1985

Tactical military deception.

Van Vleet, John Anton

(1) [illegible] — [illegible]

(2) look west — western

3) [illegible]

4) — six very [illegible]

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

TACTICAL MILITARY DECEPTION

by

John Anton Van Vleet

September 1985

Thesis Advisor: K. Herbig

Approved for Public Release, Distribution Unlimited

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): Tactical Military Deception	5. TYPE OF REPORT & PERIOD COVERED: Master's Thesis; September 1985
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): John Anton Van Vleet	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Naval Postgraduate School, Monterey, California 93943-5100	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: Naval Postgraduate School, Monterey, California 93943-5100	12. REPORT DATE: September 1985
	13. NUMBER OF PAGES: 259
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for Public Release, Distribution Unlimited.

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

18. SUPPLEMENTARY NOTES

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

Deception; Surprise; Decision-Making; Operations Security; Electronic Warfare; Stratagem

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

This is a study of deception in military operations with emphasis on the Army division level. The thesis is developed from empirical data, fundamental processes, and decision-making processes. It is a comprehensive analysis of the battlefield deception process and is a basic guide to deception planning.

The thesis formulates a theory for operational military deception as an extension of the pioneering work of Barton Whaley.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

S/N 0102-LF-014-6601

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Whaley's deception data base is analyzed to show trends in operational deception. These trends are combined with pertinent elements of game, communication, organization, and systems theory as well as decision-making and perceptual and cognitive processes.

As a result of this study, the author presents conclusions and recommendations on how deception might be better applied to support U.S. Army division operations.

Approved for Public Release, Distribution Unlimited

Tactical Military Deception

by

John Anton Van Vleet
Major, United States Army
B.S., United States Military Academy, 1974

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN SYSTEMS ENGINEERING
(Electronic Warfare)

from the

NAVAL POSTGRADUATE SCHOOL
September 1985

ABSTRACT

This is a study of deception in military operations with emphasis on the Army division level. The thesis is developed from empirical data, fundamental processes, and decision-making processes. It is a comprehensive analysis of the battlefield deception process and is a basic guide to deception planning.

The thesis formulates a theory for operational military deception as an extension of the pioneering work of Barton Whaley. Whaley's deception data base is analyzed to show trends in operational deception. These trends are combined with pertinent elements of game, communication, organization, and systems theory as well as decision-making and perceptual and cognitive processes.

As a result of this study, the author presents conclusions and recommendations on how deception might be better applied to support U.S. Army division operations.

TABLE OF CONTENTS

LIST OF TABLES

TABLE OF ABBREVIATIONS

ASAS	ALL SOURCE ANALYSIS SYSTEM
CEWI	COMBAT ELECTRONIC WARFARE INTELLIGENCE
C3CM	COMMAND CONTROL COMMUNICATIONS COUNTERMEASURES
DTOC	DIVISION TACTICAL OPERATIONS CENTER
EEFI	ESSENTIAL ELEMENTS OF FRIENDLY INFORMATION
EW	ELECTRONIC WARFARE
G2	DIVISION INTELLIGENCE OFFICER
G3	DIVISION OPERATIONS OFFICER
G4	DIVISION LOGISTICS OFFICER
HERO	HISTORICAL EVALUATION AND RESEARCH ORGANIZATION
ICD	IMITATIVE COMMUNICATIONS DECEPTION
IBP	INTELLIGENCE PREPARATION OF THE BATTLEFIELD
MCD	MANIPULATIVE COMMUNICATIONS DECEPTION
MI	MILITARY INTELLIGENCE
OIC	OFFICER IN CHARGE
OPSEC	OPERATIONS SECURITY
OPORD	OPERATIONS ORDER
PIR	PRIORITY INTELLIGENCE REQUIREMENTS
PSYOPS	PSYCHOLOGICAL WARFARE OPERATIONS
QJMA	QUANTIFIED JUDGMENT METHOD OF ANALYSIS
SHAEF	SUPREME HEADQUARTERS ALLIED EXPEDITIONARY FORCES
SIGINT	SIGNALS INTELLIGENCE
TCAC	TECHNICAL CONTROL AND ANALYSIS CENTER

ACKNOWLEDGEMENT

I wish to express my appreciation to my wife, Jeryl Ann, for her patience during the course of my studies and for all of the assistance that she has provided.

I wish to acknowledge a debt to the historian, Barton Whaley, for the use of his 1969 study of deception. That study provided the inspiration for this thesis.

Abundant thanks are given to the following professors of the Naval Postgraduate School. My thesis advisors, Katherine Herbig and Wayne Hughes, provided suport and encouragement when I needed it the most. The Chairman of the Electronic Warfare Department, John Boudry, recognized the need for a study of tactical deception within the broad categories of EW and C3CM. Thank you.

I. INTRODUCTION

This thesis was motivated by a need to provide the military staff deception planner with a bridge between the formal planning steps outlined in field manuals and the execution of tactical operations supported by deception. The thesis conforms to printed Department of the Army doctrine as closely as possible. The U.S. Army division level is used to establish the context for the integration of deception into tactical operations.

Deception must be recognized as a necessary and desirable part of every tactical operation because it leads to surprise and acts as a force multiplier. A successful deception magnifies the combat power of the deceiver and produces a tactical advantage. The synergistic effect which can be gained through integration of all of the combat power multipliers adds to fire and maneuver to produce an increase in force effectiveness.

The objective of this thesis is to provide information on the nature of operational deception in a form that may assist in the planning and execution of deception operations at the U.S. Army division level.

The thesis formulates a theory for operational military deception based on an empirical analysis of deception cases, coverage of selected historical examples, and a synopsis

of previous work done at the strategic level. The theory will draw heavily on the results of a joint investigation of strategic military deception done at the Naval Postgraduate School by a multidisciplinary research group. The seven studies at the Naval Postgraduate School focused on the application of game, communication, organization, and systems theory as well as decision-making and perceptual and cognitive processes. The multidisciplinary approach will be applied to tactical military deception within the framework of the existing division force structure.

The thesis includes a presentation of background material followed by a theoretical analysis of the deception process and an empirical analysis of deception case studies. Conclusions will be drawn from both the theoretical analysis and the empirical analysis. The final section will include a recommendation which applies the conclusions to form a theory for tactical deception as it might be applied at the division level. The theory will focus on command and staff functions, a layered planning process, and a detailed execution process which is based on the author's personal experience.

II. DECEPTION IN GENERAL

Tactical deception planning in the typical U.S. Army division is based on hiding the real and displaying the false. Every division has standing operations procedures for Operations Security (OPSEC) which are designed to hide the real. Almost every offensive operation has a supporting attack which diverts the enemy's attention because it begins before the main attack. The supporting attack displays the false. Deception for the defense is even easier as the enemy does not know if you plan to defend in place at the ridgeline or fall back to the other side of the river.

This section of the thesis provides information on what is known about deception in general in an effort to show that tactical deception requires more than a bandaid application of simplistic maxims.

A. PROPOSITIONS ON MILITARY DECEPTION

In early 1979 a multidisciplinary research group at the Naval Postgraduate School began a joint investigation of deception. The group's intent was to illuminate the nature of deception, its processes, and factors that condition when one resorts to and succeeds at deception [Ref. 1]. The result of that investigation is an excellent summary of what is known about deception. The group's effort resulted in the publication of the book, Strategic Military Deception, which

was edited by Donald C. Daniel and Katherine L. Herbig. Chapter one of that book presented concepts and propositions that would serve as a basis for formulating a theory of deception [Ref. 2]. A compressed version of information available in that chapter establishes a common level of understanding of deception.

1. Goals for Deception

Deception is the deliberate misrepresentation of reality done to gain a competitive advantage [Ref. 3]. Misrepresenting reality has both a positive and a negative side. The negative side of deception is the protection of certain portions of the real operation and plans for future operations. This is called cover and it is enforced by security measures [Ref. 4]. The enemy attempts to break that cover and learn what you do not want him to learn. The enemy will continue his attempts until he learns everything or until he runs out of time. In military terms, the commander and his staff prepare a list of "Essential Elements of Friendly Information (EEFI)" that must be protected. The EEFI list may be very similar to the enemy's list of "Priority Intelligence Requirements (PIR)" which is what he is attempting to learn.

The positive side of deception is the presentation of the false tale, the deception story. The deception story leads the enemy away from the truth by providing clues that can answer the enemy's PIR. If the enemy accepts the clues

as valid, he may form the wrong conception of reality. That wrong conception should lead the enemy to place his forces at a disadvantage. Deception should be done to achieve a desired reaction from the enemy. [Ref. 5]

Daniel and Herbig expressed the view that, "to be labeled deception an act must be done to gain a competitive advantage. This means, in effect, that there are three goals in any deception. The immediate aim is to condition the target's beliefs; the intermediate aim is to influence the target's actions; and the ultimate aim is for the deceiver to benefit from the target's actions [Ref. 6]. The three goals must be kept in mind while planning any deception so that the operation is properly designed toward the ultimate aim.

2. Deception Types

Daniel and Herbig distinguished two variants of deception that produce somewhat different effects and operate in different ways. The more simple of the variants, termed "ambiguity-increasing" or "A-type," confuses the target so that the target is unsure as to what to believe [Ref. 7]. The more complicated variant, termed "misleading" or "M-type," reduces ambiguity by building up the attractiveness of one wrong alternative [Ref. 8].

The relative values of the two variants can be shown by a simple one-on-one model of a battle between two forces, blue and red. The model requires the capability for blue and

red to be visible to each other in order for the killing shot to be delivered. The force that delivers the first killing shot wins the battle. Blue attempts an "M-type" deception by displaying a dummy that appears more real than blue himself. Red sees blue and the blue dummy and fires at the dummy. Blue fires at red and wins the battle. If the blue dummy degenerates to the point where it no longer looks better than blue or if the original deception was based on an identical dummy, the deception is "A-type". Red has only a fifty percent chance of picking the correct target while blue has only one target. Blue still has a significant advantage. Red might delay firing until he gets close enough to tell the dummy from the correct target, but doing so would provide blue the opportunity to fire first. Daniel and Herbig concluded that, "deceptions planned to mislead a target into choosing one possibility may degenerate and instead increase ambiguity if the target resists or postpones making the choice the deceiver intends." [Ref. 8]

3. The Deception Target

Tactical deception flows from the commander who initiates the deception to the commander who receives the deception. The deception is channeled through the planners and implementers on the deceiver side to the information gathering and proceessing forces on the receiver side. Daniel and Herbig do an excellent job in presenting the conceptual flow of information from the deceiver to the target.

The deception target is the enemy commander. The primary deception goal is to predispose the enemy commander to make the desired decision, but it is impossible to reliably predict individual behavior reactions. The deception is possible because patterns of behavior are predictable in acturial terms. The patterns of behavior can be predicted not only for the enemy commander but also for the entire organization which provides the information used in the command decesion. [Ref. 10]

4. Comron Factors of Successful Deception Operations

Daniel and Herbig found recently declassified documents which provided an interesting starting point for addressing factors conditioning success. One document was written by a deception planner working with the Supreme Headquarters Allied Expeditionary Forces (SHAEF) and the other was written by German General of Infantry in World War II, Hans von Greiffenberg. They revealed that experienced deceivers on either side of the conflict during the Second World War were in agreement on methods for deception. The two reports were designed to offer advice for future use of deception. The reports revealed similar conclusions about how to succeed at deception. The documents provided three useful categories: (1) secrecy, organization, and coordination; (2) plausibility and confirmation; and (3) adaptability [Ref. 11]. Daniel and Herbig added a fourth category which was applicable to operational and tactical deception,

the prepositions of the target [Ref. 12]. The author of this thesis adds a fifth category which is the use of the initiative. All five categories seem to be important in the determination of deception success.

a. Secrecy, Organization, and Coordination

Daniel and Herbig observed in Strategic Military Deception that both the SHAEF planner and von Greiffenberg agree strongly that "knowledge that cover and deception is (sic) being employed must be denied the enemy". "If the strictest secrecy is not observed," says von Greiffenberg, "all deception projects are condemned to failure from the very start." "Deceiving one's own troops for the sake of security," he adds, "is a normal byproduct of deception" [Ref. 13].

Daniel and Herbig wrote that the two WW II planners argued that deception must be well organized and well coordinated else leaks may occur and deception unravel. They are well organized when there is "detailed preparation," where even "seeming trifles are not overlooked." They are well coordinated when directed from one central point - that being the highest headquarters controlling operational forces directly benefiting form the deception [Ref. 14].

b. Plausibility and Confirmation of the Lie

The SHAEF and von Greiffenberg documents present a number of principles to the effect that the lie must be plausible. "To achieve this," they recommended, "the lie be

woven into a skein of truth and confirmed by more than one source." [Ref. 15] Von Greiffenberg wrote that the deception "must be brought into harmony with the overall situation." [Ref. 16] It must be noted that plausibility is a relative factor. The lie need be plausible only from an enemy's view.

c. Adaptability of Deception

There are many things that can happen once a deception is initiated. The real plan might change. The enemy situation might change. More real information might be obtained by either side. The deception must be able to change as reality changes. A deception that does not change with time becomes more and more divergent from reality.

d. Target Predispositions

Daniel and Herbig note that unaccountably, neither the SHAEF planner's nor von Greiffenberg's report advised that deceivers should make use of the target's predispositions. Daniel and Herbig postulated that deceptions which slant the target's mind-set in directions he is predisposed to take have a higher probability of convincing him than those that run against the grain of his expectations and assumptions. They also observed that "conventional wisdom is supported by experimental psychology on this point: the stronger his predispositions, the more a target will ignore or twist information inconsistent with them." [Ref. 17]. It is possible that the World War II deception planners did use enemy predispositions, but did not identify them.

e. Initiative

Retaining the initiative is not a function of being on the offense or being on the defense. The initiative can be obtained regardless of the situation if the enemy becomes so confused that he does not act. General Sherman called it, "placing the enemy on the horns of a dilemma." [Ref. 18]

B. STRATEGIC VERSUS TACTICAL DECEPTION

The information presented in the book, Strategic Military Deception, has application to the operational and tactical levels, as well as the strategic level. The difference between the levels is defined in terms of scope of operation but in reality there is no sharp dividing line. Strategic deceptions and operational deceptions blend at about the corps size of forces. Operational deception blends with tactical deception at about the brigade level. Tactical deception is composed mostly of tricks played on the enemy by individual soldiers and small units. Tactical deception could be considered as part of battle tactics.

For the purposes of this thesis, the operational level will be defined as that level involving forces that are smaller than a U.S. Army corps and participating in operations of a battle or a series of battles. Deception planning has normally not been associated with the echelons below corps. The division level would typically only be involved in the execution of corps' deception plans.

This thesis will concentrate on the division level because it has a large enough staff to accomplish detailed planning, and it commands sufficient resources to divert forces to accomplish the deception operations. Much of the division's deception planning involves consideration of the deception capabilities of tactical units. The deception is in support of tactical operations even though it must be considered to be operational level planning.

The author of this thesis recognizes the difference between the operational level and the tactical level. Tactical deception is that which is planned at the operational level. The term, tactical deception, is slightly misleading. It is easier to consider that tactical deception is any deception that is not strategic. That is the convention that is used in this thesis.

III. BACKGROUND

A U.S. Army division cannot afford to wage a battle of attrition. Commanders at every echelon of battle must use smart battle management to win without wasting resources. One requirement of a division commander is to execute the optimum plan which allows victory over a modern opponent that may have a three to one advantage in combat power. Another requirement is to maintain the forces of the division sufficiently to win the battles that will follow. The lethality of modern weapons is such that the alternative might well be an escalation of the war.

There is an increasing recognition on the part of all commanders of the critical difference that integration of combat power multipliers will play in future battles. Deception, for example, is included within the concepts of Command, Control, and Communications Countermeasures (C3CM) and Electronic Warfare (EW). Deception is now included in the planning for almost all division level training exercises.

While deception planning has been revived at the division level in the past years, and interest is intensifying, the tacticians must very soon come to grips with two significant problems hindering the full employment of tactical deception at the division level. These are, first, understanding how to optimize deception and, second, how to achieve integration

of the deception and the operation. These two complex issues will be addressed in light of theory and in light of past case histories, but first the background for tactical deception will be presented from the historical perspective.

A. FORCE EFFECTIVENESS AND SURPRISE

General of the Army Douglas MacArthur said, "Surprise is the most vital element for success in modern war." [Ref. 19] General MacArthur was referring to his U.N. plan for the Inchon Landing which he was presenting to a special delegation from the Joint Chiefs of Staff. MacArthur argued the risky plan through the historical precedent established in 1759 by General Wolfe in scaling the "unscalable" Heights of Abraham to seize French Quebec. MacArthur observed, "Like Montcalm, the North Koreans would regard an Inchon landing as impossible. Like Wolfe, I could take them by surprise." [Ref. 20] Evidently, complete surprise was achieved, as the North Korean troops garrisoning the area were not reinforced and the landing was virtually unopposed. The operation was a complete military success. The enemy's half-enveloped army began a headlong retreat that stopped only at the Yalu. That, however, was only half of the story. Since MacArthur achieved those results at only minimal cost in terms of casualties. The force effectiveness of the operation was enhanced by surprise such that the North Korean Peoples Army suffered 12 times the total casualties of the United Nations Command. [Ref. 21]

A summary of data compiled by a notable deception researcher, Barton Whaley, indicates that the degree of success in a military operation varies directly with the intensity of the initial surprise. One data set of 167 battles fought between 1914 and 1973 was divided roughly equally according to degree of initial surprise and yielded the following results:

TABLE 1
SURPRISE AND RESULTS OF BATTLE [Ref. 22]

	% FAR EXCEEDING EXPECTATIONS	% ENDING IN DEFEAT
NO INITIAL SURPRISE	2 %	68 %
MODERATE INITIAL SURPRISE	19 %	15.5 %
INTENSE INITIAL SURPRISE	34 %	2 %

The trend suggested by the historical evidence is that surprise breaks the normal cause and effect rules which are the basis for battle tactics. Surprise is often the difference between victory and defeat regardless of the quantifiable force effectiveness ratios.

The force that is outmanned and outgunned on the battlefield needs to maximize its own force effectiveness while minimizing that of its opponent. Achieving surprise is a major element in the force effectiveness ratio; however, it is the element that is often the least understood. Surprise is difficult to quantify because it is a psychological notion.

B. SURPRISE AND DECEPTION

There are no rules which guarantee that surprise will be achieved. Tight security or ineffective enemy intelligence does sometimes shield intentions or clues pointing to intentions resulting in the enemy remaining unwarned. However, absolute security is probably never achieved.

There are some factors which come readily to mind which cause surprise. These factors include attacking over impossible terrain, operating in impossible weather, and acting at the improbable time. It seems that the key to surprise exists in the preconceptions of the enemy. The victim of surprise is one who has formed an estimate of his opponent's intentions and capabilities which is wrong. The enemy can be helped in the forming of his preconceptions by deliberately misleading him.

Barton Whaley's theory of stratagem asserts that deception is not only a main cause but also an enhancer of surprise. Historical data verifies this theory as follows:

TABLE 2
SURPRISE AND CASUALTIES [Ref. 23]

	NO. OF CASES	AVE. CASUALTY RATIO
SURPRISE WITH DECEPTION	59	1: 6.3
SURPRISE WITHOUT DECEPTION	20	1: 2.0
NO SUPPRISE WITH DECEPTION	5	1: 1.3
NO SURPRISE WITHOUT DECEPTION	40	1: 1.1

The data suggests a clear relationship between surprise and deception in that casualty ratios are substantially greater in cases of surprise with deception than for those of surprise without deception. While surprise was gained without deception in only one third of the cases, it was rare for deception not to result in surprise. It is also significant that if deception fails to achieve surprise, it may still result in a more favorable casualty ratio than if deception was not attempted.

C. ECONOMICS OF DECEPTION

Deception is inexpensive. The most elaborate deception operation in history was for the Allied invasion of Europe in 1944. That operation involved only diverting for a few weeks the services of several hundred men, a dozen or so small boats, a few aircraft, a fair amount of radio and other electronic gear, some wood, canvas, paint, and bits of aluminum [Ref. 24]. The most costly single type of deception operation is the diversionary attack. This is the only form that necessarily costs lives and equipment and uses regular combat units. However, as such attacks are generally no more effective than plausible threats of attack, they should be used more sparingly than they have been up to now [Ref. 25].

Deception provides a high return in that it has at least an 80 % chance of yielding surprise. Surprise multiplies the chances for a quick and decisive military success, whether measured in terms of explicitly sought goals, ground taken,

casualty ratios [Ref. 26]. Deception itself can also induce the enemy to make inefficient use of his own resources by causing him to make mistakes in timing or utilization.

D. THE GENERAL STAFF SYSTEM AND DECEPTION

In early times, the commanders performed virtually unsupported by the advice of specialized staffs. The General Staff System began to spread throughout the world in the 19th century and, even then, the "Great Captains" pretty much maintained individual control over their battle plans. The 20th century, however, found the staff performing most of the military planning and even much of the decision making. The General Staff System allowed armies and the command and control of armies to become very complex, but the system separated the commander from the detailed planning and execution of functions such as deception.

The diffusion of power from the commander can result in very effective operations such as the British deception for the Third Battle of Gaza on 31 October, 1917. General Sir Edmund Allenby decided on a new campaign which abandoned the previous pattern of costly frontal assaults against the main enemy defenses at the coast. The new strategy called for an envelopment of the Turkish army by a cavalry sweep through its weakly defended left flank in the desert at Beersheba. The staff attended to the details. The tactical plan was engineered by Brigadeer General Guy Dawnay, while deception was planned by Major Richard Meinertzhagen.

Major Meinertzhagen used his position as chief of military intelligence at Allenby's GHQ to prepare a firm groundwork of intelligence, security, and deception. Accordingly, he improved the monitoring of enemy radio communications by placing a receiver on the Great Pyramid at Gizah. He greatly expanded behind the lines espionage by developing a close liaison with the Zionist intelligence service, the "Nili" group led by Aaron Aaronsshon. Security was tightened by repeating a technique he had perfected in 1915 against German agents in East Africa. He discredited and compromised the enemy agents through payment and testimonial which were "allowed" to be intercepted by enemy intelligence. In this manner he arranged that the enemy execute its own most effective Arab spy-master in Beersheba.

Simultaneously, Meinertzhagen developed the deception operation. First, he arranged a reliable, rapid, and direct communication channel for getting his information to German and Turkish intelligence. This was done by permitting the Turks to capture messages that enabled them to solve one of the British radio codes. Knowing that the German staff included an efficient radio interception and cryptanalytic team, Meinertzhagen could be confident this ruse would give him the desired channel. Beginning over a month before the battle, Captain Schiller, the chief of German military intelligence in Palestine, received a variety of ingenious clues that indicated a cover target of Gaza instead of Beersheba,

and a later attack date. Moreover, Beersheba was mentioned as a target for a mere feint or demonstration attack; and the Turks were told to expect an amphibious landing behind Gaza.

This done, the next task was to lull any doubts the enemy might have by providing plausibly "independent" verification in the form of a packet of faked documents. To do this Meinertzhagen laid on his famous "haversack ruse". As his subordinate officers had twice failed to carry this off, on 10 October, Meinertzhagen rode off alone into the desert no-man's land to deliver the mail. He simulated a reconnaissance near Girheir until spotted and chased by a Turkish patrol. At that point, feigning a wound, Meinertzhagen dropped his field glass, a life-saving waterbottle, his rifle smeared smeared with horseblood, and the haversack.

Examination of Meinertzhagen's haversack by Turkish intelligence disclosed such personal items as a letter from his "wife", 20 pounds sterling, a flashlight, and a letter from an officer stationed on the Gaza front. This letter contained disparaging remarks about Allenby's generalship and also some clues as to the time and place of the offensive. The haversack also contained official documents, orders, maps, and other papers that confirmed and elaborated on the false time and place. Within a few hours this "find" was passed along to Captain Schiller. He remained properly skeptical until the following day when he learned from promptly decoded radio intercepts, Turkish

patrols, freshly captured orders, and two prisoners, that the British were feverishly seeking to recover the "lost" haversack. All this circumstantial "confirmation" had, of course, been most carefully arranged by Meinertzhagen.

This intelligence was brought to the attention of the energetic commander of the Palestine front, General Kress von Kressenstein, who issued orders on 11 October mentioning the find and warning the officers of his command to be more careful of their own secret documents. A Turkish corps order stated that the find would allow the reinforcements to be at Gaza in time to crush the arrogant English.

Turco-German emphasis accordingly shifted to Gaza. Two divisions were moved into reserve near the coast and defenses were generally strengthened there. On 31 October 1917, Allenby launched the operation. It broke the eight-months' stalemate by throughly surprising the German Middle East theater commander and routing the off-guard and off-balance Turkish army. Victory was capped by the capture of Jerusalem on November 9th. Total casualty ratios were highly in favor of the British [Ref. 27].

The General Staff System is a key to addressing the full employment of tactical deception at the division level. The system requires that both functional expertise and authority reside in one staff office, but full integration of deception and operations is not achieved unless the commander provides central direction to establish understanding and support from

the staff. At this point it is necessary to digress and state that the commander may be the deception proponent within the General Staff System. General MacArthur often vetoed the plans of his staff and implemented deception in operations based solely on personal insight. The Korean War operations provide evidence that his staff did not systematically apply deception in that many deception measures supporting a deception story were not integrated and were not effective. The point is that even if a commander makes deception an integral part of the operation, a systematic planning and execution process must be used by the staff to fully integrate the deception and the operations plan.

E. THE G3 AS THE DECEPTION PLANNER

Historically, when the commander relinquished total control over deception, that function shifted to the intelligence arena [Ref. 28]. Most of the deception experience gained in war was lost during peacetime when the intelligence staffs were allowed to decay. Military intelligence was not even established as a permanent branch of the U.S. Army until the mid 1960's. The U.S. Army revised deception responsibilities when the concept for command, control, communications countermeasures (C3CM) was formed. The C3CM concept lists the G3, not the G2, as the principal advisor to the commander regarding C3CM, to include EW jamming, Operations Security, and deception. The Operations Officer serves as the Division's deception coordinator.

Typically, the G3 priorities for fighting the Division echo the principles of war. Fire, maneuver, and the other elements of combat power receive first priority. Security and surprise come last. The result is that the deception plan is often done as an afterthought. The work is assigned according to the established priorities. The available time and assets dictate what will be done.

The G3 does not do all of this work himself. The G3 has a small Operations Section and a small Plans Section and these are augmented with elements from the functional areas. For example, the Fire Support Element from Division Artillery and the Air Force Liaison Team plan and coordinate all of the fire support for an operation. The Signal Battalion provides a Communications Support Section. The Engineer Battalion, The Air Defense Artillery Battalion, and the Aviation Battalions all provide personnel and equipment to augment the G3. Even the Military Intelligence Battalion provides an Electronic Warfare (EW) Section and an Operations Security (OPSEC) Section.

IV. TACTICAL DECEPTION GUIDANCE

A. DECEPTION PLAN EXAMPLE

The deception plan can be written as an annex to the operations order (OPORD) using the format presented in FM 90-2, Tactical Deception. The field manual provides the following guidance:

> To coordinate the deception measures, the planner creates a "notional order of battle" which is the notional force that will be portrayed by the task organization for the true operation. The portrayal will be required for a set time, based on the deception implementation schedule, to feed the enemy collection system and affect the enemy decision-maker [Ref. 29].

The deception overlay covers the battlefield deployment for the deception and, like any overlay, is intented to cut down the amount of wording required in the annex and to gain clarity of understanding by the implementers of the various requirements. It helps subordinate elements visualize what the enemy is to "see" [Ref. 30].

1. Deception Annex to the OPORD.

The deception annex follows the five paragraph format of the operations order. The paragraphs are: situation, mission, execution, service support, and command and signal [Ref. 31]. The format is standard for all orders.

a. Situation

The situation covers enemy forces, friendly forces, and attachments and detachments. Usually, this

paragraph refers to the intelligence appendix of the CPCRD and to the notional order of battle.

b. Mission

The mission paragraph is a concise statement of the task(s) and the purpose of the task(s); i.e., the deception story.

c. Execution

The first subparagraph provides the concept of operation and the deception objective. There is a subparagraph which outlines unit tasks for each unit participating in the cover and deception operation. The final subparagraph contains the coordinating and control measures applicable to two or more units.

d. Service Support

This paragraph may refer to a current administrative logistic order or may provide specific instructions concerning combat service support requirements for the cover and deception operation.

e. Command and Signal

Reference may be made to a signal appendix containing communication deception details. Location of deception command posts and deception command relationships may be provided.

2. Deception Implementation Schedule

The Deception Implementation Schedule can be added as an appendix to the Deception Annex. It is a chronological

presentation of the deception plan, bringing together all the activities in order to provide what amounts to a scenario of the operation; in effect, a script for the actors (units). [Ref. 32]

The schedule lists the implementation time, the aspect of the deception story to be supported, the task, the unit(s) having responsibility, and applicable remarks. An example from FM 90-2 supporting the aspect that 2nd Brigade is making the main division effort has the following level of scripting. The task is to portray heavier communications-electronics traffic level in the 2nd Brigade zone. The actions are to pad traffic on 2nd Brigade communication nets and to allow only minimum-essential traffic on 1st Brigade communications nets. The units with responsibilities are 2nd Brigade, 1st Brigade, and 52nd MI Bn (CEWI). [Ref. 33]

The schedule is completed all the way through the initiation of the true operation, and past that time to include final actions in terminating the deception.

3. EW Appendix to the Deception Annex

The EW appendix lays out the electronic deception tasks to be accomplished. Since imitative communications deception (ICD) and manipulative electronic deception (MED) usually require some technical detail, the appendix usually is used to spell out tasking to both the MI Bn (CEWI) and maneuver units participating in the projection of the deception story to the enemy signals intelligence (SIGINT)

capability. In some elaborate deceptions this may have TABs which give details of scheduling and the content of false message traffic, padding, radar spoofing, etc. [Ref. 34] Usually, however, a typical tasking for the MI Battalion would be to introduce false information into enemy signal intelligence channels at intervals between D-1 and D-Day to support evidence of the division main attack in the zone of 2nd Brigade and also to provide electronic countermeasures (ECM) support to 2nd Brigade. [Ref. 35] There is a tendency to follow the guidance provided by FM 90-2 which emphasizes the brevity needed in the operations order.

B. EXECUTION AND RESULTS

The deception implementation schedule separates the deception plan into a series of deception measures which if believed by the target will result in acceptance of the deception story. The success of the deception depends on the ability to plan the appropriate deception measures and on the ability to properly execute those measures. A problem exists between planning and execution in that the deception annex is only an outline and may not provide the amount of detail necessary for decentralized execution [Ref. 36]. The effect on execution can be shown using historical examples of recent efforts to use deception to aid the operations of Army units.

1. Decentralized Execution

From 24 March to 28 March 1968, units of the 101st Airborne Division participated in a corps-level deception

plan. The plan was designed to convince the enemy that the main thrust of an attack would be in the Dong Hoa area and to the north. This was to be used to deceive the enemy of the 1st Air Cavalry Division which planned to attack west along Highway 9 to relieve the Khe Sanh combat base.

The concept of the operation required the 101st Division to move one rifle company and a signal detachment to the vicinity of Dong Hoa. The signal detachment was to transmit radio messages simulating an Arrival Airfield Control Group. Communications were to be conducted as if the 2nd Brigade, 101st Airborne Division, was moving to Dong Hoa. The rifle company was to conduct operations in the villages and populated areas to obtain maximum exposure of the Screaming-Eagle patch and give the impression that a much larger force was in the area.

One airborne rifle company and 15 personnel (1 officer/14 enlisted) from Company E, 501st Signal Battalion, moved by air from Bue-Phu Bai airfield to Dong Hoa on 25 March. Two AN/VRC-49 radios and one AN/ARC-121 radio group accompanied the signal personnel. Operational control of the task force passed to the Commanding General, 3rd Marine Division, upon its arrival at Dong Hoa. The 15 personnel were placed in two locations approximately ten kilometers apart. This enabled radio signals to emanate from more than one location. The signal team simulated three radio nets at brigade level, two radio nets for each of three

battalions, radio nets for three companies of each battalion, and two artillery nets.

The division could not evaluate the overall effectiveness of the deception operation; however, some observations and recommendations resulted from reviewing the internal functioning of the operation.

The scenario accompanying the signal personnel included approximately seven messages per net per day. Although ad-lib messages were used to keep the nets active, it was concluded that the scenario should have been expanded with more messages.

Some personnel with peculiar speech patterns were unable to disguise their voices and thereby could only be used to depict the same call sign in a net. This limited flexibility in the use of personnel. It was recommended that radio operators be thoroughly screened to facilitate maximum personnel utilization.

It was also found that inexperienced enlisted personnel had difficulty playing a convincing role as an officer or senior non-commissioned officer. It was recommended that senior grade personnel conduct such operations to add credence to radio messages. It should be noted that this situation was the result of improper radio procedures.

At the termination of the signal portion of the exercise, the Marines assumed the role of the units previously simulated. Transition passed smoothly, except that

only one call sign from the deception scenario corresponded with those of the new unit. The recommendations stated that the planning must insure that the simulated unit does not unrealistically disappear. [Ref. 37]

2. Execution at the 11th Hour

The tide of battle does not always provide the time for detailed planning and preparations. Roger Fleetwood Fesketh concluded his eyewitness report on the "Fortitude" deception that:

> "There is a tendency on the part of those who are constantly at grips with compelling realities to regard deception as a swift panacea to be invoked when other remedies have failed. Although there may be occasions when its services can usefully be enlisted to give immediate aid, it is generally more correct to regard it as a method which achieves its results by a slow and gradual process rather than by lightning strokes." [Ref. 38].

One reason why successful deceptions take time is that the enemy needs sufficient time to collect, process, and report the deception clues. The information usually must be confirmed by collateral sources before it becomes intelligence which is taken to the decision-maker.

Fesketh alluded to some exceptions to the timing rule and the author of this thesis was involved in executing such an exception. The Commanding General of the 25th Infantry Division during Exercise Team Spirit 83 decided on D-1 that a deception was needed to protect the major river crossing. The G3 and his deception officer, the EWC, quickly decided that the only possible option was a manipulative communications deception. The tasking was given to the 125th Military

Intelligence Battalion (CEWI). This battalion was to generate communications traffic over the radio nets of the 2nd Brigade Task Force. The traffic was to indicate that the assault river crossing would be conducted in the 2nd Brigade sector. The deception had to begin almost immediately as the main attack began a scant 18 hours later. The lack of preparation time demanded that experienced personnel who understood the friendly and enemy situation at the macro-level be used as the radio operators. In fact, the six personnel involved in the deception were the Battalion Commander, the Executive Officer, the Operations Officer and their respective drivers.

The personnel who executed the deception relied on their knowledge of stereotyping, pattern recognition, traffic analysis, and the specific requirements for a river crossing operation. They transmitted messages that they knew the enemy signals intelligence operators, the counterparts of soldiers found in their own battalion, would be searching for. Many of the radio transmissions were one-sided, which was acceptable because the radio intercept operators are often faced with that situation due to distances and terrain masking. Other transmissions included the participatory responses of the radio operators of the actual units who had remained on the air.

The deception attempt was a failure in that the enemy did not relocate its armor heavy reserve force. It may not

have been a total failure because the tanks were not committed in time to disrupt the actual river crossing. In fact, one exercise controller informed the 25th Division G2 that the deception activity was intercepted, analyzed, and reported to the enemy commander. A significant amount of intelligence resources were committed to confirm the deception story and the plans to relocate the reserve force were completed. The ambiguity of the situation generated in part by deception at the 11th hour may have contributed to the success of the division's river crossing. [Ref. 39].

3. Implications

The two examples in this section imply that planning is only one part of the deception process. The wartime example indicates that there is a lack of understanding on how a unit is to translate the situationally dependent "what" of the deception task into an executable and believable "how" and "when". The peacetime exercise example shows that adding a deception effort at the last minute severely restricts the scope of the deception. The last minute effort to conduct a deception operation may succeed but usually in a limited way.

The deception planner must be in a position to know the friendly and enemy tactical situation. The planner must understand how deception causes surprise and how the enemy is going to collect those clues which build up to the deception story. Further, the planner must know whether units tasked to execute the deception measures have sufficient

assets and appropriate training to do the job properly. An improper tasking may result in an improper execution.

Decentralized execution runs the risk that one or more aspects of the deception may go wrong and ruin the entire effort. There must be a system of checks to insure that the deception story has remained true to the plan.

C. SUMMARY

FM 90-2, Tactical Deception, provides an excellent outline to be used for deception guidance as long as it is understood that a deception outline is not a deception plan. The gaps in the outline must be filled in according to the situation. One unit's plan might require a complete script with the who, what, when, where, and how totally spelled out for each player. Another unit's plan might include a certain amount of flexibility in execution. Some things work in one situation but do not work in the next and that makes deception a very hard subject to teach.

Deception cannot be taught as well as it can be learned in the field. It must be learned in peacetime training, but that is not always being accomplished. Exercises are scenario-oriented and asset-limited. Many good deception plans are never executed because of lack of assets. Most units only get one chance to learn how to execute a successful deception and that is usually provided once the unit has gone to war. Deception must not be ignored in peacetime if it is to be used in times of war.

Barton Whaley, in his book, Stratagem: Deception and Surprise in War, concluded that:

> "The deceiver is almost always successful regardless of the sophistication of his victim in the same art. On the face of it, this seems to be an intolerable conclusion, one offending common sense. Yet, it is the irrefutable conclusion of historical evidence." [Ref. 40]

D. THE NEED FOR ANALYSIS OF TACTICAL DECEPTION

Historical examples and written observations can go far in explaining a complex process such as deception. Far more information on deception is available than the casual observer is aware of, this is due in part to the recent declassification of many of the operations of World War II. Yet, it is difficult to accept the impressive conclusions that analysts such as Barton Whaley have provided. Further, it is difficult to project these conclusions from the strategic level to the tactical level.

Much of what is known about deception is from the British experience. Obviously there are more recent examples that remain classified. Many changes in technology have transformed the battlefield and it is tempting to assume that the deception practices of World War II and earlier no longer apply to modern war. The dummy soldiers and vehicles of that era would not be effective against the sophisticated surveillance systems available today. Nevertheless, technology on the battlefield is an evolutionary process. Each new system fielded on one side can be rapidly countered by the systems of the other. Deception techniques are used in

hardware such as jammers and decoys against hardware such as radars and electro-optic and infrared sensors. The missions for communications jamming teams still include imitative communications deception. Much of what can be learned from earlier experience can still be usefully applied to today's battlefield.

The optimization of tactical deception must include not merely deceiving machines but ultimately deceiving the men who rely on them. Therefore, the need in analyzing tactical deception is to discover the full role that it can play in future battle.

There are several ways to systematically analyze deception to gain an understanding of means to optimize and integrate the future practice of tactical deception. One method is to do a comparative analysis of case histories to determine common factors and the cause and effect relationships. A second method would be to analyze tactical deception from a multidisciplinary approach to develop a common view of deception's primary elements and their relationships. Both methods will be used in this thesis so that conclusions can be drawn from each.

V. THEORETICAL APPROACHES

The theoretical approach was employed at the Naval Postgraduate School in a joint investigation of deception which began in early 1979. Four studies by William Reese, Ronald G. Sherwin, and Paul H. Moose specifically focused on application of game, communication, organization, and systems theories. The remaining three studies were by Donald C. Daniel and Katherine L. Herbig, Richards J. Heuer, and Theodore R. Sarbin. They were more eclectic, drawing from historical cases and documents and concepts and principles derived from many academic sources. The three eclectic studies focused on decision-making and perceptual and cognitive processes [Ref. 41]. This section will summarizize some of those multidisciplinary concepts as they can be applied to tactical military deception.

A. COMMUNICATIONS THEORY

Communications theory focuses on the problems of transmitting information between a sender and a receiver. The classic model is a linear progression of information from a source through an encoder, channel, and decoder, to a destination. Noise enters the model to affect all but the source and destination [Ref. 42]. This model can be applied to both the tactical deception planning process and the deception execution process.

1. Communications Model of the Planning Process

The planning process focuses on the deception story which must be communicated from the source to the destination. The source is the commander who authorizes the deception. The receiver is the opposing commander who is the prime target of the deception. The source determines the overall objectives that he wants the deception to accomplish. The receiver has the ability to cause the desired action to take place. The deception plan is successful if the false information that is transmitted biases the target's decision-making process at the destination and causes the target to act in a manner that is advantageous to the deceiver.

An encoder is the person or organization which assists the deceiver by planning the deception. It is possible that the commander might perform this function by himself, but usually the planning is done by the staff. In the case of strategic operations the deception planners are normally a separate body of planners who are specifically chosen for their special abilities in this function. The tactical level is much more restricted in personnel and the deception planning function at division level is often relegated to an additional duty of the Future Plans Section of the Operations Staff. That section coordinates the preparation of the division operations orders and is in a position to call upon the functional expertise of the rest of the division staff. The encoding of the deception plan is done in much the same

way as the real operations plan is encoded for the commander. The difficulty is that the encoders are normally chosen for their ability to encode tactics in a manner that will be communicated within the organization and that will be received by personnel with similar training in those tactics.

Planning the deception requires that the encoder work the communications problem backwards. The encoder must predict the information that must be received at the destination to produce the desired results. The encoder must anticipate the effects that transmission of the signals will have on their amplitude and their fidelity and make allowances for the changes that may result after the signals are sent. The encoder must recognize the channels that are available to send information to the enemy. He must convert the source message into an indicator set that is suitable for transmission over the available channels and that will be received in the desired form at the destination.

The role of the encoder of deception is made difficult in that he has no control over the signals after they have been sent. There is no assurrance that they will be received or that they will be processed in the anticipated manner. The effects of noise and the effects of chance may never be known unless there is some feedback to the deceiver.

The channels that may be used to send tactical signals include all aspects of the environment that are monitored by the enemy. Tactical deception channels are visual,

sonic, olfactory, or electromagnetic in nature. Each channel is characterized by its physical form, the time associated with transmission, and the random events that modulate the signal during its transmission from the deceiver forces to the target forces.

The channels that can be used to transmit information for a tactical deception are somewhat different than those for a strategic deception. Time produces the biggest difference. The tactical arena of modern war may be very fast-paced especially if the mechanized forces predominate. It is possible that battle areas might move up to 70 kilometers a day. In such an environment, both forces would depend heavily on electromagnetic reconnaissance, intelligence summaries from higher headquarters, and tactical reports from front line units.

Tactical situations where battle lines are more static would present the capability to transmit information through additional channels. Each force would use patrols and raids to gain information. Residue from recently-vacated enemy territory would be sifted for intelligence data. Prisoners of war, line-crossers, and personnel from the indigenous population would be interrogated for collateral information. The tactical units would report any information of what is heard, seen, or smelled by individual soldiers. Specialized intelligence units would be given the time to practice their professions.

All of the information would be processed through a series of intelligence analysts and officers until the overall picture of what the enemy is doing or intends to do becomes recognizable. Given time, even the spy networks which are so applicable to strategic deception would begin to filter information through to the intelligence system. The time is usually available even at the tactical level because there must be a lull in battle to reconstitute and resupply forces. There must be time to plan the battle and prepare for it. There must be time to clarify the situation so that the force with the initiative can avoid the costly ambush.

The role of the decoder in the deception planning analogy is to convert the signal from the form in which it is received at the channel output to the form usable in the decision-making process. Decoding involves the processing of information into the intelligence that arrives at the destination.

The information that is collected throughout the battlefield is of many types and qualities. Once it is collected it must be forwarded in a timely manner to the person who has requested it. For example, the infantry soldier who observes an enemy or specific enemy weapon reports it through his chain of command. At company level, the report is sent to the battalion intelligence officer over a dedicated intelligence net. If the information is of sufficient importance, it is sent to higher headquarters,

if not, it may be held to be combined with other information and eventually become part of a periodic intelligence report or periodic intelligence summary. [Ref. 43]. The information that is of value only to a particular level is not transmitted higher. If the intelligence value is perishable, than it dies when its designated time is up [Ref. 44].

Intelligence personnel are trained to recognize what is important. They are also trained in the manner in which different categories of intelligence should be handled. Some of the information remains intact through many different handlings of it. Other information rapidly loses its form but may not lose its content.

There is specialized information such as that which is received by radars, radio intercept, electro-optical devices, radar intercept devices, photographic, or imaging devices that enter the intelligence system directly [Ref. 45]. This direct information flows through parallel communications lines to the analysis nodes.

The decoding by the different nodes is a critical point that must be considered by the deception planner. Channels that are unreliable or unsuitable lead to nodes where that information will be neglected or ignored. Decoding paths that are not timely may result in the information being lost or arriving too late to have any effect. The framing of the information at the decoding node may result in the wrong meaning being attributed to it.

Each decoding node may be viewed as a gate which manipulates the information into the intelligence that is its end product. Some nodes process only collateral information and some process only specialized intelligence or information. Some nodes process all-source information and those nodes become more prevalent as they near the ultimate destination. [Ref. 46]

All nodes are important because the deception story was encoded into an indicator set that may be meaningful only if the majority of the indicators arrive at the destination intact. The indicators must present enough of a challenge to the enemy analysts or else they will be suspect. Too many duplicate indicators, sent to allow for attrition, may also reveal the deception. Yet, the absence of corroborating information at any node may result in inattention. The enemy analyst decoding the indicator set does not have the big picture until all of the important information has been decoded. [Ref. 47]

The indicator set of the deception story is communicated in the presence of noise which includes all random occurrences that interfere with the signals. Noise may cause the encoder to generate indicators that are not appropriate for the message simply because of a misperception of the desires of the source or a faulty understanding of the channels, the decoders, or the mindset of the enemy commander who is the deception target.

The encoder may choose the wrong or the inappropriate channels. Noise may corrupt the indicators once they have been transmitted or it may block a channel entirely. Noise may enter the decoding process resulting in critical indicators being ignored or misinterpreted. The effect of noise is unpredictable. [Ref. 48]

2. Communications Model of the Execution Process

The execution process is concerned with the specific communication of the signals which support the indicator set and the elimination of unwanted signals. Each indicator may involve many different signals which show up in physical events, movement on the battlefield, communications, or other activities. Each signal must be controlled so that it supports the desired indicator and does not interfere with other desired indicators. All of the signals whether they are hiding the real or displaying the false should be integrated to be mutually supportive.

The communications theory model may be applied to the actual signals which are transmitted in the execution of the deception. A typical illustration is that of a radio transmission. The source is the radio operator who sends the deception message. The destination is the enemy radio intercept operator who is listening to the message. The encoder is the radio transmitter and the decoder is the radio intercept receiver set. The channel is that portion of the electromagnetic spectrum used in the transmission and the

physical propagation of the electromagnetic wave from the transmitter to the receiver. The noise is the intentional or unintentional interference of other electromagnetic waves in the environment at that frequency or it could be noise internally generated by the transmitter or receiver. [Ref. 49]

Technology is more applicable to the communication model at this level. The deceiver must know the technical parameters of the situation. Electronic deception is useless if the enemy does not have compatable equipment, if the transmitted signal is blocked by terrain, or if the range is such that the signal is attenuated below the noise level. Visual deception cannot be used to transmit signals if the enemy's imaging or photographic reconnaissance effort is designed for a lesser range. Similarly, camouflage against visual observation will not protect against detection by sensors using a different part of the electromagnetic spectrum. The transmission or the protection of deception signals must be designed according to the target's capability to detect those signals. [Ref. 50]

3. Implications of Communications Theory

It might seem that there would be only a small probability that the deception story intended at the source would be correctly received at the destination. In fact, the opposite is true if the deception planner correctly understands the process. The enemy situation can be understood sufficiently to predict the mindset of the enemy commander,

his decoders, and his collectors. The key personalities and their working models can be understood in light of their training and experience.

The effect of enemy doctrine and goals on performance can be researched and all available information can be used to predict, with a fair degree of accuracy, the decoding function that will be used by the target's intelligence system. Thus, the key is to match the encoding process used by the deceiver to the decoding process used by the target. Once that is done the indicators can be transmitted with calculated redundency over channels where the noise level can be predicted in terms of accuracy and reliability.

It is possible that a direct feedback loop may be established so that the effects of the noise can be measured. This feedback could come from many different information sources, but perhaps the most applicable is the feedback coming from the intercept of the target's radio communications. Although modern armies have gone far towards the securing of key communications nets with encryption devices, many vulnerabilities still exist. [Ref. 51]

A feedback channel allows the deception planner to modify the indicator set to optimize the effect of the deception story. Feedback can indicate the level of misdirection or ambiguity that has been gererated in the target system and can highlight changes in those levels as the enemy's perception of the deception story evolves.

The level of ambiguity must remain high enough to protect the secret of the actual operation. If indicators of the real situation or plan are received by the enemy they create contrary evidence. The existence of contrary evidence could be used to indicate inadequate deception effectiveness.

Feedback can also indicate the time differential that exists between information collection and analysis. That may be a direct reflection of the effectiveness of the deception as it takes longer for the target system to function in the presence of the deception ambiguities. [Ref. 52] Other functions of feedback are to determine whether the target believes the information being received at the channel outputs and whether he attributes the meaning to the indicators that the deceiver intended. The key measure of effectiveness is whether the target acts on the deceptive information in ways contrary to his true interest. [Ref. 53]

3. ORGANIZATION THEORY

Tactical military deception is restricted to individual battles or limited campaigns, but even at the U.S. Army division level the forces involved are numerous and complex. Organization theory employs the notion that large organizations are involved as targets of deception. These organizations can be viewed as intelligence or information-processing organizations whose function is to attend to, process, and transmit information to the decision maker who is the ultimate target of the deception.

There are many sensors on the battlefield. The sensors range from the individual soldiers in contact with the enemy to complex systems of specialized equipment and men collecting signals emanating from all areas of the battlefield. These signals characterize the operations of the forces that generate them. There is little activity that exists in a division area of operations that is not subject to being sensed by the enemy. The problem is not one of collecting signals generated by the enemy, it is to collect only the important signals and to produce the intelligence from them that is essential for rational decision-making. The processing and reporting of intelligence requires a specialized organization that can be analyzed and understood from the organization theory perspective.

Analyzing the tactical deception process may be enhanced through viewing the deception target from the organizational perspective, since it allows deception to be more uniformly applied. The target is no longer an unknown or little known entity but is an organization which has discrete properties that remain relatively constant regardless of the personnel who belong to the organization. Once the factors that effect the intelligence organization's relationship to decision-making are understood, it may be possible to manipulate those factors to perpetrate a deception.

The factors of the organization which must be understood are of two types. The first type involves information of how

the parts of the organization function in relation to each other. An understanding of the men and machines at the functional level is necessary and the command and control process typifies the relationship. The second type of information is that which provides the framework for the setting of group goals and objectives. Obviously, an understanding of the military doctrine which applies to the enemy as a whole would be a source of information on the guidelines or rules of thumb being used by the specific organization that is being targeted for deception. The data base of the general attributes of the organization is the starting point upon which more specific information is built.

The physical organization of tactical units is fairly well documented for all potential deception targets. The documentation includes line and block charts which reflect the command authority. Each block can be understood in terms of function and in terms of equipment and men associated with that function. Each line can be understood in terms of the communications paths and means that will be used to provide interface networks. The general information applies to all like units and standardization of units is necessary for all large modern armies. The specific deception target may have portions of the organization which are not standard and the identification of those anomalies would be a regular intelligence collection task. It is very important to understand the target organization within the framework of the enemy

system and not simply generate functional attributes based on analogy to the U.S. system.

A significant difference between the two systems is the Soviet's ninth principle of war which goes beyond requiring commanders to be determined and decisive in carrying out the assigned mission. Subordinate commanders must carry out the spirit and letter of the plan. Soviet initiative is exercised in finding unique ways to execute the plan but does not allow commanders to revise the plan based on changed circumstances. The plan is expected to proceed according to the milestones and times dictated. [Ref. 54]

There are other features of military art which typify the organization which are very important to the deception process. Soviet command and control requires efficient staff work which in the interpretation has resulted in the use of working and decision aids that are becoming more and more automated. The decision aids are designed to speed the command and control process. Such an aid might predict the size and composition of forces that would be required to insure success against an objective in a situation in which the parameters can be codified. Other aids might yield optimum timetables for an operation or the movement of forces. Planning aids might allow the rapid coordination of staff inputs and might output the alternatives available for the solution of the military problem. The planning aid might also rank the alternatives by success probability. [Ref. 55]

One factor of the organization that can be analyzed is the interaction structure of the intelligence processing system. Knowing the patterns of interaction can help determine to what extent the deception target is structured hierarchically and can identify communications bottlenecks.

A second factor of the organization which can be observed is the degree of responsiveness to changes in the environment. Even though a Soviet combined arms army, for example, has vast resources for the collection and processing of information, that information might not be used in the decision-making process in certain situations. The decisions may not be the prerogative of the army commander but might be dictated by the front or higher level commander. In such a situation, the organization which is the combined arms army would be operating in a totally closed fashion and would not be responsive to external signals.

Another attribute of the organization is how it assigns meaning to intelligence information. An understanding of this factor can be obtained by researching the information processing system of an opponent and applying the paradigms of psychology which help predict human performance. The framework of the organization allows the general application of cognitive biases and perceptual biases which yield an understanding of what information will be attended to, how that information will be interpreted, and how it will affect the decision-making process. [Ref. 56]

The effect of stress on information processing and decision-making is also an attribute of the organization that can be analyzed. An organization under no stress can be equated to an army that is not involved in battle. The situation is ambiguous but the analysts feel that they have sufficient time to collect more information and make a more precise evaluation of the situation. There is more time to generate and evaluate alternatives. Preconceptions about the enemy will have a large impact on the generation of the initial hypothesis set. If the situation involves a moderate degree of stress such as that which is generated when battle is imminent, the organization actually performs better. Information flows faster and is less subject to being biased. The need for decisions is great, but there is a perception of sufficient time to evaluate the situation and make the decision based on information that will be sufficient.

High stress situations such as actual battle conditions introduce the perception that the decisions will have to be made before sufficient information is available. [Ref. 57] The commander has a tendency to make his decisions based on his own preconceptions of the situation rather than on the merits of the available information. An organization's reliance on preconceptions can be equated to specific time periods related to the start point of the battle. [Ref. 58] Thus, the negative impact on hypothesis-generation and decision-making can be anticipated.

Organization theory can aid in the understanding of the enemy. The battlefield application is most efficient when information on the organization's key people and their performance records is available; however, the organization framework fills in some of the data which may be missing from the intelligence data base.

C. SYSTEMS THEORY

A major weakness of much of the operational planning that is done is that it is based solely on the quantifiable principles of war without consideration of any cybernetic processes. The enemy is taken into account in the planning but usually in terms of location, disposition, combat power, possible courses of action and probable intentions. These and similar factors are based on the intelligence information that is present at the time of the course of action brief. That situation is used to generate the different hypotheses for the projection of the enemy situation to the time when the plan or operation will be placed in motion. Once the planners have decided what they think the enemy will do, that decision is very hard to change [Ref. 59].

The enemy situation serves as input to the development of the courses of action. Three to five possible courses of action are proposed to the commander. At this point, the limitations of the human mind take over. The human mind can assimilate only limited amounts of data and can maintain only three to five hypotheses at time [Ref. 60]. The enemy

situation is simplified by the mind so that only the most probable and most salient situations are used. [Ref. 61]. Again, when the commander makes his decision on the friendly courses of action, that decision is hard to change. In fact, it is hard to determine exactly what data was pertinent to the decision. There is a tendency to stick to the decision even if some of the information that was presented during the course of action brief is later proven to be faulty. [Ref. 62] The point is that the enemy should not be viewed as being a passive part of the system. The logic of military operations is such that the terrain, the weather, logistics, and the relative forces often dicate the optimal tactics for a plan. Yet, if the logical option is equally obvious to the enemy, the advantages for those tactics can be offset by the his counterpreparations. [Ref. 63]

Deception can be viewed in light of systems theory as the interaction of two organizations and their environments. Each military force is an organization with properties that will be known fairly correctly by its opponent. The two organizations are capable of communicating through their intelligence functions. The conditioning of that information as it passes through the respective organizations can be understood in light of the goals and biases of the opposing organizations. Thus, there is a certain amount of predictability which can be assigned to the system by judicious application of communications and organization theory.

Systems theory takes into account the role of feedback and the role of the environment. The environment is a third part of the system which introduces stimuli into sensing capabilities of of the two opposing organizations. The environment can be changed by the actions of either organization or by factors which are out of human control. The environment can modulate the stimuli that are inputs and the responses that are outputs of either organization. Unpredictable behavior of the system may be generated by random or unaccountable events caused by the environment or by imperfect knowledge of the predictable events. The unpredictable behavior must be adjusted for in order to optimize deception because deception requires the ability to predict future behavior of the system and influence it.

The responses or actions of each organization become stimuli which establish a new situation. The proper choice of stimuli by the deceiver can establish control over the future stream of events by sending information to an adversary with the purpose of predetermining his decision. Once initial control is gained, the deceiver can set in motion additional actions which capitalize on the advantage he has gained.

The Soviet organization was used as the primary example in the preceeding analysis of organization theory. The same example will be used to see if the Soviets have adopted a similar systems view and it seems as if they have. The

Soviets began research in cybernetics much earlier than did the United States. Soviet thought developed into a theory for reflexive control which was expressed by Lefevre and Smolyan in the 1968 book, Algebra of Conflict. They wrote:

> "Control of an opponent's decision, which in the end is a forming of a certain behavior strategy on him through reflexive interaction, is not achieved directly, not by a blatant force, but by means of providing him with the grounds by which he is able to logically derive his own decision, but one that is predetermined by the other side. . . . The process of transferring grounds for making decisions from one opponent to other we call reflexive control, any 'deceitful movements' (provocations and intrigues, disguises and feints, construction of false objects, and deceit in general in any context) are achievements of reflexive control." [Ref. 64]

The application of the systems model to military deception was based on the fact that military organizations are complex systems. The Soviets already had a model for complex systems and observed that military organisms corresponded to the objects of the research in the theory of systems. Since the formal attributes were the same, military organizations were complex systems in the broadest sense of the word. The theory evolved to where Tarakanov, in 1974, concluded that "any combat operation from the standpoint of its formalization can be considered a system." [Ref. 65]

It was determined that the systems view fit very closely to the application of military science. The concept could be used as a model governed by rules that could be quantified. In fact, it is necessary to understand the Soviet concept of systems and the Soviet concept of cybernetics before one can understand what the Soviets mean by "troop-control." Soviet

"troop-control" is similar to "command and control" but it is slightly more involved. Shavrov and Galkin expressed the following in 1977:

> "A new, most promising form of model--the cybernetic model--has appeared in connection with the necessity of research on complex systems in which particular importance has come to be given to the system's elements that carry out the function of control. In these models mainly the control processes that take place in reality are mathematically reproduced with regard to the operations of processing, transmitting, and storing information. From the point of view of the material world's dialectical development, this cybernetic modelling represents the greatest generalization of all previous methods of modelling. It allows one to investigate complex dynamic troop-control systems according to a great number of attributes. . . . The principal peculiarities of cybernetic modelling are: (1) The functional behavior of the overall system and its individual elements under environmental conditions, (2) The mandatory tory presence of effectiveness criteria for the system's functioning, and (3) The possibility to widely use for the practical realization of mathematical models contemporary electronic computers that allow one to carry out quick and accurate modeling of complex systems of control and to determine optimal ways of improving effectiveness." [Ref. 66]

The same ideas that show up in the Soviet view of command and control in the context of their principles of military art are apparent in their cybernetic model. The level to which they have been able to realize mathematical models and computer applications is questionable; however, the applications have been postulated. This theory is part of the Soviet organization and should be considered for deception.

D. GAME THEORY AS PART OF DECISION THEORY

The possible use of mathematical models to assist in Soviet decision-making at the operational and tactical levels

leads into decision theory with emphasis on game theory as one approach. The application of game theory to the decision process is a model which is distinct from war gaming. It would seem that games based on probabilities and expected values fit into simple algorithims that might be used in the Soviet command and control of operational forces.

The objective of decision theory is providing decision-makers a basis for making an intelligent choice as to which alternative is best. The methods are quantitative, using the techniques of mathematics to deal with the quantifiable aspects of the problem. [Ref. 67] The advantage of providing a quantitative basis to a decision-maker is that he is able to approach the decision with a better understanding of the consequences.

Decisions must be made with varying degrees of knowledge about the conditions under which an operation or action will take place. The book, Naval Operations Analysis, separates conditions according to the degree of risk that is involved in predicting the state of nature that will occur. The amount of risk involved in picking the single best course of action is determined by the uncertainty. Decision theory addresses four possible cases of interest. [Ref. 68]

The first and simplist case arises when it is known with certainty the state of nature which will occur. The decision matrix is simply one payoff for each possible course of action. The criterion that should be used for comparing

alternatives in the case of decision-making under certainty is the best payoff. [Ref. 69]

The second case arises when it is not known which state of nature will occur, but where the chance that each will occur is known. This situation is known as decision-making under risk and the expected payoff for each course of action would be the value of the weighted average using the probabilities assigned to the different states of nature. In decision-making under risk, the commander would be advised to choose the strategy which optimizes the expected value of the measure of effectiveness. [Ref. 70]

The third case arises when the decision-maker does not know the probabilities of occurrence for the various states of nature. This situation is called decision-making under uncertainty. This thesis will address four criteria that might be used in this situation to choose a best course of action. These four are the maximin or pessimism, the optimism, the least regret, and the rationality criteria. [Ref. 71]

The three cases of decision-making under certainty, under risk, and under uncertainty apply to situations where the states of nature occur without regard to their effect on the payoff for the decision-maker. The techniques of mathematics and statistics applied in such cases are called statistical decision theory. A fourth case of decision-making arises when the states of nature are controlled by a rational

opponent, who may be expected to act in a manner which frustrates the goals of the decision-maker. A decision situation which is against an active opponent is known as a game of strategy and is subject to a part of mathematics called theory of games. [Ref. 72]

A theory of games was established in 1944 by the publication of the book, Theory of Games and Economic Behavior, by John von Neumann and Oskar Morgenstern. The authors of the theory hoped that it might form the basis of decision-making in all situations where multiple decision-makers can affect an outcome [Ref. 73]. The theory uses the payoff matrix in the same way that it is used in statistical decision theory. The payoff matrix can be used to represent various conflict situations. In planning, the estimate of the situation is essentially a formulation of a matrix game in which the commander arrays his own courses of action against the capabilities of the enemy [Ref. 74].

It is necessary to consider all four of the situations found in the military as games of strategy and games against nature. It is necessary because the commander must be able to recognize the type of situation that he faces. He may or may not be in contact with the enemy and so he may not be in the direct conflict game situation. All of his decisions will be made under uncertainty, risk, or certainty and the difference is mainly a function of how well his intelligence service performs.

Certainty, risk, and uncertainty situations differ in the degree of knowledge available about the state of nature that will occur. The first and rare case is when the state can be known in advance. That case would correspond to complete success at G2 operations. There is no risk involved in knowing enemy intentions and so the criterion used for comparing alternatives is the best payoff. A risk situation is that in which the commander does not know for sure what will happen but can predict the probabilities for each state of nature regardless of whether a choice is possible for the opposing commander. The commander chooses the strategy which optimizes the expected value after the weighted averages for each alternative are calculated. Decision-making under uncertainty arises when a commander does not know enough about probabilities of occurrence for any of the various states of nature to predict their influence on his choice of action. In military operations, decision-making under uncertainty is primarily of interest as an indication that G2 is not doing its job properly. [Ref. 75]

1. Environments and Criteria

The four main uncertainty criteria for decision-making in the military are pessimism, optimism, regret, and rationality.

The criterion of pessimism minimizes the risk involved in making a decision. It is also referred to as the maximin criterion since the minimum payoff for each course of

action is first found and then the alternative is chosen that yields the maximum guaranteed payoffs. [Ref. 76]

The criterion of optimism may be implemented by degree of optimism. The complete optimist uses a maximax strategy assuming that the state of nature will occur which is best for the optimist. The optimist will choose the action which provides the best payoffs. [Ref. 77]

The third criterion is based on minimizing regret. It applies the pessimism criterion to a regret matrix to identify the course of action which yields the least amount of regret. A commander who would use this criterion is the one who looks back on his decisions after the action is over to see how much better he could have done by predicting the correct state. [Ref. 78]

The criterion of rationality accepts that complete uncertainty about the probable state of nature is equivalent to assuming that each state is equally probable. The expected payoff for each course of action is computed by weighting each state of nature equally.

TABLE 3
DECISION ENVIRONMENTS AND CRITERIA [Ref. 79]

DECISION UNDER	CRITERIA
CERTAINTY	HIGHEST PAYOFF
RISK	LARGEST EXPECTED PAYOFF
UNCERTAINTY	PESSIMISM, OPTIMISM, LEAST REGRET, AND RATIONALITY

2. Game Theory and the Conflict Situation

Game theory is a mathematical theory of decision-making in conflict situations between two opponents with opposing goals. The game theory payoff matrix provides a method by which each participant can make a decision as to which alternative should be chosen [Ref. 80]. The decision depends on the criterion used. The proper criterion depends on the situation and the degree of speculation allowed by the commander. In general, a military commander makes conservative decisions. He desires to gain as much as possible, safely, in the face of a skillful opponent whose objective is diametrically opposed. This is essentially the maximin criterion, which is the reasonable criterion to use in a conflict situation involving a rational opponent. [Ref. 81]

The maximin criterion is a pessimistic strategy conducted under uncertainty to insure that the greatest expected value will be attained against an enemy who makes the wisest choice. Once the criterion has been established, the conflict situation can be placed in a matrix form known as the "two-person, zero-sum" matrix. An example of this type of matrix is shown in Table 4.

TABLE 4
TWO-PERSON, ZERO-SUM GAME MATRIX

	RED OPTIONS		
BLUE OPTIONS	R1	R2	R3
B1	FAIL	SUCCEED	SUCCEED
B2	DRAW	SUCCEED	DRAW
B3	SUCCEED	DRAW	FAIL

The case shown in Table 4 is in the standard form which has all payoffs from the point of view of the blue commander. A payoff which is a blue failure is also a success for red. Red wants to minimize the payoff for blue. Red will rationally choose either option R1 or option R3. Blue, knowing that red will never choose R2, must risk either B1 or B3. Those options have an equal chance of failing or succeeding. Blue might want to be cautious and choose B2, but choosing B2 will result in a draw every time.

The military estimate of the situation is very similar to the two-person, zero-sum game [Ref. 82]. The intelligence staff predicts the red options and the operations staff develops the blue options. The commander works with the entire staff to determine which blue option will have the highest payoff in light of what red can do. The situation might be shown as a game matrix in which the matrix values represent the postulated values of the outcomes of the battle. An example would be:

TABLE 5
COMMANDER'S ESTIMATE GAME MATRIX

BLUE OPTIONS	RED OPTIONS R1	R2	R3	R4
B1	1	0	6	4	0
B2	2	2	3	3	2
B3	1	9	9	9	1
HIGHEST	2	9	9	9	2=2
LOWEST					

The rational blue commander would assume that red would pick R1 to achieve the minimum of the maximum payoffs for blue. Blue would then decide on option B2 which guarantees a payoff of at least 2. This discussion has assumed that the payoff matrix is the same for both commanders, but in this situation the blue commander can do at least as well under a different enemy payoff matrix. This example is a saddle point game. There are other other examples of games with dominance and games requiring mixed strategy. A commander's use of a single course of action for all plays of the game is a pure strategy. A mixed strategy is a way of using two or more courses of action on different plays of the game. The optimal strategy called for in the solution to a game is the optimal pure strategy in a game with a saddle-point, and is an optimal mixed strategy otherwise. The commander of the inferior force may not have an optimal strategy because he may not be able to use game theory at all. Elementary game theory and further examples are explained very well in the book, Naval Operations Analysis.

There are two observations on use of games in conflict situations. The first is that military conflict may be a series of one time plays of the game. The expected payoff which is near certainty with a large number of repetitions of the game is not realized for one time plays of a game calling for mixed strategy. For any one play of the game, the commander may realize more or less than the value

of the game [Ref. 83]. The second observation is that intelligence has a great impact on the value of the game.

Established doctrine dictates the selection of that course of action which promises to be most successful in the accomplishment of the mission, regardless of what the enemy chooses to do in opposition [Ref. 84]. Knowledge of the enemy's plan, in part, can eliminate some enemy options in the game matrix. This intelligence allows a commander to maximize against fewer enemy courses of action rather than against his whole spectrum of capabilities. It may be rare to have perfect intelligence, but it is common for intelligence to be able to eliminate many of the enemy's strategies. The strategies eliminated by intelligence may be discarded from the matrix. The use of intelligence is equivalent to eliminating some enemy capabilities. The value of intelligence is the difference in the value of the game after the enemy options are eliminated. [Ref. 85]

3. Deception Impact on the Game Matrix

Theoretically, it should be possible to use deception to influence the game matrix used by the enemy. Deception used to eliminate the best enemy course of action deletes it from the matrix. The best time to use deception is before the enemy's matrix is produced during planning. Deception might be used to convince the enemy that the blue force is not able to execute a certain option. That option would never be entered into his matrix. Deception might be used to

change the enemy understanding of the payoffs for several combinations of alternatives. The matrix changes produce changes in his expected value of the game. The use of deception by the inferior force commander, for example, is necessary to counter the enemy proper course of action so that he does not use it. The commander of the superior force might use deception to enhance payoffs, increase gains, reduce casualties, or exploit the situation. The deception may produce courses of action which are not otherwise possible, or not worth the risk.

4. Soviet Views on Game Theory

There is much of interest in game theory in Russia. Indications are that the Soviet commanders will use the cauticus criterion of choosing the best of the worst possible outcomes (maximin). There are indications that the Russians will attempt to reduce game choices through the use of intelligence, intimidation, and reflexive control; thereby increasing the Soviet payoff. [Ref. 86]

Soviet literature yields some indications that the Soviet hierarchy believes that game theory has some application to the execution of deception. In 1971, Ionov wrote,

> "Considering on the whole that tactics of deception should always run one step ahead of what the opponent knows about these tactics. . . . Control of an opponent's actions should be viewed as the fine art of applying non-repeating techniques, keeping one step ahead of the same stratagem being employed by the opponent." [Ref. 87]

Such thinking proposes that random action generated by choices determined by the flip of a coin, for example,

might be applicable to military conflict. Such techniques for random action could be incorporated into automated decision aids.

The Soviet view of game theory should be discussed in relation to their concept of reflexive control. In such a view, reflexive control would be used to predetermine the actions of an opponent. K.V. Tarakanov wrote the following in the 1974 book, Mathematics and Armed Conflict:

> "The gaming theory methods in combination with reflex control methods are an effective instrument in selecting the optimal plans for combat operations and implementation in the course of armed confrontation by sides. Here, displaying military art, the commander knows ahead of time the costs of his risk and its possible results." [Ref. 88]

One of the basic rules for the use of deception is that the plan must be based on how the enemy perceives the situation. The same necessity to understand the enemy is an important factor when using game theory. This idea was stated in 1973 by a Soviet writer, Solnyshkov. He wrote:

> "When analyzing a situation it is very important to know the psychological features of one's opponent. If he is cautious, then his selection will evidently be based on the principle of maximum [sic. Minimax?]. In this situation one can hardly count on success by selecting an action variant with the existing arrangement of manpower and means, for the enemy is already basing his decision on our most powerful variant. Perhaps it is better to create a preponderance of forces in the projected area of action by weakening forces in other sectors, since the cautious opponent will scarcely take advantage of this." [Ref. 89]

5. Implications of Game Theory

The strategies used by the two opponents determine their choices. It is the strategies which are important and

which are susceptible to analysis. Strategy can be defined as a plan for choosing individual moves which is complete in that all possible events must have been anticipated in the plan. It is possible using past experience, then, to analyze whether the opponent's game solution involves a mixed strategy and to analyze whether he bases his strategy on randomness or on the elimination of chance. Analysis can show if the opponent has a dominant choice. If so, there is no reason for him to deviate from that choice whether he is deceived or not.

Game theory provides a model which can be used to test whether an opponent's past behavior has been rational. This helps establish patterns of behavior that may be random and unpredictable, may be rational and predictable, or may be rational but unpredictable. The last would seem the most advantageous to the professional military as it incorporates the effective use of intelligence and applies the tactical rules of war. The unpredictable pattern may be introduced through the use of deception.

When deception is available as a choice, each situation becomes one of high uncertainty where an opponent can never be sure whether deception is being used or not. The uncertainty has two main effects on the payoff matrix. One effect is that the opponent must double the size of the payoff matrix to account for each choice involving deception or not. In such a case, the matrix may be too complicated to

use as a model and the game becomes of little use in simplifying the decision. The second effect is that all intelligence is placed in doubt when it is not clear if the information collected was deception or not.

The possible use of deception compensates for imperfect security as the opponent must decide whether his intelligence is based on information which is real or deceptive. This also tends to keep the situation ambiguous while the intelligence forces collect additional information to reduce the ambiguity. The advantage goes to the attacker in situations of uncertainty, but again, the fear of a trap reduces that advantage. The defender sometimes will delay commitment until the uncertainty is resolved and hope to eliminate the attacker's advantage totally. The penalty for waiting too long for clarification is that surprise is guaranteed.

Game theory is one way of looking at the system and it is applicable to a deception process if the battlefield interaction can be viewed as a direct conflict between the opposing sides. A battle may be considered to be a two-person, zero-sum game.

Game theory is of little use in analyzing the past use of deception, but it does provide a strong theoretical argument for the occasional or even the continuous use of deception at the U.S. Army operational level. The Soviet's will need evidence of the probable use of deception by the

U.S. Army. The Soviet's perception of probable American use of operational deception will make their intelligence task considerably more difficult.

E. PERCEPTUAL AND COGNITIVE PROCESSES

The target of a tactical deception is the enemy commander. The commander may be directly targeted with deceptive information if his behavior pattern is predictable. The Chinese intervention in the Korean War may have been such a situation. General MacArthur was personally and completely surprised by that action even though there had been indicators of the possibility. The fact that General MacArthur had rarely been incorrect in his past assessment of the enemy could have led him to disregard many of the indications that the Chinese might intervene. He might have influenced the intelligence collection requirements, and that could have been the prime factor which allowed the U.N. forces to be in positions of disadvantage when the surprise attack began.

The commander may be indirectly targeted if the deceiver focuses on the organization which provides the information upon which the commander bases his decisions. Knowledge of the enemy organization and the way that it functions would predict which means of deception would have the greatest probability of success.

The chance of success for a deception is enhanced by correct understanding of the thought processes of the target

and the key personnel he has working for him. Individual thought processes are biased by such things as role requirements, environment, culture, and training. Group or organizational thought processes are biased by such things as goal setting, doctrine, and experience. The result is that each key player has a pattern of biased perception and judgment that is detectable, consistent, and predictable. These biases can be understood in terms of perceptual and cognitive processes. Perceptual biases result from the way the world is perceived and they limit the accuracy of perceptions. Cognitive biases result from the way the mind works and they influence the way that a person treats evidence, attributes causality, and estimates probabilities.

1. Cognitive Biases

Perhaps the most pertinent factor of how the mind works is that working memory is very limited. The complete knowledge of how the mind works is not yet known, but it is recognized that there is an immense capacity for retention of data in long term memory. It is also recognized that the initial stimuli presented to the mind can be very complex. Case histories of trauma or hypnotic induced recollection have shown that memory of past events with exceptional detail can exist in long term memory without any recollection at all by the conscious mind. Memory that cannot be recalled, however, is of no use to the decision-maker or the intelligence analyst. The memory that is of use is that which is

placed in working memory from stimuli that are received or from data which can be recalled from long term memory. [Ref. 90]

Working memory can handle only a small amount of data. It can not handle, for example, the amount of information that is presented by eyes, ears, or other senses. The stimuli from those senses are available in great detail for only a short period of time such as the few seconds after one closes his eyes that one can still see a picture before it quickly fades. The mind must simplify the stimuli that it wants to retain and chunk it into data that can be used by working memory. The chunked data is not the same as the stimuli. It is only a model of it. [Ref. 91]

Working memory can manipulate chunked data in a manner that is similar to the way a computer does it, but working memory can only process a few chunks at a time. An upper limit would be around five chunks [Ref. 92]. Some of those chunks are discarded and the rest must be memorized. They have to be put in long term memory so that more data can enter working memory. One result is that the human mind can only handle three to five hypotheses at a time. In an ambiguous situation where many hypotheses are possible there is an overload and the mind filters out all but the most salient hypotheses. [Ref. 93]

Once a hypothesis is dropped it is almost never picked up again. Further, when time stress is present, the

mind develops cognitive tunnel vision using simplifying heuristics such as representativeness and availability [Ref. 94]. There is a bias in estimating the probability of the different hypotheses which is related to how easily the hypothesis can be imagined or how easily similar cases can be recalled from long term memory [Ref. 95]. The human mind is not very good at aggregating the information. Humans make probability judgments in loose terms such as likely, probably, or possibly [Ref. 96]. These terms are not mathematically precise enough for applications like game theory where a small difference in probability can result in large differences in expected value. The ability to place numerical ranges on probabilities can be forced, but it is questionable whether the mind generates a number that is any more accurate than the word. There are some known tendencies such as a regression towards the mean in which rare events are overestimated. [Ref. 97]

Anchoring is a cognitive bias which results in analysis being anchored around the initial estimate. Additional information or analysis may not have the impact of the initial information because the bias will only allow a small variance from the initial estimate. [Ref. 98].

The overconfidence bias is that people tend to be overconfident about what they know and how well they know it. This bias is important in that intelligence analysts at any level are regarded as experts. Their private feelings can

effect the intelligence that is produced. That can have a large effect on the decision-maker. [Ref. 99]

There are cognitive biases that effect the way that evidence is evaluated. One bias is an oversensitivity to consistency. A few indicators that all support the same hypothesis are considered to be strong evidence, while a lot of common indicators that are accompanied by a few contradictory ones would be considered weaker evidence [Ref. 100]. The number of data points that are used should be significant, but the human mind does not use internal confidence intervals. This bias can help the deception if the deceiver has control over the channels by which the information is transmitted. If contrary indicators are kept from being transmitted, then the number of deception indicators needed can be kept small.

The absence of data is not of very great importance because the intelligence analyst works with the data he has. He may request additional data routinely, but will never expect to get all the information he wants before he has to make his analysis. There are too many reasons why all the pertinent information is not available and many of the reasons are the result of inadequacies in his own intelligence organization. Too close a look at gaps of evidence might highlight failings in his own operation.

The human mind is much better at following the path from cause to effect than it is at working backwards from

effect to cause. This bias works in the favor of the deceiver because the deceiver begins with the big picture and can use cause-to-effect relationships in breaking the big picture into the desired indicator set. The intelligence analysts working for the target of the deception must work with the indicator set that they receive and trace those indicators back to the events that caused them. They have a much harder job in that the effects may lead back to causes that are real or deceptive. In essence, the target of the deception must do diagnosis rather than analysis. [Ref. 121]

2. Perceptual Biases

Perception constructs rather than records reality. It implies understanding as well as awareness. Knowledge of what is perceived and the meaning that is attributed to it is essential to the planning of a deception. The perceptual biases should be considered as one means of better understanding the enemy.

One perceptual bias is that information obtained by an observer depends on the observer's own expectations. This bias is applicable throughout the target organization. The collector at the channel output has some control over the signals that are received. The signals that are expected are accepted correctly, but signals that are not expected may be misinterpreted. The wrong meaning may be attached to the unexpected signal because it is different from signals that he expects to receive. The first analyst may be sifting

through the volumes of intercepted signals and understanding only those that support the pattern that he is expecting to develop. The remaining signals may be rejected as being worthless simply because they do not fit into the pattern that exists in the analyst's mind.

There are many signals that are worthless or that contain information that is so ambiguous that they could be used to support several possibilities. The expectations of the analyst can bias the information that is contained in the signals so that important information may be lost and unimportant information may be understood as being highly salient to the situation. [Ref. 102]

The expectations that bias the signals may be individual expectations or group expectations. A group expectation could be generated by such things as the daily intelligence summary prepared by higher headquarters. Such a document would summarize the perception of the enemy situation and project how that situation is expected to change. Each intelligence officer or analyst who receives that summary would be tempted to assume that the higher headquarter's assessment of the situation, based on all of the information available to the organization, should be accepted as being most correct. If accepted, the summary might provide a group expectation that establishes a common bias in the processing of the next day's intelligence. Each person who handles the information as it is processed through the

organization may distort it only slightly, but the finished product may have a totally different meaning than it should.

The signals entering an intelligence system are biased by the initial hypothesis generated by that system. Those signals that support the hypothesis are welcome because they prove that the initial hypothesis work was good, and everyone wants his work to be perceived as good. The signals that are contradictory to the idea of the initial hypothesis are not welcomed for the same reason. The professional intelligence system should not allow those inconsistent signals to be ignored but it will take a lot of them to generate a hypothesis reversal. The implication is that it is easier to deceive a target by reinforcing an existing preconception than it is to change that preconception.

A second perceptual bias is that information that is different from normal is hard to recognize. A logical way of understanding this bias is to use the situation in which enemy units are massing in the typical pattern associated with a regimental assembly area. The actions required to manipulate forces into that stereotyped pattern result in signals available to the intelligence collectors. The analyst receives the normal indicators and understands them correctly because they indicate activity that fits a pattern that he has learned and the pattern may be consistent with the overall situation. The enemy is expected to attack normally and that typically would require the second echelon

forces to mass in preparation for the attack. If the enemy chose to break the stereotype and attack from battalion assembly areas, it would be much harder for the analyst to foresee what was about to happen. The signals would not be clear because they would not fit the expected pattern. The implication for deception is that normal activity should be associated with the indicators of the deception story and atypical activity should be associated with the real operations.

A third perceptual bias is that once an observer has formed an opinion of the phenomena being observed, future perceptions will be conditioned by the first perception. The observer is biased towards continuing to perceive the situation in the same way. The implication for deception is that the bias of the target organization will benefit the deception as long as the deception is designed to take advantage of the preconceptions of the target. If the enemy expects that you are going to continue to delay, for example, then he is vulnerable to a deception which would have him believe that you are willing to trade space for time. The deceptive signals portraying an orderly delay could be sent while actual preparations for a much different operation are placed in motion.

The enemy would not require overwhelming signals to convince him of the delay. He would only require enough indications to reinforce his existing belief. The bias would

assist the deception to cause the enemy to assume that the conclusive evidence exists and could be obtained if necessary. The enemy would attribute missing data to the efforts of friendly camouflage or to imperfect functioning of his own intelligence collection. The bias might further assist the deception by causing indications of activity not associated with the delay to be discounted as possible deception. The implication for deception is that this bias will reduce the impact of security leaks, uncontrolled channels, and poorly executed deception measures as long as one does not actually do what the enemy expects. A second implication for deception is that this bias makes it very difficult to succeed at a deception which will require the enemy to change his mind about what he expects.

A fourth perceptual bias is that gradual evolutionary changes often go unnoticed. Transportation of military supplies might be used as an example. The requirement might be that the tonnage of supplies being moved by the division support command be doubled in preparation for a planned offensive. The movement of large convoys in the division rear area cannot be hidden and any sudden increase in the number of convoys would be a key indicator for enemy intelligence analysts. A gradual increase to the number of trucks in each convoy, however, might not be of sufficient interest to be reported even if it was noticed. The implication of this bias is that if you want the enemy to take

notice of an event you should change patterns quickly. If you want an event to remain hidden, the patterns should be changed slowly.

The last bias in perception that will be looked at is the idea that a picture that is sharp and clear can be perceived correctly and quickly, but a picture that is blurred or out of focus takes longer to perceive and is subject to erroneous perception. An ambiguous picture which has been presented for a longer time will require a sharper focus and a longer perception time for correct recognition than the same picture presented for a shorter time. The initial exposure to ambiguous or blurred stimuli interferes with accurate perception even after the subsequent clear information becomes available. There are three obvious implications for deception.

First, a very strong and clear indicator set sent at the start of a deception can insure that the desired hypothesis is perceived correctly by the enemy. The need to have the deception story considered by the enemy before he chooses his initial set of hypotheses may require that very salient indicators be front-loaded into the deception plan. The clarity of the indicators may later seem suspicious to the enemy but once the hypothesis has been accepted for consideration, even proof that some of the indicators were false may not be sufficient evidence to cause the hypothesis to be disregarded.

A second implication of this bias is that an ambiguous initial situation can be used to hide key signals. The initial picture presented to the enemy may be made so confusing that a key signal such as the movement of a special unit is lost in the noise of other signals that are presented at the same time. The initial blurred picture is such that the enemy information system may be saturated or the ambiguity is such that the enemy has not yet determined what the key signals will be. The timing of the signals can be critical as well. The movement of an artillery unit necessary for the real operation can be obscured by the subsequent deceptive movement of an armored unit which captures the complete attention of enemy intelligence.

The third implication of this bias of perception is that an ambiguous picture might be presented to the enemy and maintained for no other reason than just to delay enemy decision-making. The time that it takes for the enemy to clarify an ambiguous situation may be sufficient to provide the necessary tactical advantage.

3. Implications of Psychology for Deception

The implication of the perceptual and cognitive biases is that if the deception is designed correctly, the target will do much of the work for you. There are really only two choices for a deception, although each deception may have many different attributes. The two choices have already been identified as having to do with enemy preconceptions.

The first choice is to deceive a target with signals that reinforce the target's existing beliefs while you really are doing something else. This deception is aided by the target's preconception. The target is searching for information which supports his favored hypothesis and the intelligence profession is such that it will be looking first in the places that the signals would be if the favored hypothesis was correct. The target tends to ignore contrary evidence as deceptive, incorrect, or resulting from mistakes in his own system. In fact, the target may not even perceive the contrary signals or may attach meaning to the signals that is incorrect but supports his hypothesis.

Once the target has decided that his hypothesis is correct, it is very difficult for him to change that hypothesis. The deception that capitalizes on the target's preconception has a better chance for success because it leads the target to action which he is predisposed to take. The advantage in helping insure that he takes that action is that the deceiver can prepare the battlefield to maximize his gain.

The second choice for a deception requires the target to do something that he is not predisposed to do. This type of deception should be avoided but, if it must be attempted then it is necessary to insure that the deception story is at least one of the initial hypotheses that is considered by the target. The chance of total success of this deception type

is less than for the other type because it depends on the changing of the target's mind. This type of deception would be ill-advised in situations that will be very dangerous if the deception fails. It would be better to attempt this deception in situations where advantages can be gained by introducing ambiguities in the target organization so that timely decisions cannot be made.

F. DECISION MAKING

The tactical deception target is the opposing commander. All of the communication of the deception story must be designed to establish the deception story as the big picture that the enemy commander sees just prior to his making the decisions that result in the success or failure of the deception.

The deceiver's knowledge of the enemy organization and the system interaction is important only for the ability to predict or predetermine the desired action of the deception target which places his forces at a disadvantage on the battlefield. Knowledge of game theory or other decision aids are important only for understanding the enemy and for identifying vulnerabilities that result from predictability. Applying knowledge of perceptual and cognitive processes provides further understanding and predictability, but again, that information is of importance only as it can be used against the deception target. Knowing how the target makes his decisions makes manipulation of his decisions possible.

The commander is the key not only because he makes the decisions that result in the action which determines the success of the deception, but also because he provides guidance to the intelligence system regarding salience and interpretation. The commander sets most of the goals for the organization. His policy for deception influences how the organization treats deception. A commander who avoids using deception will probably be less attentive to the possibility of deception being used against him. On the other hand, a commander who uses deception in his own plans may not be any better at detecting its use by others. The problems of counterdeception are not solved by attention.

The commander is the key to the organization. Even though the general staff system generated a division of labor throughout the staff, the commander remains responsible. The information from staff sections is presented to the commander so that he can appprove or disapprove the actions and decisions made in his name by the staff.

The entire system interaction, the organizational functioning, and the communications flow for the deception operation end with the commander's decision. That decision is biased by perceptual and cognitive processes and is based on probabilities and expected values that the commander may not even be able to put into words.

Depending on the payoff for a correct or incorrect decision, the commander may change his decision criteria.

There is a tendency for risk aversion behavior associated with gain situations and for risk seeking behavior associated with loss situations.

1. Approaches to Decision Making

The U.S. Army approach to making decisions is that the decision belongs to the commander on the spot as long as it is within reason. The commanders are trained to recognize when a decision is necessary and are trained on how to make that decision. U.S. Army commanders love to make decisions. In fact, everyone in the U.S. Army loves to make decisions and many make tactical decisions whether they are authorized to do so or not. This decision-making at the lowest level possible results in a large amount of unpredictability which is good for avoiding deception.

The enemy can never have total certainty about what a decision will be or what the magnitude of the friendly response might be. The man, not the machine, is paramount in the U.S. approach to decision-making. A descriptive phrase might be that "it is better to be roughly right on time than totally right after it is too late."

The Soviet approach to decision-making is far different from the American approach. The difference that is important in the context of this thesis is the degree to which automation can or should be included in the Soviet Army operational level decision. The basic instruction for Soviet commanders and their staffs on the subject of automation was

published over twelve years ago in a monograph, Idea, Algorithm, Decision, which is part of the Soviet "Officer's Library." That monograph was translated by the U.S. Air Force and is relevant in that it proposes the further development of the theory for decision-making through the use of the concept of automating military operational control and management processes [Ref. 103].

The monograph begins with a justification of the use of cybernetics to solve military command and control problems and ends with a description of computer systems and some related mathematics, the display and retrieval of information, and a work study of possible sequences of operations carried out by the commanders and their staffs at the various function levels using automated systems. Included in the material are statistical statements of strategies, formalization of categories through the use of algorithmic language, and operational analysis which applies mathematical models to the Soviet decision-making process.

The Soviets placed that monograph in their "Officer's Library" over ten years ago. It is quite easy to assume that the Soviet army did not have any large amount of computer assets at that time. The sophisticated computers necessary to accomplish the goals mentioned in the monograph would have been rare items in the military system.

Colonel J. Hemsley, Research Fellow of the Department of Defense Studies, University of Edinburgh, in

1980, published a paper titled "Voennaya Sistemotekhnika: An Algorithmic Approach to Decision-making" in the Journal of the Royal United Services Institute for Defense Studies. Colonel Hemsley made the following observation:

> "The foreword to the Russian edition of the monograph is written by General of the Army S.M. Shtemenko. . . . He starts by outlining the inter-relationships between mathematics, social sciences and the humanities on one hand and the impact of the new sciences and modern technology on the other. . . . The introduction goes on to explain that automation neither replaces nor supplants mental creativity but rather gives the human mind the opportunity to extend its range of intellect. There is no implication of a substitution of machine for man; rather the two become complementary in that man is relieved of certain formal (technological) functions which can be mathematically defined and automatically executed." [Ref. 104]

The man-machine decision model at the Soviet Army operational level needs to be understood. A problem in understanding exists because it is difficult to project how well Soviet technology will be able to develop the hardware and software necessary for the tactical problems of ground combat. Reliable systems that are rugged, mobile, and integrated are necessary for the types of applications postulated in Soviet literature. The question is if and when such systems will be available to the Soviet Army. The support for such systems exists at the highest levels in the Soviet Army and should be sufficient to drive the required technology.

The form of the man-machine interface in the Soviet Army is a combination of logic and mathematics. Logic is introduced by the subordinate commanders and staff officers who

codify the essential parameters of the battlefield into symbols which can be used in mathematical models. Much of the information requires simple transformation. This information would be such things as weather conditions, terrain, roads, light, time, or vegetation as well as measurable parameters of the force such as men, weapons, ammunition, vehicles, or supplies. Other information such as morale or determination might be harder to codify.

Information on the enemy would require a certain amount of guesswork in evaluating the present situation and probabalistic conjecture in projecting the future situation. Certainly, the commander would need to understand the mathematical model that would be used by the computer to know which factors of the situation are not used in the model so that the influence of those factors could be taken into account in the final decision. [Ref. 105]

Once the environment is entered into the computer, it must be combined with the instructions that have been received by higher headquarters. These instructions establish limits on the possible output of the model. The machine function does the rapid information processing which analyzes and synthesizes the data. One conjecture of possible outputs might include force ratios, required forces, critical path movement tables, time milestones, and logistics. Sophisticated models should be able to provide alternative solutions with advantages and disadvantages. [Ref. 176]

Logic is required by the commander in evaluating the machine produced alternatives and choosing the optimal one. The commander is still the decision-maker in the Soviet approach, yet a scientifically derived Soviet decision cannot be made without calculations and quantitative substantiation. Dr. Eberhardt Rechtin, past Chairman of the Naval Studies Board of the National Academies of Science and Engineering, would view the Soviet approach to decision-making with a certain amount of distrust as indicated in his recent article in the Naval War College Review. In that article, "The Technology of Command," Dr. Rechtin wrote:

> "A difficulty inherent in decision theory is that real-world decisions all too often are made under conditions never before considered, much less characterized and quantified. . . . Another inherent difficulty in using computers in decision making is that, in a sense, computers are too perfect, too precise. For better or worse, whether computers are operating on simple data or complex algorithms, they will always produce precisely the same answers from the same inputs. If the inputs are incomplete or if unprogrammed events occur, the computers crash. If the context changes, what was the right answer before may be wrong-precisely wrong-in the new context." [Ref. 107]

The approach to decision-making that is used in the opponent organization is important to the deception process. An organization which allows decentralized decisions might be vulnerable to deception if certain commanders are isolated on the battlefield. Communications jamming or destruction of selected communications nodes could remove a subordinate force from its command and control headquarters. A false situation could be presented to the isolated force which

would require decisions to be made without the intelligence support available to percieve the situation correctly. That same isolation could support a deception against an organization which makes decisions only at the highest level possible. Once isolated, the force would continue the mission per the last guidance received. The deception would require changing the situation after the force was isolated so that the subordinate commander could not receive the guidance that might keep him from the trap.

Deception might attack the vulnerabilities of an organization that uses automated decision aids. One vulnerability is that which occurs when the use of the automated aid is denied. The communications or the electronics of the automated aid could be degraded, disrupted, or destroyed. The impact would probably be considered as a more significant information loss than if the aid had never been available. The organization would have developed a certain amount of dependence on the machine system and back-up manual systems might not be available. The loss of information would degrade the decision-making process. A more elegant attack against automated decision aids would require knowledge of the algorithms in use. Manipulation of the environment to predetermine the input parameters would also predetermine the output variants. The target's use of the automated aid would benefit the deceiver by assisting in the manipulation of the targeted commander's optimal course of action.

There will always be interaction between the opposing sides on the battlefield. The resulting communications flow establishes an impact on the decisions made by the commanders. The payoff matrix and the hypotheses available for choice may all be manipulated by the deceiver. The deceiver gains an advantage if the target chooses to act in the manner that was desired by the deceiver.

The communications, the organization, the system, the mathematical models, the thought processes, and the decision process can be viewed as simple models that can be applied to understand the battlefield.

The overall deception process is more complex than the simple models used in this theoretical analysis. The deception requires a thorough understanding of all of the processes involved so that the necessary signals reach the enemy commander to result in the correct interpretation and the desired action.

G. TRANSITION

The theoretical approach to analyzing the deception process was introduced by overviews of the application of communications, organization, systems, and game theory as well as the principles of the cognitive and perceptual processes and decision making. The theoretical models suggest that deception can be understood and can be applied on the battlefield to gain a tactical advantage. The models are not perfect in their application to deception, but there

is a great deal more information available in literature. The problem is that while the multidisciplinary theoretical approach provides insight into the deception process, it does not lend itself to an analysis of past use of deception.

Deception has been used on the battlefield throughout history. Many of great commanders used deception exceedingly well. Whether they used deception because they were great or whether they were great because they used deception is a moot point. The point is that deception has often been linked with success and analyzing how they did it may help provide future success. The travesty is that deception practices that work are kept classified after the end of each war. By the time that the next war comes along they have been forgotten. The deception art is learned by trial and error.

It is beyond the scope of this thesis to even attempt to analyze the total impact of deception in military history, but fortunately a lot of work has already been done by historians such as Barton Whaley. Barton Whaley has collected descriptive data from the important battles of this century and has assembled the case histories into a deception data base. The problem with the analysis of case histories is that the data is not perfect and is not always complete. The level of quantification that can be used on such data is limited.

A comparative analysis of case histories can provide a clearer understanding of the deception process by indicating

common factors and general cause and effect relationships. The data analysis can show limited measures of effectiveness and can support the choice of optimal deception practices to a better degree than that provided by theoretical analysis alone.

The value to be obtained from the comparative analysis of case histories that follows will be in the combining the case study data with knowledge gained from the theoretical approach. The two approaches will combine in a manner which suggests how tactical deception can be better applied in the U.S. Army.

VI. CASE HISTORY ANALYSIS

Empirical analysis of case histories from Barton Whaley's deception data base can be performed in an effort to determine what the data suggests about tactical deception. One part of the analysis is to verify that there are no major differences between the results of deception as the scope changes from strategic to tactical. A second part of the analysis is to verify that there are significant differences in the results of battle that correspond to the presence or absence of deception. The data analysis is intended to show measures of deception effectiveness in: (1) producing surprise, (2) producing victory, (3) reducing casualties, (4) increasing force effectiveness, and (5) increasing territory exchanged. The data analysis will also support the choice of optimal deception practices by indicating general trends common to successful deceptions.

A. DATA

The copyrighted data used in this analysis is from Barton Whaley's 1969 study, Stratagem: Deception and Surprise in War, which included 169 case histories. Of that number, 68 were strategic and 47 were tactical examples of surprise and/or deception. The additional 54 examples could be considered a control data set in that there is no evedence that either surprise or deception played a part in those battles.

The cases are from 16 wars during the period 1914 to 1968, and are based on Barton Whaley's survey of 509 published sources as wellas his own professional study of history.

The reader is referred to Appendix A of this thesis for the lists of the battles included in Barton Whaley's 1969 deception data base. List A is an inventory of cases of strategic surprise and/or deception. List B contains examples of tactical surprise and/or deception. List C includes examples of battles involving neither surprise nor deception. The cases are identified by a date-sequenced list number that corresponds to the time, location and code name for the battle or operation.

The assumption is made that the data from the 169 cases are representative of modern war. Obviously, lists B and C cover only a small proportion of the total examples that could fit the categories. Lists B and C are example sets selected by Whaley from large populations and are not random samples in the normal statistical sense. Tests of statistical significance would not be appropriate for use with such data. It is proper, however, to analyze this data in a quantitative way even though the data set is not random. The data can be inventoried to determine characteristics that can be compared by their presence, absence, or relative values in each of the three subsets of data. The average values of data characteristics in each of the three lists can be compared as long as the lists are typical of the populations

they represent. This can be done as long as the assumption of representativeness is made.

The data set from the 169 case histories was categorized by Whaley in a simple coded form which provides information on up to 41 characteristics for each case. This allowed a fairly rapid enumeration of frequencies of any given characteristic. Summarizing data in frequencies, percentages, or ratios does allow a comparison to be made. The tactical data set, list B, can be compared to the control data set, list C, and to the strategic data set, list A.

The strategic data set was considered in 1969 to be all-inclusive. The three criteria that Whaley used to identify cases of strategic operations were that they had to: (1) be the first stroke of a war; (2) open operations on a new front or theater of war; or (3) be a new attack or offensive on an existing but dormant front [Ref. 108].

The 68 cases in list A have been augmented with 25 additional cases from four more wars that extended the survey to 1973. The analysis of the total 93 cases has been published in the article by Ronald C. Sherwin and Barton Whaley, "Understanding Strategic Deception: An Analysis of 93 Cases," which was included in Section II of the book, Strategic Military Deception.

F. CRITERIA

The result that must be optimized is the outcome of the mission. There are two missions involved in each battle, and

for the most part they can be identified as belonging to either the attacker or the defender. Deception can be used in each operation by the attacker, the defender, or both. The analysis must differentiate between the missions of the deceiver.

There are many different ways to categorize the outcome of the deceiver's mission. One criterion is the overall result of the battle which could be victory, defeat, or degrees of each. A second criterion is the relative result. An overwhelming force that achieves only a modest victory might be considered to have suffered a relative defeat. The relative casualty ratio, for example, is very important when there is a numerical advantage on one side. The relative casualty ratio can be used as a measure of effectiveness

Relative force effectiveness is a good criterion for evaluating different units with the same mission. Training, leadership, interoperability, and experience can result in one army having a force advantage that can be quantified. Adding one more factor such as deception to a battle adds to the force effectiveness result, but that factor should not claim all of the credit for the victory or defeat. A final criterion for effectiveness is cost.

These criteria must be measurable in some way so that probabilities, conditional probabilities, or mathematical expectations can be used. The criteria must be simple enough to be understood and must be directly related to the mission.

All of the criteria must be used to determine the overall effectiveness.

The criteria of effectiveness for the outcome of the deceiver's mission will use some but not all of the data characteristics. Such criteria indicate the effectiveness of deception but do not indicate how deception can be optimized. The data which support the choice of optimal deception practices is applicable to different criteria. Those criteria are not related to the outcome of the deceiver's mission. They are related to the outcome of the deception. The result that must be optimized for these criteria is the achievement of surprise. That criterion will identify the preferred deception measures and practices.

C. ANALYSIS OF DECEPTION EFFECTIVENESS

1. Deception's Effect On Producing Surprise

Barton Whaley produced the following table as a cross-correlation to show that surprise can be achieved without employing deception. It also reveals that using deception effectively seems to guarantee that surprise will be achieved at the strategic level.

TABLE 6
USE OF DECEPTION AND ACHIEVING SURPRISE [Ref. 109]

	SURPRISE	NO SURPRISE
NO DECEPTION	11 (p=.12) p(S/ND)=.65	6
DECEPTION	76 (p=.82) p(S/D)=1.0	0

The 44 cases of tactical deception or surprise yielded the following:

TABLE 7
TACTICAL DECEPTION AND SURPRISE

	SURPRISE	NO SURPRISE
NO DECEPTION	19 (p=.40)	N/A
DECEPTION	25 (P=.53) p(S/D)=.89	3

It is seen in both cases that surprise and deception are commonly associated. That is particularly true for strategic operations but still more often than not at the tactical level. The correlation between the strategic case and tactical case is not really strong enough to support any firm conclusions. The conditional probability of tactical surprise given deception does remain high. Very little can be determined from the no deception category as all cases in list B involve surprise if they did not involve deception. It is possible to separate the data from the tactical cases by mission.

TABLE 8
TACTICAL MISSION EFFECTS ON SURPRISE AND DECEPTION

	(S/D)	(S/NO D)	(NO S/D)
OFFENSE	18 (p=.474)	18 (p=.474)	2 (p=.053)
DEFENSE	7 (p=.778)	1 (p=.143)	1 (p=.143)

The significant result of the cross-correlation is that it indicates that in the tactical environment, the defense has a much greater need for deception to produce surprise. The offense can partially rely on the initiative to produce surprise. The unfortunate situation of history is that the recorded examples of deception used by the defense are few in number. It is unknown whether the use of deception by the defense was a rare occurrance or whether the records were lost.

The impact on this thesis is that the large majority of data applies to the offensive use of deception. There is little data available to determine the overall benefits of using deception when on the defensive.

One more view of the data is necessary because the data covers a range of wars over a changing period war, 54 years. It is necessary to insure that the data set is not biased. Barton Whaley produced the following table to show the frequencies of surprise and deception through time, decade by decade:

TABLE 9
LIST A STRATEGIC SURPRISE AND DECEPTION OVER TIME [Ref. 114]

PERIOD	SURPRISE	DECEPTION	BOTH	TOTAL
1914-1919	1	0	9	10
1920-1929	1	0	1	2
1930-1939	3	0	2	5
1940-1949	5	5	30	40
1950-1959	1	2	5	8
1960-1967	0	0	3	3
TOTALS	11	7	50	68

The author of this thesis made the same cross-correlation for the tactical, list B, data to produce Table 10.

TABLE 10
LIST B TACTICAL SURPRISE AND DECEPTION CASES OVER TIME

PERIOD	SURPRISE	DECEPTION	BOTH	TOTAL
1914-1919	10	0	9	19
1920-1929	1	0	0	1
1930-1939	2	0	0	2
1940-1949	6	3	16	25
1950-1959	0	0	0	0
1960-1967	0	0	0	0
TOTALS	19	3	25	47

The tactical data shows much of the same dispersion over the time period that the strategic data did. Table 10 shows that the tactical data is mainly from the two world wars. It takes a large conflict to field armies that operate in the tactical sense. Minor wars may involve a large military conflict but they are mainly fought for political reasons, thus they are more appropriate for inclusion in the strategic category. The cases from lists A and B are combined to show the overall dispersion of cases.

TABLE 11
SURPRISE AND DECEPTION OVER TIME

PERIOD	SURPRISE	DECEPTION	BOTH	TOTAL
1914-1919	11	0	18	29
1920-1929	2	0	1	3
1930-1939	5	0	2	7
1940-1949	11	8	46	65
1950-1959	1	2	5	8
1960-1967	0	0	3	3
TOTALS	30	10	75	115

Whaley concluded that from a rough impressionistic grasp of the magnitudes involved, there were several trends that might be shown. First, the proportion of military operations involving surprise unaided by deception is sharply declining. Second, the proportion of military operations involving deception that failed to yield surprise has remained at a rather constant low level. Third, the proportion of military operations involving both surprise and deception has sharply increased. [Ref. 111]

Tables 10 and 11 roughly support the above conclusions. In support of the first conclusion, it should be noted that intelligence support to the battlefield has vastly improved since 1914. It is possible to collect data from events happening deep in enemy territory. Computers can be used in the analysis of that data. Secure communications can pass the resulting intelligence in a timely manner.

While intelligence support is still separated into tactical and strategic intelligence, it is recognized that it must be passed to the commander who needs it regardless of the source. Thus, the tactical commander at division level may have near real-time access to strategic intelligence products that pertain to his area of operations.

Passive camouflage and concealment measures have not improved at the same rate. Camouflage against infrared detection devices, for example, has received little attention or emphasis. The result is that a headquarters that is

perfectly concealed to protect against visual surveillance may have no concealment at all from infrared surveillance which detects hot objects such as the diesel generators that power the headquarters equipment. The infrared devices can detect vehicle engines or even soldiers and can image a picture of the battlefield that in some cases is even better than a visual image. [Ref. 112]

Barton Whaley's second conclusion, that deception usually results in surprise, is understandable in that counter-deception is even less understood than deception. While deception may remain people-oriented, it may require a machine solution to unmask a deception.

The third conclusion, that operations involving both surprise and deception are increasing, is a result of technology. The weapons on the battlefield are so lethal and so effective that the direct frontal approach is disasterous. Victory can still be achieved by overpowering the enemy or pressing the attack until he runs out of ammunition, but the price is excessive for both sides. The increase in surprise and deception stems from the effort to win by evading the direct approach. The unexpected, alternate approach must even be considered a form of deception.

2. Deception Effect on Producing Victory

The first category to be looked at is the offense. The case studies are categorized by whether the outcome was favorable to the initiator. The battles are coded such that a

"V+" stands for an overwhelming, unexpectedly successful victory. A "V" is in reference to a clear victory. A "V-" stands for a victory that is less than expected and a "D" stands for defeat. The only one of these that may need explaination is the "V-". A "V-" might result when an attack was only partly successful. The Battle of the Alamo is a clear example of victory that did not go according to plan for the Mexicans. For the purposes of this analysis, a "V-" will be considered an undesirable outcome. A battle will be considered a victory only if it was coded "V+" or "V". This should alleviate the effects of coding errors where the two middle cases meet on the continuous line.

The list C cases are included in the comparison shown on the next table. The list C cases do not meet the criteria for list B in that neither surprise nor deception was involved in the battle. List C can be considered a control data set for list A cases.

Taken together, lists B and C form a tactical set which, again, can be thought of as being representative of tactical operations only by assumption. The assumption may be valid because the entire set, all three lists, seems to cover the battles that had the primary impact on history. The assumption, however, can not be defended sufficiently enough to allow the use of confidence levels. It is necessary to be very cautious in the analysis of the deception data so that the evidence of history is not biased by improper methods.

TABLE 12
EFFECT OF DECEPTION USED BY THE OFFENSE

LIST	TYPE	NO.	"V+"	"V"	"V-"	"D"	VICTORIOUS
A	DECEPTION	52	16	21	9	6	71 %
A	NO DECEPTION	8	0	5	2	1	62.5 %
B	DECEPTION	21	5	7	6	3	57.1 %
B	NO DECEPTION	18	2	8	7	1	55.5 %
C	NO DECEPTION	54	1	12	12	29	24 %

Table 12 indicates several interesting trends. It shows that the probability of achieving at least a clear victory is only slightly better when deception is present than it is when deception is absent. The reason that this is true for the 52 type A cases is that only five of the type A cases did not involve surprise. In fact, all eight of the strategic cases that did not involve deception on the part of the initiator resulted in surprise anyway. All type B cases are categorized by the presence of deception and/or surprise. The type B cases without deception on the part of the offense, by definition, included actions which surprised the defense and achieved the relatively high percentage of clear victories that would be expected. The type C cases, by definition, did not involve deception on the part of the offense and did not result in surprising the defense.

Table 12 strongly indicates that one or both of the parameters of surprise and deception has a strong effect on

producing victory for the offense. It would appear that surprise has the predominant effect because of the large difference between type C cases and the rest of the cases without deception.

Table 12 is interesting in that it shows the frequency of occurrance of battles that ended in the "V+" overwhelming, unexpectedly successful victories. That is the kind of victory that is desired at every level. The trends for this occurrence warrant special attention in the form of conditional probability of the type of victory given that at least a clear victory, "V", result was obtained.

TABLE 13
PROBABILITY OF OFFENSIVE OVERWHELMING VICTORY

LEVEL	TYPE	"V+"	"(V+ & V)"	p"(V+/(V+&V)"
STRATEGIC	DECEPTION	16	37	43.3 %
STRATEGIC	NO DECEPTION	Ø	5	Ø %
STRATEGIC	TOTAL	16	42	38 %
TACTICAL	DECEPTION	5	12	41.7 %
TACTICAL	NO DECEPTION	3	23	13 %
TACTICAL	TOTAL	8	35	22.8 %

The trend shown in Table 13 is that deception may figure prominently in achieving an overwhelming victory. It also shows that the probability of achieving that overwhelming victory is small if deception is not attempted.

Most of the case histories in the data base that involved deception also involved surprise. Whether that surprise resulted from the deception or resulted from other factors is not clear. The enemy may have formed the wrong preconception without any outside help and in doing so set himself up for being surprised. On the other hand, the fact that surprise was not achieved in some cases may not have had anything to do with the way the deception was planned or carried out. The deception may have been perfect but chance may have intervened on the side of the target. A simplifying assumption must be made that deception fails when surprise does not occur. Using that assumption, it is possible to look at the results of deceptions that failed.

TABLE 14
RESULTS OF DECEPTION FAILURE

LEVEL	"V+"	"V"	"V-"	"D"	p("V+")	p("V")
STRATEGIC	Ø	1	2	2	20 %	Ø
TACTICAL	Ø	Ø	2	1	Ø	Ø

The sample size for the cross-correlation used in Table 14 is quite small. The cross-correlations are generally large enough so that the averaging effect allows some degree of confidence in the trends that are shown. That is not the case for Table 14, but the difference in those results and the results that were shown in Table 11 is so large that the obvious indication is that if deception fails,

the results of battle will not be as favorable. In fact, attempting deception is probably counterproductive if it fails to surprise the enemy.

Table 14 included one case of failed deception that was attempted by the defense. That was the case of the Germans attempting to deceive the British and Americans during the Anzio counterattack. It was a tactical deception and the battle resulted in a defeat for the Germans. The deception failed because of one channel of contradictory information. That was a direct channel from a German traitor inside Field Marshall Albert Kesselring's headquarters. The channel was through an OSS agent in Rome to the Allied Fifth Army Headquarters [Ref. 113]. The explanation of that point is included for three reasons. First, it slightly biases the data. Second, it is only one case and did not apply to any other Table. Third, it points out the need to keep a critical eye on the data-coding by referring to the actual historical records or summaries. Important issues may be lost if the cases are treated without examination in detail.

The main reason why deception is usually done by the force that is on the offense is that the offense generally maintains the initiative. The defense is only able to seize the initiative through such actions as the counterattack. The question is, can deception be very effective for use by the defense? The initial impression is that it cannot. But that is based on the extreme paucity of the historical

examples. The cross-correlation of those examples is shown below. The sample sizes are small but the results are surprising. The particular result that is of interest is the percentage of defensive operations that resulted in overwhelming victory. Six of the seventeen defensive operations resulted in overwhelming victory for the type A or B battles.

TABLE 15
EFFECT OF DECEPTION ON THE DEFENSE

TYPE	DESCRIPTION	NO.	"V+"	"V"	"V-"	"I"	VICTORIOUS
A	DECEPTION	5	2	0	1	2	40 %
A	NO DECEPTION	3	2	1	0	0	100 %
B	DECEPTION	8	1	5	1	1	75 %
B	NO DECEPTION	1	1	0	0	0	100 %
C	NO S/NO D	3	0	0	0	3	0 %

Table 15 shows that 70 % of the type A and B defensive operations resulted in at least clear victory. That was because the operations that did not include deception were still of a type that generated surprise in the enemy. The contrast is with the type C cases. Those three cases were counterattacks but they were totally predictable. They were not done in a manner that surprised the enemy. The result was that they ended in defeat.

Common battle tactics for the offense demand that once the attackers seize the objective by driving the enemy away, the force must prepare for a counterattack. The

offense sets up the defense line along the axis of the attack. Defensive tactics are to immediately regroup and counterattack before that perimeter is established. A counterattack that is done in the predictable manner may fall into the counter-counterattack trap. If the counterattack is done at the unexpected time or executed in an unanticipated manner, it performs as a deceptive maneuver.

3. Deception Effect on Reducing Casualties

A technological advantage on one side is a prime factor in the production of casualties. Consider the introduction of the armor piercing longbow as a British technology advantage over the French armored Knights in the Battle of Agincourt in the year 1415. The British were outnumbered by as much as ten to one, although the British were better-organized. The British lost less than 300 men while the French lost at least 5,500 men. The French Knights were expecting to battle other Knights and had no idea that warfare had changed overnight. [Ref. 114]

The introduction of a new technology must be done at the right time or else the surprise effect is wasted. If the enemy finds out about a new weapon during peacetime or during a minor preliminary battle the effectiveness decreases. The enemy can develop similar technology or tactics that return balance to the battlefield.

World War II provides many examples of the technology battle of measure and countermeasure. German use of

the "Lorenz" navigational aid was the first step in their effort to conduct highly directed precision bombing to force the British to sue for peace. The British realized what was happening and instituted "Meaconing" to draw the German bombers off course. The Germans switched to a new tone-based system codenamed "Headache", but the British found out about it ahead of time and countered with a deception jamming system appropriately codenamed "Aspirin". The Germans came up with another scheme to navigate to selected targets called "Ruffian" and the British developed a deception repeater, "Bromide", to counter it. The frustrated Germans put all of their navigational aids in a target-marking squadron, Kampf Gruppe 100. The British could not beat that so they switched to decoy fires called "Starfish". As long as the British kept one step ahead of the Germans they could direct a lot of German bombs onto empty fields. [Ref. 115]

The British became experts at passive and active camouflage during the "Battle of the Bombs". That expertise in fake lighting schemes, dummy installations, and decoys was used on the tactical battlefield. The need for such tricks developed in the North Africa campaigns where visual observation was excellent. The British recognized the opportunity because of their recent reliance on such tricks to protect their homeland. Other nations soon followed the British lead and dummy men and equipment were produced and used by many of the nations fighting in the war. [Ref. 116]

Once a countermeasure is used, its effectiveness greatly decreases as the new measure becomes a target for counter-countermeasures. The Germans relied heavily on their "Wurzburg" radar to counter Allied bombing raids. That radar was so effective that the British sent in a commando raid to steal the transmitter. This did not keep the radar off the air, but it allowed the British to develop primitive chaff, codenamed "Window", as an effective countermeasure. Early chaff was nothing more than aluminum foil cut by hand to the desired radar frequency, but it was effective.

The British did not use their discovery for several difficult years because they were afraid the Germans would find the pieces of aluminum, discover the principle themselves, and use it against the British [Ref. 117]. The British finally began using chaff in combination with effective jamming. It was so effective that the Germans dedicated roughly 4,000 engineers, 90 percent of their total in that category, to solve the anti-jamming and "Window" problem plaguing the Luftwaffe radars. In their rush to develop a countermeasure, the Germans were distracted from the development of microwave radar which was already being exploited by the Allies. [Ref. 116]

This analysis now returns to Barton Whaley's deception data base in order to be more specific on the effects of deception on battlefield casualties. The criterion used to select the tactical battles of interest is that the new

technology was used for the first time as a deception measure to support the battle.

The German introduction of a new tear gas in the Winter Battle of Masuria in 1915 diverted Russian attention while the Germans conducted a major movement of forces which was key to the battle. The battle resulted in only a few German casualties compared to 210,000 Russian casualties. The Germans certainly would have lost more men if the Russians had detected the build up of forces. [Ref. 119]

324 tanks were used by the British at Cambrai in 1917. The 10,000 yard advance in one day captured more ground than 51 British divisions had at 3rd Ypres during the preceeding four months at a cost of a quarter of a million casualties on each side. Using large tank forces may not have saved a half million casualties as they may have been lost in future battles of attrition, still they were saved for that battle. The British suffered only 4,000 total casualties at Cambrai. The exact count of German casualties is not available, but the German loss due just in soldiers taken prisoner was 8,000. [Ref. 120]

The combination of armor and aircraft advantages decided the outcome of the British battle against the Axis forces at Sidi Rezegh in 1941. The British won the battle largely due to the fact that Rommel was deceived as to the location, direction, and time of the attack. British losses were only 17,700 compared to 38,300 Germans and Italians.

One portion of the operation was a capture of an entire fort during which 14,000 Axis prisoners were taken at a cost of less than 500 British casualties. [Ref. 121]

Operation Bustard at Kerch in the Crimea in 1942 demonstrated that a wide range of ruses: radio deception, "Quaker Guns", and false deployments, were effective in confirming false perceptions. The Germans soundly defeated the Russians in this battle. For relatively light German casualties, 100,000 Russians were taken prisoner [Ref. 122]. The Russians should have been very happy to receive these prisoners back after the war was over, for there were 20 million Russians who died as a result of that war.

The American attack on the Japanese-held island of Tinian in 1944 was conducted under difficult circumstances. The island was only 12 miles long and four miles wide. It was defended by over 8,000 well armed soldiers who were willing to die to the last man in order to hold the island against the American attack. The Japanese were fully alert and knew that the island would be invaded that day. The final problem was that the island had only three beaches, one of which was not negotiable by existing amphibious equipment. It should have been impossible for the Americans to establish an unopposed beachhead with 5,000 troops on a clear day, but that was what happened.

The solution to the Tinian invasion problem was a technical modification to smaller landing craft which allowed

them to negotiate the treacherous coral shallows of the beach that was "impossible." A simultaneous feint at one of the proper beaches drew most of the Japanese reserves to the far end of the island. The result was that only 16 Americans were killed in the first 16 hours of the landing. In fact, on the eighth day, the Americans secured the island at a total cost of only 389 lives. 8,000 Japanese soldiers died defending Tinian. [Ref. 123]

The American attack on the island of Iwo Jima in 1945 is a case very similar to Tinian. The relative forces were larger but the real difference is that the deception did not result in surprise. The cost was not only high in absolute numbers of casualties, but the battle was one of the rare cases in which American casualties exceeded those of the Japanese. The lack of surprise was one of several contributory causes. [Ref. 124]

Complete tactical and strategic surprise was achieved by the first use of a nuclear weapon at Hiroshima on 6 August, 1945. While the civilian casualties were horrible, the inescapable conclusion is that the act saved millions of lives. The ultimate casualty reduction was due to the Japanese surrender without the need for an actual invasion of Japan itself.

The atomic bombs used at Hiroshima and Nagasaki would not have had a large effect on the tactical situation of such an invasion because the Japanese would have realized that the

bombs were not available in quantity. The point is, that a major innovation in technology may pay large dividends only if it is introduced at the right place and at the right time.

Deception reduces casualties because it avoids the frontal assault. The main reduction in casualties on the deceiver side results from not having to fight the forces that are captured intact or surrender in mass. The main advantage on the deceived side is that the casualties who become prisoners of war may be returned after the war is over.

4. Deception Effect on Force Effectiveness

There are general rules for the conduct of battle that are used to generate force planning, battlefield tailoring of forces, and operations planning. One of these rules of thumb is that the defense has a three-to-one advantage over the offense. The number three is a legacy of the machine gun and the artillery dominated western Front of World War I. That front required a large local superiority in zone in order to successfully attack.

The three-to-one advantage rule is still accepted as a generalization. A force that is outnumbered ten-to-one would need to take advantage of the defense and still need a three-to-one advantage in force effectiveness in order to achieve parity.

It is possible to train and equip a force to be very effective. The German armies that attacked the Russians

early in World War II, for example, were as much as four times more effective, man for man, than their opponents. That was a function of many factors, but in that situation, the Germans could attack a larger force and still maintain a three-to-one force advantage. Whaley prepared the following Table to compare the relationship of surprise to the relative numbers of soldiers:

TABLE 16
FORCE USED TO GAIN OBJECTIVES AFTER WW I [Ref. 125]

	SURPRISE CASES		NO SURPRISE CASES	
ACHIEVEMENT	NO.	TROOP RATIO	NO.	TROOP RATIO
VICTORY	18	1.2 : 1	1	2.5 : 1
ABOUT AS PLANNED	28	1.1 : 1	4	1.4 : 1
BELOW EXPECTATIONS	17	1.4 : 1	9	1.4 : 1
DEFEAT	4	1 : 1	20	.9 : 1

Whaley concluded that for operations not involving any surprise a substantial superiority of force is needed, although the ratio of about two to one was suggested rather than the traditional three to one. He also concluded that there was a fairly direct relationship between force and degree of success, the more the force the greater the success. Barton Whaley's more surprising conclusion was that surprise intervenes to shatter the direct and simple relationship between force and success. Thus, surprise must alter force effectiveness. [Ref. 126]

Excluding the strategic cases in the data set, it is possible to cross-correlate between the results of battle, the input force ratios, and the output casualty ratios. Force ratios and casualty ratios should be directly related as long as the force is applied efficiently. The analysis for Table 17 below and the Tables in this section that follow it are all from the point of view of the offense and include the type C data set.

TABLE 17
ACHIEVEMENT VERSUS FORCES AND CASUALTIES

ACHIEVEMENT	NO.	FORCE RATIO	CASUALTY RATIO
OVERWHELMING VICTORY	8	1 : .69	1 : 7.5+
CLEAR VICTORY	24	1 : .82	1 : 2.39
BELOW EXPECTATIONS	25	1 : .6	1 : 1.54
DEFEAT	32	1 : .71	1 : .76
TOTALS	89	1 : .71	1 : 2.07

The first observation that can be taken from Table 17 is that, in general, the offense was favored by only a 1.4 to 1 force advantage. This agrees with Barton Whaley's conclusion. A three-to-one advantage may have been engineered at the point of attack, but the clear advantage did not exist overall. A second observation is that there is no direct correlation between force ratio and achievement in the battle. There is no direct correlation between force ratios

and casualty ratios. There is a direct link between achievement and casualty ratios. That is explained in the cases of overwhelming victory by mass surrender. The defense typically suffers more casualties than does the offense simply because of the forces that become cut off and captured.

TABLE 18
ENVIRONMENT VERSUS FORCES AND CASUALTIES

ENVIRONMENT	NO.	FORCE RATIO	CASUALTY RATIO
DECEPTION WITH SURPRISE	18	1 : .88	1 : 4.75
SURPRISE WITHOUT DECEPTION	18	1 : .61	1 : 2.08
DECEPTION WITHOUT SURPRISE	2	1 : .55	1 : .80
NO DECEPTION, NO SURPRISE	51	1 : .70	1 : 1.17

Table 18 breaks out the tactical cases by the situation at the start of the battle. Of the 20 cases that involved deception, only two did not result in surprise. A set of two does not generate much confidence in a conclusion, and both cases resulted in victory below expectations. It is evident that although the defenders in these cases were outnumbered 1.8 to 1, they did inflict more casualties than they received. This is different from the expectation of Table 17 and may indicate that a deception that fails is worse that no deception at all. Rather than drawing a conclusion that is based on insufficient data, it is better to check the two cases in more detail.

The first case was the Battle of Sangro, 28 November to 2 December 1943. The British Eighth Army under General Montgomery was to open the 15th Army Group offensive by striking across the Sangro River. Montgomery used an elaborate and comprehensive deception plan. There seem to be three main factors that resulted in lack of surprise. First, the attack was postponed twice due to rain swollen rivers. It then went in one day early as the weather cleared. Field Marshall Kesselring evidently took warning of the immediate offensive as he used the time to reinforce that part of the line. Second, Kesselring was using a low risk strategy. The terrain precluded any major shift in British forces and the Germans had better lateral roads. There was no strong threat to induce Kesselring to change his strategy. Third, Montgomery had really no choice but to attack along the obvious road.

The deception was to delay the committing of the German reserves by demonstrating along the entire Eighth Army front. This was an inherently implausible alternative. The conclusion was that this deception failed because it was not plausible enough or serious enough to succeed anyway. [Ref. 127]

The second case was "Operation Detachment" which was the American invasion of Iwo Jima. Long before the actual operation, the Japanese garrison had ample and accurate foreknowledge of the assault, and had correctly calculated an

expected time. They even knew the three specific U.S. Marine divisions assigned to the mission. Two postponements gave the Japanese an extra month to dig the most formidable defenses the Americans would face in the Pacific. The channel for the Japanese intelligence coup was never identified, but there was a major security breach involving the Hawaiian press that may have made disclosure of the operation certain. [Ref. 128] In any event, speculation by soldiers and civilains in Honolulu provided many rumors.

Returning to Table 18, it is interesting to note that the 18 cases of deception that produced surprise were attempted with an average force ratio much worse than that of the 69 battles that did not involve deception, yet the results of battle and the casualty ratios were much better. An overall trend is shown in the next Table:

TABLE 19
DECEPTION VERSUS FORCES AND CASUALTIES

ENVIRONMENT	NO.	FORCE RATIO	CASUALTY RATIO
DECEPTION	20	1 : .85	1 : 4.53
NO DECEPTION	69	1 : .68	1 : 1.39

Table 19 suggests that when the force ratio is worse than normal, the attacker may feel a need to resort to deception in order to obtain the generalized three to-one force advantage. There is a difficulty in accepting the force ratios at face value in that they are direct number ratios

and do not reflect the force effectiveness merit. It is hard to nail that figure down.

One way to generate a force effectiveness ratio is to do a computer simulation using all of the realitive parameters. A U.S. tank, for example, could be compared to other tanks in a one on one, one on many, or many on many battle. The effectiveness is a function of dead tanks at the end of the battle. The result may be that tank X is the equivalent of five Y tanks, but it depends on the situation especially in multiple engagement cases.

Another way to obtain a force effectiveness ratio is to count casualties at the end of an actual battle. Again, the casualty count must be related to the initial force ratios just as they would in a simulation. The author of this thesis postulates that a rough force effectiveness ratio can be obtained by multiplying the force ratio by the casualty ratio. Performing this translation, Table 16 is changed as shown below:

TABLE 20
ACHIEVEMENT VERSUS FORCE EFFECTIVENESS

ACHIEVEMENT	NO.	FORCE EFFECTIVENESS
OVERWEELMING VICTORY	8	12.9 : 1
CLEAR VICTORY	24	2.9 : 1
VICTORY BELOW EXPECTATIONS	25	2.56 : 1
DEFEAT	32	1.07 : 1

Table 20 is an oversimplification, of course. Yet it may be defended by the magic number three. If three-to-one is the force advantage needed to produce victory, the numbers in the table clearly support the outcome of the battles. The force effectiveness advantage that was much higher than three produced overwhelming victory. The force effectiveness advantage that was close to three produced clear victory. The force effectiveness advantage lower than three produced victory below expectations. Force effectiveness parity produced defeat for the attacking force.

Usually there is little control over force ratios. The force effectiveness ratio postulate is of little use unless there is a means of controlling the casualty ratio. The premise is that surprise can produce a more favorable casualty ratio. It is also expected that surprise aided or caused by deception will be even more favorable.

The diverse outcomes that are included in Tables 18 and 19 preclude them from detailed analysis. Table 18 needs to be separated into four different Tables covering each outcome for the attacker so that the trends are seen.

TABLE 21
FORCES AND CASUALTY RATIOS (OVERWHELMING VICTORY)

ENVIRONMENT	NO.	FORCE RATIO	CASUALTY RATIO
SURPRISE AND DECEPTION	5	1 : .76	1 : 12
SURPRISE WITHOUT DECEPTION	2	1 : .65	1 : 4.65
DECEPTION WITHOUT SURPRISE	0	N/A	N/A
NO SURPRISE, NO DECEPTION	1	1 : .4	1 : 1.5
TOTALS/AVERAGES	8	1 : .69	1 : 7.5

The five cases in Table 21 that had the worst average force ratios for the attacker were associated with deception. Whether the surprise with deception produced the highly favorable casualty ratios or whether that casualty ratio was fixed by other factors is not known. Testing the postulate for the three environment cases yields force effectiveness ratios of 13.16, 7.15, and 3.75 respectively. All three agree with the actual averaged outcomes of the different categories of battle.

TABLE 22
FORCES AND CASUALTY RATIOS (CLEAR VICTORY)

ENVIRONMENT	NO.	FORCE RATIO	CASUALTY RATIO
SURPRISE AND DECEPTION	7	1 : 1.18	1 : 3.44
SURPRISE WITHOUT DECEPTION	8	1 : .78	1 : 2
DECEPTION WITHOUT SURPRISE	0	N/A	N/A
NO SURPRISE, NO DECEPTION	9	1 : .54	1 : 1.67
TOTAL/AVERAGE	24	1 : .82	1 : 2.38

Table 22 should reflect battles where the attacker had a three-to-one force advantage. Using the force effectiveness postulate, multiplying the force ratio advantage by the casualty ratio advantage, yields figures of 2.92, 2.56, and 3.09. The figures support the postulate and deception and surprise may have increased the casualty ratios, but the evidence is much weaker.

TABLE 23
FORCES AND CASUALTY RATIOS (MARGINAL VICTORIES)

ENVIRONMENT	NO.	FORCE RATIO	CASUALTY RATIO
SURPRISE AND DECEPTION	4	1 : .475	1 : 1.97
SURPRISE WITHOUT DECEPTION	7	1 : .4	1 : 1.5
DECEPTION WITHOUT SURPRISE	2	1 : .55	1 : .8
NO SURPRISE, NO DECEPTION	12	1 : .77	1 : 1.5
TOTAL/AVERAGE	25	1 : .6	1 : 1.54

The force effectiveness postulate begins to break down in Table 23. While the overall force effectiveness ratio for the data set is 2.56 to 1, the first two categories of the Table yield ratios of 4.14 and 3.75 to one. A possible explanation is that there is a limiting factor which is set by the magnitude of the force ratio. The first two categories had force ratios of 2.1 and 2.5 to one respectively. The other two categories had ratios of 1.8 and 1.3 to one. 1.4 to one was the average force ratio for all 89 cases. It may be that as the actual force ratio nears the three to one advantage, the possible contribution of surprise and/or deception weakens.

TABLE 24
FORCES AND CASUALTY RATIOS (DEFEAT)

ENVIRONMENT	NO.	FORCE RATIO	CASUALTY RATIO
SURPRISE AND DECEPTION	2	1 : .45	1 : .35
SURPRISE WITHOUT DECEPTION	1	1 : .4	1 : .1
DECEPTION WITHOUT SURPRISE	0	N/A	N/A
NO SURPRISE, NO DECEPTION	29	1 : .74	1 : .83
TOTAL/AVERAGE	32	1 : .71	1 : .76

Using the postulate yields force effectiveness numbers of .78, .25, and 1.12 to one. All three categories would have predicted the result which was defeat.

It is necessary to increase force effectiveness when adequate force advantage does not exist. It would seem that it is easy enough to determine the ratio in advance of the battle. The commander knows the relative forces pretty well. The casualty ratios for the last few battles should be available. The force effectiveness postulate, if correct, should easily show whether a combat power multiplier such as deception is required.

TABLE 25
PROBABILITY OF DECEPTION GIVEN FORCE RATIOS

FORCE RATIO	PROBABILITY OF ATTEMPTING DECEPTION	
10 : 1 TO 2.5 : 1	.33	(9 OF 27)
2 : 1 TO 1.25 : 1	.156	(5 OF 32)
1.1 : 1 TO .9 : 1	.07	(1 OF 14)
WORSE THAN .9 : 1	.5	(5 OF 10)
OVERALL PROBABILITY	.24	(20 OF 83)

The question of when a force will resort to deception is partially answered by Table 25. A force that is attacking a superior defensive force is much more prone to use deception than any other force. The vastly superior attacking force may use deception a third of the time. That force probably has the initiative and can predict the enemy action.

The vastly superior force may embrace deception simply to reduce casualties. The fact that the other two categories are rarely associated with deception may only be explained by a general misunderstanding of the deception process.

5. Deception Effect on Increasing Territory Exchanged

The attacking force which achieves an overwhelming victory is in a position to exploit that victory by driving deep into the enemy rear area. The exploitation forces would have destroyed or bypassed the enemy reserve or counterattack forces and would be able to acquire control over vast areas of territory previously held by the enemy. The defensive forces on either side of the penetration would either be captured after being cut off or would have to be withdrawn in order to establish a new line of defense.

The battles in which the attacking force is not able to achieve a penetration of the defense would result in a smaller territory exchange. A clear victory might be stereotyped as one that achieves a large salient into the enemy lines but is stopped short of the exploitation. A victory that is less than expected might be one in which the attacking force becomes decisively engaged prior to achieving the planned objectives.

An attack that ends in defeat might gain or lose ground. The typical situation for that type of battle would be that the decisive engagement begins at the main line of

defense. The attack might not make any progress at all or the progress being made might not justify the cost. Continuing the costly battle might decimate the attacking force such that it would have to withdraw from the battlefield. That would account for territory lost by an attacking force.

It must be established from the data that territory exchange is a valid criterion for measuring the outcome of battle. Again, the analysis is done from the point of view of the attacking force. The strategic cases are excluded. There are 82 cases for which Barton Whaley assigned territory exchange figures, but there are several cases which bias the analysis and which can not be averaged out. It is necessary to restrict the data set to exclude the cases which extremely bias the cross-correlation.

One case, the Italian East Africa Campaign in 1941, was responsible for conquering more territory than all the other cases combined [Ref. 129]. Another case, the World War I attack on the forces of Austria, Germany, and Bulgaria by the forces of Rumania, resulted in a defeat of the Rumanian forces and a territory loss of 54,000 square miles [Ref. 130]. These cases are not typical. They should be deleted if the averaged outcomes are to be analyzed, yet it is not proper to delete any cases from the cross-correlation without first considering them. The following Table was compiled to investigate the bias effect at different levels of data restriction.

TABLE 26
TERRITORY EXCHANGE VERSUS OUTCOME OF BATTLE

EXCLUDING CASES WITH EXCHANGES:	NO.	TERRITORY EXCHANGED (SQUARE MILES) "V+"	"V"	"V-"	"D"
NO EXCLUSION	82	82,680	5,580	552	-1,955
OVER 50,000	79	6,205	2,743	340	- 161
OVER 4,000	71	288	463.5	340	104
OVER 2,000	67	288	246	197	12.4
OVER 1,000	64	288	110	128	12.4
OVER 300 SQUARE MILES	56	80	66	65.7	12.4

Table 26 indicates that deleting more and more data reduces the effect of extreme cases to the point that the data is no longer representative of the sample sets. The range of deletion for the final category was five "V+" cases, eleven "V" cases, seven "V-" cases, and three "D" cases. There is a radical change in the outcome as extreme cases are deleted, but 32 percent of the data is lost. Eliminating cases in an effort to make the averaged data settle down results in less confidence in the analysis. The different data sets are affected differently at each setting.

The requirement is to set the threshold for deletion at the point where the data is most representative of the entire 82 cases. There is no obvious point for the threshold. The author of this thesis chose to set the threshold to exclude cases where territory exchange exceeded 1,500

square miles. The reasoning for that choice was threefold. First, that area is roughly the area that a modern army would cover in a two day exploitation. Second, that threshold removes the strongly biasing cases. Third, that threshold retains 82 percent of the data.

TABLE 27
TERRITORY EXCHANGE THRESHOLD CASE REDUCTION EFFECT

THRESHOLD	NO.	"V+"	"V"	"V-"	"D"
NONE	82	8	23	22	29
50,000	79	7	22	22	28
4,000	71	5	18	21	27
1,500	67	5	16	20	26
1,000	64	5	14	19	26
300	56	3	12	15	26

The data that is left after considering only those cases with territory exchange less than 1,500 square miles is assumed to be representative. The threshold impacts more on the "V+" and "V" sets as it deletes a higher proportion of cases from these categories. It would seem that any induced error would be on the side of caution.

The data at the threshold of 1,500 square miles is:

TABLE 28
TERRITORY EXCHANGE CASES BY CATEGORY

ENVIRONMENT	TOTAL	NUMBER OF CASES "V+"	"V"	"V-"	"D"
SURPRISE AND DECEPTION	14	3	5	4	2
SURPRISE WITHOUT DECEPTION	10	1	4	4	1
DECEPTION WITHOUT SURPRISE	1	0	0	1	0
NO SURPRISE, NO DECEPTION	42	1	7	11	23
TOTAL	67	5	16	20	26

Table 27 displays the same trends as shown previously as far as the relationship between environment and the outcome of the battle is concerned. The cross-correlation of territorial exchange and the outcome was shown in table VI-21. The cases of Table 28 for "V+", "V", and "D" displayed average territorial exchanges of 288, 246, 197, and 12.4 square miles respectively. The trend was sufficiently strong to support the idea that territory exchange is a measure of the effectiveness of the attacking force in the battle. It would also be reasonable to say that it would be a measure of effectiveness for the defense as well.

The point in question is, whether forces that employed deception can be judged as being more effective based on the criterion of territory exchanged. Fifteen of the cases shown in Table 28 involved deception and only two of them were defeats. Those two were the only deception cases that achieved a territory exchange of ten square miles or less. The remaining 52 cases did not involve deception. 24 of those cases, almost half, ended in defeat. Of the remaining 28, there were 25 that did not gain at least ten square miles of territory. Along a division frontage of 30 kilometers that equates to a gain of only 855 meters. That is still in direct fire range of where the battle began.

The cases that did not involve deception did include ten cases where surprise was achieved anyway. Of those, only one battle ended in defeat. Even including those cases, the

attacks that utilized deception produced a clear advantage in territory gained over the attacks that did not utilize deception. The fifteen deception cases averaged a 265 square mile gain. The 52 cases not using deception averaged only 109 square miles, a gain that was less than half as much.

D. ANALYSIS OF OPTIMAL DECEPTION PRACTICES

One desired deception outcome is surprise because the cases that involved both surprise and deception were the best in terms of optimizing the operational mission. Optimizing the deception mission, then, may require actions which produce surprise. The analysis shows that it is not just a case in which the deception target is surprised or is not surprised. Surprise has several psychological dimensions.

The first dimension of surprise is its extent or variety of different forms. The different forms that surprise can take were classified by Whaley as the various modes of surprise. The five modes are intention, time, place, strength, and style. The modes will be addressed in this thesis as they are slightly more descriptive than the traditional use of who, what, where, when, and how. Style should be the only mode that requires an explanation in the military sense. Defensive style, for example, could vary from "defend to the death" to a more moderate "defend to trade space for time". Style also includes battle tactics whether normal or unconventional, technical innovations, and new weapons. Style is a measure of how the whole operation is conducted. [Ref. 131]

The second dimension of surprise is its intensity. Intensity is a measure of degree of effect. Certainly, an attack that was unexpected in terms of all five modes of surprise would generate a more intense surprise than one that was predictable in all modes but one. The number of modes in which surprise is attained defines the intensity as being on a scale of zero to five.

A second measure of intensity of surprise is the degree of surprise achieved for any one mode. That degree is much harder to research or even define. For the purposes of this thesis it will be limited to being either "very surprised" or just "surprised". An example of being surprised in the mode of place would be the surprise generated when the attack was made at point B when it was expected at point A. An example of being very surprised would be the surprise that might be generated when the attack was made at point C when it was preconceived that such an attack would have been impossible. [Ref. 132]

The cross-correlation method will be used to identify the optimal deception practices used in the historical data set. The analysis is limited to the list B cases in which surprise was present.

1. Modes of Surprise

Overall there were 44 cases of tactical data in which surprise was present. Only nine of these cases included surprise in only one mode. The nine cases included one case

of surprise of intent, two of place, and three of style. Each of the three cases where surprise was due to style resulted in at least a clear victory. The same statement can not be made for the other modes. This is of interest because style is not the predominant mode of surprise. The most common mode is place. The least common mode is intention. The frequency order of the five modes is as shown:

TABLE 29
MODE FREQUENCIES OF SURPRISE

MODE OF SURPRISE	NUMBER	PERCENTAGE OF CASES
PLACE	31	70.5 %
TIME	25	56.8 %
STRENGTH	24	54.5 %
STYLE	12	27.3 %
INTENTION	8	18.2 %

The next step is to determine whether the modes of surprise were generated by a deception operation or not. Surprise can be optimized by plan if deception is most efficient in generating surprise in the proper mode. The 44 cases of tactical surprise are reduced to 25 cases of deception and surprise for this analysis.

TABLE 30
MODE FREQUENCIES OF DECEPTION GENERATED SURPRISE

MODE OF SURPRISE	NUMBER	PERCENTAGE OF CASES
PLACE	22	88 %
TIME	14	56 %
STRENGTH	15	60 %
STYLE	4	16 %
INTENTION	4	16 %

Table 30 indicates that deception has not played a large part in generating surprise in the modes of style and intention. It is difficult to conceal intention at the tactical level and that is probably why that mode is neglected. The style of battle is difficult to change. The weapons mix remains fairly constant. The tactics are rarely changed especially if they have been successful. There are only so many technological advantages that are kept secret until they can be used on the battlefield. Place, time, and strength are more readily changed and are the most common elements of a deception plan.

Place includes such factors as the point of the attack, the area or width of the attack, and the direction or axis of operations. The U.S. Army uses what is known as, "intelligence preparation of the battlefield" (IPB). IPB takes into account the known factors of the environment in both the enemy and friendly areas. Natural obstacles such as mountain ranges, rivers, heavy vegetation, and precipitation often restrict the movement of forces. Man-made features such as roads, bridges, railroads, levees, and towns can either restrict or assist operations.

The objective of IPB is to identify possible avenues of approach and determine the throughput capability for each approach. The throughput capability is a measure of the maximum size of the force that can maneuver along a particular avenue and the speed with which the force can

move. IPB is an analytic tool used to predict place, time, and strength. Deception, however, may be based on attacking over impassible terrain, during impossible weather, or at unprecedented speed.

The U.S. Army has a long tradition of doing the near impossible. That is not an attribute of every army. Americans have developed a capability to think and do for themselves. This trait was needed in the early years simply in order to survive. The problems of forcing the wilderness to grant passage to the West developed engineering skills and unique solutions. An Army of soldiers who grew up on flat land might never think to move across broken terrain.

IPB matches enemy doctrine and organization stereotypes to the physical environment. The end result of IPB is a perception. It is a strong perception because it is based on detailed analysis and current intelligence. The defense would use IPB to position combat forces and allocate combat support forces. The result could be that the combat power is maximized to block the expected main avenue of approach by minimizing the force available elsewhere. In fact, large areas in the defensive line may be loosely defended or only covered by aircraft patrols. This style of defense is highly efficient if the enemy attacks according to the preconception of his attack.

IPB is a formal method of performing a historical intelligence task. Similar effort existed in many of the

data set cases. Barton Whaley recorded that in 20 of the 44 tactical surprise cases, the defender had formed a preconception regarding where the attack was likely to occur. The mode frequencies for this data set which includes cases of surprise without deception are shown in Table 31.

TABLE 31
MODE FREQUENCIES OF PRECONCEPTION CASES

MODE OF SURPRISE	NUMBER	PERCENTAGE OF CASES
PLACE	16	80 %
TIME	13	65 %
STRENGTH	12	60 %
STYLE	3	15 %
INTENTION	6	30 %

The data set can be further restricted to the 16 cases where deception was conducted against an enemy who had formed a preconception. The assumption is made that the deceiver may have had knowledge of the preconception and may have been able to incorporate that knowledge in the deception plan. There is a requirement for a feedback channel as well as a requirement for sufficient intelligence on the enemy forces if the deception is to be based on preconceptions.

TABLE 32
MODE FREQUENCIES GIVEN DECEPTION AND PRECONCEPTION

MODE OF SURPRISE	NUMBER	PERCENTAGE OF CASES
PLACE	14	87.5 %
TIME	10	62.5 %
STRENGTH	11	68.7 %
STYLE	2	12.5 %
INTENTION	4	25 %

Comparing Tables 29 and 32, it can be seen that there is a general increase in the percentage of successful surprise modes when deception is attempted against an enemy who has formed a preconception. The exception is the mode of style. This may result from the inattention to style when planning a deception, from an inability to change style, or from the fact that the defender did not form a preconception as to style.

The next step is to look at the cases in which the deceiver was able to successfully reinforce the victim's preconception. The data is split into two groups depending on whether Whaley was able to determine successful reinforcement of preconceptions or whether it just appeared to be successful. The difference between the two groups is not obvious from the data. An assumption was made by the author of this thesis that the difference in the way that the data was coded was based on an lack of direct evidence in some of the historical files. The difference does not seem to be very important and no conclusions will be based on it.

TABLE 33
MODE FREQUENCIES GIVEN PERCEPTION REINFORCEMENT

	SUCCESSFUL		APPEARED SUCCESSFUL	
MODE OF SURPRISE	NUMBER	PERCENTAGE	NUMBER	PERCENTAGE
PLACE	8	88.9 %	6	85.7 %
TIME	5	55.5 %	5	71.4 %
STRENGTH	5	55.5 %	6	85.7 %
STYLE	2	22.2 %	0	N/A
INTENTION	3	33.3 %	1	14.3 %

A tentative conclusion from Table 33 is that the style and intention modes of surprise should not be neglected in deception planning. These modes can be used successfully to reinforce a target's preconception.

2. Intensity of Surprise Based on Numbers of Modes

Analysis of the intensity of surprise is required to indicate the number of modes that should be combined and which modes are optimum. These indications are necessary at the tactical level because time and assets are limited. The tactical level requires deception to optimize surprise in the most efficient and cost effective manner.

It has already been shown that surprise is directly related to the outcome of battle. The results of the 44 cases of tactical surprise can be correlated with the intensity of surprise. The intensity used is that which is a reflection of the number of modes in which the defender was surprised.

TABLE 34
INTENSITY OF SURPRISE

	OUTCOME OF BATTLE				
INTENSITY	"V+"	"V"	"V-"	"D"	TOTAL
1	2	4	2	1	9
2	5	10	3	2	20
3	1	5	4	1	10
4	1	1	2	0	4
5	0	0	1	0	1
TOTAL	9	20	12	3	44

As expected, surprise usually appears with multiple modes. This is because surprise as to the place usually coincides with surprise as to time, strength, or both. Surprise of intensity four or five did exist but it was rare. Almost half of the cases were of intensity two but there was no clear reason why. It would seem that it would require more planning and execution resources to conduct deceptions designed to induce surprise in multiple modes. The costs would become very expensive because the effort is not linear in nature. Each item on the deception indicator set would have to make sense in all five modes. The payoffs for the higher intensity deceptions would have to increase at the same rate in order to be cost effective.

Equating surprise intensity to the battle payoff requires a quantitative method. The method used to assign numerical values to the outcomes is a weighted system in which the payoffs "V+", "V", "V-", and "D" are assigned values of 5, 3, 2, and 1 respectively. This is based on a break-even point of 2.5, but the standard achievement hoped for would be at least a 3.0.

The outcomes of each battle are sorted by intensity categories and then divided by the number of battles in the category. The normalized values of the battle outcomes can be compared to the achievement numbers as a direct reflection of the expected value for that level of intensity. The next Table was designed to include the probability of achieving an

overwhelming victory as that value may be more important in some situations.

TABLE 35
EXPECTED VALUE BASED ON SURPRISE INTENSITY

INTENSITY	EXPECTED VALUE	PROBABILITY OF "V+"
1	3.0	22 %
2	3.15	25 %
3	2.8	10 %
4	3.0	25 %
5	2.0	0 %

Intensity level 2 exhibits the highest average payoff. Applying this historical trend to future battle would suggest that only two modes of surprise are needed to optimize the intensity. The penalty for attempting additional modes of surprise is a more complex planning and execution requirement.

Cases not involving deception are removed to produce:

TABLE 36
INTENSITY OF SURPRISE (DECEPTION CASES)

	OUTCOME OF BATTLE				
INTENSITY	"V+"	"V"	"V-"	"I"	TOTAL
1	1	1	0	1	3
2	4	7	1	1	13
3	1	3	2	0	6
4	0	1	2	0	3
5	0	0	0	0	0
TOTAL	6	12	5	2	25

It is seen that two thirds of the intensity one cases were not the result of a formal deception operation. It is

clear that intensity two cases predominate with over fifty percent of the total set. It is interesting that the cases which produced an overwhelming, unexpected victory were limited to the first three intensity levels. Intensity level three appears to be good in that it contains no cases of defeat but the number of cases is small. The low number of deceptions of intensity three or higher may also indicate the increased difficulty of properly executing an elaborate deception. The normalized value of the outcomes are:

TABLE 37
EXPECTED VALUES OF DECEPTION CASES

INTENSITY	EXPECTED VALUE	PROBABILITY OF "V+"
1	3.0	33 %
2	3.38	31 %
3	3.0	17 %
4	2.33	0 %

Again, the surprise seems optimized at the second level. While the first three intensities have the historical result of clear victory, intensity three has a lower probability of achieving overwhelming victory.

The probability of "V+" would be important to a commander willing to accept a higher risk to have a higher probability of achieving an overwhelming victory. The data from Tables 35 and 37 could also be looked at from the viewpoint of a commander who can not afford a decisive defeat.

Risk aversion behavior would lead such a commander to plan for achieving intensity level three. On an average, battles of intensity three would produce a clear victory.

Following the same trend that was used to evaluate individual modes, the data set is reduced to the sixteen cases of deception based on preconceptions made by the enemy.

TABLE 38
INTENSITY OF SURPRISE (DECEPTION AND PRECONCEPTION)

INTENSITY	"V+"	"V"	"V-"	"I"	TOTAL
1	1	Ø	Ø	Ø	1
2	3	4	Ø	Ø	7
3	1	3	2	Ø	6
4	Ø	1	1	Ø	2
TOTAL	5	8	3	Ø	16

As soon as the data was restricted to cases of deception based on the preconceptions of the enemy, all of the cases which ended in defeat dropped out.

TABLE 39
VALUES (DECEPTION BASED ON PRECONCEPTION)

INTENSITY	EXPECTED VALUE	PROBABILITY OF "V+"
1	5.Ø	1ØØ %
2	3.86	43 %
3	3.Ø	17 %
4	2.5	Ø %

Sufficient knowledge about the enemy produces a large advantage. Expected value increased or stayed the same for all levels of intensity. The probability of achieving overwhelming victory increased or stayed the same. The average expected value for a deception based on preconceptions of the enemy is 3.44. That seems significantly higher than a clear victory value, 3.0.

3. Intensity of Surprise Based on Mode Grouping

Knowledge of enemy preconceptions will provide the key to be used in the determination of which modes of surprise should be attempted. The necessity to understand the enemy before trying to deceive him remains valid. This analysis of mode pairs looks at the results of historical surprise and deception. Mode pairing may have been by design of the historical deception planners. Mode pairing may also indicate which modes should be combined.

This analysis is to investigate the effectiveness of different pairs of surprise modes. Each case of intensity two has a mode pair which was assigned the value of the outcome of the battle. The 27 intensity two cases produce:

TABLE 4V
MODE PAIR ANALYSIS AT INTENSITY TWO

MODE PAIR	NUMBER	EXPECTED VALUE
PLACE-STRENGTH	8	3.375
TIME-PLACE	5	2.4
TIME-STRENGTH	3	3.3
PLACE-STYLE	2	4.0
TIME-INTENTION	1	5.0
STRENGTH-STYLE	1	2.0

The most common pairings were as expected. Place was associated with either strength or time. The numbers in Table 40 are not large enough to insure that averaging resulted in a representative number for the battle outcome. Averaging requires more numbers. More numbers are obtained by adding the battle values for each case in which a mode pair was included in a larger mode set. The results are shown in Table 41:

TABLE 41
MODE PAIR ANALYSIS (TOTAL FREQUENCY)

MODE PAIR	NUMBER	EXPECTED VALUE
PLACE-STYLE	7	3.14
PLACE-STRENGTH	19	3.26
TIME-STYLE	4	3.0
TIME-STRENGTH	13	2.92
TIME-INTENTION	6	2.83
TIME-PLACE	18	2.72
STRENGTH-STYLE	7	2.71
INTENTION-STYLE	2	2.5
INTENTION-PLACE	5	2.4
INTENTION-STRENGTH	3	2.3

All ten possible pairings for the five modes of surprise are included in Table 41. The rank ordering in terms of expected value is surprising. There are refinements that must be made before optimum mode pairs can be selected.

The key discriminator used to select the desired data set is the existence of preconceptions. There are seven intensity level two cases involving deception based on preconceptions of the enemy. Place-strength is the dominant mode pair with four of the seven cases having that mode pair. Comparing the place-strength mode pair using Tables 41 and 41 shows that the pair's expected value was substantially different.

Restricting the data set to the cases of deception based on the preconceptions of the enemy will provide the set from which the optimum mode pair can be selected. The results of the analysis of that set are shown in the next Table:

TABLE 42
MODE PAIR ANALYSIS (PRECONCEPTION BASED DECEPTIONS)

MODE PAIR	NUMBER	EXPECTED VALUE
PLACE-STRENGTH	5	3.4
TIME-INTENTION	4	3.25
PLACE-STYLE	7	3.14
TIME-STYLE	1	3.0
STRENGTH-STYLE	1	3.0
TIME-PLACE	8	2.875
TIME-STRENGTH	7	2.857
PLACE-INTENTION	3	2.67
STRENGTH-INTENTION	1	2.0

Table 42 lists the mode pairs in order of decreasing expected value. The table indicates that deception planning in the past may have been based on what measures could be done rather than on what should be done in order to optimize surprise. The expected values and the frequencies of pairing are not associated correctly. Still, the analysis shows that the cases, where deception was based on preconceptions, were associated with battle outcomes that were better than those shown in Table 40. The conclusion is that the optimized deception is the one that is based primarily on the preconceptions of the enemy. If those preconceptions allow a choice, the mode pairs should be chosen by expected value in the order shown in Table 41. The pairs should not be chosen by their ease of execution because an easy deception is not necessarily an effective one.

4. Intensity of Surprise based on Degree of Mode Surprise

The second measure of intensity is the degree of surprise achieved for any one mode. It would be reasonable to expect that the more the deception target is surprised, the greater would be the effects of the surprise. There is very little data, however, which differentiates between "very surprised" and "surprised".

The first task in addressing this measure of intensity of surprise was to see if there was a quantifiable advantage associated with intensity levels. The method to do this was to equate the battle outcomes using the previously

established number scheme. The rating of "very surprised" was found in 25 battles. The average outcome of those battles was 3.16. Those 25 battles were taken from the larger tactical data set which had an average outcome of 3.0. The difference is not large enough to indicate an advantage.

The data set was restricted to the cases which involved tactical deception based on enemy preconceptions. The number of cases from that set that had the "very surprised" rating was ten. Those ten cases had an average outcome of 3.1. That outcome was slightly better than that of the cases that were not based on preconceptions, but the difference between 2.8 and 3.1 does not appear significant.

The tactical data set of cases which had the "very surprised" rating included nine cases that did not involve a deception operation, though the enemy had formed a preconception. Those nine cases had an average outcome of 3.44. There was no apparent difference between the data sets other than those already noted. Cases where the enemy was "very surprised" in two or three modes did not have a higher value than those of only one mode.

TABLE 43
VALUE OF A HIGH DEGREE OF SURPRISE

MODE	NO. OF "S+" CASES	AVERAGE VALUE OF OUTCOME
STRENGTH	12	3.4
PLACE	9	2.89
STYLE	6	3.2
TIME	4	3.2
INTENTION	2	4.0

Table 43 shows that the enemy is more often "very surprised" by unexpected strength than by any other mode. The observation is of no practical interest, however, since that knowledge cannot be put to use. The analysis indicates that there is no apparent advantage in pursuing a high degree of surprise in any mode. The deception plan should be diversified to induce surprise in several modes rather than focused on one mode only.

5. Effect of Security on Surprise

This analysis verified that if the victim's intelligence branch warned the victim of impending attack, such warning had an adverse effect on surprise. The tactical case required both B and C lists of battles to be considered as shown below:

TABLE 44
EFFECT OF WARNING ON TACTICAL SURPRISE

LIST	TYPE	NO.	SURPRISE CASES	OUTCOME
B	WARNING GIVEN	25	22	2.84
B	NO WARNING	22	22	3.?
C	WARNING GIVEN	46	0	1.54
C	NO WARNING	8	0	2.125

Table 44 indicates that the three cases of deception that did not produce surprise were due to efficiency of enemy intelligence in providing warning. The Table also shows that the effect of warning produced a disadvantage whether surprise was ultimately achieved or not. That disadvantage is more obvious when the tactical data of Table 44 is combined.

TABLE 45
OVERALL EFFECT OF WARNING

CASE TYPE	NUMBER	OUTCOME
WARNING GIVEN	71	2.0
NO WARNING	30	2.77

6. Effect of Schedule Changes on Surprise

False alerts sometimes produce a "Cry Wolf" effect. The "Cry Wolf" effect is a desensitizing of a force that occurs when it repeatedly responds to a threat that does not materialize. This effect has been associated with strategic deception in many sources including Whaley's 1969 study and the 1982 book edited by Daniel and Herbig, Strategic Military Deception. Professor Jiri Valenta of the Naval Postgraduate School made the following point in his 1982 article, "Soviet Use of Surprise and Deception". He wrote:

> "The most effective form of Soviet military deception during the Czechoslovak crisis was probably the continuing series of military exercises. Although they were probably intended by the Soviet Union to threaten Czechoslovakia with an invasion, paradoxically they may have desensitized the Czechoslovak and Western leaders and analysts to the very possibility of invasion." [Ref. 133]

The author of this thesis totally agrees that the "Cry Wolf" effect does occur in peacetime and in war. Military training exercises near the tense borders associated with the Federal Republic of Germany and with the Republic of Korea fit the "Cry Wolf" pattern. The "Cry Wolf" effect does occur at the operational level as well as the strategic

level, but the "Cry Wolf" effect is less often associated with schedule changes at the tactical level. The reason for this is probably associated with time.

Strategic operations might be delayed for long periods of time as it is often necessary to have long periods of favorable weather to mount such an operation. The long periods between threats provide sufficient time recover from the initial anxiety of the threat. The emotion that is remembered is the feeling of relief when the threat passed. Repeated false alerts for the same threat might generate "wishful thinking" that the next alert will be false as well. Delays of tactical operations are usually short in duration. Tactical delays might result from planning that did not allow sufficient lag time for chance events that upset the time-table for the operation. The tactical plan may be delayed for three days, for example, if the ammunition for the operation arrived three days late.

The deception data base includes many examples of battles that were postponed one or more times due to a myriad of factors. There were examples of enemy false alerts caused by anticipating the original schedule. The "Cry Wolf" effect has been observed in relation to the operational level, but usually the delays were not long enough to reduce the enemy's anxiety level caused by the initial threat. It is necessary to analyze whether the schedule changes reliably produce the desensitizing effect.

Changing the timing of an attack produces a risk of disclosure that is due to the posturing of units or to the communications used to implement the command and control. Increased communications would be necessary whether the change was a delay or whether the change was an advance. The risk to the operation should be less for the advanced schedule as the new schedule provides less time for the enemy to react.

The analysis of the effect of schedule changes was designed to verify if the historical data support the intuitive conclusion above. The following Table addresses the effect of schedule changes on the outcome of battle.

TABLE 46
EFFECT OF SCHEDULE CHANGES ON EXPECTED VALUE

LIST	TYPE	NUMBER	EXPECTED VALUE
B	ENEMY WARNED	14	2.35
B	NO WARNING	9	2.67
C	ENEMY WARNED	18	1.43
C	NO WARNING	1	3.0
	TOTAL	42	2.05

The overall probability that the enemy received warning was 71.4 percent for the cases that involved schedule changes. The average outcome of battle was much higher for the cases where no warning was given. The 32 cases where warning was present included only 14 cases where surprise was

still achieved. Nine of those cases involved deception which may have been able to reduce the effects of the warning.

The 42 cases included seven where the schedule of the attack was advanced. The average outcome of those cases was 2.43. The 35 cases of delayed schedules had an average outcome of 1.97. The difference in outcome is sufficient to support the idea that a schedule advance is less risky than a schedule delay.

Delaying an operation is usually no more than a date change. A projected start time of D-day, H-hour, is changed and the people who need to know are informed of the change. There are certain events such as the arrival of supplies and ammunition which result in rumors, but for the most part the specific dates for an operation are not released. An operation is planned based on time relative to D-day, H-hour. There are two reasons why this timing is used. The first reason is that coordination and training can be done without reference to a specific date. If the date changes, there will be no change in relative time so there is no confusion generated by the date change. The second reason is to protect the security of the projected date.

The point is, that the delaying of an operation is not necessarily the same as "Crying Wolf". The "Cry Wolf" situation seems applicable only for those operations in which a country or an army is repeatedly placed on alert for an attack which never comes. The alerts become routine and the

soldiers fail to respond properly when the attack does happen. That type of situation is more appropriate for the strategic level where repeated demonstrations at a border may be done in the form of a peacetime training exercise.

The peacetime training exercises produce a great deal of threat, but there is a return to a period of reduced anxiety once the exercise is over. It is questionable whether the same reduction in anxiety occurs in military forces on the battlefield during war. There are periods between battles that can be associated with reduced threat. There may not be any periods of reduced anxiety.

The "Cry Wolf" situation should generate the effect that after repeated false alerts, the expected value of the outcome from the point of view of the attacking force should increase. This does not happen at the tactical level for the cases which were the result of delayed schedules.

TABLE 47
EFFECT OF DEFERRED SCHEDULES ON OUTCOME

NO. OF DEFERRMENTS	NO. OF CASES	EXPECTED VALUE
1	23	2.13
2	6	1.67
3	1	2.0
4	3	1.67
MORE THAN 4	2	1.5
TOTAL	35	1.97

7. Effect of Individual Deception Measures

The measures which can be used for deception are countless. Each depends on the situation and the only limit would seem to be the imagination of the deception planner. FM 90-2, Tactical Deception, provides twelve examples of deception techniques which mainly apply to the offense and sixteen which mainly apply to the defense. The manual also provides ten deception ideas designed to trigger the imagination of the deception planner. The three ideas proposed in the manual are: (1) that each situation is different and requires different deception indicators, (2) that each deception plan must execute the measures that support the deception story, and (3) that there is no rank ordering of deception measures that applies to all situations.

The author of this thesis agrees with the above ideas with one exception. The exception is that the demonstration or diversionary attack should be avoided. The demonstration is the only ruse which by definition uses combat forces. This ruse may require a reduction in forces available to conduct the main operation and the forces may be lost once they make contact with the enemy. The ruse may create diversions which allow an overall victory but it may not make up for weakening the main force. The demonstration force may suffer excessive casualties.

There were eleven cases in the tactical data set where deception included at least one case of demonstration.

The average outcome for those battles was 2.54. The average result for the rest of the battles utilizing deception was 3.44. The difference is significant. The difference indicates that utilizing combat forces in a diversionary attack is less effective than using ruses of other form. A comparison between the feint and the demonstration is made in the next Table.

TABLE 48
DEMONSTRATION VERSUS FEINT

RUSE	NO. OF CASES	OUTCOME
FEINT ONLY	12	3.5
DEMONSTRATION ONLY	6	3.0
BOTH	5	2.0

Table 48 suggests that the feint produces the same deception effect without requiring combat forces to become engaged with the enemy. The combat forces can be used to better advantage with less risk if they are used for the feint. For that matter, combat forces are not required. The feint may be tasked to combat support or combat service support units.

The analysis also shows that using both a feint and a demonstration in the same deception may be counterproductive. The attempt to introduce a higher level of ambiguity in the place mode of surprise, may tip the enemy to the fact that deception is being employed.

Barton Whaley recorded the number and types of deception measures that were employed in or prior to each tactical operation. The data set of interest includes the 47 cases of tactical surprise and /or deception. The relative frequencies of each major type of ruse are shown in the next Table.

TABLE 49
RUSE FREQUENCY OF USE

RUSE TYPE	NUMBER
DISSIMULATIVE CAMOUFLAGE	18
FEINT	17
SIMULATIVE CAMOUFLAGE	12
DEMONSTRATION	11
RADIO DECEPTION	7
PLANTED RUMORS	5
FAKE DOCUMENTS	2
NEGOTIATIONS	1

As many as six different types of ruses were found in some tactical battles in the data set. The analysis was surprising in that the more elaborate deceptions did not produce a higher proportion of surprise. The number of ruses was compared to battle outcome in the following table.

TABLE 50
NUMBER OF RUSES VERSUS OUTCOME

NUMBER OF RUSES	NUMBER OF CASES	AVERAGE OUTCOME
0	14	2.57
1	9	3.22
2	8	3.375
3	11	3.27
4	3	2.33
5	1	1.0
6	1	2.0
TOTAL	47	2.93

Table 50 indicates that the number of major ruses used in a deception should be between one and three. That number could easily relate to the number of modes of surprise that the deception is designed to generate. There may be any number of individual deception measures that support one ruse.

There are deception measures which are used to display false indicators or ambiguity for the deception story. The case histories provided examples of the following types of measures:

TABLE 51
DECEPTION MEASURES TO DISPLAY THE FALSE

1.	False radio traffic, timing, sounds, or movement.
2.	Fake lighting schemes, dummy personnel and equipment.
3.	Controlled agents, political negotiations, press reports.
4.	Simulations, displays, command visits, false roads.
5.	Set up a false pattern that has logic the enemy expects.
6.	Present peaceful scene at the FLOT until the last minute.
7.	False training which focuses on alternate operation.

TABLE 52
DECEPTION MEASURES TO CREATE AMBIGUITY

1.	Contrary indicators.
2.	Fast moving events.
3.	Traffic volume to introduce time lags in intelligence.
4.	An attack conducted to prevent interference with another.
5.	Own forces deceived using rumors, radio, and unit orders.
6.	Deceptive bridge seizures.
7.	Showing defensive preparations while attacking.
8.	Setting counterattack traps while delaying.
9.	Keeping the tanks elsewhere. Let enemy watch them.
10.	Allowing a salient in your lines for later decoy use.
11.	Position crack units in plain view.
12.	Cause enemy to choose between two real deployments.
13.	Deploy two forces and attack with only one of them.
14.	Present enemy with fictitious alternatives.

The deception measures can be anything at all. The data included the following examples designed to conceal the real:

TABLE 53
DECEPTION MEASURES USED TO CONCEAL THE REAL

1.	Controlling channels to create missing data.
2.	Deceptive camouflage.
3.	False explanation of true events.
4.	Executing one operation to conceal another.
5.	Directing attention away from a certain area.
6.	False meaning to signals that could not be hidden.
7.	Map exercises restricted to a handful of key people.
8.	Late dissemination of the operations order.
9.	Restricted access to knowledge of real plan.
10.	Radio silence used as forces are concentrated.
11.	March at night and conceal in forests by the day.
12.	Conceal final approach through noise/light discipline.
13.	Abnormal air attack timing.
14.	Abnormal land attack timing.
15.	Visual deception.
16.	Conceal forces and materiel in zone of main effort.
17.	Conceal concept of operation.
18.	Strict security.
19.	Conceal direction of main effort.
20.	Change usual tactics.
21.	Keep reserves held much further back than normal.
22.	Conceal composition of forces.
23.	Do not conduct reconnaissance by large detachments.
24.	Do not hold familiarization sessions with new forces.
25.	Portray that more rehearsal time is needed.

E. SUMMARY

1. Major Points Developed Through Case History Analysis

Surprise and deception are commonly associated, although surprise can be achieved without employing deception. The data analysis revealed that using deception effectively seems to almost guarantee that surprise will be achieved at the strategic level. Further, the conditional

probability of tactical surprise given deception was .89.

The offense can partially rely on the initiative to produce surprise. The defense has a much greater need for deception to produce surprise.

Surprise unaided by deception is in decline. Deception usually produces surprise. The probability of achieving at least a clear victory is highest when both surprise and deception are present.

Uncontrolled channels can cause even the most elaborate deception to fail.

Operations conducted in a predictable manner commonly end in defeat.

Any technological surprise rapidly loses its effectiveness once it is used.

The use of deception results in a casualty reduction. Surprise enhances force effectivenees. The aforementioned enhancement in combat power due to surprise and/or deception diminishes as the actual force ratio nears and then exceeds a three to one advantage for the attacker.

The force effectiveness ratio obtained by multiplying the force ratio and the casualty ratio experienced in prior battles may be used to predict whether an additional combat power multiplier such as deception is needed for success in a future operation.

Territory exchange is a valid criterion for measuring the outcome of battle. The attack that utilized deception

produced a clear advantage in territorial gain over the attack that did not utilize deception.

Surprise has two dimensions: variety and intensity. Intensity is a measure of degree of effect. Increasing intensity by number of modes is more beneficial than increasing a single mode intensity. The style and attention modes of surprise should not be neglected in deception planning. Only two modes of surprise are necessary to optimize the surprise intensity.

Feints should be used in preference to demonstrations and the two should never be used together.

Deception is best when it is based on preconceptions formed by the enemy.

Allowing the enemy to be warned of an impending operation produces disadvantages, regardless of surprise.

A failure to deceive the enemy rarely results in a penalty to the deceiver. The enemy gains almost nothing from the identification of deception signals as deception. Knowing what is false does not necessarily indicate anything about what is true. The deception effort may be wasted, but that small cost need not have any effect on the real operation. The exception is if essential forces are used in a feint or a demonstration. A penalty would result if those forces were unable to gain a required objective that was essential to success. A penalty would also result if those forces were attrited during the battle.

Schedule changes often result in the enemy being warned, thus they should be avoided. Delaying an operation is worse than advancing a schedule. Multiple deferments do not necessarily produce the "Cry Wolf" effect; however the possibility does exist.

The number of major ruses used in a deception should be between one and three. The actual number would depend on the situation. The key is keeping the plan cost effective.

2. Confidence Evaluation

The case history data set required the assumption of representativeness and the data set is limited to cases that are not classified. The recorded data may be biased in at least two ways. One bias may be due to inaccuracy in the historical records used by Whaley as sources of information. A second bias might exist in the way that Whaley coded the data. These biases must be checked as they may have introduced bad data into the data base. The total effect of bad data in the data set is not clear. The data set was accepted by the Central Intelligence Agency, however, and does contain much excellent information.

There are two things that can be done to increase confidence in the data and the analysis of this thesis. The first approach is to make a comparison of the data and the analysis results with the data and analysis results of an established research group. The comparison will be made with the work done by the Historical Evaluation and Research

Organization (HERO) in support of their Quantified Judgment Method of Analysis of Historical Combat Data (QJMA). The second approach will be to do a sensitivity analysis on the numerical weighting scheme used in this thesis to represent the expected values of battle outcomes.

Colonel T.N. Dupuy's book, Numbers, Predictors & War, included a list of selected battle statistics [Ref. 134] which included 22 battles from the same time period covered by Whaley's deception data base; 15 of those battles were analyzed in the 1969 study by Whaley. In all but one case, there was agreement between Dupuy and Whaley as to which side was the victor and which side was the defeated. The case that was different was the Battle of the Ardennes in 1944. Dupuy classed the battle as a German victory. Whaley classed the battle as a German defeat. The difference was one of scope. Whaley's case analysis was only on the German counterattack which eventually did end in German defeat. The difference in methods of historical research used by Whaley and Dupuy does not seem significantly large.

Colonel Dupuy did not classify battle outcomes to the same degree that Whaley did. Dupuy's closest comparison to the "V+", "V", "V-", and "D" outcomes recorded by Whaley was a short listing of "Quick Wins", "Almost Quick Wins," and "Stalemates." [Ref. 135] Using a rating scheme which equates "V+" and "Quick Win" to 5.0, "V" and "Almost Quick Win" to 3.0, and the "V-" and "Stalemate" to 2.0; this Table emerges:

TABLE 54
COMPARISON OF VICTORY CRITERIA

DUPUY'S CRITERIA	NO. CASES	AVE VALUE	WHALEY'S CRITERIA	NO. CASES	AVE VALUE
QUICK WINS	4	5.0	"V+"	4	4.0
ALMOST QUICK WINS	3	3.0	"V"	3	3.67
STALEMATES	3	2.0	"V-"	7	2.43

The comparison would remain valid regardless of the weighting scheme used because Whaley's "V-" ratings were only found in the cases that corresponded to "Stalemates." Whaley's "V+" ratings were found associated with "Quick Wins" in all but one case which was an "Almost Quick Win." The comparison was made to show that Whaley's data was not significantly biased by his coding criteria. The lack of a significant bias is shown by the Table as long as there was not an equal bias in Dupuy's work.

Colonel Dupuy published his book, Numbers, Predictors & War, in order to describe the analytical model, QJMA. The book is detailed in regards to the model but does not include very many details for his examples from history. Dupuy and the HERO group developed their model from the mathematical interaction numbers that were calculated from historical battles, but the book really only included detailed statistics from one battle. The details of the Somme Offensive [Ref. 136] in Dupuy's book can be compared to

similar details presented by Whaley [Ref. 137] as shown in the following Table.

TABLE 55
SOMME OFFENSIVE DATA COMPARISON

CRITERIA	DUPUY DATA	WHALEY DATA
FORCES	600,000 GERMAN TO 250,000 ALLIES	71 DIVISIONS TO 29 DIVISIONS
FORCE RATIO	2.4 TO 1.0	2.45 TO 1.0
CASUALTIES	200,000 TO 240,000	348,000 TO 330,000
CAS. RATIO	.83 TO 1.0	1.05 TO 1.0
TERRITORY EXCHANGE	PHASE 1: 30 KM PHASE 2: 12 KM TOTAL = 42 KM	1200 SQUARE MILES (PER 60 MILE FRONT) EQUATES TO 40 KM
SURPRISE FACTOR	GERMAN SURPRISE (SLIGHT)	GERMAN SURPRISE (NO PRECONCEPTIONS)
OUTCOME	SLIGHT GERMAN VICTORY	"V-" FOR GERMANS
ARTILLERY	6,473 TUBES	6,000 TUBES
MORTARS	3,532 TUBES	3,000 TUBES

Table 55 shows that Whaley and Dupuy recorded almost exactly the same data for the Somme Offensive. There was a slight difference in scope and Dupuy did break the battle into two phases; however, the Somme example indicates that Whaley's research and coding was at least as accurate as that done by Dupuy. In fact, Dupuy admits that he used only three secondary sources [Ref. 138] while Whaley cites 16 references and provides 11 direct quotes to support his analysis of the case [Ref. 139].

Colonel Dupuy and his HERO associates decided as military historians that the outcome of the battle should be assessed on the basis of three outcomes: (1) accomplishment of the opposing missions, (2) effectiveness in relation to ground gained or lost, and (3) casualty effectiveness [Ref. 140]. The QJMA model compares relative combat effectiveness using up to 73 separate variables in an algorithm which determines the influence of environmental and operational variables upon the force strengths of the two opponents. If the algorithm result is different from that predicted by the combat power ratio, further analysis is done to explain the discrepancy. The discrepancy is usually due to behavior considerations [Ref. 141]. The model is important because it is the only known model that reliably represents real-life combat over the course of history. The model works so well, that Dupuy wrote,

> "In 1979 it was the only model that provides a basis for confidence that it can extrapolate realistically to the future, permitting reliable proces within ranges of future possibilities." [Ref. 142]

Dupuy's model does not deal with deception, but it does deal with surprise as perhaps the most important operational effect that is not quantifiable in the combat power ratio. The calculations for Dupuy's model account for three major effects of surprise. The first effect is on the mobility of the surprising force. Mobility is enhanced by permitting optimum disposition of troops before the attack. The second effect is to increase the vulnerability of the

surprised force. The vulnerability is increased by the surpriser's ability to place fire unexpectedly and accurately. The third effect is to decrease the vulnerability of the surprising force. That vulnerability is decreased through pre-planning and pre-positioning of forces. [Ref. 143] The values that are used in the QJMA calculations are as follows.

TABLE 56
TACTICAL SURPRISE FACTORS [Ref. 144]

DEGREE OF SURPRISE	SURPRISER'S INHERENT MOBILITY CHARACTERISTICS	SURPRISER'S VULNERABILITY	SURPRISED'S VULNERABILITY
COMPLETE	5.0	0.4	3.0
SUBSTANTIAL	3.0	0.6	2.0
MINOR	1.3	0.9	1.2

The total surprise using the QJMA algorithm takes into account the interaction of many factors. The influence of surprise is different for each battle. The QJMA data base includes 52 battles in which the surprise effect was calculated. The results are shown in the next Table.

TABLE 57
QJMA DATA BASE VALUES FOR SURPRISE.

PERIOD	NO. OF CASES	AVERAGE VALUE OF SURPRISE
1940-1967	34	1.66
1973 WAR	18	2.23

There are two observations that can be made in relation to Table 57. The first is that Dupuy's calculations indicate that surprise has a significant effect on the battlefield. That observation is not surprising in itself, but the degree of effect is surprising. The average case of battlefield surprise between 1940 and 1967 resulted in a two thirds increase in combat power. That large effect provides support for the observations made in this thesis and suggest that Whaley's data is, at least, roughly accurate. The second observation is that the surprise effect in the 1973 War was 134 percent of that of the earlier set of wars. The increased technology on the battlefield in 1973 did not reduce the effect of surprise. The trend shown by Dupuy's data is that surprise is now even more important now than it was for earlier wars. Dupuy made the following observation:

> "In the last century there has not been a single change in weapon's technology with as great a statistically measurable impact on war as the transition to rifled small arms in the 1840s and 1850s. The reason for this is that the principle weapon of war is, and always has been, man himself. Thus the nature of warfare has changed only in its details (sometimes dramatically, but always relatively slowly) as man adapts himself and his thinking to new weapons and new technology." [Ref. 145]

Dupuy's CJMA model is applicable to modern war with modern weapons. It has reproduced the results of the 1973 October War, even though no other model available in 1979 for use by or in service to the Department of Defense could do so. [Ref. 146]

The QJMA model provides the ability to extend the application of this thesis to include modern war. If man is the principal weapon of war, then the ability to predict the human decision criteria remains an essential military requirement. The ability to manipulate that decision to provide a combat advantage remains valid. Modern sensors on the battlefield do not necessarily make deception more difficult. Modern sensors allow more channels that can be used to send information to the enemy in order to manipulate the enemy's decisions.

Comparison of Whaley's data and results to Dupuy's data and results has shown that the two sets are very similar. That produces a fair amount of confidence in Whaley's data. This thesis has kept very close to the data provided by Whaley with only one exception. That exception is the use of numbers to represent the value of the battle outcomes recorded by Whaley.

It is necessary to examine whether the selective choice of values to represent the results of battle biases the average expected values presented in some of the Tables in this thesis. The value scheme used in Tables 35 to 50 was used in order to provide a quick reference number. That value scheme could be shifted along the number line and still represent the relative values of "V+", "V", V-", and "D". The relative weighting of the values can be changed by expanding the differences between the outcomes.

TABLE. 58
OPTIONAL WEIGHTING SCHEMES

OPTION	NAME	"V+"	"V"	"V-"	"D"
THESIS SCHEME	A	5	3	2	1
OPTION 1	B	5	3	1	-1
OPTION 2	C	5	3	1	-2
OPTION 3	D	5	1	-1	-5
OPTION 4	E	10	0	-5	-10

The different options include both linear and non-linear shifts in the weighting of outcomes. Selective analysis using the different weighting schemes will indicate whether the results are sensitive to the choice of the weighting scheme. Table 41 was chosen for the analysis as it was the table with the largest number of factors for which the expected values were calculated. A comparison was made among the five weighting schemes.

TABLE 59
COMPARISON OF WEIGHTING SCHEMES

MODE PAIR	NO.	A	B	C	D	E
PLACE-STYLE	7	3.14	2.71	2.71	1.286	0.71
PLACE-STRENGTH	19	3.05	2.68	2.68	1.105	0.263
TIME-STYLE	4	3.0	2.5	2.5	1.0	0.2
TIME-STRENGTH	13	2.92	2.54	2.54	0.85	-0.38
TIME-INTENTION	6	2.83	2.33	2.33	0.67	-0.83
TIME-PLACE	18	2.72	2.11	2.0	0.22	-1.39
STRENGTH-STYLE	7	2.71	2.14	2.14	0.43	-1.43
INTENTION-STYLE	2	2.5	2.0	2.0	0.0	-2.5
INTENTION-PLACE	5	2.4	1.8	1.8	-0.2	-3.0
INTENTION-STRENGTH	3	2.3	1.67	1.67	-0.33	-3.33

Table 59 can be used to show that the analysis results are not sensitive to changes in the weighted values. Sensitivity is demonstrated by the relative ordering of the mode pairs. That ordering remains essentially unchanged over the five sets of weighting options. The mode pair "Time-Place" does have a tendency to drop slightly below the mode pair "Strength-Style" as emphasis is placed on the "D" outcome. The difference is not significant. Mode pairs "Time-Strength" and "Time-Style" change places when weighting schemes B and C are used. The difference is only 0.04 and that cannot be considered significant. The rest of the relative rankings remained unchanged as follows:

TABLE 60
MODE PAIR RANKING BY WEIGHTING OPTION

	RANKING FROM HIGHEST VALUE TO LOWEST (BY OPTION)				
MODE PAIR	A	B	C	D	E
PLACE-STYLE	1	1	1	1	1
PLACE-STRENGTH	2	2	2	2	2
TIME-STYLE	3	3	3	3	3
TIME-STRENGTH	4	3	3	4	4
TIME-INTENTION	5	5	6	6	5
TIME-PLACE	6	7	5	5	6
STRENGTH-STYLE	7	6	7	7	7
INTENTION-PLACE	8	8	8	8	8
INTENTION-STRENGTH	9	9	9	9	9

Sensitivity analysis will be applied to one more Table in order to confirm that the choice of value system does not bias the analysis. Table 59 was used to calculate the following results for the options:

TABLE 61
EFFECT OF WARNING SHOWN BY WEIGHTING OPTION

			EXPECTED VALUE BY WEIGHTING OPTION		
		NO.	A	B	C
B	NO WARNING	25	3.0	2.64	2.59
B	WARNING GIVEN	22	2.84	2.28	2.16
C	NO WARNING	46	2.125	1.25	1.0
C	WARNING GIVEN	8	1.54	0.63	0.565

The three weighting options shown in Table 61 all had the same value associated with "V+" and "V". This is important because the intent of the original table was to show the effect of warning and surprise on the achievement of the "Clear Victory" outcome with its value being 3.0. Options B and C retain the same order of decreasing value for the four different situations. This supports the idea that the results are not sensitive to the choice of weighting scheme.

It is possible, of course, to devise a weighting scheme that changes the order of the outcomes. It is not possible to do it without introducing a bias that accentuates the effect of defeat in a totally obvious manner.

Different options do change the scale of the numbers that are represented. This may make some trends more visible, but there are only two important issues shown in the Table. The first is that warning given to the enemy has a

negative impact. The second is that the surprise that is associated with list B cases has a positive impact. The expected value should be viewed as a means of easily representing these trends rather than as an accurate means of anticipating future outcomes.

There was much more good data than was expected. The data was looked at from numerous points of analysis and the results were consistent. Analysis of the data was done in a cautious manner that should have reduced the effects of bias. The magnitude of the differences in the analysis results and the consistency of the differences establish the author's confidence that the data is representative.

The consistency between the results of the case history analysis and the theoretical analysis is high. The two analysis approaches to the deception process are complementary.

VII. CONCLUSIONS

The theoretical analysis and the case history analysis support three main conclusions. The first conclusion is that deception has played a dominant role in the battles of this century. The second conclusion is that deception will continue to play an important part in future wars. The third conclusion is that optimal deception practices can be identified based on the theoretical analysis and the empirical analysis.

A. IMPORTANCE OF PAST USE OF DECEPTION

The case history analysis section of this thesis indicated the positive effect that deception has had on the following evaluation criteria: producing victory, reducing casualties, increasing force effectiveness, and increasing territory exchanged. The primary element that produced the operational advantages was the element of surprise. Surprise is a byproduct of a successful deception, but it is not the goal. The goal for deception is the operational advantage.

Operational deception has been important throughout the period covered by the case history analysis. The advantages have been summarized earlier and do not need to be repeated in detail. In general, the advantages of operational military deception that were shown in this thesis are similar to the strategic deception advantages shown by Barton Whaley.

The operational advantages of deception were developed through analysis of each evaluation criterion. The four criteria are measures of effectiveness. Three of the criteria, producing victory, reducing casualties, and increasing the ability to gain or hold ground are the same as the measures of effectiveness used by Colonel Dupuy and HERO associates in the quantifying of battle outcomes [Ref. 147]. The fourth criterion, increasing force effectiveness, is comparable to the surprise variable factors used by Dupuy to modify the combat power ratio in the QJMA model [Ref. 148]. The QJMA data base included 34 cases between 1940 and 1967 for which the surprise effect was calculated. The average result shown in Table 57 was a two-thirds increase in combat power. That number verifies the importance of past use of deception by the offense.

It is not possible to conclude that deception done by the defense is as important as deception done for the offense. There are indications that it may be even more important, but there are not enough historical examples to support any conclusion.

B. FUTURE IMPORTANCE OF OPERATIONAL DECEPTION

Modern war was not covered in the case history analysis. This thesis projects the importance of deception in future wars using the postulate that human nature does not change. War is fought by men who control and direct machines not only by machines.

It has already been pointed out that the QJMA analysis of the surprise effect in the 1973 war was 134 percent larger than the same effect for the Dupuy set of wars between 1940 and 1967. The relationship betwen surprise and deception at the operational level has been established. The conclusion is that deception should be even more important in modern war than it has been in the past.

C. OPTIMAL DECEPTION PRACTICES

Chapter II listed five categories which could be associated with successful deception operations: (1) secrecy, organization, and coordination; (2) plausibility and confirmation; (3) adaptability; (4) predispositions of the target; and (5) initiative.

1. Secrecy, Organization, and Coordination

The first conclusion is that a successful deception does not happen by accident. Deception requires detailed planning and precise execution.

The case history analysis confirmed that secrecy must be maintained. Allowing the enemy to become warned produces a disadvantage whether surprise is achieved or not. There are two levels of secrecy that must be maintained. It is necessary to protect the security of the operations plan and it is necessary to protect the security of the deception. There is no general rule at the operational level that says one is more important than the other, but perhaps there should be. The operations plan is the critical one.

Organization is necessary if the deception is to be executed as it was planned. Organization requires trained personnel with sufficient knowledge about the tasking to portray the false. When deception tasks are assigned to several units there is a requirement to provide detailed execution guidance. The best form of execution guidance is probably the deception implementation schedule because it can be detailed enough to answer the who, what, when, where, and how the deception task is to be accomplished. The implementation schedule can also be used to coordinate the deception plan with the operation plan.

There is one excellent example which provides strong support for the conclusion that deception needs secrecy, organization, and coordination. The example is provided by the unit history of the 23rd Headquarters, Special Troops during World War II. That unit was the only U.S. Army unit activated, trained, and equipped specifically for the purposes of tactical deception. [Ref. 149] The unit conducted 21 deception operations in the European Theatre from June 1944 to June 1945 using radio deception, decoys, sonic deception, and impersonation of other units [Ref. 152]. The conclusion for the need for organization, coordination, and secrecy can be evaluated against the lessons learned from the operations of the 23rd Headquarters.

The Tactical Operations Analysis Office, Aberdeen Proving Ground, published Interim Note Number T-11 which made

the following summary as an evaluation of that unit:

> "There were three principle lessons which the 23rd Headquarters learned regarding their employment of tactical deception. First, there was a need for close coordination between the 23rd Headquarters and all real troops involved in a deception operation. Second, a deception operation must be thoroughly planned to the last detail. Third, it is necessary to insure authenticity in a deception operation. The false picture that presented to enemy intelligence must appear completely authentic and plausible in every aspect. Lack of close coordination was responsible for the failure of the 23rd Headquarters earlier missions." [Ref. 151]

The conclusion of the report stated that, "Even though there were instances where the 23rd Headquarters failed to accomplish their mission, due to poor intelligence, or incomplete security measures, there is not one occasion of such a failure leading to a military defeat for friendly forces [Ref. 152]. That is a fairly interesting conclusion, not just because it supports the need for secrecy and organization, but because it addresses what happens if the deception fails. If the deception fails, it does not necessarily tell the enemy anything that helps him. The enemy may know what is not real, but he still does not know what to do about it.

There is one further point that can be made about coordination which provides an example of what can happen if the deception plan is not compared to the operations plan. 23rd Headquarters provided three forces in a deception to assist the U.S. III Corps' attack on the port of Brest, France, from 20 through 27 August 1944. Force "X" simulated the 15th Tank Battalion in the area of the 8th Infantry

Regiment, 29th Infantry Division. Force "X" did a good job of deception in that the S-2 of the 9th Regiment reported that the enemy installed from 20 to 50 more anti-tank guns after the "X" operation. Unfortunately, "X" deceived the enemy into believing that the tanks were going to attack from exactly where they did. Company D, 709th Tank Batlaion, attacked directly in the face of the reinforced German anti-tank defenses. [Ref. 153]

2. Plausibility and Confirmation

The operation plan and the deception plan must be different enough so that the essential forces of the operation are protected, but they must be similar enough to support enemy collection of the deception signals. The enemy sensors will be searching for indications of the real plan. The sensors do not search blindly. They are directed by the collection requirements which are based on what the enemy thinks the real plan will be.

The enemy will be able to eliminate many of the options that are not probable. The enemy would not seriously consider that untrained troops would be used in a massive airmobile operation. The enemy would also hesitate to accept a deception story involving an armored brigade attack over swampy terrain with no existing roads. Such operations might be possible, but would rarely be attempted. They would not seem plausible to the enemy. They would not seem very plausible to the friendly commander and staff, as well.

An important consideration in deciding whether the enemy will accept the plausiblity of the deception story is determining whether the deception plan might be acceptable as the real plan. A variant of one of the discarded options for the operations plan might make an excellent choice for a deception. The enemy does not have perfect intelligence and might be easily convinced that the logic of the operation requires the deception choice. Care would have to be taken to insure that the discarded option is sufficiently different from the operations plan as each option that is presented at the commander's course of action briefing does share a large proportion of common features. The common features establish the "skein of truth" for the deception plan.

The features common to the deception and the operation may not need to be portrayed. Those features involve real forces conducting real operations which just happen to support the deception story. Security for the common features could be relaxed if doing so does not produce excessive danger, but even normal security will not be perfect. The enemy can be expected to intercept many of the indicators of such activity. Providing an alternate explanation for the activity should help protect the security of the operations plan.

The critical aspects of the operations plan must be provided increased security so that contradictory signals are not presented to the enemy. The critical aspects of the

deception plan need to be presented to credible sensors in a manner that allows the signals to be mutually supporting. The number of sources that confirm a fact and the credibility of the sources are both important and their effects interact.

Knowledge of what the enemy will accept as plausible and what degree of confirmation is necessary before he will believe a fact is a firm requirement for a successful deception. Knowledge of the enemy organization is the key to prediction of how the enemy will react to the information he receives. Much of the information he receives will be real, but it can be combined with deceptive information to produce a plausible but false picture for the enemy commander. As the false conception builds and is supported by confirming signals, the enemy will tend to ignore or misinterpret the details that do not fit.

3. Adaptability

The deception must be able to change as reality changes. The deception normally begins before the real operation begins. If the real operation is changed after the deception has started, it may be impossible to support the original deception plan. The signals that were part of the "skein of truth" would probably be contradictory to the deception signals. There are three options available in such a situation: (1) abandon the deception, (2) continue the deception and hope that it at least produces some ambiguity, or (3) adapt the deception to support the new reality and

the new operation. It is obvious that the third option would be the most beneficial. It would also be the most difficult.

The ability to adapt a deception might require that the deception signals have more than one possible explanation. The desired explanation would evolve from the enemy's analysis of the composite set of signals. An adaptable deception story might become very complex.

A conclusion of this thesis is that it is necessary to at least plan to execute an adaptable deception operation. It is necessary because of the systems theory applicability to deception. It is not just the friendly situation that changes. The enemy situation and the overall environment can change. The simple deception plan that has only one explanation may deviate from the system reality too soon to receive confirmation. That may be acceptable to maintain an ambiguity producing deception but not to maintain a misleading type deception. The misleading type deception is considered the optimal choice.

An adaptable deception requires the ability to react to change and also requires knowledge about when to react. The ability to react to change is a function of planning and execution flexibility. The ability to know when a change is needed is a function of coordination and intelligence.

Flexibility in deception planning requires "Big Picture" knowledge of what is really happening on the battlefield. That experience and expertise is not available under

the present system at division level where the deception officer is usually a coordinating staff officer working in the G3 plans section. Even if a deception planning section was authorized and trained to the necessary level of expertise, it would be difficult to keep such an element informed to the "Big Picture" level. Thus, the expertise could be provided by a trained deception officer or staff, but the guidance which comes from knowledge and experience must be found elsewhere.

Execution flexibility requires positive control over the execution forces. Positive control is not established easily. Communications are required to insure that changes can be made as needed. Controls are necessary to insure that deception measures are executed as they were intended. A commander is needed to get the job done right. An adaptable deception operation might be considered as having similar command and control problems as those for a river-crossing operation. An ad-hoc command headquarters is established for a river-crossing operation. It is conceivable that an ad-hoc headquarters might be necessary to implement a complex deception.

Coordination is a staff responsibility. The division operations officer is responsible for insuring that the deception plan is well coordinated. It is necessary that coordination be continuous if the deception is required to adapt as reality changes. The necessary information about

friendly forces and the environment is available at the division headquarters and it must be readily available to the deception planners. Without that information, they could not know what to change or what forces might be endangered by the change.

The ability to know when a change is needed is also a function of intelligence about the enemy. Friendly intelligence must provide feedback on what the enemy is doing and why. The feedback from the enemy to the deception planner can indicate which deception measures are working and which are not. Feedback is necessary if the deception planner is to know if the enemy has interpreted the signals in the desired manner so that the deception execution can continue as planned or so that the execution can be modified to produce the desired effect.

Intelligence can also indicate changes in the enemy part of the system. Those changes can invalidate the deception or require it to react. A different tailoring of the enemy force, for example, might ruin the chances for deception success in one area while generating new opportunities in another area.

4. Preconceptions

The theoretical analysis and the case history analysis strongly agree on the need for the deception to be based on the preconceptions of the target. An enemy which forms a preconception about what will happen is predisposed

to act in a certain manner. A deception which plays on the predispositions of the target will be successful more often than one which requires the target to change his mind or go against his predispositions.

There are essentially three situations prior to the battle. The enemy's estimation of the situation may have: (1) been correct, (2) been wrong, or (3) been ambiguous. The enemy may not know for sure if his conception of reality is correct, but if he has formed a firm conception it will influence his battle planning and his intelligence collection requirements. The preconceptions will also bias how the enemy processes and reports intelligence and will bias the commander's decisions.

The first situation is the worst from the point of view of the deception planner because the enemy expects to confirm his hypothesis. The enemy correctly diagnosed the real operation the execution of which will provide clues which confirm the enemy hypothesis. The deception must present a more salient false hypothesis while discrediting the true hypothesis. This may require initiating the deception with strong and obvious evidence. The deception must shock the enemy into considering that he has made a serious mistake in his analysis. The deception must grab the enemy's attention and provide supporting evidence to keep his attention.

The receipt of contrary evidence at the same time would probably defeat the deception. This demands that

strict security for the real operation would have to be maintained, but that security will never be perfect. Deception might or might not work to change the target's mind. Deception which goes against a target's predispositions probably would have a better chance to produce ambiguity than it would to produce a hypothesis change.

There is a great deal of threat involved when the enemy expects the friendly operation to proceed in the same manner in which it is actually planned. It would seem more prudent to change that operation than it would be to take the chance that deception would protect it.

The second possible outcome of the enemy's estimate of the situation was that he had formed the wrong conception. That is the ideal situation for deception. The deception can be designed to feed the enemy with exactly the right information to support his misperception. The common features of the deception operation and the true operation will be accepted as true indicators supporting the false hypothesis. The contrary evidence that will be received may not be attended to or may be misinterpreted to fit the false hypothesis.

The situation in which the enemy remains in a state of ambiguous conception has many possibilities for deception. The enemy has not formed a preconception and may accept any plausible hypothesis as valid as long as it is confirmed. This provides a great deal of flexibility in deception

planning and is essentially the same as the case in which intelligence cannot verify anything about the enemy's preconceptions. The enemy cannot be as efficiently targeted because there is less information available. It would seem that there is a better chance to keep the enemy ambiguous than there is to convince him to accept the deception story. That is not a bad situation. The enemy who is not sure of the friendly disposition or intentions will normally require forces that are kept in reserve to react once the situation is clarified. The deception may keep the enemy ambiguous past the time needed to effectively commit those forces.

The preconceptions of the enemy predispose him to make decisions and take actions that are consistent with his initial preconceptions. Those decisions and actions are the key factor in the success of the deception. If the enemy has not formed a preconception, deception can be used to help him form one that is easier to target. Once the enemy has formed a preconception, it is the responsibility of friendly intelligence to find out what it is and keep track of any changes. That is a difficult task but it is one that is not impossible.

5. Initiative

Deception cannot be used if there is no opportunity to use it. There is no opportunity to use deception on the part of the force that is totally controlled by another force. The force that is totally controlled is one that

allows its enemy to act and then just reacts to the situation.

The initiative is the ability to act. Initiative has little to do with the relative force sizes or the difference between the offense and the defense. The initiative is normally held by the superior force because the superior force usually has the dominant position. The superior force has many options and it is the superior force that is normally on the offense. The inferior force is usually on the defense as it needs the inherent advantages of the defense. The defense provides fewer options due to its lack of mobility. The offense has more options that are available but does not necessarily control the initiative.

An example of defense having the initiative is the Team Spirit 82 exercise conducted by the 25th Infantry Division. The division commander, who was Major General Alexander M. Weyand, had very few options. His division was directed to be on the defense and the exercise scenario was established by phase lines. The division was required to delay a given distance in a given period of time. There was very little chance that the enemy could be surprised in the modes of place, time, or strength. A passive defense, however, was not in line with Weyand's style and it was not his intention.

The deception plan was simply that the 25th Infantry Division was willing to trade space for time in an effort

to reduce casualties on both sides. Essentially, the war was being won elsewhere so there was little need for costly combat when it could be avoided. The deception was designed to surprise the enemy in the modes of style and intention. The goal was to set up a "luring" defense which would trap the lead enemy forces at a time when the 25th Division was thought to be most vulnerable to direct and indirect fire.

The style was that the defense would become ferocious and tenacious once the delay had reached the area of the retrograde river-crossing under enemy pressure. The intention was to spring a trap using several reinforced battalion task forces which were to emerge from hiding at the critical hour. The desired operational advantage was to be from a surprise attack against the flanks or rear of the enemy lead battalions. The enemy fires against the vulnerable units crossing the river would be denied.

The operation was a complete success. The enemy lead units were overextended and overconfident after the days of easy victory. The enemy attack was stalled and the trapped forces were decimated. The majority of the 25th Division forces were able to cross the river without enemy pressure. The stay-behind forces were able to keep the enemy away from the river long enough for the rest of the division to complete its preparations for the defense. Covering fires were adequate to support the withdrawal of the stay-behind forces and they suffered only a few casualties. [Ref. 154]

The 25th Division plan was risky. The stay-behind forces could easily have been cut off from the rest of the division and destroyed or captured. The risk was worth it. The key to the success was that the initiative could be taken by the defense.

D. INTEGRATION OF THE OPERATIONS PLAN AND THE DECEPTION PLAN

The Team Spirit 82 deception operation by the 25th Infantry Division can be used to support the conclusion that integration of the operations plan and the deception plan is needed. The two plans must be mutually supporting if the deception is to be optimized.

The 25th Division's deception plan was of the misleading type and the situation was such that deception had to succeed totally. There was no chance that the deception could degenerate to produce ambiguity as there was no plausible alternate explanation for the actions of the stay-behind forces. If the enemy located those forces once they had entered their "hiding" positions, the operation would have to be changed.

Security for the deception plan was essential. The security measures were strict. First, initial coordination and planning for the deception was limited to the division commander and a few selected staff officers. The division commander used late-night sessions which were essentially one-on-one so that security could be maintained. The commander gave specific guidance to the rest of the planning

staff so that the body of the real plan would be compatible with the deception. [Ref. 155]

The deception officer worked as a member of the G3 plans section. This insured that the deception measures were done in coordination with the operations plan. The map overlay for the operations plan was the focus of attention of the coordinating staff throughout the planning process. This provided the means by which the deception officer interfaced with the rest of the staff. The deception plan was never put on the operation's map overlay in order to maintain security. The deception officer directed the counterintelligence teams to check the security of all staff sections to insure that only the information that was necessary would be displayed on similar maps. All planning areas had to be guarded. Planning papers and overlays were secured when not in use. [Ref. 156]

Security measures continued to be emphasized after the plan was completed. An operations security and a deception annex were published as part of the operations order. The operations security annex was specific, but it addressed security for the routine aspects of the operation. The deception annex was itself part of the deception as it addressed only the cover plan for the units and key personnel of the division. It also addressed bumper markings and provided instructions for same. It was hoped that the enemy looking for deception might be satisfied with that part of

the deception. These actions were in accordance with the corps' deception plan. [Ref. 157] The actual deception plan was written by the deception officer, prepared and reproduced by personnel cleared for the appropriate security, and disseminated separately from the operations order on a strict need-to-know basis [Ref. 158].

There were few soldiers who needed to know anything about the deception plan supporting the use of the stay-behind forces. If captured, they could reveal little information other than unit identifications and the fact that the division was not defending in its normal manner. In fact, the combat units were withdrawing by phase lines without being decisively engaged. This was done for two reasons. It confirmed the deception story and it denied the enemy the receipt of critical information. The enemy had no opportunity to keep track of the actual disposition of combat forces.

The stay-behind forces were able to disappear without being observed by the enemy. Once in their camouflaged positions they were not allowed to move. Signals from those positions were eliminated. The security at that point was essential and it was maintained. [Ref. 159]

Organization for the deception was established using the normal command and control structure where possible. The style of the delay was controlled by the commanders on the ground. The intention of the stay-behind units was maintained by the strict discipline of the officers which kept

those units secure. The combat support forces involved in the deception were organized under the operational control of the division staff. Officers in charge of those forces, however, did control the execution.

The division intelligence officer, G2, maintained operational control over the intelligence and electronic warfare forces. Intelligence collection was done to keep track of the enemy actions and intentions. The sections providing interrogation of prisoners of war, counterintelligence, ground surveillance, and signals intelligence were specifically tasked throughout the operation. Deceptive jamming, imitative communications deception and manipulative communications deception were ordered. This was done in close coordination with the deception officer who controlled the rest of the operation. [Ref. 18]

The deception officer performed several functions for the G3 and did require additional equipment for the operation. The deception officer exercised operational control over the functions of electronic warfare, operations security, and psychological warfare operations (PSYOPS). The four functions were combined in order to insure that the deception support provided by those force multipliers would have a synergistic effect. The coordinated effort was established in the planning process using phases which corresponded to the operations order and detailed using specific implementation schedules.

Specific measures for jamming, communications deception, and operations security were not really different from normal. It was the timing of the signals and the content of the signals sent to the enemy which were designed to support the deception. The primary value in having central direction of the four functional areas was that contradictory signals were eliminated in the planning process. [Ref. 161]

PSYOPS support to deception needs to be explained. The first goal of PSYOPS is to destroy the enemy's will to fight. Use of PSYOPS to support deception can degrade the effectiveness of the overall PSYOPS program. PSYOPS was used to support the 25th Division's deception only after the plan was approved by the corps commander. The vulnerability of the 25th Division during the river-crossing operations was high enough to justify the calculated risk to the PSYOPS operation.

PSYOPS support to the deception involved numerous leaflet drops and the use of two loudspeaker teams. The PSYOPS theme was established as a duplication of the deception story. The leaflets and the loudspeaker broadcasts were designed to provide clear and obvious evidence that the 25th Division was willing to trade space for time. The PSYOPS theme supported the corps PSYOPS operation and also provided explanation of the operations of the 25th Division up to the time that the trap was sprung. It could be argued that the deception supported PSYOPS as much as PSYOPS supported

deception. It worked well because the deception and the operation were planned together. [Ref. 162]

The leaflets did not have a fast response time. A pre-planned scenario was used for the first four days of the operation. The leaflets were prepared in advance in several varieties. The dissemination of the thousands of leaflets was done using the units conducting the delay. During the operation, additional leaflets were designed using current intelligence so that the deception content of the leaflets remained appropriate for the situation. [Ref. 163]

The loudspeaker teams were directed by the deception officer on a day-to-day basis. The teams deployed forward before first light and returned for a midnight briefing by the deception officer. The voice messages and vehicle noise broadcasts were based on current intelligence. The deception activities and the normal PSYOPS broadcasts were tasked using a master schedule and checked by a review of the activity logs. [Ref. 164]

The coordination requirements for the deception have been addressed as a continuous staff function. It is also necessary to brief the deception to higher, lower, and adjacent units. This was done for the 25th Division's deception plan. [Ref. 165]

Summarizing the deception, it can be seen that the deception plan was plausible. It was a close variant of the only real option available to the division. The enemy was able to

confirm the deception plan because roughly 95 percent of the deception story was real. The deception was based on the preconceptions of the enemy and those preconceptions were verified by intelligence. The enemy remained predisposed to accept that the division would continue to trade space for time. The indications of that fact were observed in his radio communications and was confirmed by the actions of the enemy forward units. Those units became increasingly less cautious and more overconfident as the operation progressed. The enemy had the initiative but lost it to the "luring" defense. [Ref. 166]

E. SPECIFIC CONCLUSIONS

Deception is not easy to plan. It requires an understanding of a complex process. The enemy is an uncooperative part of that process. The enemy organization and the entire system must be understood in order to control deception signals and project a coherent deception story. Human behavior cannot be predicted, but patterns of behavior can be predicted. The prediction of those enemy behavior patterns requires an understanding of the nature of the deception process and the decision-making process.

The estimate of the situation establishes the preconceptions of a force. The estimate is essentially a formulation of a matrix game, thus, game theory is a quantification of the estimate of the situation. The payoff matrix is the common link between decision theory and game theory.

The payoff matrix can provide a measure of the worth of intelligence as the difference in payoff between basing an estimate on enemy capabilities and basing it on enemy intentions. The authors of the book, Naval Operations Analysis, put it this way:

> "Knowledge of the opponent's plan can be valuable if there is no saddle-point in the game matrix. This intelligence allows a player to maximize against a single enemy course of action rather than against his whole spectrum of capabilities. If it happens that the intelligence is not sufficiently complete to identify a single course of action, but does eliminate certain of the enemy strategies, these latter courses of action may be treated as dominated and discarded from the matrix. The use of intelligence is equivalent to listing enemy intentions instead of enemy capabilities. The value of intelligence is related to the difference between the minimax and the maximin--the smaller this difference, the less the intelligence is worth." [Ref. 16?]

The value of deception is in the change made to the payoff matrix which is apparent to the deceiver but not to the target. The inferior force commander can use deception to counter the enemy's proper course of action so that he does not use it. The superior force commander can use deception to increase his payoff with regard to accomplishment of the mission, reduction of casualties, or territory exchanged.

Deception should be designed to produce an operational advantage. Surprise is important to deception, but surprising the enemy is not the goal. Attaining a specific operational advantage is a goal which provides clarity for the deception mission. It helps insure that the deception is properly coordinated and integrated with the operations plan for mutual benefit.

Optimizing deception requires the establishment of security, coordination, and organization. The deception must be plausible and confirmable. The optimal deception is based on the target's predispositions and is adaptable when the situation changes. The use of deception requires the initiative.

The modes of surprise and the intensity of surprise are ideas which provide a starting point for deception planning. Deception planning requires imagination to think of what might work to successfully deceive the enemy. It requires knowledge to determine the deception measures that are possible. It requires intelligence support to determine the measures that are optimal.

A rule of thumb would be that a deception story should be designed to produce surprise in two modes rather than in one mode. The rule may be modified in certain operations where it might seem necessary to attempt to gain surprise in three or more modes in order to insure that surprise is achieved in at least two modes. The decision would depend on how operationally critical the deception was and on whether the increased costs in terms of deception assets was acceptable.

The difference between operational deception to support division and corps level operations and tactical deception to support brigade and lower level operations must be recognized. Deception measures to support the front line combat should become an automatic part of battle tactics

The primary measures are signature reduction and false target generation.

Signature reduction must go beyond the camouflage and OPSEC procedures already being implemented. Signature reduction should be expanded to include multi-spectral signal suppression and the avoidance of predictable patterns. False target generation should be supported by realistic and rugged pieces of decoy equipment that can be quickly emplaced by front line soldiers to confuse enemy target acquisition. There are two primary benefits that are expected from the use of such devices. The enemy will waste munitions on false targets and the friendly forces will be able to engage more lucrative enemy targets. Flank shots can be set up against an enemy that maneuvers to engage a false target.

Deception has a place in modern war because of the human involvement. It is not sufficient just to include deception as an option; it must be supported. Multi-spectral decoys, target simulators, and intrusion devices need to be developed and produced. Modern technology can make such devices possible and cost effective. Continued efforts to improve signature reduction techniques, camouflage, and obscurants is necessary.

Deception forces must be made available at division level. The size of the deception force need not be large as most of the deception measures can and should be done by soldiers assigned deception tasks on an ad-hoc basis. There

are, however, certain tasks and specialized equipment that will require training and maintenance. Periodic requirements for a platoon sized deception force could be handled as a unit tasking.

Deception planning forces may require that a team be assigned that duty on a permanent basis so that they can become deception and counter-deception experts. The function is a G3 planning function. Increased emphasis on deception may require that the deception officer perform that function as a single duty. The officer should be assisted by at least one soldier capable of maintaining deception files and a computerized deception data base.

Quantifiable measures of effectiveness are necessary. It is possible to establish a quantitative rating for a qualitative evaluation. An example of that is the handling qualities rating scale used for test pilot ratings of experimental aircraft. Such a system might be applicable to the deception process. [Ref. 198] If results are recorded in a scientific manner, they may provide a data base needed for complete analysis of deception. Computer algorithms might become available to provide on-line battlefield indications of deception effectiveness, optimization measures, and counter-deception measures.

A quantifiable data base is also necessary for the isolation of the deception effect from other effects. The Whaley data used in this thesis provided a lot of data on surprise

and deception, but it is only sufficient for an indication of trends. Part of this thesis, for example, tried to isolate force effectiveness effects from the deception effect, but the Whaley data specified only the relative forces.

Force effectiveness is not merely forces multiplied by casualties. That definition was used in this thesis. There are other parameters which combine to define force effectiveness more completely, but they were not available from the Whaley data. Dupuy's QJMA model does account for force effectiveness in a much better manner. It is possible that additional research applied to the cases in the Whaley deception data base might allow the Dupuy model to be used. The factors affecting battle outcomes and the interaction of those factors might be more specifically identified using the QJMA algorithm.

VIII. RECOMMENDATIONS

There are three recommendations that will be made. The first recommendation is that the U.S. Army adopt Whaley's theory of "alternative objectives" within its existing decision-making process. The second recommendation is a concept proposal as to how deception can be planned and executed at the division level using the existing force structure. The third recommendation is that additional analysis of operational deception should be done.

A. ALTERNATIVE OBJECTIVES MODEL FOR OPERATIONS

Sun Tzu, the great military expert of ancient China, advised in his book, The Art of War, that, "the ultimate in disposing one's troops is to be without ascertainable shape. Then the most penetrating spies cannot pry in nor can the wise lay plans against you." [Ref. 169]

The author of this thesis believes that Sun Tzu's concept of "the shape of the enemy" is the same as the modern idea of needing to be able to "see the battlefield." The idea is to locate the enemy forces. The enemy force is sorted by location, function, size, and movement. The pattern that develops is the "shape" and it provides composite information on intentions as well as capabilities. Being able to "see the battlefield" requires the ability to perceive the existing enemy situation, analyze it according to established

stereotypes, and project the future situation based on the present one.

The fundamental military ideas proposed by Sun Tzu remain applicable to modern war and, in many military circles, his aphorisms have become as familiar as those of Clausewitz.

The logical ideals of Clausewitz are exemplified by his principle of "the objective." The objective is the key to the planning process of the General Staff System in which all effort is geared towards attaining the one common objective. Barton Whaley observed that "most battles since 1914 have been planned and launched with but a single objective or goal in mind." [Ref. 170] The Army has designed its decision-making process in such a way as to insure that the single, best course of action is chosen for the objective required.

The author of this thesis contends that executing a single course of action provides a definite shape to a force. The shape is a function of the location and composition of combat forces, their direction, and their speed. The shape is also identified by the actions of combat support and combat service support units. The location and activity of friendly forces provide the enemy a chance to "see the battlefield." The enemy can observe this shape even if it is very complex.

The technical advances in battlefield reconnaissance may have made perception of the battlefield possible. The

mobility of modern weapons is such that the enemy who perceives the obviousness of a single friendly course of action will be able to interdict it.

This thesis has proposed that deception can be used to alter the shape that is seen by the enemy. A misleading deception would use illusion to transform one shape into a different one. An ambiguity deception would produce an additional shape or shapes to keep the enemy from perceiving the correct one. This thesis has also shown the historical advantages that have been achieved when the enemy has made the wrong decisions. Deception seems to be the obvious and effective method by which the shape of the single course of action can be concealed.

1. Alternative Objectives and Deception

It does not seem prudent to assume that deception will work for every operation. History has shown that good deceptions do not always succeed and often they only produce a small advantage. The optimal deceptions have been those that are based on the preconceptions of the enemy. The question is what should be done if the enemy does not form a preconception, if intelligence cannot ascertain the enemy situation, or if there is simply no plausible, serious, and workable deception course of action that is available. Many operations may have to be conducted without a deception plan.

Deception is termed as a combat power multiplier. It is not a very good asset if it cannot be available for every

operation. The author of this thesis suggests that deception can be part of every operation if there is a change in the decision-making process to adopt the "alternative objectives" concept originated by Liddell Hart and developed by Whaley.

The suggested change in decision-making is simply that the staff continuously evaluate alternatives to the chosen course of action. A well defined objective remains essential to planning; however, it is realized that there is more than one way to achieve that objective. Alternative paths to the objective are kept in mind.

Continuously evaluating alternatives is nothing new. That is a normal function of command and control. The author is only suggesting that the process be made slightly more formal. The alternative plan, which might have been one of the options presented at the Course of Action Brief, should be kept as a working file. The alternative plan should be periodically reviewed during the operation to refresh the minds of the planners about the good points of the alternative plan.

The situation may change enough during the course of battle so that the alternative plan offers the highest probability of success. It seems reasonable that when a change must be made, that change should be to adopt an alternative that has been carefully evaluated.

Having a viable alternative plan ready in at least outline form would simplify decision-making under stress. It

would alleviate the detrimental effects of cognitive and perceptual biases. Further, it might reduce the chances of having crisis decisions manipulated by the enemy

The notion of alternative objectives is not new. Barton Whaley had studied Captain B.H. Liddell Hart's concept of "alternative objectives" and noted that Pierre Joseph Bourcet (1700-1780) had expressed the dictum as follows:

> "Every plan of campaign ought to have several branches and to have been so well thought out that one or other of the said branches cannot fail of success." [Ref. 171]

The idea of "alternative objectives" is based on preparing several courses of action for each plan. The enemy could be sold on one course of action while a different course of action is implemented. The enemy that sets itself up to oppose the correct course of action could be thwarted by a switch to a different course of action.

It is necessary to question whether the concept of "alternative objectives" is in opposition to the principle of "maintenance of the objective." The author of this thesis contends that the two need not be in opposition, but there can be no question as to what the ultimate objective is. The concept of "alternative objectives" must be qualified to insure that there is no such question. This section of the thesis will use the "alternative objectives" concept expressed by Hart and Whaley to introduce the possibility of dual paths to the same ultimate objective. The dual paths are alternative courses of action that lead to the objective.

"Alternative objectives" should apply to intermediate steps in the path to the ultimate objective. The path can be changed along the way because one finds the enemy to be waiting in force along the path. Many times it may be wiser to go around an obstacle than it would be to remove the obstacle. It should not matter as long as the end result, the ultimate objective, was satisfied.

One aspect of the model is that the staff would pay more attention to alternative courses of action. The author believes that the commanders are already doing this. The result is that the commanders respond quickly to changes in the situation but the staffs cannot. Battlefield "command and control" can implement a plan rapidly. The staff needs to prepare in advance to react as quickly.

A qualification to the idea of "alternative objectives" is that there may be higher and lower order objectives. An example of the ultimate objective might be the securing of a particular road junction. The alternative objectives might be: (1) control the terrain that dominates the road junction, (2) destroy all enemy forces in the area, (3) successfully attack elsewhere in order to draw the enemy away, or (4) deceive the enemy into voluntarily moving his forces. The higher order objective is to accomplish the mission. The lower order objectives may be to secure the road junction in the quickest time, with the smallest expenditure of ammunition, or with the fewest casualties. It

is obvious that lower order objectives may impact on the alternative objectives chosen by the commander.

Other lower order objectives may be more systematic. A commander may have a lower order objective that demands that he follow certain rules. One such rule is that flanks should never be left exposed. The commander would follow a path which allocates fighting power to reinforce weakness. An opposite rule would be to reinforce strength. If the left is succeeding then the commander would continue to give priority to the left. Reinforcing strength to achieve exploitation is a path which disregards threats to the flanks.

The "alternative objectives" model is a continuous process of change as the situation changes. The model assumes that changes will be necessary in any plan and anticipates them. Sun Tzu put it as:

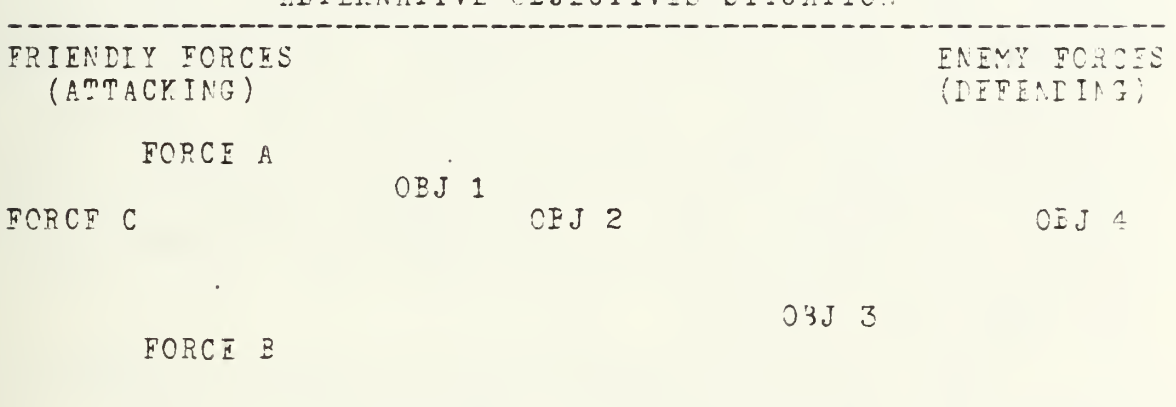
> "Now an army may be likened to water, for just as flowing water avoids the heights and hastens to the lowlands, so an army avoids strength and strikes weakness. And as water shapes its flow in accordance with the ground, so an army manages its victory in accordance with the situation of the enemy." [Ref. 172]

The use of deception is enhanced by the use of the duality planning model. The most significant advantage is that the operation becomes a deception in itself. Each deviation becomes an unexpected event. Each choice of the indirect approach defies enemy analysis as each phase of the operation may have alternate objectives from which the final objective cannot be determined.

2. The Operational Advantage of Alternative Paths

A simple example will be used to clarify how the idea of "alternative objectives" can be used to achieve an operational advantage. The situation is shown in Figure 1.

FIGURE 1
ALTERNATIVE OBJECTIVES SITUATION



The friendly division shown in figure 1 has two committed brigade task forces, A and B, with task force C in reserve. The ultimate objective of the division is to seize physical objective 4. The enemy is defending as far forward as possible, but is determined to retain the dominant terrain at objective 3 and has positioned its reserve force there.

The friendly division course of action for the situation is a ground assault by "A" followed by "C" to objective 4 through intermediate objectives 1 and 2. The alternative plan is to airmobile a portion of "C" to objective 3 which would allow "B" to successfully attack objective 4 once it had arrived at 3. The airmobile operation cannot be implemented as long as the enemy is at 3.

The location of the enemy reserve is the key to the operation. If that force stays at objective 3, the division plan will succeed although force "A" will be subjected to heavy casualties. If the enemy reserve moves to a blocking position between objectives 2 and 4, the division plan will fail. The enemy preconception about the importance of objective 3 can be used to advantage. The enemy commander will keep his reserve at 3 at least until he observes the direction that "A" takes once it leaves objective 2. At that point, the enemy commander will have only a short time to make the right decision.

The deception plan for the situation is based on the alternative course of action. The deception story is that the attack on objectives 1 and 2 is a diversion to draw the enemy reserve away from the ultimate objective which is 3. The airmobile operation will take place once the reserve has moved. The mission of the airmobile force is to hold objective 3 until relieved.

The three combat forces participate in manipulative communications deception to portray the deception story. Force "C" undergoes the airmobile rehearsals necessary for such a complex operation. Aerial reconnaissance is centered on objective 3 in such a way as it satisfies the intelligence needs of the planned operation as well.

The theoretical analysis of this thesis would suggest that the preconceptions of the enemy commander will be

sufficiently reinforced to keep the enemy reserves at objective 3. That reserve force will be kept out of the battle and will have to be withdrawn once objective 4 is taken by the friendly division. The value of the deception is that the enemy is not able to use his force effectively.

The value of "alternative objectives" is shown if the enemy disregards the deception story and moves his reserve force to block the obvious attack. That reserve force is again placed at a disadvantage since the alternative plan can be immediately implemented. The necessary training, coordination, and allocation of airmobile assets was accomplished as part of the portrayal of the deception story.

The immediate execution of the alternative plan does generate partial enemy surprise. More importantly, it executes a viable plan which produces an operational advantage which insures at least partial success. The enemy commander is faced with two choices. If he uses his reserve force to attempt to regain objective 3, it may be subjected to attack from the rear or flank by the forces from objective 2. On the other hand, the enemy commander must recognize that his forces that remain between "B" and objective 3 are threatened to be cut off if he does not regain objective 3. Attacking objective 3 will have disadvantages. The enemy force must face direct fire to attack the dominating terrain.

The flow of battle from that point and the taking of objective 4 is beyond the scope of this thesis. It is

obvious that a new situation exists. The new situation is more favorable to the friendly commander.

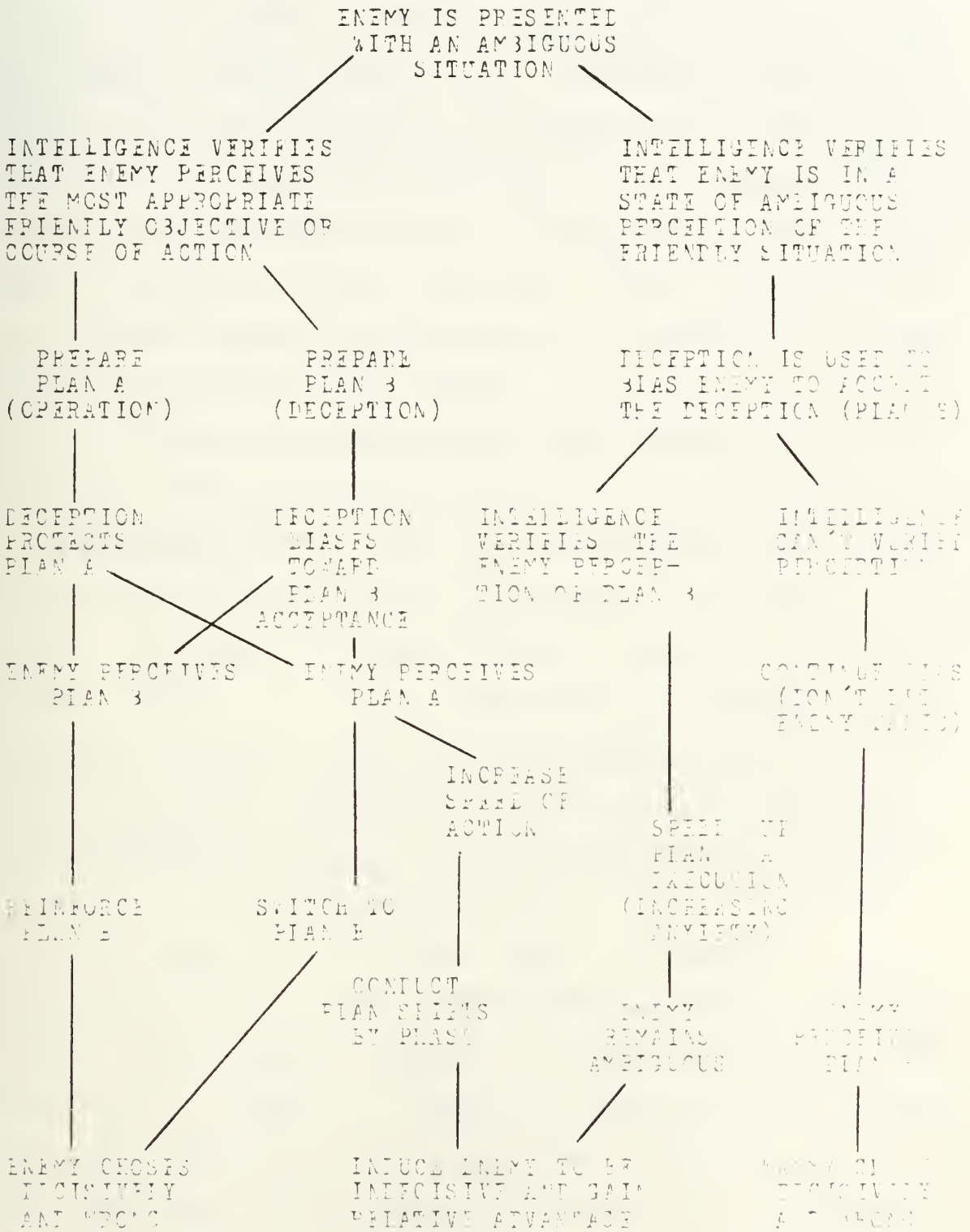
An advantage of "alternative objectives" is that the deception planner is always provided the opportunity to practice his craft. The enemy is always presented with an ambiguous situation. The reason is obvious. A plan which changes as the situation changes cannot be compromised nor can it be predicted. This is a significant advantage over the present planning process because it increases the enemy's chance of making the wrong decisions even without the use of an actual deception operation.

The author has suggested that the "alternative objectives" concept is not in opposition to the principle of "maintenance of the objective." It is possible that the two concepts will be opposed in a given situation and the concept of "alternative objectives" must not be used. It is also possible that only one viable course of action exists. Two viable alternatives might not be compatible. "Alternative objectives" can only be used in the right situations.

3. Model of the Deception Flow

Figure 2 presents the conceptual flow of deception as it might exist in a operation for which the "alternative objectives" concept is implemented using the primary course of action as Plan A (operation) and the secondary course of action as Plan B (deception).

FIGURE 2
DECEPTION FLOW UNDER THE ALTERNATIVE "OBJECTIVES" MODEL



The central idea of "alternative objectives" is the concept of having two viable courses of action instead of just one. The alternate courses of action must have a discernible difference. The target might provide the difference. One option might be for gaining key terrain while another option might be for the destruction of key enemy forces. The courses of action might be different in the modes of place, time, strength, style, intention, or they might be different in combinations of several modes. The intermediate objectives need not all lead directly to the ultimate objective. The path taken might simply be the path of least resistance which retains the initiative while the enemy force is manipulated into positions of disadvantage.

Distracting the enemy's attention with actions that he cannot anticipate should provide an advantage. Whaley quoted Liddell Hart as having said:

> "To insure reaching an objective one should have alternate objectives. For if the enemy is certain as to your point of aim he has the best possible chance of guarding himself and blunting your weapon. If, on the other hand, you take a line that threatens alternate objectives, you distract his mind and his forces." [Ref. 173]

Intelligence remains essential in the support of duality planning. Intelligence must allow the commander to know the enemy so that the alternative plans can be shifted back and forth to avoid the enemy's strengths. Intelligence must also find enemy weaknesses and this may entail the need to discover any or all of the preconceptions that the enemy has formed.

Knowledge of the enemy predisposition to act in a certain manner is essential to the deceptive use of alternative plans. Such knowledge allows the commander to choose one course of action as a deception while the other is chosen for the operation. The feedback channels are also necessary to signal when changes to the plan are needed. The changes may be simple timing modifications designed to play on the enemy's mental biases. The changes might interchange the deception plan and the real plan as required to insure that the enemy is always wrong.

There are times in any operation when the "Fog of War" is such that intelligence is unable to reliable predict the enemy situation. The temporary advantage that the enemy might have at such a time can be offset if the enemy is also faced with the ambiguous situation provided by the "alternative objectives" model. The shifts in the plan during a "fogged" situation could be made in a totally random manner. The theoretical advantage of random behavior could be obtained without degrading tactics. Each path would be equally viable in a "fogged" environment.

Deception is the basis for the "alternative objectives" model shown in Figure 2. The deception is threefold. The central deception is that the operation that evolves is itself a deception because it is based on alternate objectives at the key times during the battle. The central deception is most important in that it is based on

achieving an operational advantage rather than generating surprise.

The operational deception conducted at division level is the second of the three deceptions. It focuses on confusing the enemy as to the final objective of the campaign. Theoretically, the operational deception supported by the central deception has a much greater probability of misleading the enemy than does a deception supporting a single course of action. The ambiguity produced by the central deception should insure that ambiguity is the least expected result of the operational deception. The goal of the operational deception is reduced to achieving advantage at the final objective. The scope of the deception is reduced and the more simple and elegant solutions become viable.

The third deception is a tactical deception conducted by the maneuver units during each phase of the operation. The tactical deception measures would rely on modern devices such as false target generators, multispectral decoys, and communications-node simulators. These devices would be combined with maneuver to portray one plan while the other was in effect. The tactical deceptions would gain an operational advantage for the maneuver forces due to their tendency to collect enemy bullets. Tactical deception would also generate ambiguity to support the central deception without a requirement for additional planning. The tactical deception

planning is provided by the alternative plan. The path not executed in the operation is the path to be executed in the deception. Signals generated along both paths provide the ambiguity.

The threefold deception possible when using alternative plans optimizes deception because it goes beyond the optimal deception practices that were reviewed in the conclusions of this thesis. Alternative plans reduce the risk that the enemy might correctly predict how the friendly operation will proceed. Alternative planning does not reduce the demands for quality intelligence, but it does provide more security against the possibility that the intelligence is wrong or that it becomes "fogged". The model provides for the cooperative use of operational and tactical deception at the division level. It insures that the operation itself is based on deception. The model seems to meet the estimate made by Sun Tzu that "all warfare is based on deception." [Ref. 174].

Maintaining an alternative plan at division level could satisfy the present requirements for deception. The continuous search for paths of least resistance promises tremendous operational advantages while presenting ambiguity signals to the enemy.

There are significant costs involved with maintaining an alternative plan. The critical issue is finding additional resources to accomodate the increased need for planning

and coordination. The author of this thesis recommends that the "alternative objectives" model be adopted as a slight modification of the present planning process and realized through automation rather than additional manpower. A multiple user computer/word processor serving the planners would allow an increase in efficiency which would offset the increased requirements.

B. DECEPTION PLANNING AND EXECUTION BY A U.S. ARMY DIVISION

Tactical deception can be done to support U.S. Army brigade level operations. Significant benefits can be obtained simply by supporting tactical deceptions for the front line units and this can be done with only a modest investment in resources. The use of active camouflage to complement passive camouflage is a cost effective measure which carries almost no overhead in terms of planning and support. A decoy which costs a thousand dollars, for example, is cost effective if it saves only one tank. The same decoy could be built tough enough to be killed many times. The author of this thesis recommends that procurement of tactical deception devices for all combat units be developed, approved, and funded.

Operational deception can be done to support U.S. Army division level operations whether or not the "alternative objectives" model is adopted. The difference is that operational deception under the "alternative objectives" concept would probably not be required for all operations. The

occasional manipulative deception necessary to supplement the built in ambiguity could be handled on a case by case basis. The routine use of deception as a combat multiplier; however, would overload the part-time resources that presently are used to plan and execute deception operations. The author of this thesis recommends that operational deception be planned on a routine basis and executed as often as the situation demands.

The requirements for increasing the use of operational deception follow the arguments developed in this thesis. The needs for secrecy, organization, and coordination produce a substantial resource demand. Competition for resources of the division is such that the requirements will have to be filled using the existing force structure. Any proposal for how to do that will have significant drawbacks and will produce many reasons why it cannot be done. The author of this thesis recommends that the resource problem should be studied in terms of how it can be done so that an eventual compromise can evolve into a viable deception organization and operations concept.

The author proposes one solution to the deception resource problem. It is recommended as a starting point for additional studies as it does provide ideas as to how deception could be done at the division level without increasing or changing the force structure. The solution does involve some changes in roles and responsibilities.

1. Deception Planning Resources

a. Command Level

The commander remains the central character in deception planning. The commander must extend his command and control to include the enemy by retaining the initiative. He must keep the enemy's possible options in mind and must try to keep at least one move ahead of the enemy decision-maker. He will retain the initiative if he is able to reduce the enemy's options and manipulate the enemy's forces into positions of disadvantage. The commander provides focus to both the deception plan and the operations plan to insure that the central aspects of the plans are complimentary.

b. Coordinating Staff Level

The coordinating staff level contains much of the talent, knowledge, and experience that allows a division to conduct efficient operations. These senior personnel manage and direct the action staff and they are the principle advisors for the commander. They rarely become as directly involved in deception planning as they do in operations planning.

The proposal is that the commander select appropriate personnel from the coordinating staff level, augment them with some additional expertise, and charge the group with providing the deception guidance necessary to translate the desires of the commander into cohesive deception objectives. This group might meet with the commander after

evening mess to address deception requirements for the medium to long range battle. Deception may not be applicable to every battle and this group might only meet occasionally.

The author of this thesis would call this group the "Extended Battle Planning Group" and would organize it with well-experienced personnel. The group might be formed around the division Chief of Staff and his assistants in charge of the functional staff sections. The G3 and the G2 would be required as a minimum. Executive officers from the major subordinate units might be included whenever they were available and special staff officers for deception might be added. The deception staff expert might be a deception expert of whatever rank, a member of the local resistance, or even a converted civilian with special attributes. Magicians might be particularly adept at the application of illusions.

c. Action Staff Level

The action officers in the division staff sections actually conduct most of the planning and coordination of orders. They also supervise the execution of the operation as it pretains to their functional areas. The action staff should not normally be involved in deception planning and execution.

d. Deception Planning Level

A deception planning cell should be formed with the G3 deception officer as the officer in charge (OIC). A staff representative should be provided from G3 operations,

G3 plans, G4 plans, and G2 plans, the fire support office, and the signal office. The OIC's for PSYOPS and OPSEC and the MI battalion (CEWI) S3 should also be included.

The deception planning cell is a subset of the action staff but the separation is necessary for security reasons. The members of the cell must plan the specific deception requirements from the guidance received from the Extended Battle Planning Group and must integrate the requirements into cohesive deception plans. They must insure that conflicts with the operations plan are resolved without compromising the deception plan to the rest of the headquarters.

2. The Flow of Deception Planning

The commander initiates duality planning. The Extended Battle Planning Group attempts to predict enemy actions, assign probabilities, and predict outcomes of possible scenarios. It also attempts to predict enemy reactions, determine enemy preconceptions, and focus intelligence requirements. It would be expected that much of this work would have to be done in conjunction with the analysts in charge of the All Source Analysis Center (ASAS) supporting the division tactical operations center (DTOC).

The commander presents guidance for duality planning alternatives based on results of the extended battle estimate. The staff estimates of the situation are prepared and briefed.

The course of action briefing is conducted as it normally would be; however, the commander would then select two courses of action instead of just one.

The Extended Battle Planning Group would then conduct a revision of the two courses of action to establish duality using a phased approach of intersection points, decision points, milestones, or phase lines. An alternate method could include a time line or snapshot approach. The revised courses of action would then be coordinated and receive command approval. The Extended Battle Planning Group would then prepare the deception theme and guidance for the operational deception to support the alternative plan.

The next phase in the flow of deception planning is done in conjunction with detailed planning. The division G3 planning section initiates the detailed planning by providing guidance to the staff action officers. The section conducts the supervision, the coordination, and the preparation of the operations order. It is also responsible for disseminating the operations order by phases. The deception OIC would have to work closely with the plans OIC to establish the non-essential aspects of the operations plan which can be used in the deception to provide a basis of truth. The critical aspects of the operation would be identified to insure their protection. The deception OIC would then prepare the details of the deception story using the guidance that was received and the operations information that was provided.

The deception OIC would then form the deception planning cell and would provide guidance. The OIC would serve as the focal point in the preparation and coordination of functional aspects of the deception. The deception OIC would prepare the detailed deception plan after the coordination was complete. The deception plan would be reviewed by the Extended Battle Planning Group and would be presented in a decision briefing to receive command approval. The deception OIC would then translate the plan into an execution matrix specifying the action agency, the activity, the time, and the location. The execution of the plan would begin.

The Extended Battle Planning Group would conduct continuous reviews of the environment by applying the principles of war, cost of actions, cost effectiveness of actions, chances of success, and freedom of action effects. The Group would base their evaluations on enemy action, changes in the enemy situation, changes in enemy preconceptions, and appropriate measures of effectiveness. The Group would be in a position to appreciate the operational situation of the friendly forces and would be able to apply their operational expertise to recommend changes in the deception plan. The Group would be able to specify additions to the intelligence collection requirements and would monitor feedback on the deception progress through reports from OPSEC, counterintelligence, and interrogation of enemy prisoners of war. Group actions would be on a continuous basis.

3. Deception Execution Resources and Operations

Execution resources are an essential part of a deception organization. The deception measures must be executed in a very precise manner if they are to convey the correct signals to the enemy. Positive control over deception must be established. The author of this thesis recommends that the execution requirement be considered a command responsibility of a subordinate unit. The unit used as an example will be the division's military intelligence battalion (CEWI).

The first requirement is for a commander of the deception forces. The MI battalion commander would have the required experience in operations and in intelligence. As a commander of one of the division's major subordinate units, the MI commander has an established relationship with the members of the Extended Battle Planning Group. He also has direct access to the division commander which would be essential for such an operation.

The MI commander runs a very complex unit, but for the sake of argument, he does not have an additional job. The engineer battalion commander is also the division engineer. The signal battalion commander is also the division signal officer. The division intelligence officer is the G2, not the MI battalion commander.

The second requirement for the execution forces is a command and control organization. The use of an existing

force structure is an obvious improvement over an ad-hoc organization. Deception measures may be required over the entire division area of operations. This requires communications which for security reasons should be kept encrypted on nets that are not used for normal division operations.

The MI battalion has assets located throughout the division area. Each maneuver brigade is provided a brigade support team that is the size of a reinforced company. There are battalion liaison teams at each of the brigade headquarters. The battalion headquarters and the battalion Technical Control and Analysis Center are centrally located in the division area. The ASAS at the DTOC is provided and manned by personnel organic to the MI battalion. The battalion has aviation assets in the form of the QUICKFIX platoon. There are battalion assets located in the division support area and, finally, there are OPSEC teams and counterintelligence teams which may be anywhere. All of these elements are connected using organic communications. The MI battalion commander owns more internal communications than would be found in an infantry or armored brigade. The communications are in place and should be sufficient to handle the increased requirements for deception command and control.

The third requirement is for deception forces. A unit the size of a battalion should have enough flexibility to divert small forces for limited periods of time. The

advantage of using the MI battalion is that it includes a wide variety of assets. The battalion has 13 tracked vehicles in the TRAILBLAZER, TACJAM, And TEAMPACK sections which might be used to lay a false track pattern. The battalion has more than twenty large trucks, more than forty medium sized trucks, and more than sixty small trucks. The vast majority of these vehicles are associated with small teams which are normally deployed independently and so might be given short duration deception tasks without a significant impact on their intelligence missions. The battalion also owns over a hundred generators which provide acoustic and thermal emissions that are of increasing value in deception operations.

The fourth requirement for deception execution forces is an ability to provide the right signals to the enemy. The use of intelligence soldiers should reduce the need for detailed scripts that would have to be prepared by the planners. That would be a time consuming task that would be near impossible during war. It would be much easier if the specific signals were determined by the execution forces.

The MI battalion could use the operational and technical expertise of its more than forty officers and warrant officers to advantage. The division's expertise in all of the functional areas of intelligence is directly available to the MI battalion commander who controls sufficient assets to choreograph individual signals into a coordinated operation.

The MI battalion's main function is to collect and analyze signals of the enemy and it is in a good position to know the signals from friendly forces that are equally important to the enemy.

A fifth requirement for a deception execution force is that it must have the capability to support assigned or attached deception elements. A battalion-sized unit could do that better than if it was attached to the division headquarters company.

An MI battalion has the additional advantage of having an organic general support maintenance capability for communications and electronic equipment. There will be an increased need for the fielding of new deception equipment to meet the advances in enemy intelligence collection capability. Much of this equipment will be electronic in nature and will probably operate automatically once it is placed in position. The equipment will need to be stored, maintained, and transported. The authorized manning for such an element may have to be minimal. Support would have to be provided by a host unit.

The use of a battalion sized unit in the execution of a deception operation should be much more efficient than the use of an ad-hoc organization or the use of decentralized control. The deception mission could be handled in the same manner as any other mission. The existing command and control structure could provide the positive control needed

for adaptability. The use of only one unit has security advantages. The designation of one headquarters should ease the coordination problems. The flow of the deception operation could become a smooth and obvious extension of command.

There are many obvious advantages to giving the deception mission to the division's MI battalion. Some of those advantages have been discussed. Others include such things as a direct link to both G2 and G3 through the support teams provided to those sections and also the direct links to feedback channels through signals intelligence, counterintelligence, and interrogation. A direct link to OPSEC exists to provide immediate feedback on friendly signals that might compromise the deception.

Another advantage is that many measures such as imitative communications deception and jamming are already tasks for the MI battalion. The very mission of intelligence will always link the battalion to deception because of the requirement to know the enemy before you can deceive him.

The importance of the intelligence mission, however, is and should be sufficient to justify the idea that MI battalions should not be assigned the deception mission. The author has used the MI battalion example simply because he is most familiar with that organization. Deception is an operations function and an increased tie to intelligence might be a serious mistake. The author recommends that serious study be given to determining the best way to organize.

C. REQUIREMENTS FOR ADDITIONAL ANALYSIS

Deception seems to be a wide open area in which there are few experts and fewer solutions. This thesis has tried to present some of the issues and provide some ideas regarding tactical deception. There is a lot more work that is necessary before it will even be possible to begin detailed analysis of the problem. The development of capabilities, programs, tactics, employment concepts and intelligence and communications support applicable to future tactical deception requirements are just some of the initial analysis requirements.

Studies must be done on methods to train commanders and other decision makers, operating elements, and staffs to understand the deception process. They must be trained to effectively plan for, make, and execute deception decisions and integrated actions.

Analysis must be done to identify and provide the additional intelligence requirements in support of deception. The key issue will have to be on the intelligence required to identify enemy predispositions and preconceptions.

Analysis is needed to identify training requirements and qualifications for personnel who perform deception-related activities.

Research, development, test and evaluation, and procurement of systems applicable to deception are all possible requirements that require analysis.

Analysis is required to identify all options available for use in tactical deception. Because each option may not be sufficient to accomplish the deception task alone, the options must be carefully blended to insure that optimal advantage is obtained from available resources.

Finally, additional work is needed to insure that the best possible deception data base is available. Whaley's data base is a good start, but it could be improved. The best possible data base is required before much of the other work can be done.

APPENDIX A. LISTS OF BATTLES IN THE DATA SET

A. LIST A: CASES OF STRATEGIC SURPRISE AND/OR DECEPTION

CASE	DATE	PLACE	OPPONENTS
A1	2/11/14	TANGA (GER. EAST AFRICA)	BRITAIN/GER.
A2	25/04/15	GALLIPOLI (TURKEY)	BRIT-FR/GER-TURK
A3	2/05/15	GORLICE (GALICIA)	GERMANY/RUSSIA
A4	4/06/16	BRUSILOV OFFENSIVE (RUS.)	RUSSIA/AUSTRIA
A5	24/10/17	CAPORETTO (ITALY)	AUSTRIA-GER/ITALY
A6	31/10/17	3RD BATTLE OF GAZA (PAL.)	BRITAIN/GER-TURK
A7	21/03/18	ST. QUENTIN (FRANCE)	GER/BRIT-FRANCE
A8	31/09/18	ST. MIHIEL (FRANCE)	U.S./GERMANY
A9	19/09/18	MEGIDDO (PALESTINE)	BRIT/GER-TURK
A9A	26/09/18	MEUSE-ARGONNE (FRANCE)	U.S.-FR/GERMANY
A10	16/08/20	WARSAW (POLAND)	POLAND/RUSSIA
A11	26/08/22	DUMLUPINAR (TURKEY)	TURKEY/GREECE
A12	12/03/37	GUADALAJARA (SPAIN)	REP. SPAIN/ITALY
A13	15/12/37	TERUEL (SPAIN)	REP. SP/NAT. SP
A14	25/07/38	EBRO (SPAIN)	REP. SP/NAT. SP
A15	20/08/39	KHALKHIN-GOL (MANCHURIA)	RUSSIA/JAPAN
A16	1/09/39	POLAND	GERMANY, POLAND
A17	9/04/40	DENMARK	GERMANY/DENMARK
A18	9/04/40	NORWAY	GER/NORWAY-BR-FR
A19	10/05/40	NETHERLANDS	GER/NETH-FR-BR
A20	10/05/40	BELGIUM	GER/BELG-FR-BR

A21	10/05/40	FRANCE	GER/FR-BR
A22	06-09/40	INV. OF BRIT (PLANNING)	GERMANY/BRITAIN
A23	09/40-42	INV. OF BRIT (HOAX PEASE)	GERMANY/BRITAIN
A24	23/09/41	DAKAR	BRITAIN/VICH. FR
A25	9/12/41	SIDI BARRANI (W. DESERT)	BRITAIN/ITALY
A26	31/03/41	MERSA EL BREGA (CYRENAICA)	GERMANY/BRITAIN
A27	6/04/41	YUGOSLAVIA	GER/YUGOSLAVIA
A28	22/06/41	RUSSIA	GERMANY/RUSSIA
A29	25/08/41	KIEV (RUSSIA)	GERMANY/RUSSIA
A30	7/12/41	PEARL HARBOR (U.S.)	JAPAN/U.S.
A31	8/12/41	MALAYA	JAPAN/BRITAIN
A32	26/05/42	GAZALA (W. DESERT)	GERMANY/BRITAIN
A33	3-4/06/42	MIDWAY (PACIFIC)	JAPAN/U.S.
A34	28/06/42	SOUTHERN RUSSIA	GERMANY/RUSSIA
A35	23/10/42	ALAMEIN (W. DESERT)	BRIT/GER-ITALY
A36	8/11/42	NORTH AFRICA	U.S.-BR/GER-VICH
A37	06-10/43	HUON PENINSULA (N. GUINEA)	U.S./JAPAN
A38	10/07/43	SICILY (ITALY)	BR-U.S./GER-IT
A39	1/11/43	BOUGAINVILLE (S. PACIFIC)	U.S./JAPAN
A40	20/11/43	TARAWA (GILBERT IS.)	U.S./JAPAN
A41	22/01/44	ANZIO (ITALY)	U.S.-BR/GERMANY
A42	1/02/44	KWAJALEIN (MARSHAL IS.)	U.S./JAPAN
A43	22/04/44	HOLLANDIA (NEW GUINEA)	U.S./JAPAN
A44	11/05/44	4TH BATTLE OF CASSINO	ALLIES/GERMANY
A45	5/06/44	NORMANDY (FRANCE)	U.S.-BR/GERMANY
A46	22/06/44	BELORUSSIA (RUSSIA)	RUSSIA/GERMANY

A47	25/07/44	NORMANDY BREAKTHROUGH	U.S.-BR/GERMANY
A48	15/08/44	SOUTHERN FRANCE	U.S.-FR/GERMANY
A49	20/10/44	LEYTE IS. (PHILIPPINES)	U.S./JAPAN
A50	24/10/44	LEYTE GULF	JAPAN/U.S.
A51	16/12/44	ARDENNES (BELGIUM)	GERMANY/U.S.
A52	9/01/45	LUZON (PHILIPPINES)	U.S./JAPAN
A53	01-05/45	THE BAVARIAN REDOUBT	GERMANY/U.S.-BR
A54	14/02/45	IRRAWADDY (BURMA)	BRITAIN/JAPAN
A55	6/08/45	HIROSHIMA	U.S./JAPAN
A56	22/12/48	ISRAEL	ISRAEL/EGYPT
A57	25/06/50	KOREA	N.KOR/S.KOR-U.S.
A58	1950-1953	KOREA (USSR INTERVENTION)	RUSSIA/U.S.
A59	15/09/51	INCHON	U.S./N. KOREA
A60	25/10/51	YALU	CHINA/U.S.
A61	15/10/53	KOJO FEINT	U.S./N.KOR-CHINA
A62	20/11/53	DIENBIENPHU (VIETNAM)	FRANCE/VIET MINH
A63	29/10/56	SINAI CAMPAIGN (EGYPT)	ISRAEL/EGYPT
A64	31/10/56	SUEZ CANAL	FR-BR/EGYPT
A65	17/04/61	BAY OF PIGS (CUBA)	U.S./CUBA
A66	5/06/67	THE SIX DAY WAR	ISRAEL/EGYPT
A67	20/08/68	CZECH INVASION	RUSSIA/CZECH

B. LIST B: CASES OF TACTICAL SURPRISE AND OR DECEPTION

CASE	DATE	PLACE	OPPONENTS
B1	4/08/14	LIEGE (BELGIUM)	GERMANY/BELGIUM
B2	27/08/14	OSTEND DEMONSTRATION	BRITAIN/GERMANY
B3	7/02/15	MASURIA (EAST PRUSSIA)	GERMANY RUSSIA

B4	10/03/15	NEUVE CHAPELLE (FRANCE)	BRITAIN/GERMANY
B5	22/04/15	2ND BATTLE OF YPRES (BELG)	GERMANY/BR-FR
B6	6/08/15	SUVLA BAY (GALLIPOLI)	BRITAIN/TURK-GER
B6A	7/10/15	SERBIA	GER-AUS-BUL/SERB
B7	20/12/15	EVAC. OF SUVLA AND ANZAC	BRITAIN/TURK-GER
B8	9/01/16	EVAC. OF CAPE HELLES	BR-FR/TURK-GER
B8A	21/02/16	VERDUN (FRANCE)	GERMANY/FRANCE
B9	18/03/16	LAKE NAROCH (RUSSIA)	RUSSIA/GERMANY
B10	31/05/16	BATTLE OF JUTLAND	GERMANY/BRITAIN
B11	9/04/17	SCARPE & VIMY RIDGE (FR)	BRITAIN/GERMANY
B12	7/06/17	BATTLE OF MESSINES (BELG)	BRITAIN/GERMANY
B13	20/11/17	CAMBRAI (FRANCE)	BRITAIN/GERMANY
B14	27/05/18	CHEMIN-DES-DAMES	GER/FR-BR-U.S.
B15	4/07/18	HAMEL (FRANCE)	BR-U.S./GERMANY
B16	18/07/18	2ND BATTLE OF THE MARNE	FR-BR-U.S./GER
B17	8/08/18	AMIENS (FRANCE)	BR-FR/GERMANY
B18	9/07/21	BATTLE OF ESKISHEHIR (TUR)	GREECE/TURKEY
B18A	6/02/37	JARAMA (SPAIN)	REBELS/LOYALISTS
B18B	6/07/37	BRUNETE (SPAIN)	LOYALISTS/REBELS
B19	02-05/41	ITALIAN EAST AFRICA	BRITAIN/ITALY
B20	20/05/41	CRETE	GER/BR-GREECE
B21	18/11/41	SIDI REZEGH (W. DESERT)	BRITAIN/GER-ITALY
B22	21/01/42	MERSA EL BREGA	GERMANY/BRITAIN
B23	8/05/42	KERCH (RUSSIA)	GERMANY/RUSSIA
B24	20/06/42	TOBRUK (W. DESERT)	GERMANY/BRITAIN
B25	17/08/42	MAKIN ATOLL (C. PACIFIC)	U.S./JAPAN

B26	19/08/42	DIEPPE (FRANCE)	BRITAIN/GERMANY
B27	31/08/42	ALAM HALFA (W. DESERT)	BRITAIN/GERMANY
B28	14/02/43	KASSERINE (TUNISIA)	GERMANY/U.S.-BR
B29	6/03/43	MEDENINE (TUNISIA)	BRITAIN/GERMANY
B30	6/05/43	MASSICAULT (TUNISIA)	BRITAIN/GERMANY
B31	28/11/43	BATTLE OF SANGRO (ITALY)	BRITAIN/GERMANY
B32	2/12/42	MONTE CAMINO (ITALY)	U.S.-BR/GERMANY
B33	29/02/44	ANZIO COUNTERATTACK (ITALY)	GERMANY/U.S.-BR
B34	8/04/44	CRIMEA (RUSSIA)	RUSSIA/GER-RUM
B35	10/06/44	KARELIA (RUSSIA)	RUSSIA/FINLAND
B36	15/06/44	SAIPAN	U.S./JAPAN
B37	24/06/44	TINIAN	U.S./JAPAN
B38	25/08/44	GOTHIC LINE (ITALY)	BRITAIN/GERMANY
B39	8/02/45	REICHSWALD	BR-CANADA/GERMANY
B40	19/02/45	IWO JIMA	U.S./JAPAN
B41	9/04/45	PO VALLEY (ITALY)	ALLIES/GERMANY
B42	15/10/48	PALESTINE	ISRAEL/EGYPT
B43	28/10/48	GALILEE	ISRAEL/EGYPT

C. LIST C: TACTICAL CASES NOT INVOLVING SURPRISE OR DECEPTION

CASE	DATE	PLACE	OPPONENTS
C1	12/08/14	SERBIA	AUSTRIA/SERBIA
C1A	17/08/14	TANNENBERG (E. PRUSSIA)	RUSSIA/GERMANY
C1B	9/05/15	2ND BATTLE OF ARTOIS (FR)	FRANCE/GERMANY
C2	23/06/15	1ST & 2ND BATTLE OF ISONZO	ITALY/AUSTRIA
C3	25/09/15	BATTLE OF LOOS (FRANCE)	BRITAIN/GERMANY
C4	25/09/15	2ND BATTLE OF CHAMPAGNE	FRANCE/GERMANY

C5	18/10/15	3RD & 4TH BATTLE OF ISONZO	ITALY/AUSTRIA
C7	15/05/16	TIROL (ITALY)	AUSTRIA/ITALY
C8	1/07/16	BATTLE OF SOMME (FRANCE)	BR-FR/GERMANY
C9	6/08/16	6TH BATTLE OF ISONZO	ITALY/AUSTRIA
C9A	27/08/16	RUMANIA	RUM/AUS-GERM-BULG
C9B	12/09/16	BATTLE OF MONASTIR (SERBIA)	FR-BR-SERB/GERM-BU
C10	14/09/16	7TH-9TH BATTLE OS ISONZO	ITALY/AUSTRIA
C11	26/03/17	IST BATTLE OF GAZA	BR/TURK-GERMANY
C12	16/04/17	2ND BATTLE OF AISNE (FR)	FRANCE/GERMANY
C13	17/04/17	2ND BATTLE OF GAZA	BR/TURK-GERMANY
C14	23/04/17	2ND BATTLE OF SCARPE	BRITAIN/GERMANY
C15	12/05/17	10TH BATTLE OF ISONZO	ITALY/AUSTRIA
C16	31/07/17	BATTLE OF PASSCHENDAELE	BRITAIN/GERMANY
C17	18/08/17	11TH BATTLE OF ISONZO	ITALY/AUSTRIA
C17A	9/06/18	NOYON-MONTDIDIER (FR)	GERMANY/FRANCE
C18	15/06/18	BATTLE OF PIAVE (ITALY)	AUSTRIA ITALY-FR
C19	15/07/18	CHAMPAGNE-MARNE (FRANCE)	GERMANY/ALLIES
C20	24/10/18	BATTLE OF VITTORIO VENETO	ITALY-FR-FR/AUST
C21	23/08/21	BATTLE OF SAKARYA (TURKEY)	GREECE/TURKEY
C21A	8/11/36	SEIGE OF MADRID (SPAIN)	REBELS/LOYALISTS
C22	30/11/40	RUSSO-FINNISH WAR	RUSSIA/FINLAND
C23	11/08/40	BRITISH SOMALILAND	ITALY/BRITAIN
C23A	13/08/40	BATTLE OF BRITAIN	GERMANY/BRITAIN
C24	12/04/41	SIEGE OF TOBRUK	GERMANY/BRITAIN
C25	15/06/41	BATTLE OF SOLLUM	BRITAIN GERMANY
C26	5/07/43	KURSK (RUSSIA)	GERMANY RUSSIA

C26A	1/08/43	PLOESTI (RUMANIA)	U.S./GERMANY
C27	9/09/43	SALERNO (ITALY)	U.S.-BR/GERMANY
C28	20/01/44	1ST BATTLE OF CASSINO	U.S.-BR-FR/GERMANY
C29	3/02/44	ANZIO, IST PREP. ATTACK	GERMANY/U.S.-BR
C30	15/02/44	2ND BATTLE OF CASSINO	ALLIES/GERMANY
C31	16/02/44	ANZIO, 1ST COUNTEROFFENSE	GERMANY/U.S.-BR
C32	7/03/44	IMPHAL (BURMA)	JAPAN/BRITAIN
C33	15/03/44	3RD BATTLE OF CASSINO	ALLIES/GERMANY
C34	21/07/44	GUAM	U.S./JAPAN
C34A	2/11/44	VOSSENACK-SCHMIDT (GER)	U.S./GERMANY
C35	26/12/44	SERCHIO VALLEY (ITALY)	ITALY-GER/ALLIES
C35A	5/03/45	LAKE BALATON (HUNGARY)	GERMANY/RUSSIA
C36	1/04/45	OKINAWA	U.S./JAPAN
C37	22/04/51	1ST COMM. SPRING OFF.	CHINA-N.KOR/U.N.
C37A	20/05/51	KANSAS LINE (KOREA)	U.N./CHINA-N.KOR
C38	18/08/51	BLOODY RIDGE	U.N./NORTH KOREA
C39	13/09/51	HEARTBREAK RIDGE	U.N. N.KOR-CHINA
C40	3/10/51	JAMESTOWN LINE	U.N./CHINA
C41	11/12/51	LITTLE AND BIG NORI	CHINA/S. KOREA
C41A	14/10/52	TRIANGLE HILL	U.S./N. KOREA
C42	28/05/53	NEVADA OUTPOSTS	CHINA/TURKEY
C43	1/06/53	FINAL COMMUNIST OFF. (KOREA)	CHINA/U.N.

LIST OF REFERENCES

1. Daniel, Donald C. and Herbig, Katherine L. (eds.). Strategic Military Deception, New York: Pergamon Press, 1982, p. xi.

2. Ibid., p. 3.

3. Ibid.

4. Ibid., p. 4.

5. Ibid., p. 5.

6. Ibid.

7. Ibid.

8. Ibid., p. 6.

9. Ibid., p. 7.

10. Ibid., p. 16.

11. Ibid., p. 9.

12. Ibid., p. 21.

13. Ibid., p. 16.

14. Ibid.

15. Ibid., p. 18.

16. Ibid.

17. Ibid., p. 21.

18. Hart, B.H. Liddell, Sherman, New York: Dodd Mead, 1929. pp. 315 - 316.

19. Whaley, Barton, Stratagem: Deception and Surprise in War, Cambridge Mass: MIT Center for International Studies, 1969, p. 86.

20. Ibid., p. A-480.

21. Ibid., p. A-496.

22. Whaley, Barton, Stratagem: Deception and Surprise in War, p. 218.

23. Ibid., p. 195.

24. Ibid., p. 232.

25. Ibid., p. 233.

26. Ibid., p. 234.

27. Ibid., pp. 93 - 100.

28. Ibid., p. 99.

29. Department of the Army, Field Manual 90-2: Tactical Deception, Washington D.C., 1978, p. C-6.

30. Ibid., p. C-6.

31. Ibid., p. C-12.

32. Ibid., p. C-8.

33. Ibid., p. C-9.

34. Ibid., p. C-11.

35. Ibid.

36. Ibid., p. C-1.

37. U.S. Army Intelligence Center and School, SubR 05069/80313: Deception, Fort Huachuca, Arizona. 1978, pp. 7-18 to 7-22.

38. Daniel and Herbig, Strategic Military Deception. p. 239.

39. Van Vleet, J. A., training exercise recollection of the operations of the 125th Military Intelligence Battalion (CEWI), 25th Infantry Division, during TEAM SPIRIT 83, Republic of Korea, April 1983.

40. Whaley, Stratagem: Deception and Surprise in War, p. 146.

41. Daniel and Herbig, Strategic Military Deception, p. vi.

42. Ibid., p. 101.

43. Department of the Army, Field Manual 30-5: Combat Intelligence, Washington D.C., 1971, p. 2-3.

44. Ibid., p. 6-1

45. Ibid., pp. 4-14 to 4-19.

46. Department of the Army, Field Manual 34-10: Military Intelligence Battalion (Combat Electronic Warfare and Intelligence, Division), 1981.

47. Wickens, Christopher D., Engineering Psychology and Human Performance, Charles E. Merril Publishing Company, Columbus, Ohio, 1984, p. 260.

48. Pandel, Michael, "Intelligence and Deception," Journal of Strategic Studies, 5(1), March 1982, p. 134.

49. Schlesinger, Robert J., Principles of Electronic Warfare, Peninsula Publishing, Los Altos, California, 1981, pp. 26 - 27.

50. Ibid., p. 15.

51. Pandel, "Intelligence and Deception," pp. 137 - 138.

52. Wohlstetter, Roberta, "Cuba and Pearl Harbor: Hindsight and Foresight," Foreign Affairs, 43(4), July 1965, pp. 691 - 707.

53. Daniel and Herbig, Strategic Military Deception, p. 9.

54. Scott, Harriet F., and Scott, William F., The Armed Forces of the USSR, 3rd edition, Westview Press, Boulder Colorado, 1984, pp. 107 - 116.

55. Ibid., pp 120 - 122.

56. Wickens, Engineering Psychology and Human Performance, pp. 78 - 79.

57. Ibid., p. 99.

58. Ibid., pp. 97 - 98.

59. Ibid., p. 99.

60. Ibid., p. 94

61. Ibid.

62. Ibid., pp. 226 - 227.

63. Daniel and Herbig, Strategic Military Deception, p. 42.

64. Lefervre, V. A., Algebra of Conflict, Moscow, 1968 (Trans.).

65. Tarakanov, K.V., Mathematics and Armed Combat, Voyenizdat, Moscow, 1974, FTD-ID(RS)T-0577-79 (Trans.).

66. Shavrov, I. Ye., and Galkin, Mi., Methodology of Military-Scientific Knowledge, Voyenizdat, Moscow, 1977 (Trans.).

67. Operations Committee, Naval Science Department, U.S. Naval Academy, Naval Operations Analysis, Naval Institute Press, Annapolis, Maryland, p. 3.

68. Ibid., pp. 23 - 24.

69. Ibid., p. 24.

70. Ibid.

71. Ibid., p. 25.

72. Ibid.

73. Washburn, Alan, "Notes on Game Theory," Naval Postgraduate School, Monterey, California, Class handout used in OS3003, 4th Quarter, FY 1984, p. 1.

74. Operations Committee USNA, Naval Operations Analysis, p.41.

75. Ibid., p. 25.

76. Ibid., p. 26.

77. Ibid.

78. Ibid., p. 27.

79. Ibid., p. 28.

80. Ibid., p. 29.

81. Ibid., p. 30.

82. Ibid., p. 41.

83. Ibid.

84. Ibid.

85. Ibid., pp. 42 - 44.

86. Hughes, Wayne, Captain, U.S. Navy (Retired), OS3003 lecture, Naval Postgraduate School, 29 August 1984.

87. Ionov, On Methods of Influencing an Opponent's Decision, Moscow, 1971, (Translation).

88. Tarakanow, Mathematics and Armed Combat, p. 316.

89. Solnyshkov, Yu. S., 1973, (Trans. by Prof. James G. Taylor, Operations Research Department, Naval Postgraduate School, provided as class notes in 1984).

90. Wickens, Engineering Psychology and Human Performance, pp. 11 to 13.

91. Ibid., pp. 218 - 220.

92. Ibid., p. 95.

93. Ibid., pp. 220 - 221.

94. Ibid., pp. 78, 79, and 95.

95. Ibid., p. 80.

96. Ibid., p. 86.

97. Ibid., pp. 24 and 25.

98. Ibid., pp. 85 - 87.

99. Ibid., pp. 92, 93, 108, and 109.

100. Ibid., pp. 98 - 100.

101. Ibid., pp. 76 and 77.

102. Ibid., pp. 127 - 137.

103. Pemsley, J., Colonel, "Command Technology: Voennaya Sistemotekhnika, An Algorithmic Approach to Decision-Making," Journal of the Royal United Services Institute for Defense Studies, Volume 125, p. 59, 3 September 1980.

104. Ibid., p. 59.

105. Wickens, Engineering Psychology and Human Performance, p. 494.

106. Scott and Scott, The Armed Forces of the USSR, pp. 120-122.

107. Rechtin, Eberhardt, Dr., "The Technology of Command," p. 18, Naval War College Review, 1983.

108. Daniel and Herbig, Strategic Military Deception, p. 179.

109. Ibid., p. 187.

110. Whaley, Stratagem: Deception and Surprise in War, p. 168.

111. Ibid., p. 169.

112. Boyd, J. A.; Harris, D. B.; King, D.D.; and Welch, E.W.; editors; Electronic Countermeasures. Peninsula Publishing, Los Gatos, California, 1978, (reprint of a 1971 book declassified in 1973) p. 21-6.

113. Whaley, Stratagem: Deception and Surprise in War, p. A-358.

114. Ibid., p. 191.

115. Jones, R. V., The Wizard War, Coward McCann and Geoghegin Incorporated, New York, 1978. pp. 85 - 138.

116. Fisher, David, The War Magician, Coward - McCann Incorporated, New York, 1983, pp. 99, 112, and 121.

117. Fitts, Richard E., The Strategy of Electromagnetic Conflict, U.S. Air Force Academy Text, 1974, p. 6.

118. Boyd, Harris, King, and Welch, Electronic Countermeasures, p. 2-1.

119. Whaley, Stratagem: Deception and Surprise in War, p. A-23.

120. Ibid., p. A-102.

121. Ibid., p. A-243.

122. Ibid., p. A-281.

123. Ibid., p. A-395.

124. Ibid., p. A-453.

125. Ibid., p. 199.

126. Ibid., p. 200.

127. Ibid., p. A-393.

128. Ibid., p. A-452.

129. Ibid., pp. B-24 to B-37.

130. Ibid.

131. Ibid., p. 210.

132. Ibid., p. 215.

133. Valenta, Jiri, "Soviet Use of Surprise and Deception," Survival, March-April, 1982, pp. 54 and 55.

134. Dupuy, T.N., Colonel (Retired), Numbers, Predictors & War, Bobbs-Merril Company, Inc., New York, 1979, pp. 14 and 15.

135. Ibid., p. 162.

136. Ibid., p. 158.

137. Whaley, Stratagem: Deception and Surprise in War, pp. A-103 and B-3 to B-9.

138. Dupuy, Numbers, Predictors & War, p. 158.

139. Whaley, Stratagem: Deception and Surprise in War, pp. A-103 to A-109.

140. Dupuy, Numbers, Predictors & War, p. 47.

141. Ibid., p. 50.

142. Ibid., p. 148.

143. Ibid., p. 63.

144. Ibid., p. 231.

145. Ibid., p. 142.

146. Ibid., p. 143.

147. Ibid., p. 42.

148. Ibid., p. 97.

149. Kronman, Mark, Interim Note Number T-11: The Deceptive Practices of the 23rd Headquarters, Special Troops Dur-ing World War II, Tactical Operations Analysis Office, Aberdeen Proving Ground, Maryland, January 1978, p. iv.

150. Ibid., pp. 1 - 2.

151. Ibid., p. 50.

152. Ibid.

153. Ibid., pp. 25 - 26.

154. Van Vleet, J. A., Training exercise recollection of the plans and operations of the 25th Infantry Division during Team Spirit 82, Republic of Korea, March 1982.

155. Ibid.

156. Ibid.

157. Ibid.

158. Ibid.

159. Ibid

160. Ibid.

161. Ibid.

162. Ibid.

163. Ibid.

164. Ibid.

165. Ibid.

166. Ibid.

167. Operations Committee USNA. Naval Operations Analysis, p. 42.

168. Appendix IX to PT-BOR-70, Handling Qualities Rating Scale, Handout provided by CAPT. Poivik for OS4601, 3rd Quarter, FY 1985, at the Naval Postgraduate School, Monterey, California.

169. Griffith, Samual B., Sun Tzu: The Art of War, Oxford University Press, New York, 1963, p. 102.

170. Whaley, Stratagem: Deception and Surprise in War, p. 132.

171. Griffith, Sun Tzu: The Art of War, p. 101.

172. Whaley, Stratagem: Deception and Surprise in War, p. 129.

173. Ibid., p. 130.

174. Griffith, Sun Tzu: The Art of War, p. 66.

INITIAL DISTRIBUTION LIST

		No. Copies
1.	Defense Technical Information Center Cameron Station Alexandria, Virginia 22304-6145	2
2.	Library, Code 0142 Naval Postgraduate School Monterey, California 93943-5100	2
3.	Professor Katherine L. Herbig, Code 56Hi Department of National Security Affairs Naval Postgraduate School Monterey, California 93943-5100	2
4.	Professor Wayne P. Hughes, Code 55H1 Department of Operations Research Naval Postgraduate School Monterey, California 93943-5100	2
5.	Professor John Boulden, Code 73 Chairman, Electronic Warfare Academic Group Naval Postgraduate School Monterey, California 93943-5100	2
6.	Commander US Army Combined Arms Center and Fort Leavenworth ATTN: ATZL-CAC-I Fort Leavenworth, Kansas 66027-5300	2
7.	Commandant U.S. Army Command and General Staff College Fort Leavenworth, Kansas 66027-5300	1
8.	Library U.S. Army Command and General Staff College Fort Leavenworth, Kansas 66027-5300	1
9.	Commander U.S. Army Intelligence Center and School ATTN: Combat Developments Fort Huachuca, Arizona 85613-7222	1

10. Commander 1
U.S. Army Intelligence Security Board
ATTN: ATSI-BI-EC
Fort Huachuca, Arizona 85613-7000

11. Commander 1
U.S. Army Intelligence School, Fort Devens
ATTN: Library and Information Services Division
Fort Devens, Massachusetts 01433-6301

12. Chief, Tactical Training Division 1
Maintenance Training Department
U.S. Army Intelligence School, Fort Devens
Fort Devens, Massachusetts 01433-6301

13. Frank Snyder 1
Operations Department
Naval War College
Newport, Rhode Island 02840

14. Robert Wood 1
Director of Naval Warfare Studies
Naval War College
Newport, Rhode Island 02840

15. President 1
ATTN: Electronic Warfare Chair
Naval War College
Newport, Rhode Island 02840

16. Dr. Edward Vandiver 1
U.S. Army Concepts Analysis Agency
8120 Woodmount Avenue
Bethesda, Maryland 20814

17. Director 1
U.S. Army Signals Warfare Laboratory
Vint Hill Station
Warrenton, Virginia 22186

18. Major John A. Van Vleet 2
399A Ricketts Road
Monterey, California 93940