff SOP and training and success. According to the report, "There was also a strong relationship between success as rated by the O/C and the extent that the staff had trained to and established SOP (71%)."⁸¹ In the same area, the study quotes a correlations between arriving at the NTC with an effective and tested SOP (67%), staff understanding of the SOP (57%), acting in accordance with the SOP (57%), and each staff member being trained in his role (54%).⁸² Finally, the study reports a strong correlation (84%) "between order quality (doctrinal soundness and timeliness) and the staff's order process."⁸³ Detailed support for this finding included a 55 percent correlation between using the FM 71-2 decision making process and success, a 71 percent correlation between wargaming and success, and a 69 percent correlation between having "all the right people" involved in the wargame and success. One final conclusion from the ARI study was that effective staffs are supervised by the XO or the S3 (66 percent).⁸⁴

This report reinforces the idea that, in addition to the significant need for training, there is a need for the doctrine to promote staff integration, time and task management, and constant situation awareness through battletracking. The doctrine must go beyond stating the requirment, and offer procedures for units to employ during operations.

Decision Types

What types of decisions must be made during tactical operations? There are several different perspectives on where, when and why a commander makes decisions. One perspective is to examine events, that is, the change in the situation and determine the level of battle stress prevalent when he makes the decision. Another perspective looks at the level of the decision within the context of his plan, in other words, the command and control systems requirement to perceive and respond to a change in the situation with an appropriate change to the plan. A final dimensional description is the opportunity level based on the factors of stochasticity and dynamism in time.

Decision Hierarchy

In one sense, the level of decision within the plan equates to the three functions of the command and control system: planning; directing; controlling. This is not completely clear if one recalls the fact that the commander is making decisions on the current plan and future plans in a parallel pattern, not in a sequential fashion. A way to think of these dimensions of decision making are mission, concept, and force management.

Missions

Mission decisions are focused on evaluating the purpose of the operation, the essential task to be performed and, once the formal mission has been determined, include

the physical objective to be achieved. The commander must balance the evolving situation against the purpose, or goal, of the operation assigned to his unit by the higher commander. Analysis of the situation allows the commander to determine physical objectives. FM 100-5 describes this analysis:

The selection of objectives is based on the overall mission of the command, the commander's assigned mission, the means available, the characteristics of the enemy, and the military characteristics of the operational area.⁸⁵

FM 100-5 (Preliminary Draft) echo's these concepts by stating, "Using the analytical framework of mission, enemy, troops, terrain and time, . . . commanders designate physical objectives."⁸⁶

This concept of objective is critical to the military decision making process. This is based on the fact that, as Sound Military Decision puts it:

the commander expects to receive, from his immediate superior, an *assigned objective*, which that superior thus enjoins the commander to attain. The commander, in turn, through the use of the natural mental processes already explained, decides on an objective, *for the general effort of his own force*, to attain the objective assigned by his immediate superior.⁸⁷

This becomes a basic element of mission orders, to be able to modify one's own mission, at least in terms of task and objective, as the situation unfolds. This is one of the greatest expectations placed on the judgment of the military officer. Infantry in Battle states:

In war, situations will frequently arise which are not covered by express orders of superiors. Perhaps the situation will appear entirely different from that which higher authority seemed to have in mind when it issued orders. The subordinate may feel that literal compliance with orders received would be disastrous. In such cases he must act in accordance with the general plan.⁸⁸

From the commander, and his unit's perspective, this is a strategic decision. From this decision the commander and his unit derive their overall direction. The commander must be prepared to make mission decisions during operations. Once the commander has identified the mission and the objective, he must determine how he will accomplish the mission.

The Concept Decision

After the commander determines what he must do, he must plan the way in which he will achieve this mission, this is known as his concept of operation. This reenforces the implied task for the system to support commanders' visualization. In other words, this is the decision level in which the commander conceptualizes the situation based on his estimate of the situation. According to FM 100-5, the heart of the concept is the main effort.⁸⁹ AirLand battle doctrine emphasizes, as well, that the concept of operation outlines the commander's scheme of maneuver.⁹⁰ The manual emphasized that the remainder of the plan is built around the scheme of maneuver. The doctrine recognizes that the commander may have to change his concept of operation to respond to the evolving situation as the battle or

engagement unfolds. FM 100-5 states, "If conditions change and success of the overall mission can be obtained more cheaply or quickly another way, the commander shifts his main effort to another force."⁹¹ The doctrine must prepare the commander to make decisions on the merits of his plan.

Force Management

All things being equal, the remainder of the decisions are somewhat deterministic in nature. These decisions consist of allocating forces, assigning support, and resourcing the selected operation and developing control measures. FM 100-5 states, "The commander's scheme of maneuver usually determines the subsequent allocation of forces and governs the design of supporting plans or annexes."⁹² Force management decisions consist of selecting specific units for tasks based on various factors such as readiness, availability, and other factors which might make one unit more appropriate for a specific task. These taskings, and the resourcing of these taskings, are much more deterministic in that planning factors can be applied, rules of thumb used, or specific calculations made. This level of decision making truly emphasizes the traditional ideas of control. Except when leadership factors are influential, these types of decisions are usually delegated to the staff or a supporting commander. Examples of solving this type of problem are the use of the "decide-detect-deliver" method and the use of maxims such as the "adequate.

. .weight. . .facilitate. . .immediate. . .maximum. . ."
"fundamentals" used to plan fire support.⁹³ The doctrine must insure that detailed planning and force management are accomplished with a high degree of speed, accuracy and synchronization.

The commander must constantly assess the situation to determine if his mission is appropriate to the higher commander's intent and the situation, he must validate the utility of his course of action based on the evolving situation, and he must insure that tasked units are appropriate, capable and adequately supported. None of these decision areas is less critical than others, they merely require less judgment and experience from an overall tactical unit perspective. For this reason, the decision making system must allow the commander to distinguish mission, concept, and force management decisions, delegate those which are appropriate, and approve delegated decisions rather than follow the traditional recommend and decide approach used at higher levels.

Crisis Level

The crisis level describes the decision in terms of the level of arousal in the system. This analysis shows that for all practical purposes, the control of tactical operations is a constantly evolving crisis management problem. Arousal results from stress full stimuli, which are, according to Entin and Serfanti, "overload, conflict,

and uncontrollability."⁹⁴ As the battlefield and human analysis has shown, battlefield stress is one of the critical dynamics in tactical command and control. It is critical that the command and control system be designed to operate to the maximum width of this spectrum.

Catastrophe

Likewise, as De Greene points out, the successful decision managers and commanders must anticipate change in the situation so the system is not overwhelmed by the sudden shift from the routine to crisis.⁹⁵ Reflecting on the previous discussion of stress effects one sees why, as Entin and Serfanti point out, overload occurs when stimulus exceeds the capability to adapt.⁹⁶ Reitzel refers to this sudden perception of change as the fundamental uncertainty.⁹⁷ If the change has been anticipated or the organization is flexible, they are able to respond. Reitzel has determined that units may not be prepared to respond. According to Reitzel, this rapid change, beyond expectations, results in a state of shock in which the organization is frozen and no longer able to adapt.⁹⁸ De Greene identifies this shock effect as a catastrophe, in which the organization becomes so overwhelmed by the rate of change in variables of situation that the organization not only breaks down but to a certain extent breaks apart.⁹⁹

At the other end of the spectrum lies the routine decision situation, which Simon has referred to as the programmed decisions. According to Simon, these decision situations are those which can be solved by habit, routine, standard operating procedures, or deterministic methods.¹⁰⁰ The danger of routine decisions lies not in the nature of the decision itself, but in the potential that a continued sequence of routine decisions could lull the system and set up a potential for catastrophe when a dramatic change occurs.

This danger of routine can be compounded by success. Tudor Rickards notes that individuals and organizations can be lulled into a "stuckness loop" when habitual responses are sufficient to solve a series of decisions. In his analysis, this loop can only be broken when the organization is willing to challenge assumptions, search for improvements, or experiences a forced need to change. Rickards notes that his observations imply that, "under fast-changing conditions, efforts to create new insights or new innovations can be blocked by 'stuckness' or the satisfaction block."¹⁰¹

There are some decisions that can be made by routine, should, because this reduces demands on the commander. However, the commander must determine this delegation and reassess the delegation, with the help of the chief of staff, on a mission by mission basis. In some long

duration missions, the commander must have a program of "inspecting" delegated decisions to insure "stuckness" does not develop.

This analysis shows that the system must anticipate the potential crisis level of the decision on a spectrum that ranges from routine to catastrophe. Further, the doctrine must include methods for dealing with such situations.

Windows of Opportunity

The final description of problems is the level of chance and certainty. These decision making situations can include decisions under certainty, decisions under risk, or decisions under uncertainty. As military decision making includes much of all three modes, this creates a spectrum of stochasticity. It is more important that as Davis, et al, point out, the decision be classified as dynamic or static.¹⁰² In military decision making, all decisions are made in a dynamic environment, but a certain level of relative dynamism can be assigned based on the analysis of time and space, with particular focus on rate of change. Out of this analysis of the combined effects of stochasticity and dynamism comes the idea of a changing number of opportunities. On one end lies a situation with little or no true choice, on the other, unlimited options. As tactical operations are dynamic, the options (opportunities) change over time.¹⁰³ Martin Shubik points out that the options open for each "turn" are derived from

the combination of friendly and opponent options.¹⁰⁴ As the commander chooses an opportunity, he must also understand the opportunity cost, that is the other options closed to him. FM 100-5 recognizes this need to make, and execute opportunity decisions as part of the overall unit characteristic of "agility." The command and control system must allow the commander to identify the time and space dimensions of his opportunities. This identification must be within the opportunity window. The command system must identify options open to the commander, and the time windows associated with them.

Soundness Analysis

In the final analysis of the tactical command and control situation there are clear functions the system must provide, and clear measures of effectiveness. These functions and measures are the determinants of suitability within the mission, feasibility within the situation, and completeness in covering the necessary elements, ways, and means of the system. These are the measures of soundness for a system to operate successfully on the modern battlefield.

Suitability

The ultimate test of suitability is an ability to accomplish the mission. To accomplish the command and control mission during operations, the doctrine must provide for quickness in regards to windows of opportunity to defeat

the enemy. The doctrine must provide the commander with the information necessary to identify his opportunities in time for him to strike the enemy where decisively vulnerable. This allows the commander to impose his will on the enemy.

Feasibility

Feasibility on the modern battlefield means dealing with the combined effects of speed and chaos. This means crisis. In order for the system to be effective, the doctrine must anticipate decisions and crisis. Further, the doctrine must deal with potential and actual crisis. Third, the doctrine must identify methods for insuring the commander has critical information appropriate for the decision required. Fourth, the system must be continuous despite battlefield effects. Fifth, the system must insure decisions are timely. Sixth, the doctrine must provide for effective integration.

There are solutions for these problems. McMullin notes that research has indicated that the training of analyst and decision makers to recognize this bias helps overcome the effect.¹⁰⁵ The doctrine must caution decision makers of the bias effects.

The fundamental solution to group think is a reestablishment of open-mindedness. According to Tanouye, by either having decision makers prepare criticism separately, or by designating someone to play the "devil's advocate," group leaders may overcome this tendency.¹⁰⁶ In

a similar vein, the solutions to heuristics are found in the estimate: generate options, use external benchmarks, study all the angles.¹⁰⁷

Moore offers three solutions which can be paraphrased as:

1. Put first things first. Some decision by indecision is inevitable, spend time on the important ones.
2. Set a time limit for making the decision. When the deadline is established, apply the five phased decision cycle as thoroughly as possible and act before the deadline.
3. Carefully weigh the alternatives, using the logical procedures for evaluating proposals for action, then act within the deadline.¹⁰⁸

Entin and Serfanti offer some hope in that they found that, by knowledge of the group and anticipation of the pattern of events, high stress situations could be identified and the stimuli offset or managed.¹⁰⁹ Second, they note that through selection and training an organization can be manned with individuals who are equipped to handle stress.¹¹⁰

Completeness

To be complete, the doctrine must cover the roles of each part of the system in each general type of decision situation. The doctrine must integrate cell organization into the decision making process. In particular, the doctrine must integrate the individual roles of the various members of the staff and decision team. It is critical that the doctrine provide specific instruction on situation updates, battle tracking, and continuous situation analysis.

Finally the doctrine must explain how the commander and chief of staff can train and organize the staff into an efficient team with a clear, flexible. procedure.

FM 101-5 (Coordinating Draft)

Is the doctrine for using the command and control system, expressed in FM 101-5 (Coordinating Draft) sound? The draft does include several discussions of rapid decision making. In particular, the manual adds an "abbreviated command estimate," which is different from previous estimate procedures.¹¹¹ The manual also discusses using the "troop leading procedures" as a decision making methodology.¹¹²

In order to better understand the new manual's approach to tactical decision making and rapid planning, it is best to start at the beginning. There are specific discussions of techniques which bear mentioning.

The draft's first chapter provides the commander with seven principles for command and control. Of these seven, three relate directly to the requirements:

Delegate decision authority to subordinates to the maximum extent feasible while using prudent judgment.

Establish a regular reporting and information-transmission system which integrates information from higher and subordinate commands into the command estimate.

Establish means to rapidly find or clarify critical information from higher and subordinate commands.¹¹³

After this philosophy, the manual covers control proper. The manual is not clear on the probable role for positive control in a rapid situation. Although the manual discusses forward command, it does not mention that forward presence is a form of positive control. The manual seems to imply that control is the antithesis of command, rather than a sub-component of command. Further, the manual is incorrect in describing positive control as prescribing events. Positive control means that the controlling element is in contact with the controlled subject, prescriptive measures are procedural control. As a result of this, the one measure the commander can take to insure rapid awareness and quick implementation of his control, which is forward command, is not clear.

The problem with clarity continues in the discussion of staff structure. The manual focuses on the peacetime staff organization. Chapter two is devoted to command and staff relationships and does not clearly address the formation of the battle staff.¹¹⁴ The battle staff has already been shown as the key to integrating and coordinating for synchronization.

Chapter three continues the discussion of staffs, and addresses the specific functions staff officers are to perform. As with chapter two, the focus is on peace time organization, not command and control of operations. In particular, the discussion of the command group does not

mention that the commander must have the liaison means to control and coordinate the battle from within the command group.

Chapter three does address the battle planning group under the chief of staff. This discussion does not establish the chief's critical role in time management towards decision making.¹¹⁵ Finally, the manual does not address the chief of staff's responsibility for anticipating potential crisis points which could lead to overload of the system.

The section on common staff functions does not establish the during operations functions up front.¹¹⁶ Under a subsection on monitoring the operation, supervision is addressed and recommendations are addressed, but battle tracking for analysis is not. Analysis must not be limited to assuring everything seems to be going well, it must anticipate and recognize windows of opportunity and possible crisis.

Chapter four is a detailed discussion of the decision making process. The discussion of a commander's choices in a decision making environment are limited to no change or contingency. The doctrine, to be complete would need to address crisis. The chapter does not identify the types of decisions and the information the commander may consider in order to make them. The doctrine should identify the hierarchy of decisions and the level of crisis. These should be addressed in the time management section as

well. The time management section does not offer techniques the commander and staff could use to insure timely yet effective command and control.¹¹⁷

Chapter four does address the need to constantly update the situation assessment, but the manual does not explain how. The discussion of the staff estimates does not explain that they are prepared in a parallel fashion, not a sequential pattern. The diagram is incomplete compared to that on page 5-7 (fold-out) of the current FM 101-5.

This is further complicated by the fact that the "METT-T" analysis done in the initial mission analysis phase no longer includes the S3 giving an initial analysis of relative combat power.¹¹⁸ This deserves special mention.

Relative combat power and opposing lines of action have been a part of the estimate since the turn of the century. FM 101-5 (Draft) mentions this in section III, "Tactical-Estimate Procedures."¹¹⁹ According to FM 100-5, Operations, (Final Draft),:

Combat is the traditional role of the Army. Winning battles depends on an understanding of the dynamics of combat power and putting them together to ensure the defeat of the enemy.¹²⁰

If the commander has time for only one update, it must contain the latest analysis of combat power as dynamics in time and space. Further, to anticipate where he can impose catastrophe on the enemy, while avoiding crisis, the commander must know how dynamic the situation could be.

The abbreviated command estimate is detailed in chapter four. The procedure described is vulnerable to a confirmed bias fallacy as it allows consideration of a single course of action. At first, this might seem an acceptable risk, but if one considers that the commander and staff will be called upon for rapid decisions at precisely the time the crisis goes up, the procedure should call on the commander to personally consider several courses of action in order to prevent entrapment. Further, the commander may be advised to meet with one of the subordinate commanders and tap into the subordinate units command and control to augment his own perspective. This could prevent a neglected aspect problem.

For speed, it might seem desirable to let the wargame identify the neglected aspects. However, the further the group proceeds, the more they have invested. The better option is to have the chief, an AC, or another trusted individual pick the plan apart based on discussion of the commanders personal estimate. This last portion is critical. Estimates need not be formal, the commander must always make an individual estimate.

Chapter four is confusing in the discussion of the troop leading procedure. This procedure is one of supervision and preparation, not decision making. The commander does an estimate as part of the troop leading

procedure. Suggestions that the commander make a decision without doing so are risking logical fallacies. The text is not clear. This point must be clear.

The discussion of the abbreviated command estimate is repeated on page 4-48. In this section the various levels of decision are not discussed. How would the process differ if the commander had identified that he must change his mission? When does the commander assess the changes to relative combat power and determine courses of action open?

Section V of chapter four discusses the troop leading procedure. Again, this portion does not clearly state that the commander has continuously updated his previous estimate, and constantly looked for signs that his plan may have been invalidated. This manual is for battalion through corps level commanders and their command and control systems. This portion should address how the commander can interact with his staff and subordinates to track the battle, and confirm or deny his estimate. This section needs to tie in to FM 34-130, Intelligence Preparation of the Battlefield, and the portion of this manual covering how the command posts and operations centers will track the battle. All of this must be integrated with the ATTCS.

Chapter five addresses the organization portion of the tactical command and control system, command and control posts and the support system for those organizations, command and control facilities. The initial discussion is

important, but not mission focused. The purpose of command and control centers is effective command and control. This chapter should address how the various players in the system will come together to command and control effectively. In particular, the section should provide a methodology for task grouping the various personnel involved in decision making to balance current requirements with future requirements. As the staff have to form a task group on the commander, these temporary groupings should be addressed.

Finally, in regards to the command post, the doctrine should address how the command post will support rapid planning each of the three types of decisions in hierarchy.

The discussion of the commander's critical information requirements in chapter six is in track with the earlier analysis of both remedies to confirmation bias and triggering the levels of decision. The text might be improved by discussing information that would specifically trigger these types of decisions.

In the section on information management tools, the text discusses charts and maps.¹²¹ This leads into a discussion of the command center.¹²² This description is not clear as to how it would apply at various levels. During operations, the tradition has been forward command, not command from a "bridge." The RAND study does recommend forming an "information sink" where anyone who needs "basic situation information" can get an update.¹²³ If the

doctrine is to promote forward command, the emphasis should be on getting this information to the commander where he is rather than at the command post.

The battlefield functions table on page A-22 describes the chief of staffs responsibility. It does not include time management of the decision making process.

Summary

Is the doctrine suitable: Does it achieve the objective criteria functions? Although the doctrine does provide an abbreviated process, this process does not provide the commander with the up-front requirements for appreciating relative combat power in terms of time and space. Without this, it cannot be called effective.

Is the doctrine feasible: Does the doctrine operate within the situational constraints and provide the implied to operate in the environment. As written, doctrine does not take into account the normal human reactions to stress and take measures to overcome that stress. Further, the doctrine does not provide detailed guidance on how to effectively manage time or track the battle, therefore it does not address the most common problems identified.

Is the doctrine complete: As the "capstone" manual, does it address all the functional elements of the command and control system, as well as the types of decision making

situations? The manual is very long and covers many topics in depth. It does not, however, cover the hierarchy of decisions, the role of crisis, the pitfalls of logic, or specific techniques for dealing with common problems.

ENDNOTES

¹FM 101-5, Command and Control for Commander's and Staffs (Coordinating Draft) (Fort Leavenworth: CAC, July 1992), p. xi.

²United States Army, FM 100-5, Operations (Washington, DC: Department of the Army, May 1986), 22.

³Ibid, 14.

⁴Ibid, 21.

⁵Ibid.

⁶Ibid.

⁷Ibid, 22.

⁸Ibid, 21.

⁹Ibid, 22.

¹⁰Ibid, 23.

¹¹Ibid, 21-22.

¹²Ibid, 21.

¹³Ibid, 22.

¹⁴Ibid, 22-23.

¹⁵Ibid, 15.

¹⁶Ibid, 17.

¹⁷Carl von Clausewitz, On War (Princeton: Princeton University Press, 1976), 104.

¹⁸FM 100-5, 24.

¹⁹van Crevald, 2.

²⁰Infantry in Battle, in United States Marine Corps, FMFM 1-3, Tactics (Washington, DC: Dept. of the Navy, June, 1991), 55.

²¹Anthony G. Bohanan, "C3I in support of the Land Commander," in Principles of Command and Control, Boyes, et al, ed. (Washington, DC: AFCEA Int. Press, 1987), 180.

²²Richard E. Simpkin, Human Factors in Mechanized Warfare (Oxford: Brassey's (UK) 1983), 22.

²³Sun Tzu, The Art of War, Samuel B. Griffith, ed. (Oxford: Oxford University Press, 1963), 92.

²⁴C2RA, 1-1.

²⁵Infantry in Battle, 16.

²⁶Clausewitz, 84.

²⁷C. Kenneth Allard, Command Control and the Common Defense (New Haven: Yale University Press, 1990), 156.

²⁸Ibid, 157.

²⁹Ibid.

³⁰Arthur J. Athens, "A Simulation Study of Organizational Decision Making Under Conditions of Uncertainty and Ambiguity" (Masters Thesis, U.S. Naval Post Graduate School, June, 1983),

³¹van Crevald, 7.

³²Clausewitz, 118.

³³Harry L. Van Trees, "C3 Systems Research: A Decade of Progress," in Science of Command and Control, vol two, Stuart Johnson, et al, ed (Fairfax, VA: AFCEA Int. Press, 1989), 31.

³⁴A. E. R. Woodcock, "Indications and Warnings as an Input to the C3 process," in Science of Command and Control, (Washington, DC: AFCEA Int. Press, 1988), 37.

³⁵Bohann, 180.

³⁶Ibid, 180.

³⁷National Defense University, AFSC Pub 1, The Joint Staff Officer's Guide (Norfolk: Armed Forces Staff College, 1991), I-8.

³⁸Gabriella Heichal, "Decision Making During Crisis: The Korean War and the Yom Kippur War" (Ph.D. Dissertation, George Washington University, February 1984), 27.

³⁹Ibid, 28.

⁴⁰Elliot E. Entin and Daniel Serfanti, Information Gathering and Decision Making Under Stress (Burlington: ALPHATECH Inc., January 1990), 8.

- ⁴¹Ibid, 9.
- ⁴²Ibid, 10.
- ⁴³Ibid, 10.
- ⁴⁴Elyse Tanouye, "Why Smart Managers Make Bad Decisions - And How to Avoid Them," Working Woman, 14-9 (August 1989): 56.
- ⁴⁵Ibid.
- ⁴⁶Ibid.
- ⁴⁷Ibid, 57.
- ⁴⁸Ibid, 57.
- ⁴⁹Ibid, 59.
- ⁵⁰James D. McMullin, "Determinants of the Effectiveness of Situation Estimation" (MSST Thesis, Naval Post Graduate School, June 1990), 38.
- ⁵¹Entin and Serfanti, 60.
- ⁵²Ibid.
- ⁵³Ibid.
- ⁵⁴William A. Reitzel, "Background to Decision Making" (United States Naval War College, June 1958), 23.
- ⁵⁵W. Edger Moore, Creative and Critical Thinking (Boston: Houghton Mifflin, 1967), 153.
- ⁵⁶Ibid, 153-170.
- ⁵⁷Ibid.
- ⁵⁸McMullin, 39.
- ⁵⁹Ibid, 163.
- ⁶⁰Ibid.
- ⁶¹Ibid, 164.
- ⁶²Entin and Serfanti, 2.
- ⁶³McMullin, 21.
- ⁶⁴Operational Requirements Document, paragraph 1.

- ⁶⁵Ibid.
- ⁶⁶McMullin, 21.
- ⁶⁷Heichal, 7.
- ⁶⁸Ibid.
- ⁶⁹Moore, 169.
- ⁷⁰Moore, 169-170.
- ⁷¹McMullin, 29.
- ⁷²Ibid, 29.
- ⁷³Extracted from a task force take home packet.
- ⁷⁴Extracted from a brigade take home packet.
- ⁷⁵Extracted from a cavalry squadron take home packet.
- ⁷⁶Ibid.
- ⁷⁷Army Research Institute, "Home Station Determinants of Unit Readiness" (Fort Leavenworth: ARI, 1991).
- ⁷⁸Ibid.
- ⁷⁹Ibid.
- ⁸⁰Ibid, 29.
- ⁸¹Ibid.
- ⁸²Ibid, 36.
- ⁸³Ibid, 30.
- ⁸⁴Ibid, 33.
- ⁸⁵FM 100-5, 173.
- ⁸⁶Ibid, A-2.
- ⁸⁷U.S. Naval War College, Sound Military Decision (Newport: U.S. Naval War College, 1942), 48.
- ⁸⁸Infantry in Battle, 136-137.
- ⁸⁹FM 100-5, p.24

- ⁹⁰Ibid, 34.
- ⁹¹Ibid, 24.
- ⁹²Ibid, 34.
- ⁹³U.S. Army, FM 6-20, Fire Support in Airland Battle (Washington D.C.: Department of the Army, 1988), 2-10.
- ⁹⁴Entin and Serfanti, 8.
- ⁹⁵Kenyon De Greene, The Adaptive Organization (New York: John Wiley and Sons, 1982), 35-36.
- ⁹⁶Entin and Serfanti, 8.
- ⁹⁷Reitzel, 23.
- ⁹⁸Ibid.
- ⁹⁹De Greene, 181-193.
- ¹⁰⁰Simon, 5-8.
- ¹⁰¹Tudor Rickards, "Innovation and Creativity: Woods, Trees and Pathways, Research and Development Management, 2 (April 1991): 105.
- ¹⁰²Roscoe Davis, et al, Management Science (Boston: Kent Publishing Company, 1986), 11.
- ¹⁰³One might propose a situation of multiple, negative options, a delima in which the leader must select the "lesser of two evils." For the purpose of this discussion, this is still an opportunity choice.
- ¹⁰⁴Martin Shubik, The Uses and Methods of Gaming (New York: Elsevier, 1986), 1-13.
- ¹⁰⁵McMullin, 30.
- ¹⁰⁶Tanouye, 59.
- ¹⁰⁷Ibid, 58.
- ¹⁰⁸Ibid, 170.
- ¹⁰⁹Entin and Serfanti, 8.
- ¹¹⁰Ibid.
- ¹¹¹FM 101-5 (Draft), section IV.

112 Ibid, section V.

113 Ibid, 1-3.

114 Ibid, 2-1 to 2-35.

115 Ibid, 3-3.

116 Ibid, 3-83.

117 Ibid, 4-4.

118 Ibid, 4-13.

119 Ibid, 4-12.

120 U.S. Army, FM 100-5, Operations (Final Draft) (Washington D.C.: Department of the Army, 1993), 2-18.

121 FM 101-5, (Draft), 6-32.

122 Ibid, 6-33.

123 James P. Kahan, Robert Worley, and Cathleen Stasz, Understanding Commanders' Information Needs (Santa Monica: RAND, June 1989), 22.

CHAPTER FIVE

CONCLUSION

The purpose of this thesis was to critically analyze the emerging doctrine for the Army Tactical Command and Control System as it applies to making plans and reaching decisions under the conditions expected on the modern battlefield. These conditions were identified as the mission, environmental factors, decision types, and systems capabilities. The battlefield environmental factors were the most dramatic of these conditions, and were shown to invariably cause human reactions, reactions which required preventive actions in order to preserve the efficiency of the command and control system. Less dramatic, but just as critical, was the commander's need to have a model of the battlefield options and threats, a visualization. Likewise, the system as a whole must be integrated to resolve decision incidents based on changes of mission, concept, and force management. All of these needs affect the soundness of decision making, and therefore indicate the soundness of the doctrine.

Recommendations

Focusing on the purpose of this thesis, the basic problem was to determine whether or not the U.S. Army's new command and control doctrine for tactical operations should be modified or replaced in order to better solve problems under the conditions of constrained time and stress associated with warfare. Certain of the problems noted might also be overcome with training, but most training will be rooted in doctrine. Other problems were based on clear doctrinal shortcomings. The conclusion is that the emerging doctrine should be modified. Change the doctrine to insure:

1. That the commander has an accurate assessment of the situation with regards to relative combat power.
2. That the commander and staff can anticipate crisis situations.
3. That the commander and staff manage the planning and directing process.
4. That the staff has procedures for tracking the situation.
5. That the staff is able to rapidly analyze information.
6. That the commander is able to delegate appropriately.
7. That the commander and staff avoid the pitfalls associated with battle stress.

8. That the commander and staff understand the effects of stress on the decision making process.

9. That battle staff operations are integrated by building decision teams.

10. That parallel planning occurs vertically and horizontally.

12. That the doctrine addresses the entire system rather than focusing on the procedural aspects.

General Conclusions

The Army's mission for the command and control system during tactical operations is to act more rapidly and effectively than the enemy. The doctrinally stated objective or purpose is to impose the commander's will on the enemy. The doctrinally stated functions are to rapidly assess the situation in terms of opportunities to defeat the enemy through the application of combat power. The doctrine must clearly articulate the concept for integrated system accomplishment of this mission. FM 101-5 (Coordinating Draft) must be improved by incorporating specific measures the battlestaff could use to provide this information to the commander using all the systems available.

The performance of the process has doctrinally stated measures of effectiveness as well. Ultimately, the command and control system must allow the unit to act more quickly and effectively than the enemy. Short of that, the doctrine in FM 100-5 implies functions. Primary among these

implied functions is an ability to act rapidly against vulnerabilities. Finally, the commander must be able to receive information on these opportunities from anywhere on the battlefield, and be reinforced with staff assistance as necessary to achieve a decision which allows him to exploit opportunities on the battlefield. This problem requires an integrated system solution for mission accomplishment.

Understanding the mission, what is environment which encompasses the tactical decision making and planning situation? First and foremost, the battlefield is changing constantly. Numerous types of decisions and plans must be made. The commander must assess how the changes affect his mission, plan, and synchronization. He must understand the battlefield factors which he must deal with. One of the biggest of these factors the decision maker will face is stress, which results from the battlefield and the constrained time in which he must reach his decision. What are the human factors which must be dealt with? Primarily, the decision maker must resist the temptation to oversimplify, ignore contrary information, assume away problems, and allow indecision to prevent action. The doctrine must address measures which will help the commander and staff avoid these problems.

What are patterns of problematic unit performance which must be dealt with? The unit problems parallel the human problems. Units fail to manage time, they fail to

consider all the options, they fail to include key specialist, and they don't criticize the plan until events are well under way. Most importantly, there is a problem with in depth battle staff training. The manual cannot solve the training problem, but it can provide the units a complete picture of what tactics, techniques and procedures they should train on. These tactics, techniques and procedures must be simple enough to learn, yet adaptable to all the decision making situations.

What specific functions must the system provide, and to what measures of effectiveness, if it is to operate successfully on the modern battlefield? The system must drive time management. Likewise, the system must drive early criticism of the plan. Finally, the system must insure the commander is kept aware of information which may change his estimate of the situation, and thereby his mission, plan, or key synchronization.

Soundness Analysis

Is the doctrine for using the command and control system, expressed in FM 101-5 (Coordinating Draft) sound? For now the conclusion must be that it is not sound.

Is the doctrine suitable: Does it achieve the objective criteria and functions? As written, the doctrine does not provide the means to give the commander a clear understanding of the windows of opportunity, and when and where these will open and close. The doctrine must provide

a method for supporting the commander's requirement to build a battlefield vision. Inherent in this is the need to address the role of the Army Tactical Command and Control System as described in the requirements document. All of these elements must be brought together so that the commander can conceptualize the battle.

The first step in any problem solving situation is having a realistic model of the problem environment. If the commander's task is to synchronize combat power to impose his will on the enemy, he must have an accurate visualization of how, where and when he can gain superior combat power over the enemy. This means that the command and control system must provide the information necessary to make these estimations in a clear, usable fashion. The commander must be told how and where he could move and position his forces in relation to the enemy and gain a specific advantage. He must have a clear picture of how all fires can be employed in time and space to destroy the enemy or support maneuver. He must know where the enemy can hurt his unit and the options open to protect the force from these threats. Sustainability limits must also be clearly shown in terms of endurance over time and space. Finally, the commander must be given a mission specific assessment of the other command functions, to include the control system capabilities and limitations, human concerns, and future requirements. All of this information will give him an

evolving model of the situation. The system should put a picture of the multiple options open to the unit at the commander's fingertips and avoid unnecessary delays in the decision making process. The system must put this picture in front of the commander anywhere and at any time he needs to consider his options.

Is the doctrine feasible: Does the doctrine address the situational factors which effect system performance? The doctrine does not address the specific problems identified as resulting from, or identified as demonstrated in, the battlefield environment. The doctrine does not provide measures to insure units avoid logic pitfalls. The doctrine does not provide for stress effect compensation. The doctrine also does not provide for detailed time management, especially by the Chief of Staff or XO. The doctrine does not provide for decision making task organization to insure the appropriate teams are assembled for synchronization of the plan.

The doctrine must provide specific steps, such as those identified, to offset the effects of battlefield stress and human nature. The doctrine must offer specific techniques for time and task management as well. Much of this can be done with training, but doctrine sets many training priorities. Another step would be freeing the chief of staff from his position as the manager of the main command post and turning this over to an assistant chief of

staff. An optimal solution would be splitting the plans officer off as a separate "G5" in parallel with the joint staff system. The chief of staff must be trained, tasked and enabled to manage the entire command and control process. He cannot do that if he is relegated to supervising one portion of the system.

Is the doctrine complete: Does it address all the functional elements of the command and control system? No it does not. The doctrine does not address the echelons of decision making, the nature of stress, or the specifics of how to be a good time manager as an XO or chief of staff. As the lead manual for command and control, this manual must bring all the elements that support the commander and staff together.

The doctrine must address how the commander could approach each type of decision, to include cues that he may have to make a specific type of decision. Likewise, the doctrine should address how the commander will be supported by the staff and all the other elements of the command and control system in each type of decision, not just in new mission situations. The doctrine must explain how procedure, to include grouping and communicating, will mesh with command and control systems architectures such as the Army Tactical Command and Control System and the Information Mission Area to insure responsiveness and effectiveness from anywhere on the battlefield. Finally, the manual must be

clear and focused. This is the command and control doctrine for tactical operations, not a staff officer's guide. "Nice to know" information on homestation, routine staff functions should be eliminated. This manual must provide complete yet clear guidance for the command and control system and its functions, nothing more nothing less.

Final Thoughts

Now that the doctrine has been studied for soundness, some general conclusions on a final criteria are pertinent. Is the doctrine acceptable: Does the value of the new doctrine outweigh the cost of implementation? In the doctrines present form it is unacceptable. In addition to the specific problems noted, the doctrine was also noted as having many clarity problems. The doctrine should be organized based on the elements of the command and control system, the process of the system, and the objectives of the system. This organizational approach would contribute towards the completeness as well as clarity. The doctrine must be clear and concise, as almost every change to the old doctrine will have to ripple through the body of army doctrine. This behooves the Combined Arms Center, and the Army, to issue the most effective doctrine possible. Ultimately, this doctrine will determine, to a great extent, how well U.S. Army units will accomplish command and control. This means that the doctrine must be published with a high degree of integration.

To insure integration, the proponent office for writing FM 101-5 should be given personnel to form a doctrine writing task-force. This task force should include the author of the command and control system sections of the latest FM 100-5, a systems expert for the Army Tactical Command and Control System project, experts on command and control integration with BCTP and CTC observer controller experience, and any other expert available. Manuals cannot be written by committees, coherent doctrine must be written by teams with unity of purpose, expertise, and coordinating authority. Most importantly, they must work for the proponent, otherwise the manual becomes diluted by an "all things to all people" approach rather than a mission focus.

Beyond this, the study offers further opportunities for research. Specific research would be appropriate for integrating the Maneuver Control System into the current decision making process. One question which comes to mind is, how will briefings be conducted as computer conferences rather than map-front conferences. Secondly, the doctrine writing process might be studied to see if there are new approaches which might bridge the philosophical gaps between the acquisition teams and the doctrine writers. The entire subject of man, doctrine and machine interface for telecommunications in command and control will continue to stir curiosity for years to come. The technology changes so fast that one wonders if doctrine can keep up. The doctrine

must keep up if the command and control system is to accomplish the mission and achieve responsiveness.

This study constantly came back to two factors, both of which are significant. The first was the importance of remembering the nature of the human mind. The second was training. The doctrine must accommodate human nature and group process. As the system becomes more complex, the difficulty of addressing the human factor may also become complex.

Time and again the study showed the importance of an open mind which sees new opportunities in situations where others might respond in hide-bound fashion. The study also showed that humans may not be prone to open mindedness in a high stress environment. At its worst, this could cause crisis and catastrophe. The best means to offset this tendency is constant, team oriented, high stress training. Unfortunately, the analysis of unit performance showed this as a weakness. The Army must continue to challenge commanders and battlestaffs with high stress training that encourages open minded, rapid decision making. Commanders and staffs must develop an ability to be both creative and self-critical, using pragmatic yet opportunistic thinking.

BIBLIOGRAPHY

Books

- Allard, C. Kenneth. Command Control and the Common Defense. New Haven, Conn: Yale University Press, 1955.
- Boyes, Jon L., and Andrianopel, Stephen J., eds. Principles of Command and Control. Washington D.C.: AFCEA International Press, 1987.
- von Clausewitz, Carl. On War. Edited and translated by Michael Howard and Peter Paret. Princeton: Princeton University Press, 1976, 1984.
- van Crevald, Martin. Command In War. Cambridge: Harvard University Press, 1985.
- Davis, Roscoe K., McKeown, Patrick G., and Rakes, Terry R. Management Science. Boston: Kent Publising Company, 1986.
- De Greene, Kenyon. The Adaptive Organization. New York: John Wiley and Sons, 1982.
- Dickenson, Roger, Miller, David, and Oxenfeldt, Alfred. A Basic Approach to Executive Decision Making. New York: AMACOM, 1978.
- Dupuy, Trevor N.. Understanding War, History and Theory of Combat. New York: Paragon, 1987.
- Fay, Charles H., ed. Research-Based Decisions. New York: Random House, 1987.
- Gjertsen, Derek. Science and Philosophy (Past and Present). London: Pelican Books, a subsidiary of Penguin Books Ltd., 1989.
- Hall, Robert. Soviet Military Art in a Time of Change. Oxford: Brassey's (UK), 1991.
- Hemsley, John. Soviet Troop Control, The Role of Command Technology in the Soviet Military System. Oxford: Brassey's (UK), 1982.

Infantry Journal Inc.. Infantry In Battle, 2d ed. Fort Leavenworth: Reprinted by th USACGSC with the permission of the AUSA, 1939.

Ivanov, D. A., Savel'yev, V. P., and Shemanskiy, P. V. Fundamentals of Tactical Command and Control, A Soviet View. Translated by The United States Air Force. Moscow: All-Union Copywrite Agency of the USSR, 1977.

Johnson, Stuart E. and Levis, Alexander H., eds. Science of Command and Control: Coping with Uncertainty. Washington, D.C.: AFCEA International Press, in cooperation with the National Defense University, 1988.

Johnson, Stuart E. and Levis, Alexander H., eds. Science of Command and Control: Part II, Coping with Complexity. Washington, D.C.: AFCEA International Press, in cooperation with the National Defense University, 1989.

Moore, W. Edger. Creative and Critical Thinking. Boston: Houghton Mifflin, 1967.

Shubik, Martin. The Uses and Methods of Gaming. New York: Elsevier Scientific Publishing Company, 1975.

Simon, Herbert. The New Science of Management Decision. New York: Harper and Row, 1960.

Simpkin, Richard E.. Human Factors in Mechanized Warfare. Oxford: Brassey's (UK), 1983.

Articles

Bohanan, Anthony G.. "C3I in support of the Land Commander," in Principles of Command and Control, Boyes, et al, ed.. Washington, DC: AFCEA Int. Press, 1987.

Glassman, Edward. "Creative Problem Solving." Supervisory Management, Vol: 34, Iss: 1 (Jan 1989) 21-26.

Phillips, T. R.. "Solving the Tactical Equation," Quarterly Review of Military Literature. Vol: XVII, n.s. 66 (3rd. Qtr 1937): 5-51.

Rickards, Tudor. "Innovation and Creativity: Woods, Trees and Pathways." Research and Development Management, Vol: 21, Iss: 2 (April 1991) 97-108.

Gordon R. Sullivan. "Delivering Decisive Victory: Improving Synchronization." Military Review, Vol: LXXII, n.s. 9 (September 1992): 2-11.

Tanouye, Elyse. "Why Smart Managers Make Bad Decisions - and How to Avoid Them." Working Woman, Vol: 14, Iss: 8 (Aug 1989) 55-57, 96-97.

Military Publications

Center for Army Lessons Learned. Newsletter. No. 92-X. (Draft). Fort Leavenworth, Fall 1993.

National Defense University. AFSC Pub 1, The Joint Staff Officer's Guide. Norfolk: Armed Forces Staff College, 1991.

United States Army. FM 7-20, The Infantry Battalion. Washington, DC: Department of the Army, April 1992.

_____. FM 17-95, Cavalry Operations. Washington D.C.: Department of the Army, September 1991.

_____. FM 22-100, Military Leadership. Washington D.C.: Department of the Army, July 1990.

_____. FM 22-103, Military Leadership and Command at Senior Levels. Washington D.C.: Department of the Army, June 1987.

_____. FM 24-1, Signal Support in the AirLand Battle. Washington D.C.: Department of the Army, October 1990.

_____. FM 34-130, Intelligence Preparation of the Battlefield. Washington D.C.: Department of the Army, May 1989.

_____. FM 71-2, The Tank and Mechanized Infantry Battalion Task Force. Washington D.C.: Department of the Army, September 1988.

_____. FM 71-3, The Armor and Mechanized Infantry Brigade. Washington D.C.: Department of the Army, May 1988.

_____. FM 71-100, Division Operations. Washington D.C.: Department of the Army, June 1990.

_____. FM 100-5, Operations. Washington D.C.: Department of the Army, May 1986.

_____. FM 100-15, Corps Operations. Washington D.C.: Department of the Army, September 1989.

_____. FM 101-5, Staff Organization and Operation. Washington D.C.: Department of the Army, May 1984.

_____. FM 101-5-1, Operational Terms and Symbols.
Washington D.C.: Department of the Army, October 1985.

_____. FM 100-5, Operations (Final Draft). Washington
D.C.: Department of the Army, 1993.

_____. FM 101-5 (Coordinating Draft), "Command and
Control for Commanders and Staffs." U.S. Army Command
and General Staff College, July 1992.

_____. ST 100-9, "The Command Estimate Process." U.S.
Army Command and General Staff College, 1 July 1992.

United States Marine Corps. FMFM 1-3, Tactics. Washington,
DC: Department of the Navy, June 1991.

United States Navy. "Background to Decision Making."
Phamphlet. United States Naval War College, June 1958.

Reports and Thesis

Army Research Institute. "Home Station Determinants of Unit
Readiness." Fort Leavenworth: ARI, 1991.

Athens, Arthur J. "A Simulation Study of Organizational
Decision Making Under Conditions of Uncertainty and
Ambiguity." Masters Thesis, Naval Post Graduate
School, June 1983.

Drelling, Joseph S. "AirLand Battle and the Operational
Commander's Information Requirements. " School of
Advanced Military Studies. Monograph, United States
Army Command and General Staff College, 1989.

Entin, Elliot E. and Serfaty, Daniel. Information Gathering
and Decision Making Under Stress. Burlington:
ALPHATECH Inc., January 1990.

Fallesen, Jon J., Lussier, James W., and Michel, Rex R.
Tactical Command and Control Process. Fort Leavenworth
Kansas: U.S. Army Research Institute, Fort Leavenworth
Field Unit: July 1992.

Heichal, Gabriella. "Decision Making During Crisis: The
Korean War and the Yom Kippur War." Doctor of
Philosophy. Dissertation, George Washington University,
February 1984.

Kahan, James P., Lawrence, Marilee F., Darilek, Richard E.,
Jones, William M., Platt, Alan A., Romero, Philip J.,
Schwabe, William L., and Shlapak, David A. Testing the
Effects of Confidence- and Security-Building Measures
in a Crisis. Santa Monica: The RAND Corporation,
December 1987.

- Kahan, James P., Worley, D. Robert, and Stasz, Cathleen. Understanding Commander's Information Needs. Santa Monica, CA: Rand, 1989.
- Klien, Gary A. and Calderwood, Roberta. Investigations of Naturalistic Decision Making and the Recognition-Primed Model. Yellow Springs: Klien and Assoc., July 1990.
- Klien, Gary and Crandall, Beth. Recognition-Primed Decision Strategies: First-Year Interim Report. Yellow Knife: Klien and Assoc., August 1990.
- Lynch, Timothy D. "Problem Solving Under Time Constraints: Alternatives for the Commander's Estimate." School of Advanced Military Studies. Monograph, United States Army Command and General Staff College, March 1990.
- James D. McMullin. "Determinants of the Effectiveness of Situation Estimation." Master of Science in Systems Technology. Thesis, Naval Post Graduate School, June 1990
- Michel, Rex R. and Riedel, Sharon L. Effects of Expertise and Cognitive Style on Information Use in Tactical Decision Making. Fort Leavenworth: Army Research Institute, June 1988.
- Muhl, James. "In Search of a Combat Theory: The Tactical Utility of TMC's Military Combat Theory." School of Advanced Military Studies. Monograph, United States Army Command and General Staff College, March 1990.
- Pawlowski, Thomas J. and Rameden, David A. Command and Control Responsiveness Analysis. Fort Leavenworth: TRADOC RESEARCH AND ANALYSIS COMMAND-Operations Analysis Center, September 1991.
- Shirron, Edward. "An Optimum Method of Wargaming Tactical and Operational Course of Action as an Integral Part of a Corps Commander's and G3's Estimate of the Situation in a Time-Constrained Environment." Master of Military Art and Science. Thesis, United States Army Command and General Staff College, October 1984.

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