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Reaction of Combat Service Support Troops Under Stress: The Small
Maintenance Support Unit in a Combat Environment

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Final report 6 June 1975

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



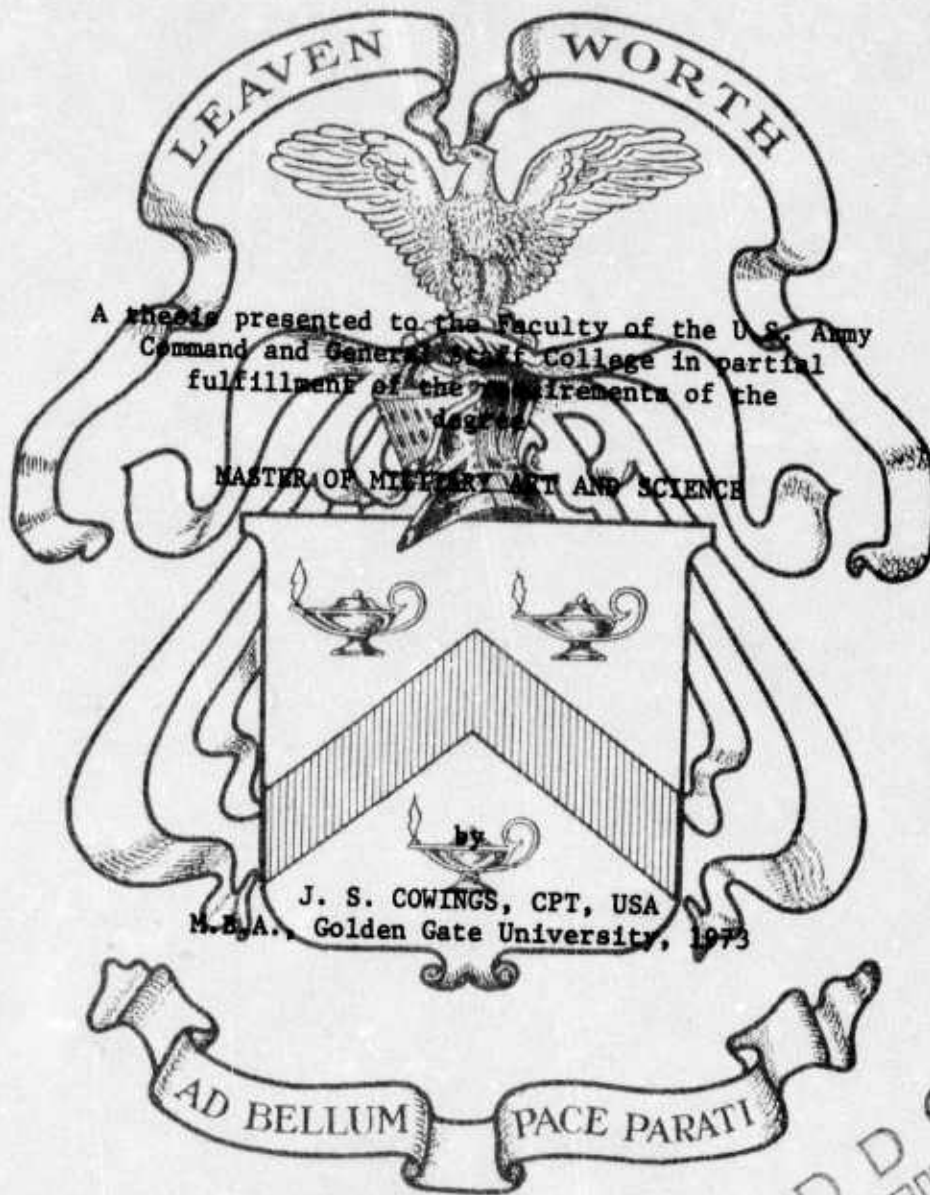
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Reaction of Combat Service Support Troops Under Stress is a study of military organizational behavior within an active combat environment. The study is directed toward the manager assigned to a small maintenance support unit, and strives to acquaint him (or her) with the various psychophysiological reactions apparent in combat service support personnel during periods of combat. These reactions, often erratic in nature, are depicted herein as being environmentally interdependent in that the physical environment acts as a stimulus producing predictable behavioral tendencies.

It is the author's hypothesis that, given the exigency of a combat situation, personnel within a small maintenance support unit will exhibit a definite pattern of organizational behavior. The R.O.C.S.S.T.U.S. Study provides a graphic illustration of the aforementioned behavior pattern, and incorporates this pattern into an Analytical Model of Organizational Behavior.

REACTION OF COMBAT SERVICE SUPPORT
TROOPS UNDER STRESS: THE SMALL MAINTENANCE
SUPPORT UNIT IN A COMBAT ENVIRONMENT



Fort Leavenworth, Kansas
1975



A B S T R A C T

Reaction of Combat Service Support Troops Under Stress

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It is the author's contention that maintenance unit managers -- unlike their counterparts in the combat arms branches of the Army -- have little opportunity to formally concern themselves with the subtle nuances of personnel management under combat conditions. The professional development of most maintenance managers has been geared toward production management as opposed to personnel management.

Therefore, to entrust the management of maintenance unit personnel, in a combat situation, to the unaided judgement of the maintenance (Ordnance) manager is to ask of a combat service support officer (or NCO) that he make decisions within an unfamiliar environment; and that he make these decisions without the benefit of a yardstick by which he can measure the appropriateness of his judgement.

The Analytical Model of Organizational Behavior developed within this study, provides the necessary yardstick vis-a-vis personnel management decisions, by acting as an aid to the managerial decision making process under stress conditions generated by combat.

As a 1st Lieutenant and company commander, serving with a maintenance forward support company in the Republic of Vietnam, the author experienced the personal trauma of attempting to provide effective personnel management for 145 combat service support troops during 30 days of intensive combat -- the 1968 Tet Offensive. This research effort has been undertaken in the sincere hope that some of the lessons learned, and management techniques acquired, will serve to assist maintenance unit managers on some future and as yet undefined battlefield.

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CHAPTER I

AN ANALYTICAL MODEL FOR USE BY MANAGERS OF SMALL MAINTENANCE SUPPORT UNITS

A scientific analysis of human behavior is obviously relevant. It helps in two ways: it defines what is to be done and suggests ways of doing it.¹

The Vietnam conflict provided the United States Army with a viable test bed for the application of modern military techniques and technology. That the conflict served as a medium in which significant new lessons were learned is an irrefutable fact. Of equal consequence, however, is the fact that U. S. military involvement in Vietnam also resulted in many 'old' lessons being learned anew.

For those Army combat service support personnel who served in Vietnam, the conflict generated considerable exposure to the hazards of combat. This exposure was manifested in part by the large number of security measures prevalent on U. S. military installations in Vietnam. Security measures such as reinforced bunkers, barbed wire entanglements, and two-man fox-holes bespoke of the vulnerability of the combat service support personnel who were stationed on those installations. Vietcong attacks launched against U. S. bases housing combat service support personnel, were common occurrences in this particular

¹B.F. Skinner, Beyond Freedom and Dignity (New York: Random House, 1971), p. 138.

theater of operations; a theater possessing neither front lines nor clearly defined boundaries within which combatants meet and hostilities are pursued.

It is the author's intention in Chapter I to introduce a problem which exists in the Army today, and -- after having described the problem -- to offer a rationale for the development of an analytical model designed to help attenuate/eliminate the generic cause of that problem. Some general background material concerning the problem will be presented as well as a statement of the hypothesis upon which this study is predicated.

Chapter II will consist of a review of research literature pertaining to the problem of human behavior in response to the stresses of a combat environment. Chapter III will involve a detailed description of research methodology, to include an explanation of the questionnaire which served as the chief instrument in gathering information on the subject of the reaction of maintenance personnel to combat. Chapter IV will provide an evaluation of the responses to the aforementioned questionnaire.

A summary of the author's research findings will be presented in Chapter V, along with a brief recommendation addressed to the Ordnance School at Aberdeen Proving Ground, Maryland.

Introduction

As is the case in an insurgency, so it is in other types of warfare that the combat service support soldier occasionally finds himself subjected to direct attack by enemy forces. A

brief look through U.S. military history will reveal numerous instances of combat service support units becoming engaged in combat. One such instance occurred in the Battle of St. Vith, during World War II. Lieutenant Colonel Robert C. Erlenbusch, Commanding Officer, 31st Tank Battalion, recounts the following incident reference that historic battle:

Division trains were heavily engaged in combat in order to keep from being overrun...Frequently, this combined maintenance section operated under artillery fire, and many times they had to drop their work and engage in a small fight with enemy patrols which (had) penetrated to their area.²

One might conclude from the previous passage, and from similar passages found throughout U.S. military history, that a general awareness exists in the Army regarding the vulnerability of combat service support units to direct encounter with enemy forces. Such an awareness, borne out of lessons learned in World War II, the Korean Conflict, and the Vietnam Counterinsurgency effort, does in fact exist. What is more, this awareness has generated special combat training programs for combat service support personnel at institutions such as the Ordnance School at Aberdeen Proving Ground, Maryland. The following excerpts, reference logistics-peculiar combat training, were extracted from Programs of Instruction at the Ordnance School:

...combat organizations of Army Divisions, to include: missions, characteristics, capabilities and limitations of the combat and combat support units in the Division; the techniques for employ-

²Reference Book (RB) 100-2, Vol. I, Selected Readings in Tactics, "The Ardennes Defensive of 1944" (U.S. Army Command and General Staff College, Fort Leavenworth, Kansas, April 1974), p. 2-57.

ment of Air Defense, Engineer, Signal, and Artillery assets. (The student will be able to identify) infantry, armor, and cavalry operations, to include special combat service support requirements to support combined arms teams. He will state the fundamentals of rear area protection and activities of combat service support units in support of rear area protection operations; electronic warfare and its impact on combat and combat service support activities; logistical problems associated with combat and combat support units and their employment.³

...combat operations and the close relationship required of combat and combat service support units while conducting combat operations to include: fundamentals of offensive operations of armor, infantry, and mechanized infantry, and cavalry units in the movement to contact, coordinated attack, pursuit and exploitation; combat service support required in support of the mobile and area defense; the deployment and maneuver of armor, infantry, mechanized infantry, and cavalry in defensive operations; the special logistical considerations for retrograde operations; the unique maintenance and supply requirements to support the airborne and airmobile operations; the employment of Division Support Command units to meet the changing support requirements of offensive, defensive, retrograde, airborne and airmobile operations; to include the coordination, tactical site location and movement of the Division Support Command units to maintain adequate support to the combat units.⁴

...conduct counter-ambush operations against aggressor force in an insurgency environment...establish and conduct a perimeter defense, to include terrain analysis, fields of fire, integrated defense plans ...counter-guerilla measures in defense of the logistical unit.⁵

³Program of Instruction for 4-9-C22: Ordnance/Chemical Officer Advanced Course, p. A-2. This 27-hour block of instruction was approved by the U.S. Army Training and Doctrine Command (TRADOC) in July 1974.

⁴Ibid., p. A-2. This is a 38-hour block of instruction.

⁵Program of Instruction for 4-9-C20: Ordnance Officer Basic Course, p. E-1. This 25-hour block of instruction was approved by TRADOC on 12 April 1974.

Courses of study such as these are designed to give the combat service support (Ordnance) manager a feel for the roles played by the combat and combat support arms. These courses also provide the Ordnance manager with a brief introduction into those defensive measures necessary to protect the small maintenance support unit in the field.

The reader is asked to note, however, that nowhere in these Programs of Instruction is the combat service support manager instructed as to what type of behavioral reaction he might expect of his personnel, given the eventuality that his small maintenance support unit were to become entangled in a combat situation. Given a literal interpretation of the Programs of Instruction, many questions go unanswered for the Ordnance student; questions such as: "How will unit personnel react to enemy bombardment?"; "How will their reactions affect the unit's mission effectiveness?"; and, "How do I, as a manager in a small maintenance support unit, gauge the production capacity of my shop operations when the shop area is under enemy bombardment?"

While it is apparent that officer students at the Ordnance School are being trained to (temporarily) take on the role of combat soldiers -- should the need arise -- they do not appear to be receiving instruction in the nuances of human behavior vis-a-vis personnel management under conditions of stress induced by combat. It is this omission in the Ordnance manager's training which the author hopes to rectify by suggesting the development of an analytical model as a guide to behavioral analysis.

Assumptions

A series of assumptions (1 through 8, below) lie at the foundation of this particular study. In adopting these assumptions the following rationale was employed:

- Assumptions selected were considered to be essential for simplification of the research effort.
- In the author's opinion, each assumption offered is both reasonable and valid.
- The assumptions selected do not 'assume-away' the problem.
- In his role as a decision maker, the manager assigned to a small maintenance support unit, should consider the appropriateness of each assumption listed with respect to his specific circumstances.

1. Behavior exhibited by maintenance unit personnel during periods of combat differs considerably from that behavior exhibited during periods of relative calm.

2. Ordnance officers and noncommissioned officers generally lack the specialized combat training necessary to engage in personnel management in a combat situation.

3. Ordnance officers and noncommissioned officers engaged in providing maintenance support, differ from combat arms personnel with respect to their degree of personal combat experience.

4. In an active combat theater of operations, the importance of the combat service support role increases as the intensity of combat increases. At the same time, the mission effectiveness of many combat service support units decreases (initially)

because of the requirement to adjust to, and to work within, a combat environment.⁶

5. The work environment in Vietnam was essentially the same for both direct support and general support maintenance units.

6. The Vietnam Conflict does not represent a ten-year deviation from doctrine. The lessons learned, and the techniques of personnel management developed in that conflict, will have application in other theaters of operation.

7. Valid information can be obtained from both noncommissioned officers and commissioned officers; therefore, no requirement exists to draw a distinction between these two information source categories.

8. Interviewees will be able to recall circumstances surrounding a combat situation which occurred several years past; and be able to recall in sufficient detail to respond to a questionnaire.

Admittedly, the ability to recall events from one's past -- reference assumption number 8, above -- diminishes with the passage

⁶The expression 'mission effectiveness' is defined for purposes of this study as a measure of the adequacy of combat service support provided by a maintenance support unit to its supported units. The author contends that a decrease in a given unit's mission effectiveness does not of itself imply a lack of ability within that unit. On the contrary, the ability to perform mission related work, at acceptable levels of efficiency still exists within the maintenance support unit in spite of the unfavorable environment of combat. What is needed, therefore, is a device for tapping this reservoir of ability.

of time. However, some past events meet the criteria of being either sufficiently unique or sufficiently traumatic as to cause them to be locked indelibly in our memory. This was one of the conclusions reached by the author during an interview conducted with Dr. Lynn L. Sims, a U.S. military historian, and member of the Faculty at the U.S. Army Command and General Staff College.⁷

In the course of the interview, Dr. Sims mentioned that while a person being interviewed about some historical event of which he is presumed to possess first-hand knowledge, might not be able to recollect the entire event, he(or she) might nevertheless be expected to recall certain happenings of personal significance. It is not uncommon for individuals to be able to vividly recall a seemingly insignificant event which transpired within the same time frame as a major historical event -- such as a great battle. The example cited was of a young soldier's recalling that he lay for a long period of time with the side of his face pressed down in the mud during an intense enemy attack. From the collection of impressions such as these, the military historian is able to weave a fairly accurate pattern, and to recreate a given historical occurrence. At the conclusion of the interview, Dr. Sims summarized by suggesting that he shares with the

⁷Interview conducted with Dr. Lynn L. Sims, on 7 November 1974. Subject of the interview was "the individual's ability to remember past occurrences of historical significance." Dr. Sims is the U.S. military historian in the Department of Tactics, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas.

author the belief that a 'combat experience' qualifies as being sufficiently unique in the repertoire of a combat service support manager to trigger a fairly accurate recollection of that experience. Such would not necessarily be the case when interviewing a combat arms officer or noncommissioned officer -- one who had served in a combat role while in Vietnam -- regarding a particular combat incident. The latter category of interviewee would tend to experience much greater difficulty when attempting to distinguish between numerous combat situations in which he played a part.

The reader is asked to judge the validity of any conclusions offered within this thesis based upon the degree of credence that he would ascribe to each of the eight assumptions.

Scope of the Study

One particular type of combat service support unit will be focused upon within this study: the small maintenance support unit. Irrespective of the specific designation of a given maintenance support unit -- whether direct support or general support, divisional or nondivisional -- it will be referred to within these pages as 'a small maintenance support unit.'

Figures 1 and 2 contain several examples of the type of small maintenance support unit for which this study has application.⁸

⁸Source document for information appearing in Figures 1 and 2 is TRADOC Pamphlet No. 310-4, Reference Digest of Tables of Organization and Equipment, November 1973.

Type Maintenance Unit	TOE	Aggregate Strength (Level 1)	Division/Other
Transportation Aircraft Maintenance Company (DS)	55-89H	185	Infantry Division
HQ and Light Maintenance Company (DS)	29-26H	123	Mechanized Infantry Division
Forward Support Company (DS)	29-27H	162	Mechanized Infantry Division
Heavy Equipment Maintenance Company (DS)	29-38H	248	Armored Division
Maintenance Support Company (DS)	29-57H	176	Airborne Division
Forward Support Company (DS)	29-87H	96	Airmobile Division
Maintenance Company (DS)	29-79H	242	Separate Armor Brigade
Maintenance Company (rear) (DS)	29-208H	273	Non-divisional

Figure 1. Examples of Small Maintenance Support Units (Direct Support)

Type Maintenance Unit	TOE	Aggregate Strength (Level 1)
Transportation Aircraft Maintenance Company (GS)	55-458H	278
Heavy Equipment Maintenance Company (GS)	29-137H	255
Light Equipment Maintenance Company (GS)	29-134H	132
HAWK Support Platoon (GS)	9-59G	81
Rocket-Missile Support Detachment (GS)	9-550H	96
HHD, Maintenance Battalion (DS/GS)	29-136H	56

Figure 2. Examples of Small Maintenance Support Units (General Support)

The military personnel who serve as the locus of attention for this study are those Ordnance officers and enlisted personnel assigned to a small maintenance support unit. Ordnance officers and noncommissioned officers in the latter category will be referred to as managers in the pages which follow. The author prefers to employ the word manager, as opposed to commander or leader; and offers the following logic in support of that preference:

The term commander has been discarded because it refers to only a single individual (a single manager) within the small maintenance unit. Leader, on the other hand, is a term with broader application, but suffers from ambiguity. A leader could be any individual within a small maintenance support unit who possesses exceptional powers of persuasion over his fellow soldiers. Consequently, a leader need not necessarily be one of the personnel or production managers within a given unit. Leadership, per se, resides to a marked degree in the realm of art, whereas management is much more of a science. For the reasons just enumerated, the author has elected to address managers and not commanders and/or leaders in this study.

Organizational behavior and organizational management constitute the two overlapping disciplines which form the basis for much that the reader will be exposed to in the passages which follow. As a final note with respect to the scope of this study, the reader is asked to observe that the problem statement is environmentally dependent in that it concerns a combat situation -- a specific slice of time in which personnel in a small maintenance support unit experience an enemy attack.

Significance of the Study

Small maintenance support units currently serve the Army on a global basis, performing an essential logistical function. The mission effectiveness of these maintenance

support units directly influences the combat readiness of the Army's combat and combat support forces. In time of war, any degradation in the mission effectiveness of the small maintenance support unit -- such as could result from an inability to work effectively while in a combat environment -- will have a direct impact on those combat forces dependent upon it for maintenance support.

At present, a manager in a small maintenance unit has three options from which to select whenever his unit comes under enemy attack: (1) He can elect to temporarily cease all maintenance work, and require his personnel to serve as infantry; (2) he can elect to place his personnel in protective shelters to await the end of the enemy attack; or (3) he can choose to continue to conduct his primary mission to the degree that enemy action will permit. It is the intention of this study to show that the latter option (i.e., "3") is a viable one, and that it is the most desirable option from a combat service support point of view.

Statement of the Problem

Does the organizational behavior exhibited by a small maintenance support unit, in a combat environment, form a distinct pattern?

Background Concerning the Problem

While serving in a maintenance battalion in the Republic of Vietnam, the author observed that small maintenance support

units often experienced a degree of difficulty in conducting their mission while in the midst of an active combat situation. It was noted that whenever an installation housing a maintenance support unit was subjected to enemy bombardment, or to an enemy ground assault, the normal work routine (organizational behavior) of the unit tended to become erratic. The affect of this erratic behavior was usually an initial reduction in the mission effectiveness of the maintenance unit; lasting anywhere from a number of hours to a full day, and terminating only after unit personnel were able to adjust to the initial shock of having been thrust into a combat environment. Erratic behavior is defined as that organizational behavior which is distinct in nature from the organizational behavior which existed prior to the start of the combat situation. Erratic behavior is further defined as a phenomenon of organizational behavior, and not as the independent behavior exhibited by individual members of a given maintenance support unit. The following logic is offered in explanation of the author's concentration upon 'organizations' as opposed to the individuals who comprise organizations:

An organization is fundamentally a pattern of roles and a blueprint for their coordination; it exists independently of particular people and can survive in spite of a 100 percent turnover of membership.⁹

⁹Edgar H. Schein, Organizational Psychology (New Jersey: Prentice-Hall, Inc., 1970), 2d edition, p. 10.

An exception to this rule of placing emphasis upon organizations as opposed to individuals, appears in Chapter II, where the author discusses the psychological and physiological reactions of individual soldiers to environmentally-induced stress factors.

The causes of the erratic organizational behavior, referred to on the previous page, may be categorized as (1) surface causes, and (2) subliminal causes. The surface, or obvious, cause of erratic behavior observed in a small maintenance unit under hostile fire, is the enemy attack itself. The attack acts as an environmental stimulus, producing in maintenance unit personnel a fear for their physical safety. It will be shown in Chapter II that the environment is the chief factor in producing both psychological and physiological stress in maintenance unit personnel. The Pavlovian stimulus-response explanation of behavior does not, however, provide an all inclusive explanation for the initial perturbation seen in the maintenance unit's normal work routine at the beginning of a combat situation. The stimulus-response type of explanation does not take into account, for example, the generic cause of organizational behavior in a small maintenance support unit under enemy attack.

Dr. B.F. Skinner claims that, "Seldom does any environmental condition elicit behavior in an all-or-nothing fashion of a reflex; it simply makes a bit of behavior more likely

to occur."¹⁰ This observation by Dr. Skinner serves as an appropriate introduction to what will be referred to as the subliminal (or generic) causes of erratic organizational behavior in the small maintenance support unit.

The term subliminal is employed as a means of emphasizing that this type of causal factor generally exists outside the arena of conscious awareness. Consequently, one must seek out some of the underlying causes of erratic organizational behavior outside of the immediate combat situation; specifically, in several not-so-apparent attitudes commonly shared by many Ordnance managers.¹¹ Attitudes are defined as, "predispositions to respond in certain ways to situations. They are more or less stable and do not change readily. Furthermore, they tend to color responses to a wide variety of concepts and situations."¹²

Four specific attitudes have been identified as contributing to erratic organizational behavior: (1) low credibility, (2) low probability, (3) brief duration, and (4) a false sense of security. No doubt the reader could expand this list, but these four attitudes will suffice for purposes of this study.

¹⁰B.F. Skinner, op. cit., p. 15.

¹¹In discussing attitudes commonly shared by many Ordnance managers, the author is expressing an opinion based upon nearly a decade of service in Army Ordnance. Over the years, Ordnance officers and noncommissioned officers have expressed opinions to the author which he has taken to represent verbal formulations of their attitudes.

¹²New Soldier's Attitudes: Section 1, p. 112. A study conducted in 1951 by the Attitude Branch, Armed Forces Information and Education Division, Office of the Secretary of Defense.

Attitude 1: Low Credibility.

Most Ordnance officers and noncommissioned officers realize that an occasion may one day arise when, as managers assigned to a small maintenance support unit, they might be required to either fight as infantry or to perform their combat service support role while under enemy fire. Very few of these managers, however, actually believe that such an eventuality will ever occur.¹³ This incredulity continues to exist today, despite efforts by institutions such as the Ordnance School directed toward emphasizing the importance of special combat training for maintenance unit managers.

Attitude 2: Low Probability.

Even among those Ordnance officers and noncommissioned officers who accept the possibility that a given maintenance support unit might one day experience a direct engagement with an enemy force, there remains an element of doubt that they will ever personally become involved in a combat situation.¹⁴ This attitude tends to play down the need for special combat training; once the Ordnance manager has made the transition from basic student to a full-fledged manager, working in the field. Such an attitude is particularly dangerous because it fails to take into consideration that it is during these instances of combat -- however rare or fortuitous -- that the combat service support function of a small maintenance support unit is most crucial.

¹³See footnote 11, p. 16.

¹⁴Ibid.

Attitude 3: Brief Duration.

Quite a few Ordnance managers who have actually experienced enemy attacks while serving as members of a small maintenance support unit, remark that the duration of these attacks were usually so brief -- lasting for only a few hours, or for a few days -- as to appear insignificant when compared to the much higher percentage of their time spent in conducting their mission under normal (i.e., other than combat) conditions.¹⁵

The author would suggest to those Ordnance personnel of this persuasion that even in a brief instance of combat a maintenance support unit may suffer unacceptable losses in human lives, in materiel and facilities, and in mission effectiveness.

Attitude 4: False Sense of Security.

Finally, there is a tendency among many Ordnance managers and workers alike to be lulled into a false sense of security as a result of being stationed on a large base camp.¹⁶ The enormous size of some of the U.S. installations in Vietnam occasionally caused military personnel to 'forget' that their base camp was situated in an active combat theater. The familiar surroundings found on a typical large base camp in Vietnam were often reminiscent of physical surroundings found on military installations in the Continental United States (CONUS). Such things as a Post Exchange, a motion picture theater, heavy vehicular traffic, comfortable living quarters, etc., can combine

¹⁵Ibid.

¹⁶Ibid.

to produce a sort of hypnotic effect, producing in the soldier (and in the manager) a false sense of security which colors his perception and creates an illusion of normalcy. Once a manager falls prey to this false sense of security he begins to feel that there is little need to emphasize special combat training in his particular maintenance support unit. In such cases, it often requires the eruption of violent enemy action, with its attendant destruction and casualties, to shock a manager into an awareness of his tenuous situation.

The four attitudes just described can synthesize over a period of time into a formidable philosophy. This subconscious philosophy has resulted in many Ordnance/maintenance managers -- unlike their counterparts in the combat arms -- being unprepared psychologically to cope with the exceptional problems of small unit personnel and production management during periods of combat. Unless this philosophy, and the attitudes of which it is composed, are brought to the attention of the Ordnance manager early in his career, the Ordnance branch will be perpetuating a credibility barrier which has thus far prevented much valuable combat training from making a profound impression on its officers and noncommissioned officers.

Purpose of the Study

The purpose of this research study is to point out to the manager in the small maintenance unit, the need for some type

of special management tool geared toward personnel management under adverse environmental conditions generated by combat.

At this point the reader might wish to ask, "Is there a need for this special management tool?" "Why not just entrust the management of a maintenance unit -- in combat -- to the judgement of those Ordnance/maintenance managers assigned to the unit?" In the interest of brevity only four reasons will be offered by way of suggesting that perhaps under the present training system, it is undesirable to entrust personnel management to the 'unaided' judgement of the Ordnance/maintenance manager.¹⁷

First, to entrust the management of maintenance unit personnel, in a combat situation, to the unaided judgement of the Ordnance manager is to ask a combat service support officer (or NCO) to make decisions within an unfamiliar environment; and to make those decisions without the benefit of a yardstick by which he can measure the appropriateness of his judgement. There is at present no standard of behavioral analysis against which a maintenance unit manager can compare his decisions regarding personnel management in a combat environment.

Second, without the benefit of some guidance, each manager within a maintenance support unit could possibly be exercising widely varied judgement in a given combat situation.

¹⁷The expression 'unaided' implies the existance of an aid to decision making. Such an aid will be developed in Chapter III.

Their judgement would tend to be based upon intuition rather than derived from a real knowledge of organizational behavior in a combat environment. Professor Drucker emphasizes the desirability of having some type of aid to the management decision making process, in the following passage from one of his texts on management science:

"... nor is managing a business just a matter of hunch or native ability; its elements and requirements can be analyzed, can be organized systematically ... (and can be learned in an academic setting). The days of the intuitive manager are numbered."¹⁸

The comparison between a business -- to use Drucker's terminology -- and a small maintenance support unit, is rather easy to visualize by anyone familiar with maintenance shop operations. For the reader who is unfamiliar with the organization and workings of a maintenance shop, the following quotation is offered in support of the analogy which the author has drawn between a civilian business and a small maintenance support unit:

Some of the work which soldiers and sailors do is similar to ... work in civilian life. (Examples include) servicing both trucks and planes. More of it (i.e., military-peculiar work) is novel, but still subject to the same laws of efficiency as civilian work.¹⁹

¹⁸Peter F. Drucker, The Practice of Management (London: Pan Books Ltd., 1968), pp. 20,21.

¹⁹Psychology For The Armed Services (Washington, D.C., 1945), p. 167. Edited by Edwin G. Boring of Harvard University. Prepared by a Committee of the National Research Council.

Dr. Bernard M. Bass capsulizes the author's third point by observing that, "...groups with highly trained leaders and members are more likely to be able to cope with sudden crisis."²⁰

The fourth, and final point, is that there exists an inherent danger in believing that just because a large number of Ordnance managers have generally been successful in the past, in employing intuitive judgement in combat situations, that there is no need for an analytical tool to aid in personnel management and/or decision making. Professor Drucker, in addressing the fourth point, states, "As long as we can handle the events on the operating level by adaptation rather than by thinking, by feel rather than by knowledge and analysis, operating people -- in government, in the military, or in business -- will be untrained, untried, and untested when...confronted with strategic decisions."²¹

The need for an analytical tool to provide some standard of measurement to augment the judgement of the decision maker is not an original idea. Indeed, the need for such an aid to judgement was recognized several centuries ago as attested to in the following Chinese parable (c. 234 B.C.):

²⁰Bernard M. Bass, Leadership, Psychology, and Organizational Behavior (New York: Harper and Row, 1950), p. 460.

²¹Peter F. Drucker, The Effective Executive (London: Pan Books Ltd., 1967), p. 167.

A certain man of Cheng was going to buy himself a new pair of shoes. He took measurements of his feet, but forgot to bring the measurements along when he went to the shoe shop. He returned home for the measurements but the shop was closed by the time he went back to it, so he could not buy any shoes. Someone asked him, "Why didn't you let them try the shoes on your feet?" And the man replied, "I would rather trust the measurements than trust myself."²²

In referring to the above parable, Dr. Bass has the following comments to make:

Perhaps the absurd man of Cheng may not have been so absurd after all. Perhaps careful, repeated, exhaustive, and objective measurements would have provided better shoes than (would have been) possible from a single brief trial of the shoes inside a busy shoe store, subject to the salesman's pressures and to the need to distinguish different feelings of comfort produced by a variety of shoes tried on."²³

The material presented thusfar in Chapter I has been designed to convince the Ordnance manager that perhaps he -- like the man of Cheng -- can produce better decisions by employing an analytical model as a substitute for intuitive judgement.

Statement of the Hypothesis

An examination of organizational behavior in a small maintenance support unit -- in a combat situation -- will reveal a distinct behavior pattern.

²²Han Fei-Tse, Parable of the Absurd Man of Cheng (c. 234 B.C.); translated by Lin Yutang.

²³B.M. Bass, op. cit., p. 106.

Toward Obtaining A Behavioral Insight

Managers assigned to a small maintenance support unit in an active combat theater of operations need to know how their personnel might be expected to react to an enemy attack. If a manager possessed such knowledge beforehand he could take advantage of the following newly gained capabilities:

- The manager, especially the unit commander and first sergeant, could develop a realistic training program for unit personnel. This training program would be oriented toward a specific theater of operations and would be designed to: (1) reduce the impact on maintenance unit personnel of those environmental factors which impede good job performance during combat periods; and (2) to reinforce those factors which support good job performance -- even in a combat situation.

- The manager would be able to forecast to within a reasonable degree of accuracy, the mission effectiveness of his unit in a given combat situation.²⁴

- Armed with such a perspective regarding organizational behavior within his own unit, the manager would possess information of value to: (1) The commander of the small maintenance support unit; (2) the commander and managers assigned to the maintenance unit's parent organization; and (3) the commanders and staff officers of those organizations dependent upon the maintenance support unit for their combat service support.

²⁴See footnote 6 for an explanation of the term 'mission effectiveness.'

• Managers would be able to better assess the special requirements of their unit in order to successfully meet any number of different combat contingencies.

How then is the manager in a small maintenance support unit to obtain this behavioral insight? What, for example, can the Ordnance School employ as a training vehicle for its officer and noncommissioned officer students? In answer to these questions the author will suggest the use of an analytical model. This analytical model -- developed in Chapter III -- should not be considered as a substitute for sound thinking on the part of the Ordnance/maintenance manager. Any model which claims to do the manager's thinking for him will be rejected by those in the academic world of management science. In support of this claim the author offers the following passage from Professor Drucker's book, The Practice of Management:

The attempt to replace judgement by formula is irrational; all that can be done is to make judgement possible by narrowing its range and the available alternatives, giving it clear focus, a sound foundation in facts and reliable measurements of the effects and validity of actions and decisions.²⁵

The analytical model unfolded within this research effort will attempt to meet the criteria established in the abovementioned paragraph. An analytical tool regarding human behavior could well prove to be the one essential element

²⁵P.F. Drucker, The Practice of Management, p. 82.

needed by the small unit manager faced with the problem of conducting his mission under hazardous conditions. The manager requires a comprehensive basis for the study of behavior exhibited by his personnel during periods of enemy attack. With such a basis for analysis, the manager will be able to gain a better insight into personnel management in a combat environment. The analytical model mentioned provides the manager with a systems approach to behavioral analysis; one which would permit the integration of both human behavior and the physical environment. The analytical model will enable the manager to predict human behavior as stemming from the interaction of his personnel and their physical environment. Professor Schein of the Massachusetts Institute of Technology, concludes that, "The kinds of assumptions a manager makes about the nature of people (within his organization) will determine his managerial strategy."²⁶

Summary and Conclusion

The Twentieth Century battlefields of World War II, Korea, and Vietnam, have served to cast the American combat service support manager in a new role. No longer can he concern himself exclusively with either performing his primary mission in a secure environment, or temporarily taking on a defensive combat posture. Today the manager must consider the managing

²⁶Edgar H. Schein, Organizational Psychology (New Jersey: Prentice-Hall, Inc., 1965) p. 56. Words appearing in parenthesis were added by the author for purposes of clarity, and do not alter the intent of the original author (Dr. Schein).

his organization in an environment of frequent and direct contact with enemy forces. The manager must become a 'combat manager' ; someone capable of accomplishing his combat service support mission under the threat of (or actual) enemy firepower. Possessing an analytical model, the manager will be able to a priori determine his unit's behavior pattern under stress of combat. Without a knowledge of human behavior under stress conditions, Ordnance/maintenance officers and noncommissioned officers will continue to be bound to an intuitive handling of each separate instance of combat that they experience.

CHAPTER II

STRESS AND THE SMALL MAINTENANCE SUPPORT UNIT: IMPLICATIONS FOR THE MANAGER

The psychological problem for the organization becomes, therefore, how to develop in its personnel the kind of flexibility and adaptability that may be needed for the organization to survive in the face of a changing environment.¹

A rationale for the employment of an analytical model to aid in the decision making process, was offered in Chapter I. The material presented in this chapter represents a further step toward the development of that model. Also to be discussed within this chapter are the research findings of a number of behavioral scientists, doctors of medicine and psychiatry, as well as business management analysts, with respect to the influence of environmentally-induced stress factors (stressors) on both individual and organizational behavior.

Operations reports of lessons learned by U.S. Army maintenance support units in Vietnam will be examined, as will two original case studies. Finally, there will be a brief review of research conducted in the area of civilian business enterprise with respect to stress, and its influence on organizational efficiency.

A review of research methodology texts and procedures

¹Edgar H. Schein, Organizational Psychology (New Jersey: Prentice-Hall, Inc., 1965), 2d edition, p. 19.

in the field of behavioral science, appears in Chapter III.

A Rationale For The Study Of Behavioral Science

In discussing conceptual issues of organizational theory as related to the behavioral sciences, Scott and Mitchell state that there exists today no 'gestalt' science of human behavior.² In their book, entitled, Organizational Theory: A Structural And Behavioral Analysis, the authors examine the three fundamental categories of human behavior -- psychology, sociology, and anthropology -- and come to the conclusion that each represents a distinct entity unto itself. The mere fact that these three approaches to human behavior allow for an occasional interface does not negate the fact that no single interdisciplinary science of human behavior has been discovered to date.³

Bass agrees with the conclusion reached by Scott and Mitchell, but he goes on to expand upon the triad of behavioral sciences -- adding the disciplines of political philosophy, industrial management, and history.⁴ Indeed a search through behavioral science literature will reveal to the reader that there exists as many classifications of behavioral science as

²William D. Scott and Terrence R. Mitchell, Organization Theory: A Structural And Behavioral Analysis (Illinois: The Dorsey Press, 1972), p. 307. The expression 'gestalt', as employed here, refers to a series of behavioral sciences, so integrated as to constitute a single functional unit with properties not derivable from its parts in summation.

³Ibid., Chapter 17.

⁴Bernard M. Bass, Leadership, Psychology, and Organizational Behavior (New York: Harper and Row, 1960), Chapter 20.

there are vested interests to be served by the various researchers in the field.

Although behavioral scientists differ in their use of terminology there is one point upon which they all seem to agree. In each of the texts examined by the author during the preparation of this research paper, there existed a consensus reference the practical application and the value that behavioral science has for management. This consensus is summed up in the following quotation from Scott and Mitchell:

(Behavioral science helps the manager in that it) formulates abstract concepts and explanations about human behavior in open systems of interdependency. (It) provides a way of gathering data and thinking about these relationships. (It) contributes to administrative policy decisions with respect to change.⁵

Let us now turn our attention to the key factor impacting upon organizational behavior in a small maintenance support unit in combat -- the environment.

An Environmental Approach
To The Study Of Human Behavior

If a manager in a small maintenance support unit seeks to understand why it is that his personnel react as they do when thrust into a combat situation, he must first be aware of the concept of the interdependency between his personnel and

⁵Scott and Mitchell, op. cit., p. 308.

their physical environment. Dr. Skinner, the noted behavioral psychologist, capsulizes the environmentalist approach to the study of human behavior in his book entitled, Beyond Freedom and Dignity. In this book, Dr. Skinner refers to an autonomous man who is both captain of his fate and master of his own actions. Dr. Skinner then goes on to explode the myth of this autonomous man, stating that no man is capable of always adjusting his own behavior pattern so as to have his actions logically fit into the mold of a given real world situation. Complete control over one's actions is an illusion because man is an inseparable part of his physical environment. This then is the environmentalist approach to the study of human behavior. The environmentalist claims that as the environment changes so does the individual existing within the environment. Perhaps the reader can gain a better appreciation for this abstract concept of individual/environmental 'oneness' from the following anonymous parable taken from Zen literature:

The young fish inquired of the King of the Sea, "What is this thing called the ocean?" The King of the Sea replied, "The ocean is all around you, and it is within you. You came from the ocean, and when you die you will return to the ocean. You move through the ocean each day of your life, and as it changes so do you."

This parable is one used by Zen Masters when instructing young novitiates who always ask, "What is Zen?" For our purposes an analogy can be drawn between the ocean and the environment regarding the interdependency of the two.

This same environmentalist approach is taken by Jules Karlin, a sociologist who claims that, "The artificial dualism of organism and environment ... has been discarded in favor of the concept of mutual interaction and determinism."⁶

Dr. Skinner has stated that as we learn more about the affect of the environment on human behavior we will have less reason to attribute human behavior to an autonomous controlling agent (i.e., an autonomous man). He claims that, "A scientific analysis of human behavior disposes autonomous man and turns the control he has been said to exert over to the environment."⁷

Of what significance to the manager in a small maintenance support unit is this concept of a relationship between man and his environment? One possible answer to this question might be that the manager would be able to summarize that of the many factors influencing the behavior of maintenance unit personnel in a combat situation, the environmental factor plays the dominant role.⁸ Second, the manager can infer that any attempt on his part to alter unproductive organizational behavior

⁶Jules Karlin, Man's Behavior: An Introduction To Social Science (New York: The MacMillan Co., 1967), p. 129.

⁷B.F. Skinner, op. cit., p. 196.

⁸The dominant role played by the environment in determining human behavior is the major axiom presented by Dr. B.F. Skinner and by many other behavioral psychologists. This is not to suggest that the dominance of the environmental factor vis-a-vis human behavior, is a universally accepted theory among behavioral scientists.

within his unit, must first be preceded by a change in the environment. "Man himself may be controlled by his environment but it is an environment which is almost wholly of his own making."⁹

In the final portion of his book (see footnote 1, Chapter I) Dr. Skinner contends that by controlling the environment we can control human behavior. He says that what management science needs is a 'technology of behavior' geared toward environmental/behavioral manipulation. From Dr. Skinner's hypothesis, the author (CPT Cowings) concludes that if a manager in a small maintenance support unit wishes to overcome the adverse affects of an enemy attack on the mission effectiveness of his organization, he must first seek methods of altering the environment within which his personnel must live and work (see Table 1). The manager cannot cause the enemy to cease bombardment of the maintenance shop area, but he (the manager) can take other positive measures such as those suggested in Table 1, entitled, "Environmental Stress Factors Impacting On The Behavior Of Maintenance Unit Personnel During Periods Of Combat." Table 1 is presented as a working tool for the manager in a small maintenance support unit. This table does not represent the analytical model which the author has referred to earlier.

⁹B.F. Skinner, op. cit., p. 196. The reader has no doubt noted that the author quotes Dr. Skinner at length within this particular study. This is because Skinner's theories of environmental interdependency most closely parallel the opinions of the author. This specific quote by Skinner is somewhat contradictory. If taken literally, it does not accommodate the existence of human creativity.

By employing a table similar to Table 1 the manager can jot down those negative environmental factors which usually accompany an enemy attack -- or the threat of an imminent attack -- and then address each factor individually; concentrating on how to alter it.¹⁰

Military-Oriented Research Regarding
The Effects of Environmental Stress

A considerable amount of research material exists on the subject of stress in the military. Much of this material is of a highly technical nature, both in its scope and in its use of scientific terminology. Studies relating to World War II, the Korean Conflict, and the Vietnam Counterinsurgency, provide the researcher with an excellent background regarding some of the more common causes of stress in the military; as well as the effects of stress on the individual soldier's health and job performance.

¹⁰ It has been suggested by several of the author's classmates at the U.S. Army Command and General Staff College, that Table 1 represents the normal thought process that a unit manager (or commander) goes through, given the advent of a combat situation. The author agrees with this conclusion in part, but only to the extent that it applies to an experienced manager, or to a manager who has received instruction in a similar technique of personnel management. The author disagrees that any thought process can be classified as normal (or intuitive) on a universal basis. To claim this would be to hold that different maintenance managers, with different degrees of training and experience, serving in different maintenance support units, would each inevitably come up with the same problem solving technique; concentrating on altering the environment.

Table 1. Environmental Stress Factors Impacting On
The Behavior Of Maintenance Unit Personnel
During Periods Of Combat

Ordnance Manager's Worksheet (An Example)	
Stress Inducing Factors Of The Physical Environment	Considerations For Altering The Physical Environment
<p>Note: This worksheet does not provide a complete listing of all possible stress factors found in the physical environment. It has been designed for the purpose of providing the manager with an initial point of reference, which he is free to expand upon.</p>	
Personnel unable to work because shop area is under continuous bombardment.	Consider decentralizing the maintenance shop operation, temporarily. Shop vans and contact teams can move to those portions of the base camp which have received very little, or no, enemy bombardment. Once there, personnel can commence mission work.

<p>Personnel cannot eat in dining facility because this would constitute crowding too many personnel into one area. Furthermore, personnel will lose valuable work time in traveling from the shops to the dining hall.</p>	<p>Establish a temporary kitchen in the shop area employing the unit's field kitchen equipment. Personnel can pick up their meals at this temporary location, and return with their trays directly to their shops.</p>
<p>Personnel cannot obtain adequate rest in the evening, because of the need to leave their barracks every few hours in order to go to the nearest bunker.</p>	<p>Enlarge bunkers in the barracks area so that personnel may sleep inside of them. One or two men can stand guard outside the bunkers while the remainder of unit personnel get some sleep.</p>
<p>Personnel experience difficulty in concentrating on their work in the shop area for fear that a mortar/rocket attack will catch them at their duty stations.</p>	<p>Build revetments of sand bags, or similar material, around each shop building. Build additional, smaller bunkers in the shop area: one bunker beside each shop building. Have personnel take their helmets, flack vests, and weapons (with ammunition) to the shop area each day during the combat period.</p>
<p>Personnel hesitate to use the unit shower for fear that bombardment might begin again while they are inside -- and unprotected.</p>	<p>Empty engine and transmission containers (metal) can be filled with water. The containers should be placed in the shop area -- where unit personnel spend the bulk of their time during combat -- in a location with good drainage. The men can use this water -- heated by fires -- to shave and to bathe with during the emergency conditions generated by combat. Managers will determine how often to change the water.</p>
<p>Personnel will begin to exhibit fear because they are uncertain of their unit's ability to survive an enemy attack. Since personnel are not combat arms personnel they become even more cognizant of the fact that their survival depends on mechanics and radio repairmen. More on the subject of fear appears in Table 3.</p>	<p>Train all personnel in the use of their weapons (prior to the combat period) in realistic attack scenarios. Allow personnel to gain self-confidence in their weapons, their leaders, and in their fellow soldiers. Conduct drills during which personnel are timed as to how long it takes for them to reach their fighting positions with their weapons.</p> <p>Have a certain number of personnel designated as a company reserve during these training sessions, and have this reserve practice moving to different parts of the company's defensive line.</p>

Have a certain number of personnel designated as a company reserve during these training sessions, and have this reserve practice moving to different parts of the company's defensive line.

Employ the unit's M88 recovery vehicle, and all flat tanks and armored personnel carriers as a part of the unit's defensive posture.

Each of these actions will do much to reduce fear of combat in unit personnel. In each case the physical environment has been altered by giving unit personnel something that they can see; and something which they know is available should the need arise.

Personnel may become restless once they have completed all of the jobs in their particular shop. It should be noted that during combat, the work load can become disproportionately high in some sections of the shop operation, while in other sections almost no work exists.

Restlessness breeds more apprehension in unit personnel. During the combat period all efforts must be taken to insure that personnel remain busy -- to the extent that their efforts will have meaningful results, such as rebuilding damaged barracks, enlarging bunkers, etc. This is not to say that personnel should be allowed to work to a state approaching physical exhaustion. Work performed should relate to the immediate combat situation. Few personnel will be interested in paperwork, or in work which is directed at improving the aesthetic appearance of the area. Almost all personnel, however, will gladly give a hand in building revetments around shops and barracks, cleaning up the debris of enemy bombardment, etc.

At the request of the author, Dr. James H. Banks of the Army Research Institute, offered the following comments with respect to the study of stress in the military:

(The study of stress in the military) is a most complex and difficult area. There is an immense quantity of research -- mostly laboratory type -- on stress, and there is an equally immense disagreement among experts in this area. The most common observation is that there is a great deal of variability between people and, for a given individual, from one time to another. Defining what we mean by the term 'stress' is another major difficulty. It is a very vague concept, and the magnitude of stress is complexly determined by the nature of the stressor (stress inducing factor), the situation in which it occurs, and the individual's subjective interpretation of the stressor and the situation... The stress of combat results from combinations of such factors as physical danger, fatigue, sleep loss, uncertainty, etc., over periods of weeks and months. Furthermore, reactions to these factors are affected by leadership, unit morale, the individual's personality, etc. A second difficulty... is to measure the effect of the stressor. Generally there are three types of measures that are taken: subjective and 'emotional' reactions, physiological responses, and behavioral responses.¹¹

Taking advantage of Dr. Banks expertise, the author has established the following additional parameters with respect

¹¹Extracted from a letter dated 7 January 1975; written by Dr. James H. Banks, Office of the Deputy Chief of Staff for Experimentation (DCSEX), Army Research Institute, U.S. Army Combat Developments Experimentation Command (USACDEC), Fort Ord, California. Dr. Banks has been instrumental in answering questions for the author reference the study of behavioral science in the military. He recommended research documents to the author on the aforementioned topic, and has offered valuable insights into the area of stress analysis from the perspective of a technical expert. In his letter, portions of which are shown above, Dr. Banks warned the author of the pitfalls of this particular area of behavioral research, and concluded his remarks by discouraging any attempt at unraveling mysteries which today befuddle even the experts in the field.

The Army Research Institute (ARI) has its home office in
(continued)

to the scope of this study.

Definition of Stress

The term 'stress' has a dual meaning for purposes of this research effort. It refers to the physiological condition of a soldier resulting from some environmentally-induced irritant such as noise and/or climatic extremes. Stress also refers to the psychophysiological condition of a soldier brought on by a threat -- either real or perceived -- to his physical well-being.

Environmental Stress

The expression 'environmental stress', or environmentally-induced stress', is used as a means of emphasizing the author's premise that the stress factors of greatest significance to the maintenance unit manager are those generated by the environment. In support of this assertion the reader is asked to consider the following proposition: the small unit manager can affect a change in the physical and social environment of his unit; but antithetically, it would be impractical for that same manager to psychoanalyze each of his personnel in order

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Arlington, Virginia, as well as a number of field offices spread throughout the country. The particular division of ARI located at Fort Ord is the Individual Training and Performance Research Laboratory. The mission of ARI is to conduct research in the whole spectrum of Army problems related to the selection, manpower utilization, training, organizational development, combat effectiveness, social processes, etc.

to determine their deep-rooted psychological and emotional problems.

Stress Factors (Stressors)

Of the many categories of stress factors from which to choose, the author has selected two which have relevancy for the manager. First to be discussed will be physiological stress induced as a result of sleep deprivation, noise, and climatic extremes -- specifically heat. This will be followed by an examination of one type of psychological stress -- fear.

Of the many documents examined in the course of the conduct of this research effort, only one could be found which specifically addressed the topic of combat service support personnel in a combat environment: "Service Troops In Combat," What The Soldier Thinks (War Department Publication, September 1944). The latter represents a survey taken among combat service support personnel in the Pacific theater during WW II, and concludes by surfacing the opinions of said personnel reference their involvement in combat.

The author has concluded that the bulk of research in the field of individual and group reactions to the stresses of combat are almost exclusively geared toward the combat arms. This conclusion is based upon: (1) a direct enquiry of Dr. James H. Banks, Army Research Institute; (2) a query of the computer data bank at the Defense Logistics Studies Information Exchange (DLSIE), located at the U.S. Army Logistics Management Center,

Fort Lee, Virginia; (3) a search of the Bibliography of Publications: Human Resources Research Organization (HumRRO), dated 30 June 1971; and, (4) a search of military related behavioral science literature on hand at, and available through, the library at the U.S. Army Command and General Staff College.¹²

The scope of this research project is sufficiently limited, however, so that certain select findings with respect to the combat reactions of combat personnel, will also have application for combat service support personnel.

Rationale For The Study Of Environmental Stress

The following quotations are taken from authorities in the fields of medicine, psychiatry, and human psychology. They serve to provide the reader with a rationale for the study -- in the military -- of human behavior under stress conditions. Words appearing in parenthesis have been added for purposes of clarity and continuity. They do not alter the meaning of the original authors. The reader is asked to note that each of the quotations

¹²The Defense Logistics Studies Information Exchange (DLSIE) is charged with the mission of acquiring, storing, and disseminating logistics research management information on a Department-of-Defense-wide basis. The Human Resources Research Organization (HumRRO) is a nonprofit research and development corporation whose purpose is to improve human performance, particularly in organizational settings, through behavioral and social science research, development, and consultation. HumRRO was established at The George Washington University in 1951, for the purpose of carrying out an integrated program of human resources research for the Department of the Army.

makes reference to the need for some form of analytical device to serve as both a measure and a predictor of human behavior.

Without (information regarding the effects of environmentally-induced stress) it seems unlikely that we shall ever be able to form general statements about the mode of action of the various stresses encountered in military environments, much less be able to predict, even approximately, what the effect of any given environmental stress or combination of stresses will be in a particular work setting.¹³

To the officer, knowledge of the things his men worry about is essential to effective leadership. Worry saps a man's working and fighting efficiency. Anything an officer can do to alleviate worry in his command will pay off in a better fighting (and working) outfit.¹⁴

(The Army has) placed by far the major emphasis of its research upon determining individual capacities, characteristics, and means of measuring them...yet we have no adequate or reliable means of measuring or predicting group performance.¹⁵

¹³Robert T. Wilkinson, "Changes In Performance Due To Environmental Factors," Symposium On Medical Aspects Of Stress In The Military Climate (Washington, D.C., 22-24 April 1964), p. 132. In 1964, Dr. Wilkinson was a research psychologist and member of the Applied Psychology Research Unit, Medical Research Council, Cambridge, England.

¹⁴Quotation extracted from an article entitled, "Worries Of Combat Troops," What The Soldier Thinks (Washington, D.C., April 1944), p. 10. What The Soldier Thinks was a monthly troop information publication of the War Department. It consisted of statistically-sound attitude surveys concerning Army personnel. The publication ran its last issue in December 1945.

¹⁵Quotation was extracted from the "introduction" to a collection of medically-oriented articles entitled, Symposium On Medical Aspects Of Stress In The Military Climate (Washington, D.C., 22-24 April 1964), p. 52. The symposium was sponsored by the Walter Reed Army Institute of Research, Walter Reed Army Medical Center. It consisted of presentations delivered by 70
(continued)

(It is recommended that the Army conduct) special studies...to test the ability of a wide variety of measures to predict success (of personnel performance) in combat. These studies must involve attempts to secure better on-the-job measures of combat performance.¹⁶

For the military services the most important type of behavior is combat behavior. Nevertheless this is the type of behavior which has received the least systematic study.¹⁷

These (military) field experiences emphasized to me in a very vivid manner the reality and importance of the subtle psychophysiological effects which the physical and social environment may have upon an individual and upon his performance in stressful situations.¹⁸

(continued)

distinguished scientists, doctors of medicine and psychology, and medical academicians.

¹⁶Quotation extracted from an article entitled, "Research On Human Behavior In Combat," Report Of Working Group On Human Behavior Under Conditions Of Military Service (Washington, D.C., June 1951), p. 29. This textbook was conceived as a joint project of the Research and Development Board and the Personnel Policy Board in the Office of the Secretary of Defense.

¹⁷Ibid., p. 32.

¹⁸Bruce L. Welch, "Psychophysiological Response to the Mean Level of Environmental Stimulation: A Theory of Environmental Integration," Symposium On Medical Aspects Of Stress In The Military Climate (Washington, D.C., 22-24 April 1964), p. 39. In 1964, Dr. Welch was serving as Director, Laboratory of Population Ecology, Department of Biology, College of William and Mary, Williamsburg, Virginia. Dr. Welch comments that he was prompted to write this article based upon his field experience while serving with the Army.

Sleep Deprivation
and Its Effect On Job Performance,

In a 1964 symposium conducted at Walter Reed Army Hospital on the topic of stress in the military, Lieutenant Colonel H.H. Williams, Medical Service Corps, delivered a lecture entitled, "Decrement In Performance Due To Sleep Deprivation,"¹⁹ In his lecture, LTC Williams cited recent experimentation in which military personnel engaged in the performance of manual tasks over a period of 86 hours -- without sleep. The results of the experiment showed that as personnel approached the end of the second day of sleep deprivation, the speed at which they had been performing manual tasks decreased significantly; but there was no appreciable decrease in the accuracy (quality) of the work being performed. Eighty-six hours was discovered to be the maximum length of time that an average individual could go without sleep. This particular experiment was conducted in a laboratory.

Another key discovery emanating from this experiment, and one which has application for the present research effort (ROSSTUS), was the discovery that impairment of job performance

¹⁹Lieutenant Colonel Harold L. Williams, "Decrement In Performance Due To Sleep Deprivation," Symposium On Medical Aspects Of Stress In The Military Climate (Washington, D.C., 22-24 April 1964), pp. 187-202. LTC Williams was (then) Chief, Department of Clinical and Social Psychology, Division of Neuropsychiatry, Walter Reed Army Institute of Research.

due to sleep deprivation also takes on the characteristics of increasing irregularity (erratic behavior pattern) in the work routine of the individual soldier.

In a 1969 HumRRO study regarding the effects of sleep deprivation, Drs. Eugene H. Drucker, L. Dennis Cannon, and J. Roger Ware, arrived at the conclusion that, "The greater amount of activity in the field, as well as an increase in the motivation of the subjects may reduce the magnitude of performance decrements (due to a lack of sleep)."²⁰ The time period examined by the HumRRO staff was a 48-hour period, during which time 242 military personnel performed manual tasks in an effort to determine how sleep deprivation would effect job performance. The conclusions drawn from this test were essentially the same as those cited five years earlier by LTC Williams. The implications of these two independently conducted experiments for the manager in the small maintenance support unit are depicted in Table 2, entitled, "Environmental Stress Factors Impacting On The Job Performance Of Maintenance Unit Personnel."

The Effects of Heat and Noise
On Job Performance

Two other physiological stress factors have been singled out for discussion in this chapter -- heat and noise. While these two factors do represent stressors which are commonly found

²⁰Eugene H. Drucker, L. Dennis Cannon, J. Roger Ware, The Effects of Sleep Deprivation On Performance Over A 48-Hour Period (HumRRO, FIGHTER Series: Technical Report 6908, May 1969).

in a combat environment, they by no means exhaust the list of physiological stressors impacting on the individual and group job performance.

In a 1964 dissertation entitled, "Changes In Performance Due To Environmental Factors," Dr. R. T. Wilkinson addressed the results of experimentation employing heat and noise as stressors. Dr. Wilkinson concluded that both heat and noise impair job performance. Specifically, he discovered that these two stressors reduce both job accuracy and the speed at which the same task can be performed by the same individual.²¹ He also concluded that individuals can become acclimatized to extremes of temperature -- his experiment also investigated 'cold' and 'vibration' -- with the result that the extent of work impairment attributable to the stressor is somewhat reduced.

Noise, on the other hand, remained a cause of job impairment -- even over an extended period of time. It was learned that individuals cannot seem to adjust to prolonged exposure to noise. In seeking the implications which Dr. Wilkinson's research might have for the Ordnance manager, the author uncovered this quote: "In such cases (i.e., under stress) it may be that the task becomes, in effect, a different skill."²²

²¹R.T. Wilkinson, op. cit., pp. 127-133.

²²Ibid., p. 130.

Table 2. Environmental Stress Factors Impacting On
The Job Performance Of Maintenance Unit Personnel

Ordnance Manager's Worksheet (An Example)			
Considerations	Heat (80°-90° F)	Noise (90-110 decibels)	Sleep Deprivation
<p>Note: This worksheet does not provide a complete listing of all possible physiological stress factors. It has been designed for the purpose of providing the manager with an initial point of reference, which he is free to expand upon.</p>			
1. Duration of the task or work period.	Impairment of job performance due to this stress factor decreases with the passage of time, as personnel become acclimatized.	Impairment of job performance due to this stress factor does not decrease with the passage of time.	Impairment of job performance due to this stress factor increases with the passage of time.
2. Degree of prior experience with the task.	Under conditions of stress, a task becomes a different skill, according to Wilkinson (see footnote 13); therefore, the manager must develop his own experience factor based upon observations of his own maintenance support personnel.		
3. Degree of prior experience with the stress.	As regards experience with the stress itself, I am concerned with the question of whether repeated, periodic exposure affects the impact of the stress upon performance. There appears to be little clear evidence on this point. It is difficult to know whether any change in performance over repeated exposures were due to relearning of the task in the stress (environment) or to adaptation to the stress per se.		

4. Level of motivation and unit morale.

Any increase in this stress factor will reduce both motivation and morale. If there is no appreciable increase in this stress factor, a higher degree of motivation will be generated by the advent of a combat situation; and there will be a temporary increase in job performance.

Any increase in this stress factor will reduce both motivation and morale. If there is no appreciable increase in this stress factor, a moderate and temporary increase in job performance will probably result, given the advent of a combat situation, and its attendant increase in motivation.

The higher degree of motivation accompanying the eruption of a combat situation, will extend the level of this stress factor at which job performance is likely to be impaired.

Being members of a group -- social motivation -- not wanting to let buddies down, is the most important single factor in keeping men going, especially when the going is tough (i.e., combat). Even this motivator will attrit, however, in prolonged exposure to combat. Primary group allegiance (i.e., loyalty to one's peer group) was found to have had the longest duration of any motivating force under stress of combat in (studies conducted during) WW II. 23

5. Aspect of job performance which is most important: speed or accuracy.

This stress factor will initially have an adverse effect on both speed and accuracy of job performance. The soldier will become acclimatized in time, however.

This stress factor will have a continuous adverse effect on both speed and accuracy.

This stress factor effects job speed, but usually does not impair accuracy of job performance.

<p>1. The presence of other environmental stresses in the working situation; such as enemy bombardment and/or small arms fire.</p>	<p>Adding the psychological stress of fear, tends to aggravate the physiological stress that the soldier is already experiencing from heat.</p>	<p>Adding the psychological stress of fear, tends to aggravate the physiological stress that the soldier is already experiencing from noise.</p>	<p>Prolonged periods of sleeplessness will tend to produce symptoms of paranoia and irritancy in the soldier. The advent of a combat situation -- while extending the level at which this stress factor will impair job performance -- will tend to aggravate any paranooid symptoms; and can increase the level of fear that a soldier experiences.</p>
<p>2. Effects of the passage of time.</p>	<p>The soldier can become acclimatized to this stress factor with the passage of time. The exact amount of time differs from soldier-to-soldier.</p>	<p>The soldier cannot become acclimatized to this stress factor with the passage of time.</p>	<p>The detrimental effect of this stress factor on job performance, increases as the amount of time increases.</p>

26... p. 131.

23... G. Mandelbaum, "Group Dynamics of Military Units," Report of Working Group On Army Behavior Under Conditions Of Military Service (Washington, D.C., June 1951), pp. 375.

The Effects of Fear On Job Performance

The final environmentally-induced stress factor to be addressed, is 'fear.' Fear as seen in maintenance unit personnel during, and immediately prior to, an enemy attack is attributable to a number of factors -- the most common of which are outlined in Table 3, "The Psychophysiological Impact Of Fear Upon Maintenance Unit Personnel During Periods Of Combat."

The term 'fear', as employed in this research effort, refers to an emotional state characterized by the anticipation of pain or of great distress, and usually accompanied by heightened autonomic activity, especially involving the bodies nervous system. The effects and characteristics of fear which should be of concern to the manager in a small maintenance support unit, have been capsulized and incorporated in Table 3. Data appearing in Table 3 represent conclusions resulting from experimentation which involved the military in a combat environment. These data were primarily extracted from the following textbooks:

- Richard P. Kern, A Conceptual Model Of Behavior Under Stress, With Implications For Combat Training (HumRRO, FIGHTER Series: Technical Report 66-12, June 1966).
- Psychology For The Armed Services (Washington, D.C., 1945), pp. 383-389. Edited by Edwin G. Boring, Harvard University.
- Material extracted from an article entitled, "Special Training During First Combat," Report Of Working Group On Human Behavior Under Conditions Of Military Service (see footnote 16), p.28
- James E. Deese, "Skilled Behavior Under Conditions Of Stress," Symposium On Medical Aspects Of Stress In The Military Climate (Washington, D.C., June 1951), pp. 303-308.

Table 3. The Psychophysiological Impact Of Fear Upon Maintenance Unit Personnel During Periods Of Combat

Ordnance Manager's Worksheet (An Example)	
Effects and Characteristics Of Fear In The Combat Environment	Considerations For Reducing The Impact Of Fear Upon Maintenance Personnel
<p>Fear is a disorganizing emotion which can result in erratic behavior. It can alter the personality of individual soldiers in the unit, as well as alter the personality of the unit itself.</p> <p>Fear can effect the body's physiological balance.</p> <p>Fear of battle <u>increases</u> with experience.</p> <p>Factors which increase fear include: idleness, fatigue, uncertainty (not knowing what to do, or what is expected).</p> <p>Fear causes personnel to react (temporarily) in manners which might otherwise be considered neurotic or abnormal. This is to be expected under combat conditions. These reactions do not necessarily render personnel ineffective.</p>	<p>The first step in an individual's adjustment to fear is to identify the nature of the danger.</p> <p>Group support, effective leadership, group allegiance, intensive indoctrination, and repetitive training, can help to attenuate the undesirable effects of fear.</p> <p>Knowing what to do and what to expect can reduce the effects of fear.</p> <p>Concentration upon a task will reduce fear.</p> <p>Confidence in one's group (unit), confidence in one's leaders, confidence in one's weapons -- and in the ability to use those weapons effectively -- will reduce fear.</p>

Fear sometimes produces limited periods of super- or hyper-efficiency, with the result that unit personnel willingly work longer hours, work without supervision, perform duties with a minimum of sleep, and accomplish a comparatively larger amount of work in any set time period.

We cannot expect that men in combat will respond to each other, or to commands, in a normal manner. Fear can manifest itself as irritability, the misunderstanding of simple commands, and similar abnormal behavior which can impair the effective functioning of a unit.

The amount of physical or psychological stress which is necessary before a decrement in job performance occurs is a function of individual personality. Sooner or later, however, if combat stress is sustained, all unit personnel will exhibit reduced efficiency.

Fear-oriented behavior generated by a combat situation, will intrude upon and eventually block out job-centered behavior; if the combat situation becomes sufficiently intense.

The shock induced by combat is such that it may be expected to disorganize habits. Therefore, the more thoroughly these habits are 'overlearned' via repetitive training, the less chance of disorganized behavior in combat.

Improvements in training with the goal of increasing stress resistance cannot be expected to render the soldier immune to the effects of combat stress. Such improvements, however, might be expected to make the soldier less vulnerable to stress during his initial exposure, and to increase his effectiveness (in combat) in the long run.

Some of the most potent sources of fear can only occur in combat. Therefore, the manager must conduct training in the proper responses to fear during and immediately following an actual combat situation.

Each of the aforementioned texts concluded with a recommendation that the Army indoctrinate its personnel by conducting intensive training in: (1) the loss of effective behavior resulting from fear; (2) the psychological and physiological factors which tend to induce fear; and (3) in those factors which help to reduce the negative effects of fear.

Two Original Case Studies

In an attempt to obtain additional data with respect to the reaction of combat service support personnel to the stresses of combat the author searched through several scores of operational reports of lessons learned in the Vietnam Conflict. Material found in many of those reports served to verify the author's contention that managers in small maintenance support units must today concern themselves with the effects of combat upon their unit's mission effectiveness. The following quotations, extracted from four of these operational reports of lessons learned, are cited as examples of the combat considerations impacting on the maintenance unit manager:

At 0345 hours on 1 February 1968, Lai Khe (Base Camp) came under a rocket and mortar attack. From 1 February through 10 April, the post had, at least, one mortar/rocket attack each day, except for two²⁴ periods of 48-hours during which no rockets fell.

²⁴Operational Report: Lessons-Learned, 3rd Brigade, 1st Infantry Division - for the period 1 January through 30 April 1968. During the period referenced in this report -- the 1968 Tet Offensive -- the author served as 'acting' commander of a maintenance forward support company, located at Lai Khe Base Camp. Refer to Schematic Case Study #1, for more details.

Maintenance units of the battalion are engaged in semi-garrison type operations. Due to the nature of the Vietnam Conflict these personnel can be rapidly thrown into a combat situation through enemy attacks on their own area or within their geographic area.²⁵

(There is an) estimated one day loss of work effort in direct support maintenance for each four days (of duty) as a result of a requirement to provide security guards for Long Binh Post. This degrades the capacity of units to perform their basic mission.²⁶

The increasing probability of hostile rocket and mortar attacks in the Long Binh Post area focused the (maintenance battalion's) attention on the need for greater security during such attacks.²⁷

The author would highly recommend to both Ordnance officer and NCO students, and to managers assigned to maintenance support units, that they review any of the operational reports of lessons learned, with respect to maintenance units in the Vietnam Conflict. Such reports are forthright, unembellished, and extremely relevant to the topic at hand.

By way of expanding upon the theme expressed in the

²⁵Operational Report: Lessons-Learned, Headquarters, 86th Maintenance Battalion (General Support) - for the period 1 October 1966 through 31 January 1967. Units organic to the 86th Maintenance Battalion were located in the vicinity of the Cha Rang Valley, approximately 19 miles west of Qui Nhon, astride Highway No. 19. See map on page 47.

²⁶Operational Report: Lessons-Learned, Headquarters, 185th Maintenance Battalion (Direct Support) - for the period 1 October 1966 through 31 January 1967. See map on page 47.

²⁷Operational Report: Lessons-Learned, Headquarters, 185th Maintenance Battalion (Direct Support) - for the period 1 May through 31 July 1967.

preceding paragraphs, two original case studies are now offered (Tables 4 and 5). The author refers to these case studies as 'schematic case studies' due to their abbreviated nature. It is hoped that these schematic case studies will enable the reader to gain a clearer perspective regarding the hazards faced by maintenance unit personnel, as well as their reactions to combat.

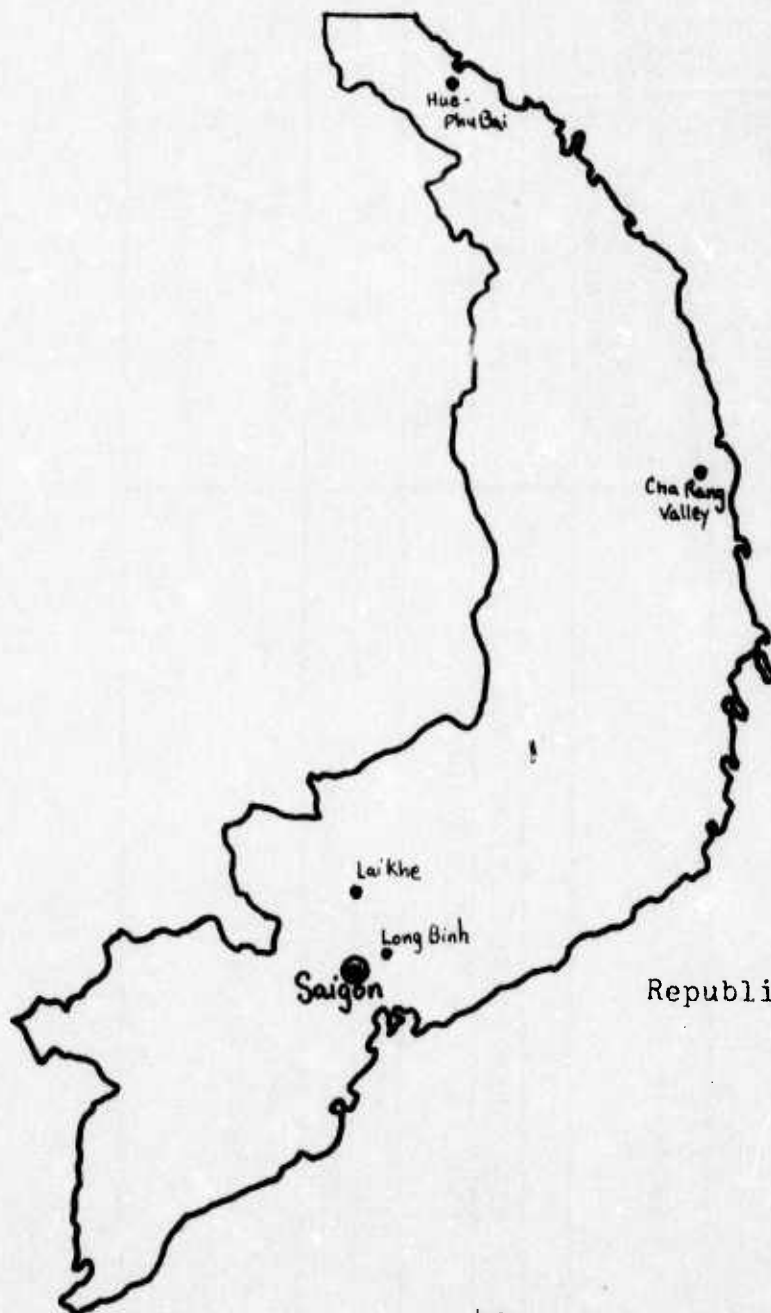


Figure 3.
Republic Of Vietnam

Table 4. Schematic Case Study #1

A Maintenance Forward Support Company (DS)	
Type of Maintenance Unit:	A maintenance forward support company (DS); one of three such companies found in a typical maintenance battalion (DS).
Mission:	Provide direct support maintenance to a brigade of an infantry division. In addition, to provide support to other divisional and nondivisional units on an area basis.
Location:	Lai Khe Base Camp, Republic of Vietnam.
Percentage of Authorized Strength:	Between 105% and 115% of authorized strength.
Nature of the Combat Situation:	Rocket and mortar bombardment, and a single ground assault.
Date Combat Period Began:	1 February 1968.
Duration of Combat Period:	Six days.
Source of data:	Information appearing in this case study was obtained from personal notes which were maintained on a daily basis by the commander of the subject maintenance unit.

Observations of Organizational Behavior

Observation 1. Prior to the start of the combat period cited above, maintenance unit personnel had only experienced occasional harassing mortar attacks. These attacks usually occurred in the late evening and early morning hours. Unit personnel were generally cognizant of the threat to their physical security posed by the ever-present possibility of an enemy attack, but these attacks had been rather infrequent over the past several months. Unit personnel performed their duties routinely and professionally. The company was considered to be mission effective. Unit morale was of a moderate level, in that it was not low, but neither was it particularly high.

Observation 2. The initial rocket and mortar bombardment of the base camp began while personnel were asleep in their barracks. The attack proved to be of such an intensity that for almost six hours personnel could not leave the security afforded by their bunkers. Unit personnel had never before experienced an attack of either this duration or magnitude. Nevertheless, all seemed confident that within a few hours (i.e., at sunrise) the attack would end and the situation would return to normal. Just after 0900 hours, while personnel were still in their bunkers, the bombardment came to an abrupt halt. Within minutes the enemy launched a ground assault against the base camp perimeter. Unit personnel were forced to leave their bunkers and to take up fighting positions along the camp perimeter. It should be noted here that personnel had been extremely reluctant to leave the security of their bunkers. Only vigorous action on the part of unit managers could get the men out of the bunkers and onto the defensive line. Later, many personnel explained that they believed the halt in bombardment to be a ruse, and were afraid to expose themselves lest the bombardment begin again within a few moments. Among unit personnel there existed a general feeling of disbelief that this could be happening to them -- to combat service support personnel.

Observation 3. After the enemy ground assault had been beaten off, unit personnel appeared relieved, but nevertheless, emotionally shaken. This brief encounter with combat had created a new unit cohesiveness. In spite of the injuries suffered by several personnel during the night-long attack, personnel emerged from their first taste of combat with a self-confidence that bordered on cockiness. In a period of about seven hours, personnel had experienced a gamut of combat stresses to include: sleep deprivation, nerve shattering explosions occurring in their immediate area, and an enemy ground assault. No one in the unit had eaten since the previous evening, although C rations were available. Officers and enlisted personnel alike were noticeably dazed. With respect to their post-attack behavior, unit personnel considered themselves to be both alert and 'normal.' An objective observer, however, would note that personnel were in a high state of tension. This tension manifested itself in the rapid speech pattern of personnel (due to an increased metabolic rate), in the hyper-activity of unit personnel (i.e., not being able to sit still), and in the wide-eyed look of unit personnel each time an explosion occurred off in the distance. Personnel had been unable to work in the maintenance shops for almost the entire morning of the first day of combat.

Observation 4. After the initial six hours of combat (at about 1000 hours), unit personnel resumed their mission-related work. By late afternoon they had completed what could be considered as a normal day's work; and this had been achieved in only a fraction of the time that was usually required. Throughout the first day, unit personnel worked at an erratic and usually required pace. Personnel set about cleaning up the debris of battle and strengthening unit bunkers. Without having been told to do so, personnel returned to the shops in the evening hours and continued to work until about 0200 hours. Each evening thereafter, for approximately twenty days, 30 percent of the unit personnel performed perimeter guard duty. The enemy continued intermittent bombardment during daylight hours, forcing personnel to leave the maintenance shops to seek shelter. As soon as these brief attacks ended, personnel would immediately return to their jobs. Personnel worked without supervision, and the unit was able to provide adequate support.

Observation 5. Over the next four to five days the company's work load increased by approximately two hundred percent. This was due to an increase in the amount of damaged equipment caused by enemy action. In spite of the increased work load, unit morale could have been classified as extremely high. This is partially explained by the fact that personnel felt for the first time that they were playing an important role in the combat picture. The men worked all day in the shops, and after the evening meal they would set about the task of rebuilding their damaged barracks. Personnel on guard duty would return at about 0630 hours. They would eat breakfast, sleep for about four hours, and return to the shops in the afternoon. This exhausting pace continued for about six days. Unit managers had to be constantly on the watch for the following exigencies which could effect personnel health and job performance:

- Some personnel, unless held in check by unit managers, would work themselves into a state of physical and emotional exhaustion. Personnel faced by fear, induced as a result of combat, seem to learn intuitively that constant work (activity) would reduce their anxiety. Unit managers sometimes found it necessary to force this type of soldier to rest.
- Personnel who worked all day under intermittent bombardment, performed guard duty in the evening, and who then returned to work the next day after having had only a few hours of sleep, tended to neglect their personal hygiene. In such instances unit managers had to strictly enforce health requirements. Managers had to personally check to be certain that personnel were shaving, bathing, and changing their underclothing and socks.

Observation 6. On the sixth day the bombardment suddenly dropped off and became sporadic in nature. Unit personnel had concomitantly reached the limit at which they could maintain their unusually high level of job performance. The psychological and physiological stresses induced by the combat period began to manifest themselves in work-related injuries, emotional irritability, and physical exhaustion. At this point (i.e., at the end of the bombardment) both morale and job performance started to drop off and to approach an unacceptable level. When unit managers noticed this change in organizational behavior, they immediately ordered a halt to all but essential maintenance work. Personnel were given a day off, and a company party was held. This one-day halt in maintenance shop work, along with a steak-n-beer party, effectively arrested the downward spiral of troop morale and job performance. It gave unit personnel an opportunity to regain their emotional and physical equilibrium, and did much to ease the transition of personnel from a combat pace to a more natural (i.e., non-combat) pace of activity.

Observation 7. On the seventh day, the day after the company party, unit personnel returned to work in rather good spirits. Morale and job efficiency were not as high as they had been during the height of the combat period; however, both morale and job performance were on a higher level than had existed prior to the start of the combat situation.

Table 5. Schematic Case Study #2

An Aircraft Maintenance Unit(DS)	
Type of Maintenance Unit:	An aircraft maintenance job service platoon, organic to a Mohawk Company.
Mission:	Provide direct support and organizational maintenance in support of a Mohawk Company.
Location:	Hue-Phu Bai Base Camp, Republic of Vietnam.
Percentage of Authorized Strength:	Between 80% and 90% of authorized strength.
Nature of Combat Situation:	Mortar attack.
Date Combat Period Began:	April 1967.
Duration of the Combat Period:	Approximately one week.
Source of data:	Information appearing in this case study was obtained in a series of interviews conducted in December 1974, with the officer who commanded the subject Job Service Platoon at the time of the combat period.

Observations of Organizational Behavior

Observation 1. Prior to the start of the combat period cited above, unit personnel had only experienced a few minor mortar attacks launched against their base camp. Although personnel were aware that the enemy could launch such attacks against their camp at any time, they were not particularly concerned with such an eventuality. Personnel performed their mission-related duties routinely and professionally. The Job Service Platoon was considered to be mission effective.

Observation 2. The enemy launched a heavy mortar barrage at the base camp while unit personnel were at their normal duty stations. All personnel ceased work and sought whatever shelter was available until the attack ceased. The attack lasted for approximately thirty minutes. Within moments after the bombardment stopped, unit personnel were out of their bunkers and back on the job. The initial shock of the heavy mortar attack caused some personnel to appear dazed; but the rush of activity which followed the attack, soon brought everyone around. Those personnel who could be spared from the shops were given the job of fire-fighting and cleaning up the debris of combat left in the wake of the attack. Others continued to work in the shops repairing aircraft.

Observation 3. The manager's role seemed to be transformed into a purely decision-making role during the next several days of intermittent bombardment. By this statement, the author wishes to imply that unit personnel -- during the combat period -- went about their duties (and performed additional duties) without being told what to do, or how to do it. The men were self-motivated. Unit managers decided what priority was to be applied to work, and to area damage control, and personnel took over from there. Each man appeared to work with a renewed purpose. Each man seemed to work to a point which was thought to be beyond his normal endurance. This hyper-activity was attributed by the unit commander, to the fact that personnel suddenly felt that they were a part of the 'big picture.' This period of hyper-activity continued throughout the first four days of the combat period; and marked a higher level of unit job performance than had existed prior to the start of the combat period. Throughout these first four days, personnel were required to perform many tasks in addition to their normal shop duties. Personnel performed guard duty and area cleanup jobs.

Observation 4. Personnel seemed to be driven by a desire to return their mission work load to its pre-combat level. Once this was achieved -- at the end of the fourth day -- personnel started to slack off in the level of their job performance. This dropping off in the job performance came without warning, and suddenly (on the fifth day) the unit found itself at a level of job performance somewhat below normal (i.e., below its pre-combat level of efficiency). A number of factors led to this decline in job performance to include: (1) the fact that the men were exhausted; (2) there no longer appeared to be an urgent need for their services; and, (3) the men genuinely felt that they were deserving of a rest

Observation 5. The unit commander, realizing what effect the end of the bombardment was having on his personnel, ordered a complete work halt for one day. He directed that a bar-b-que party, with beer and soft drinks, be held in the shop area on the work-free day. Personnel were better able to make the transition from hyper-activity to a more natural working pace, as a result of this day of grace.

Observation 6. The day following the unit party found troop morale and job performance back up to its pre-combat period level. Personnel had gained a new self-confidence and a stronger feeling of unit cohesiveness as a result of working together during the one-week combat period. During the height of the combat period, personnel had been totally mission-oriented. With the end of the combat period, personnel returned to a more normal behavior pattern, wherein their concern for the mission did not occupy their every thought.

Stress and Civilian Business

Stresses found in the civilian business environment closely parallel those found in the military -- with the noticeable exception of combat. Workers who perform manual tasks, whether in civilian coveralls or in military fatigue uniforms, are occasionally subjected to pressures which can have an impact upon their job performance. Almost every management textbook touches upon the subject of how best to manage people in a stress situation. Several of these textbooks are cited in the bibliography attached to this study.

In the course of conducting this research effort, the author has discovered that the stress reactions of civilian workers who perform manual tasks, closely approximate the stress reactions of maintenance unit personnel. It should not be surprising, therefore, to learn that the authors of many management textbooks recommend the adoption of management techniques similar to those suggested earlier within this chapter.

In addressing the topic of stress in a civilian working environment, Bass makes an observation which is particularly pertinent to the manager in a small maintenance support unit: "Stress may be conceived as a condition where motivation is high...and where permissive leadership is less likely to be effective. In emergencies, members want rapid decisions given them by those with power."²⁸ Chapter III will attempt to provide the Ordnance manager with a tool to assist him in arriving at just such rapid decisions during emer-

²⁸Bass, op. cit., p. 255

gencies; decisions in which both he and his subordinates can have confidence.

Summary and Conclusion

An abundance of literature and research material exists with respect to the subject area of human behavior. Much of this material deals exclusively with the topic of human behavior in the military environment; specifically, the reactions of military personnel to the stresses found on the battlefield.

While these stresses are numerous and varied, they are almost always generated by the physical or social environment; and they basically impact upon the soldier either psychologically (as in the case of 'fear') or physiologically (as in the case of fatigue or hyper-activity).

The manager in the small maintenance support unit, in attempting to attenuate the negative effects of these environmentally-induced stresses, must first seek methods of altering the physical environment within which his personnel live and work.

CHAPTER III

TOWARD THE DEVELOPMENT OF AN ANALYTICAL MODEL OF ORGANIZATIONAL BEHAVIOR

All man's disciplined creations have form. Architecture, poetry, music, painting, mathematics, scientific research -- all have form. Man puts great stress on the content of his creations, often not realizing that without strong structure, no matter how rich and how significant the content, the creations may be weak and sterile.¹

Chapters I and II set the stage for the development of an analytical model designed for use by managers, as an aid in decision making; a model oriented toward organizational behavior. Chapter III will reveal the logic which forms the foundation of the model, and will include a description of the methodology employed in developing the model. Figure 4, on page 51A, represents a PERT overview of the sequence of events which resulted in the development of the final model. Events 1 through 3 (Figure 4) roughly correspond to material presented in Chapters I and II of the current study. Events 4 through 18 represent material to be covered in detail within the remainder of this chapter. Events 19 through 23 focus on subjects to be stressed in Chapters IV and V.

Identifying the Real Problem

It was during World War I that the United States, confronted with the specter of unrestricted German submarine warfare, set off in search of a solution to that problem.

¹Fred N. Kerlinger, Foundations of Behavioral Research (New York: Holt, Rinehart and Winston, Inc., 1964), p. 290.

In an effort directed at attenuating the harmful effects of this type of warfare upon U.S. merchant shipping, the Department of the Navy approached the reigning genius of the day -- Thomas Alva Edison -- and proposed that he develop a device for detecting and locating submarines beneath the ocean surface.

After studying the matter for some time, Mr. Edison announced to an astonished Chief of Naval Operations, that the Navy had failed to identify the real problem; which was not "How to detect submarines beneath the ocean surface", but rather "How best to move ships from point "A" on the U.S. coast to some point "B" (a North Atlantic or Mediterranean port), while at the same time minimizing the probability of their loss to German submarines." As a result of this redefining of the problem, Mr. Edison was instrumental in developing for the Navy Department the dual concepts of 'convoy shipping' and the 'zig-zag pattern.'

In an attempt at capitalizing on Mr. Edison's observation reference the identification of the actual issues at hand, a considerable amount of time was spent at the outset of the current research effort in drafting a problem statement that would be truly representative of the real problem under investigation. The result is shown below:

Problem Statement { Does the organizational behavior exhibited by a small maintenance support unit, in a combat environment, form a distinct pattern? }

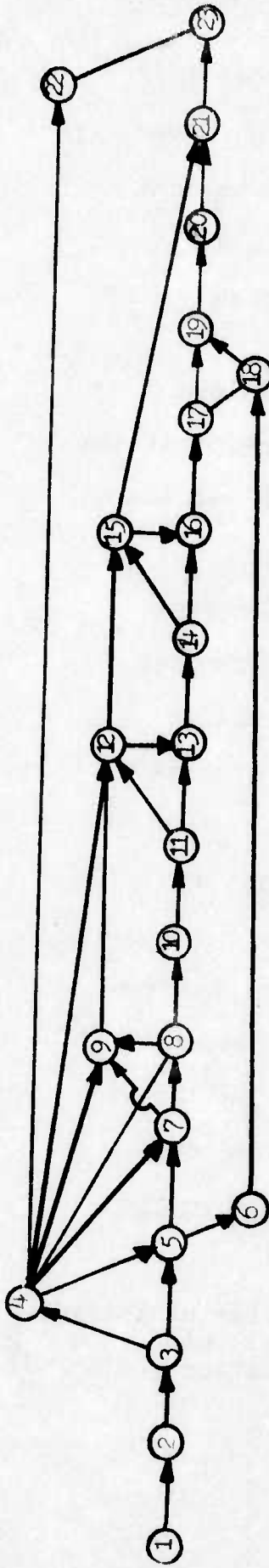


Figure 4. Sequence of Events In Model Development and Research Analysis

1. State the problem.
2. Draft the hypothesis.
3. Identify information needed to address the problem.
4. Review literature on behavioral science research methodology.
5. Identify the sources of needed information.
6. Conduct liaison with 701st Maintenance Battalion.
7. Identify best method of obtaining information.
8. Draft a questionnaire.
9. Design a conceptual model of organizational behavior.
10. Submit draft questionnaire for critical review.
11. Review criticisms of draft questionnaire.
12. Refine the conceptual model based upon criticisms of the draft questionnaire.
13. Complete a 2nd draft questionnaire and submit for critical review.
14. Review criticisms of 2nd draft questionnaire.
15. Refine model based on comments relative to the 2nd draft questionnaire.
16. Write a third draft questionnaire and submit for approval.
17. Distribute questionnaire to primary group and to secondary group.
18. Make final liaison arrangements with 701st Maintenance Battalion.
19. Receive completed questionnaires from primary and secondary groups.
20. Extract data from questionnaires. Process data, analyze, and evaluate.
21. Superimpose data extracted from questionnaires onto the conceptual model.
22. Conclude the review of behavioral science research literature.
23. Construct an analytical model of organizational behavior.

An equal amount of agonizing went into the development of a hypothesis that would: (1) be truly representative of the problem; and (2) would be verifiable by experimental means. The final result is shown below:

Hypothesis { An examination of organizational behavior in a small maintenance support unit -- in a combat situation -- will reveal a distinct behavior pattern. }

Asking the Right Questions

The search for an answer to the problem statement was preceded by a search for requisite information. What the author was seeking was the minimum number of questions, the answers to which would provide a basis for resolving the problem statement and the hypothesis, in either the affirmative or in the negative. A list of 84 questions eventually emerged as the progeny of this search. The latter questions generally addressed the many environmental variables which impact upon military organizational behavior in a combat situation.

Next followed the task of categorizing the information that would result from the posing of these questions -- such as essential, nice-to-have, or nonessential information. A tool used in determining the essentiality or nonessentiality of each of the 84 questions, was the identification of the type of variable represented by each question (i.e., whether it represented an independent or a dependent variable). Independent variables, by definition, are presumed to be the cause of dependent variables. Dependent variables, on the other hand, are considered to be the effect.

Given the limited scope of this research effort, all questions providing other than essential information had to be eliminated.²

Once it was decided that the revised/categorized list consisting of 38 questions was adequate to provide the necessary information required in addressing both the problem statement and the hypothesis, the task evolved of locating a source(s) of answers to those questions.

Existing research studies in the field of behavioral science, conducted under the auspices of the U.S. Department of Defense, served as an excellent point of origin. The conclusions and recommendations extracted from a number of these studies have been capsulized in Chapter II. Yet another source of information are those Army personnel on active duty who meet the following criteria: (1) are maintenance officers or enlisted personnel by virtue of their MOS; and (2) have served in a maintenance support unit while in the Republic of Vietnam.

It might appear at first glance that the aforementioned selection criteria for prospective respondents to a possible survey or questionnaire, are not valid. By eliminating all military personnel with the exception of those with Vietnam service, the author would seem to be restricting his study to one specific conflict -- one specific environment. How then could meaningful and universally representative data be obtained

²Only a few of the variables resulting from this categorization of questions, were determined to be true dichotomies in the sense that they were either present or absent. Most of the variables were found to be capable of taking on continuous values.

that would have validity for military organizational behavior on battlefields other than in Southeast Asia?

The answer to this apparent paradox lies in a number of assumptions:

(1) The Vietnam Conflict did not represent a ten-year deviation from acceptable military doctrine. Indeed, the mere fact that the United States maintained a direct military presence in South Vietnam for at least a decade certainly served to rewrite many of the pages of U.S. military doctrine. Consequently, many of the lessons learned, and many of the techniques of personnel management developed in that conflict will have an impact on future military action in other theaters of operation.

(2) While technological advances have transformed the nature of man's weaponry, and have compressed time by enabling him to project his combat power over great distances and with phenomenal speed, man's psychological reactions to combat have not been subjected to as dramatic a change. Man still seeks to avoid pain. His mouth still becomes dry at the prospect of his own violent death. These psychological and physiological responses to the stresses of combat have been with mankind as far back as recorded history, and -- in the opinion of the author -- will remain as an integral part of man's psycho-physiological structure in the foreseeable future.

(3) It is also assumed that, because of the time element involved, the recollections of combat service support personnel

who had experienced combat in Vietnam would tend to be more vivid and accurate than would be the recollections of personnel with maintenance support experience who had seen action during the Korean Conflict or World War II.

In Search of A Target Audience

Having thus defined the target audience for any prospective research survey or questionnaire (i.e., military personnel meeting the criteria listed on page 53), the job then became one of locating these military personnel. In so doing, research objectivity had to realistically take into account the cost involved in canvassing the entire Army Ordnance Branch in an effort to obtain a list of possible subjects for questioning -- a list that would include all of the maintenance officers and enlisted personnel who had served with maintenance support units while in Vietnam. A compromise solution was decided upon in which the author was to: (1) locate a 'typical' group of maintenance officers and enlisted personnel who had served with maintenance units while on duty in Vietnam; (2) to sample a representative fraction of that group (sample size is explained later within this chapter); and (3) to draw a statistical inference from the opinions gathered in that sampling, which would be indicative of the opinions of the total population -- within certain parameters (i.e., taking into consideration a margin of error and a confidence level).³

³The author's inability to obtain an accurate figure as to the total number of maintenance personnel (Army-wide) who had served with maintenance units in Vietnam, led inevitably to the sampling of a representative portion of that total population; and to the drawing of conclusions about that total population based upon a small sample size. This is recognized as a limitation capable

An assumption was made that such a group of typical maintenance personnel, as described in the preceding paragraph, could be discovered among the nearly 1000 officers and enlisted men of the 701st Maintenance Battalion, 1st Infantry Division, located at Fort Riley, Kansas.

A further assumption was made that the sampling of a representative fraction of this 'typical group' of maintenance personnel (i.e., a portion of the 701st Maintenance Battalion) would provide the author with representative data with respect to the entire population of the battalion who had served with maintenance units while in Vietnam.

A discussion of specific statistical techniques applied in this study, appears at a later point within this chapter.

The next step was to seek the assistance of the commanding officer of the 701st Maintenance Battalion, LTC John S. Drosdeck Jr. LTC Drosdeck agreed to let his battalion assist in the research effort, which led to a subsequent question: "What would be the best means of questioning the maintenance personnel at Fort Riley?" The best means of obtaining data was determined to be a personal interview of all personnel in the sample.⁴ Cost and time constraints, however, resulted in the adoption of an alternate method: a questionnaire.

(continued from previous page)
of effecting the credibility of conclusions shown in Chapter IV.

⁴This determination evolved from a discussion between the author and his research advisors.

The Questionnaire

The original draft of the questionnaire (a final copy of which is attached hereto as Appendix A) consisted of 38 questions. It was submitted in early autumn of 1974 to the following personnel -- for purposes of conducting a critical review:

- Two Ordnance officers with maintenance unit experience; a member of the Faculty, and a student at the U.S. Army Command and General Staff College.

- The author's Research Advisors; each of whom is a member of the Faculty at the U.S. Army Command and General Staff College.

- A member of the Faculty, USACGSC, with a background in statistical analysis.

- The Comptroller, USACGSC, reviewed the questionnaire with respect to its format and its suitability for possible statistical analysis.

Considerable altering and massaging of the questionnaire resulted in approval of the third draft. With the consent of the Director, Military Art and Science Degree Program -- Dr. Ivan J. Birrer -- the approved questionnaire was proliferated in mid-December 1974, with a return date of early February 1975.⁵

⁵Admittedly, the final questionnaire (shown in Appendix A) is somewhat lengthy; consisting of 8 pages and 21 questions. As such it violates a main principle of questionnaire writing (i.e., brevity). The length of the questionnaire is an acknowledged shortcoming. The author was convinced, however, that had the possibility for statistical analysis not been present, the answers to the 21 questions -- as obtained from a small number of respondents -- would still have served as a basis for some form of meaningful analysis -- other than statistical.

The questionnaire consists of 21 questions: 19 of which are independent variables, with the remaining 2 questions representing dependent variables. The latter 2 questions, appearing on page 6 of the questionnaire, serve as the key elements in constructing the analytical model of organizational behavior. The relationship between the questionnaire and the analytical model is discussed in the section of Chapter III entitled, "Refining the Model."

Statistical Analysis

In order to quantify the findings obtained via the medium of the questionnaire, a statistical analysis of question responses was undertaken. Such a statistical analysis requires a sampling of the population; and will provide the observer with adequate data and parameters within which he (or she) will be able to make certain inferences with respect to the total population.

In his book entitled, Statistics: An Introductory Analysis, Taro Yamane provides the following formula for determining the appropriate sample size for conducting an experiment with a desired 95% confidence level:⁶

$$n = \frac{N}{1 + Ne^2}$$

⁶Taro Yamane, Statistics: An Introductory Analysis (New York: Harper and Row, 1968), p. 528.

In the formula appearing on the preceding page, n is the symbol used to represent the sample size; N represents the size of the total population (i.e., all military personnel assigned to the 701st Maintenance Battalion who served with maintenance units while in Vietnam); and e represents the margin of error. The size of the population (N) was determined to be 485. The margin of error (e) was established by the author at 0.15.⁷ With these two values established there remained only to solve for the value of n . It is the value n which determined how many questionnaires were to be distributed among the officers and enlisted personnel of the 701st Maintenance Battalion, in order to obtain a 95% confidence level. The computations involved in solving for n are shown on the following page.

⁷The current behavioral analysis experiment was not conducted under laboratory conditions, as were many of the HumRRO studies cited in Chapter II. The author offers, therefore, an apologia numerus (i.e., an apology for the presumptuous use of statistics).

A margin of error (e) of 0.15 was selected because it appears to be sufficient to indicate the existence of a behavior trend. No claim is made by the author that his statistical analysis is unchallengeable. The statistical technique employed, however, does allow for a 95% confidence level that all conclusions will fall within "+" or "-" 0.15 of the population.

A margin of error smaller than 0.15 would have required a much larger sample size. A margin of error of 0.05, for example, would have required a sample size of 219 maintenance personnel out of the total population of 485.

$$n = ?$$

$$N = 485$$

$$e = .15$$

$$n = \frac{N}{1 + Ne^2}$$

$$n = \frac{485}{1 + 485e^2}$$

$$n = \frac{485}{1 + 485 \times .15^2}$$

$$n = \frac{485}{1 + (485 \times .0225)}$$

$$n = \frac{485}{1 + 10.9125}$$

$$n = \frac{485}{11.9125}$$

$$n = 40.7135$$

$$n = \underline{\underline{41}} \text{ approximate}$$

The conclusion drawn from the above computation, was that 41 questionnaires were to be distributed to the target population if a 95% confidence level was to be obtained. Further, the 41 questionnaires were to be randomly distributed across the population.

Expressing A 95% Confidence Level

Upon the return of 41 completed questionnaires, the following procedure was required in expressing confidence:

- Step 1 - Total the number of responses given for each answer to each question. An example of such a process is shown in Table 6, below.

Total Response	Q. Describe the nature of a typical enemy attack.
0	<input type="checkbox"/> A large ground assault.
4	<input type="checkbox"/> A small probing ground assault.
37	<input type="checkbox"/> A rocket and/or mortar attack.
0	<input type="checkbox"/> Other (Please explain) _____
<u>41</u>	Total No. in Sample Size

Table 6. Computing the Number of Responses to A Given Question (example only).

- Step 2 - Compute the percentages represented by the values '4', and '37' (shown above).

$X: 4 \div 100: 41$	$X: 37 \div 100: 41$
$41X = 400$	$41X = 3700$
$X = \frac{400}{41}$	$X = \frac{3700}{41}$
$X = \underline{9.7\%}$	$X = \underline{90.3\%}$

Table 7. Computing the Percentage of Responses to A Given Question (example).

- Step 3 - One may conclude from the foregoing computations that 9.7 percent of the sample population experienced small probing ground assaults, and that 90.3 percent of that sample population experienced rocket and/or mortar attacks.

Significance

The notion of a significance test is a required augmentation to any experiment in behavioral science involving statistical inference. A significance test adds credibility to an experiment by providing two isolated groups (i.e., a primary and a secondary group) with the exact same data and questions. It is the task of the analyst to examine responses extracted from these two groups, and to determine if a correlation exists -- and to assign a significance to the degree of correlation discovered.

In determining whether or not a correlation actually exists between the primary and secondary group responses to the questionnaire, the author employed a linear regression (LINREG) computer program from the Pre-Programmed Application Library, USACGSC, dated July 1973. The LINREG program is designed to accept data arrayed in two variables -- "X" and "Y" -- where X represents data extracted from the primary group questionnaires, and Y represents data extracted from the secondary group questionnaires. The LINREG program then plots these X and Y data as if they were coordinates on a Cartesian plane. The result is: (1) the determination of a linear

equation representative of the input data; and (2) the determination of a coefficient of correlation. The coefficient of correlation is expressed as a percentile. The closer that the coefficient of correlation approaches to 1, the greater is the linear relationship between X and Y. A coefficient of correlation of .92, for example, would be indicative of a very close linear relationship (or correlation) between X and Y.

In the following example a linear equation and coefficient of correlation have been determined via use of the LINREG computer program.

EXAMPLE: Tally the responses to the question shown on the next page. Compare the answers provided by the primary and secondary groups. Moving from left to right and from top to bottom, extract the data from the boxes shown in the primary group questionnaire. List these data under the column labeled X. Next, extract data from the secondary group questionnaire. List this data under the column labeled Y. Employ the LINREG program by inputting the X and Y data into the computer in the appropriate sequence. Next, indicate to the computer the assumption that Y is a linear function of X. Finally, run the LINREG program! Subsequently, the computer will provide the following data:

Linear Equation - $Y = (.282578) + X(.21432)$
Coefficient of correlation - = .847005

-- END OF EXAMPLE --

How significant, however, is the above coefficient of correlation of .85, approximate? Abraham N. Franzblau, in his text entitled, A Primer of Statistics For Non-Statisticians, defines significance -- reference a given correlation -- as a value judgement used to denote the meaning of the result. He states that significance differs from reliability in that the

Q. Describe the unit's overall efficiency and ability to perform its mission.

	T	L	M	N	O	P
		excellent	good	fair	poor	very poor
1	The week before the combat period began	11 .27	21 .51	6 .15	3 .07	0 .00
2	The first day(s) after the combat period began	33 .81	6 .15	1 .02	1 .02	0 .00
3	The day prior to the end of the combat period	29 .71	8 .20	3 .07	1 .02	0 .00
4	The first day after the end of the combat period	16 .39	19 .46	4 .10	2 .05	0 .00
5	The week following the end of the combat period	11 .27	28 .68	2 .05	0 .00	0 .00
6	other (explain)					

Table 8. Primary Group (X)

Q. Describe the unit's overall efficiency and ability to perform its mission.

	T	L	M	N	O	P
		excellent	good	fair	poor	very poor
1	The week before the combat period began	0 .00	8 .80	1 .10	1 .10	0 .00
2	The first day(s) after the combat period began	7 .70	2 .20	1 .10	1 .10	0 .00
3	The day prior to the end of the combat period	6 .60	2 .20	2 .20	0 .00	0 .00
4	The first day after the end of the combat period	0 .00	6 .60	3 .30	1 .10	0 .00
5	The week following the end of the combat period	1 .10	7 .70	2 .20	0 .00	0 .00
6	other (explain)					

Table 8a. Secondary Group (Y)

Table 8b.

X	Y
11	0
21	8
6	1
3	1
0	0
33	7
6	2
1	1
1	1
0	0
29	6
8	2
3	2
1	0
0	0
16	0
19	6
4	3
2	1
0	0
11	1
28	7
2	2
0	0
0	0

latter refers to a purely statistical interpretation of results. Franzblau goes on to say that since significance is essentially a matter of judgement, it cannot really be determined by any formula, and therefore the significance of a given experiment's findings should be evaluated according to one's best judgement. In keeping with Franzblau's definition of significance, it was the author's decision to establish significance -- reference a coefficient of correlation -- as any comparison between primary and secondary groups which either equals or exceeds 80%.

The coefficient of correlation of approximately .85 (shown in the example on page 63) is indicative therefore, of a significant linear relationship (or correlation) between the questionnaire responses of the primary and secondary groups.

The secondary group selected by the author, for the purpose of testing the significance of questionnaire responses, consisted of a mix of ten officers and enlisted personnel stationed at Fort Leavenworth, Kansas. Appendix B contains a comparison of the questionnaire responses obtained from the primary and secondary groups.

Developing The Analytical Model

Simultaneously with the drafting of the questionnaire, the author developed and refined a conceptual version of the analytical model of organizational behavior which serves as the *raison d'etre* of the current research effort. The concept of the model had taken shape in the author's mind long before

the drafting of the questionnaire and the initiation of serious research. Reflecting on this admission, the reader might be tempted to accuse the author of a lack of scientific objectivity, and with having a priori assumed the existence of a pattern of organizational behavior in combat. In defense of his position, however, the author makes reference to the following three observations:

There is no genuine progress in scientific insight through the Baconian method of accumulating empirical facts without hypothesis or anticipation of nature. Without some guiding idea we do not know what facts to gather. Without something to prove, we cannot determine what is relevant and what is irrelevant.⁸

It is often said that experiments should be made without preconceived ideas. That is impossible. Not only would it make every experiment fruitless, but even if we wished to do so, it could not be done.⁹

A fundamental principle can be stated: If one wants to solve a problem, one must generally know what the problem is. It can be said that a large part of the solution of a problem lies in knowing what it is that one is trying to do.¹⁰

A Primary Consideration

In developing an analytical model of organizational behavior, for use by the manager in a small maintenance support unit, a primary consideration must be given to the complexity of that model. To be truly effective as an aid to the manager,

⁸M. Cohen, A Preface To Logic (New York: Meridian, 1956), p. 148.

⁹H. Poincare, Science and Hypothesis (New York: Dover, 1952), p. 143.

¹⁰F.N. Kerlinger, op. cit., p. 19

the model must be so designed as to be intrinsically manageable. That is, a model designed for use within an active combat environment should not be replete with complicated arithmetical computations. A good model should be almost intuitively understandable; providing the manager with a quick, and reasonably accurate, picture of his organization's behavioral trend.

The model should be able to tell the manager, at a glance: where his organization is now -- with respect to its behavior pattern -- ; in what direction it is moving; and where it was previously. The value of such a model to the manager lies in its enabling him to possess information needed for decision making; and providing that information on a timely basis. The uses to which this information can be put have been enumerated in Chapter I of this study.

What follows is a detailed description of how a conceptual version of an analytical model of organizational behavior was developed. In keeping with the idea that a model should be simple to use, it must be mentioned here that the manager will never be required to go through the exercise of actually having to construct an analytical model. The interface between the model and the manager will be discussed at a later point within this chapter, entitled, "Employing the Model."

Constructing the Basic Model

The description of how the model was constructed is a matter of academic interest only. It need not concern the manager in the field who will eventually be called upon to employ the model. Considerable detail is offered in the following pages so as to insure that the reader will understand each step involved in constructing the analytical model.

- Step 1 - Employing the principle of the Cartesian coordinate system, construct a simple diagram (see Figure 5).

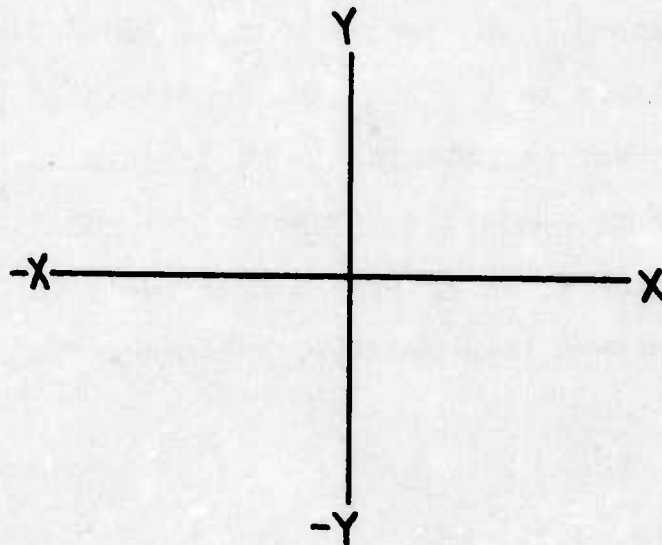


Figure 5.

- Step 2 - Select an arbitrary point along the "Y" axis, above its intercept with the "X" axis (i.e., a point where the value of the abscissa is zero). Indicate the location of that point as shown in Figure 6.

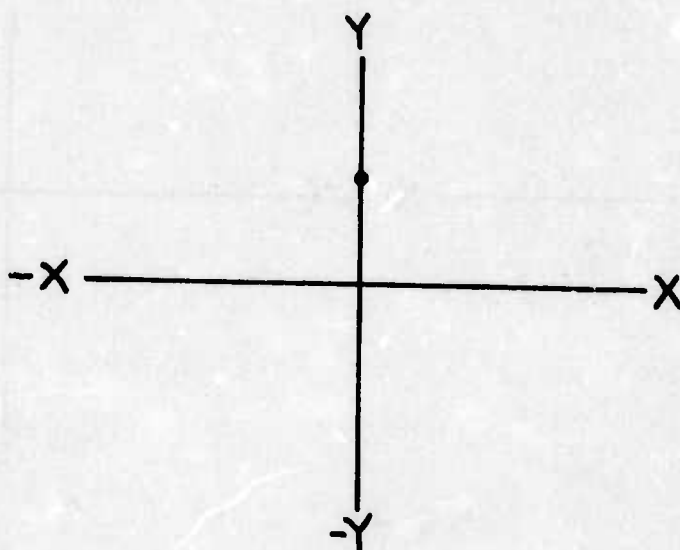


Figure 6.

- Step 3 - Label this diagram, "Unit Morale."
- Step 4 - Construct a second diagram, similar to that depicted in Figure 5, and label it, "Unit Efficiency" (see Figure 7).

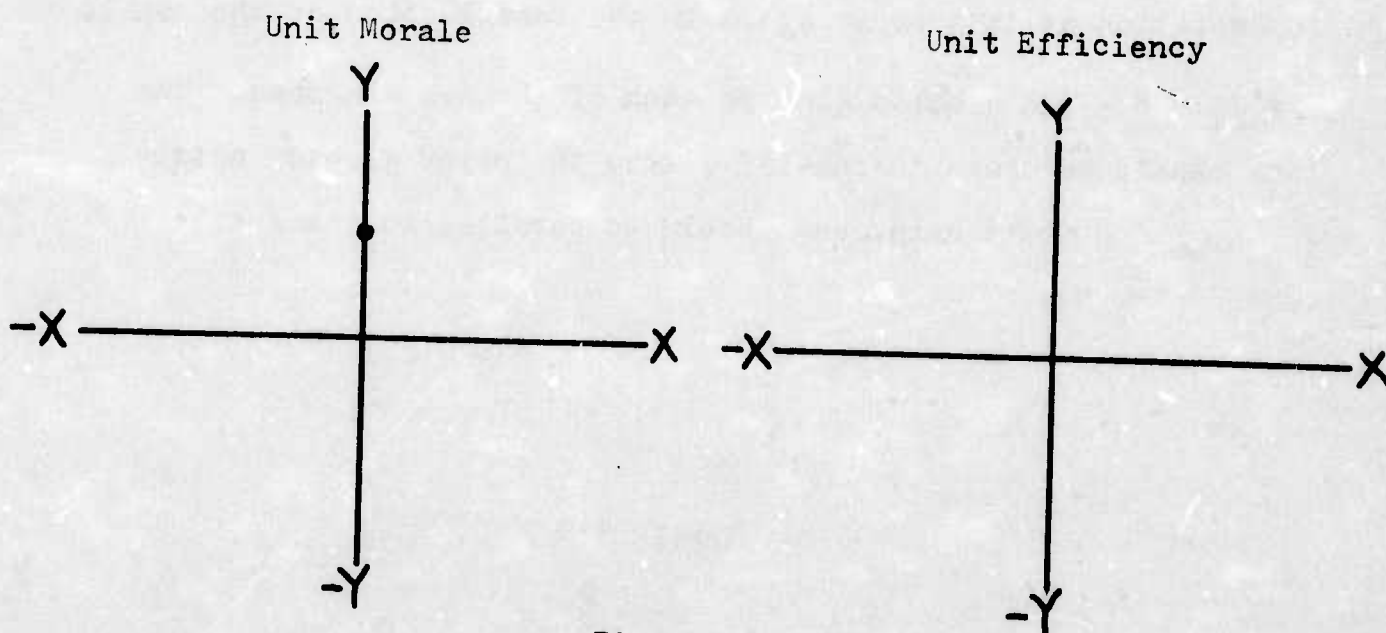


Figure 7.

• Step 5 - Select an arbitrary point along the "Y" axis of the Unit Efficiency diagram, above the intercept of the X and Y axes. Indicate the location of that point as shown in Figure 8.

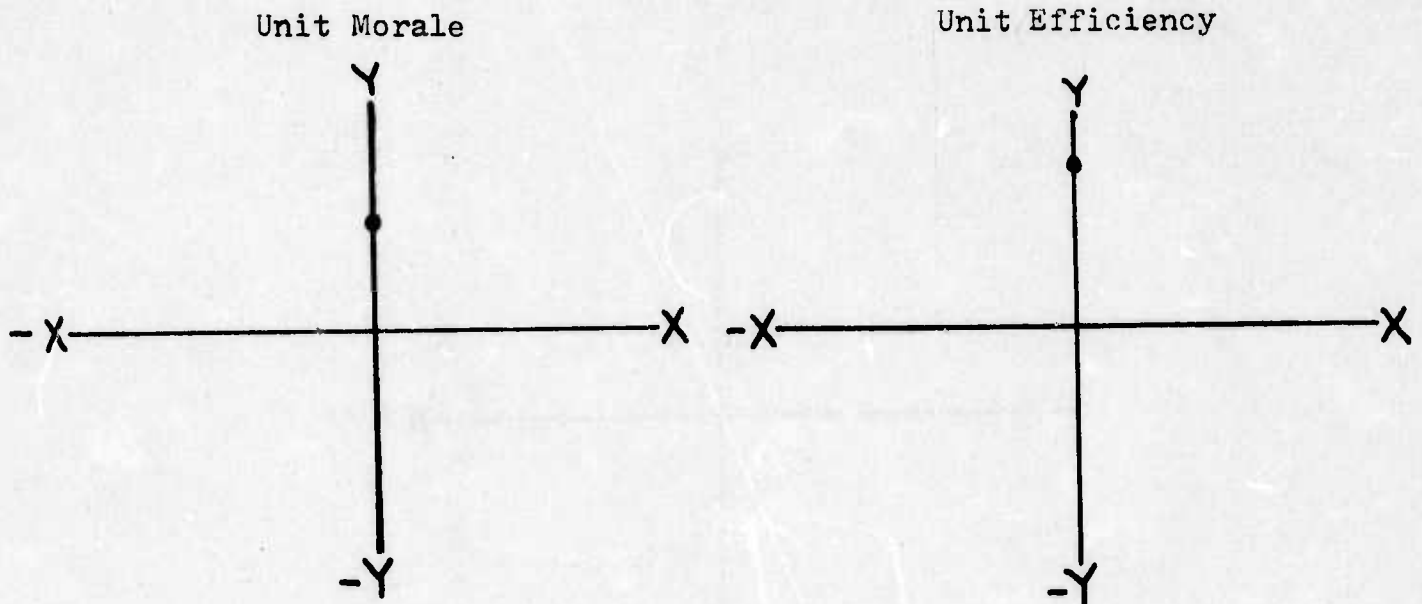


Figure 8.

Note that the point selected along the Y axis in the Unit Efficiency diagram, need not necessarily correspond to the same coordinates as the point indicated in the Unit Morale diagram. The point being made is that the two diagrams should be considered in isolation at this early stage in the construction of the model.

• Step 6 - Add a solid line to each of the two diagrams. The line should be drawn to-the-left, from the point already established along the Y axis, and should be parallel to the X axis (see Figure 9).

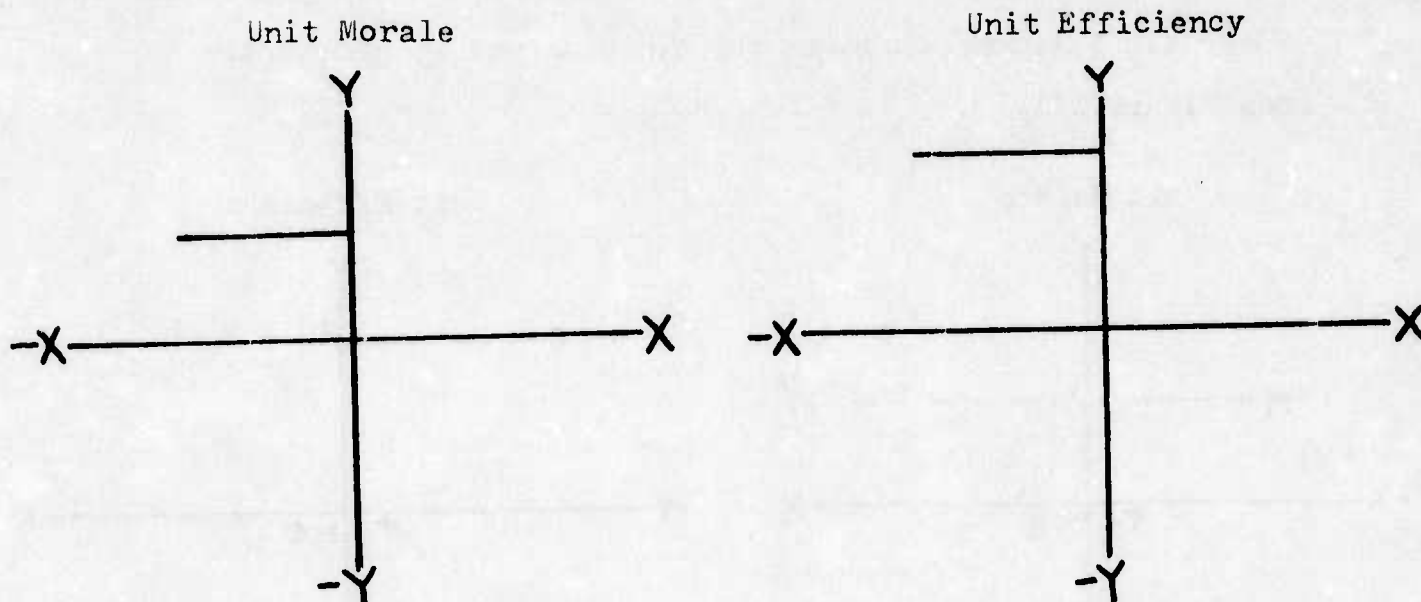


Figure 9.

o Step 7 - Returning to the original point on the Y axis, draw a continuation of the line sketched in Step 6. The line should be a broken line, drawn to-the-right, and parallel to the X axis (see Figure 10).

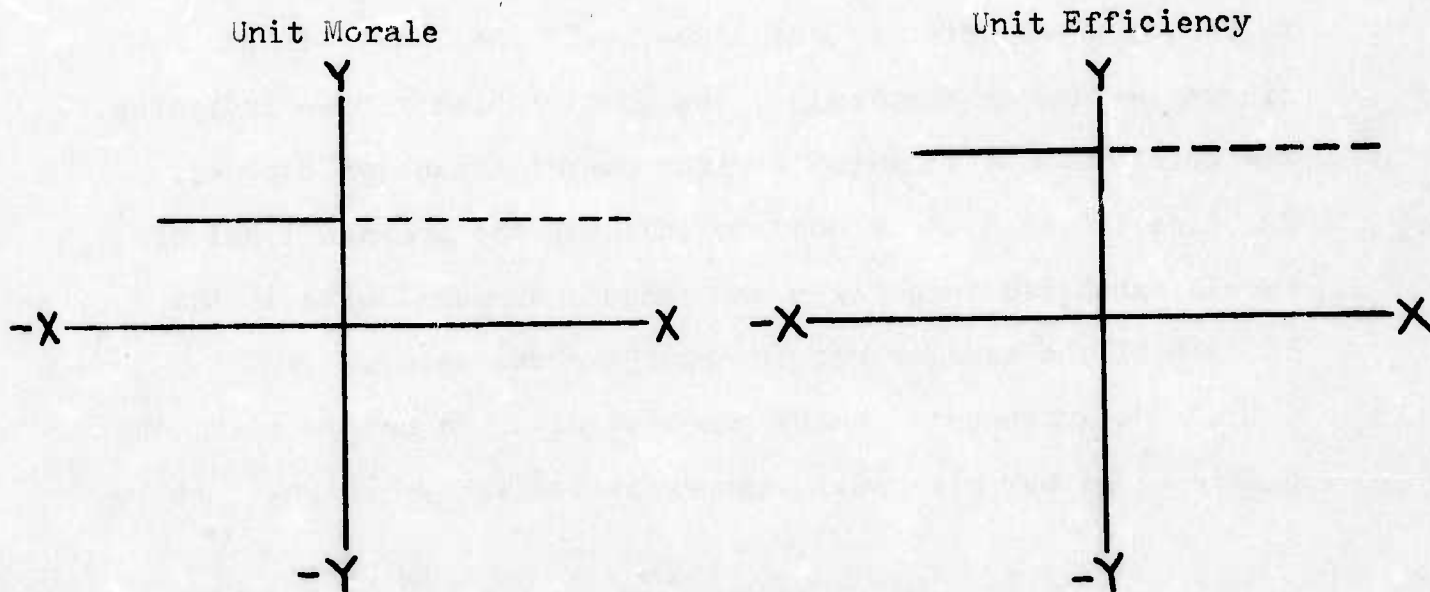


Figure 10.

At this point in the construction of the model, the labelling of certain features shown on the two diagrams is appropriate (see Figure 11).

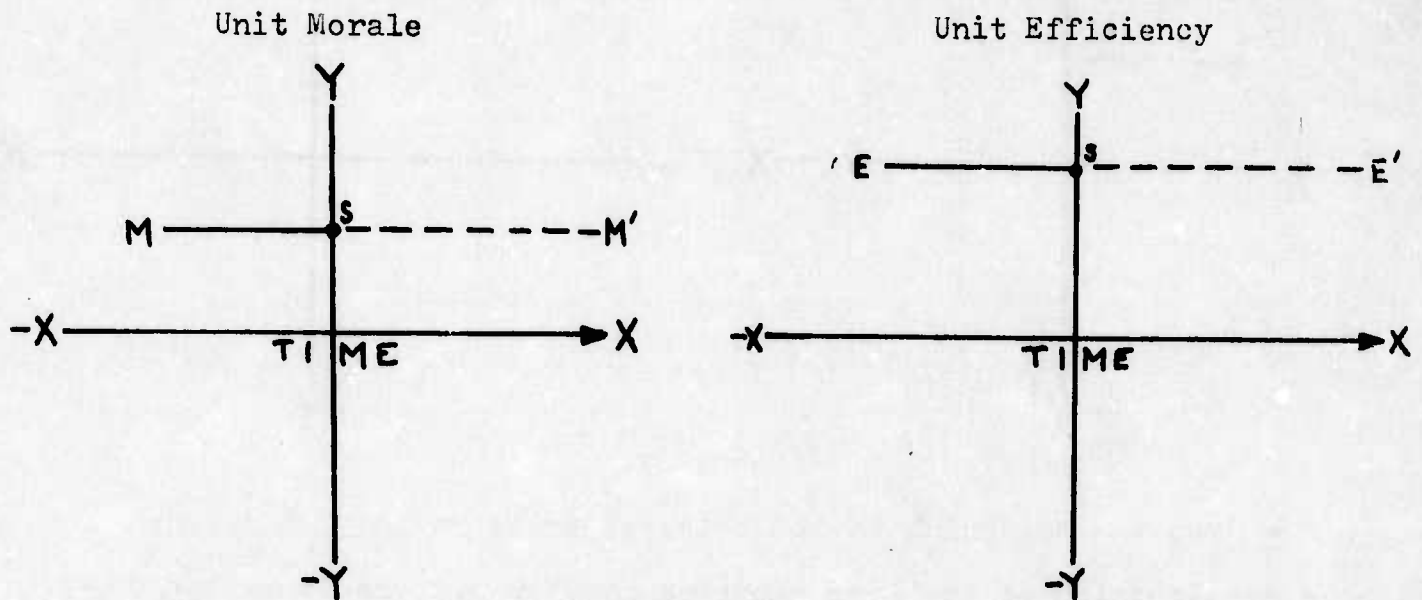


Figure 11.

The X axis in each diagram is used to indicate time. The flow, or passage, of time is from left-to-right along the X axis. An arrowhead has been added to the X axis (Figure 11) in order to indicate the direction of time-flow. The Y axis in each diagram -- and in particular, the point labeled "S" -- indicates the point in time at which a given combat situation started. The line labeled M M' is used to indicate the average level of morale exhibited in a given maintenance support unit: in the opinion of the manager who is employing the model.

No incremental value has been given to points along the Y axis of either diagram. This omission is by design. It is

hoped that this absence of increments along the Y axis will encourage the manager to select an arbitrary point along the Y axis when employing the model, rather than painstakingly trying to determine if Unit Morale should be a "10" or a "12", had the Y axis been calibrated. To coin a phrase, there is no necessity to measure with a micrometer, that which has been chopped with an axe. The latter refers to the fact that the manager need only apply his judgement as to what constitutes an average level of Unit Morale within his organization.¹¹ Theoretically, the line labeled M M' (shown in Figure 11) could indicate to one particular manager that "high" morale is the average state of nature within his maintenance unit; while at the same time, the identical M M' line could represent "low" morale to another manager viewing the model.¹²

¹¹The average level of Unit Morale is a judgemental determination on the part of the specific manager who is employing the model. For purposes of this study, the average level of unit morale can be classified as either: (1) very high, (2) high, (3) moderate, (4) low, or (5) very low.

¹²It is also theoretically possible that several managers within the same unit could arrive at widely divergent views as to what constitutes the average level of Unit Morale within that unit. The same holds true for opinions with respect to the average level of Unit Efficiency. Such a divergence of opinion could arise from personality differences among the various unit managers (e.g., optimistic vs pessimistic outlook). It might also be explained as stemming from parochialism and/or the perspective of some of the unit managers. Characteristic of the latter trait is the tendency to view one's own section, and to conclude -- without benefit of an analysis -- that the morale and efficiency exhibited by that section is indicative of the unit as a whole. In such cases, it becomes incumbent upon the unit commander to establish an average level of morale and efficiency, and to provide this data to his subordinate managers upon the outbreak of a combat situation. In this manner the commander can be assured that all managers are reading from the same sheet of music, regarding organizational behavior.

The line labeled E E' (Figure 11) represents the average level of Unit Efficiency, in the opinion of the manager.¹³ All other comments relative to determining the location of the E E' line on the diagram, correspond to the comments made in the preceding paragraph with respect to the M M' line. Observations made in Footnote 13 also have application for the E E' line.

Refining the Model

The diagrams depicted in Figure 11 do not as yet represent a model of organizational behavior that can be employed by a manager in the field. Such a model should be predictive in nature, and should provide the manager with a graphic representation of the behavior pattern of maintenance personnel under enemy fire. The existence of such a behavioral pattern is presupposed in this chapter for purposes of illustrating what an analytical model might possibly look like.¹⁴

¹³The average level of Unit Efficiency is determined judgementally by the particular manager who is employing the model. For purposes of this study, the definition of Unit Efficiency coincides with the definition of mission effectiveness (Footnote 6, Chapter I, page 7). Unit Efficiency is further categorized as either: (1) excellent, (2) good, (3) fair, (4) poor, or (5) very poor.

¹⁴Up to this point in the study the author has not provided the reader with any definitive information that would confirm the existence of a pattern of organizational behavior, with respect to a combat service support unit caught in a combat situation. It should be noted, therefore, that Figure 21 (p. 90) represents only an example of what an analytical model might resemble. The existence of a pattern of organizational behavior under combat conditions, will be shown in Chapter V; as a result of calculations and statistical analysis with respect to the questionnaires received from the 701st Maintenance Battalion (primary group) and from the secondary group located at Fort Leavenworth. The confirmation of the hypothesis as a result of the aforementioned analysis, will culminate in the development of the "actual" analytical model -- revealed in Chapter V.

The two questions appearing on page 6 of the questionnaire (Appendix A), along with one of the Schematic Case Studies presented in Chapter II (Table 4, "A Maintenance Forward Support Company) will serve as a basis for drafting an illustrative example of an analytical model of organizational behavior.

A critical examination of Table 4 (Chapter II) will reveal that the behavior exhibited by maintenance unit personnel followed a pattern of behavior similar to that depicted in Figures 12 through 21, which follow.

• Step 8 - Consider, for example, that the lines $M M'$ and $E E'$ (shown in Figure 12) represent the average levels of unit morale and unit efficiency with respect to the specific maintenance unit discussed in Table 4. If "S" represents the point in time when the combat situation started (i.e., the launching of an enemy attack) then the lines $M S$ and $E S$ represent the average levels of morale and efficiency, respectively, which existed in the unit prior to the start of the combat period.

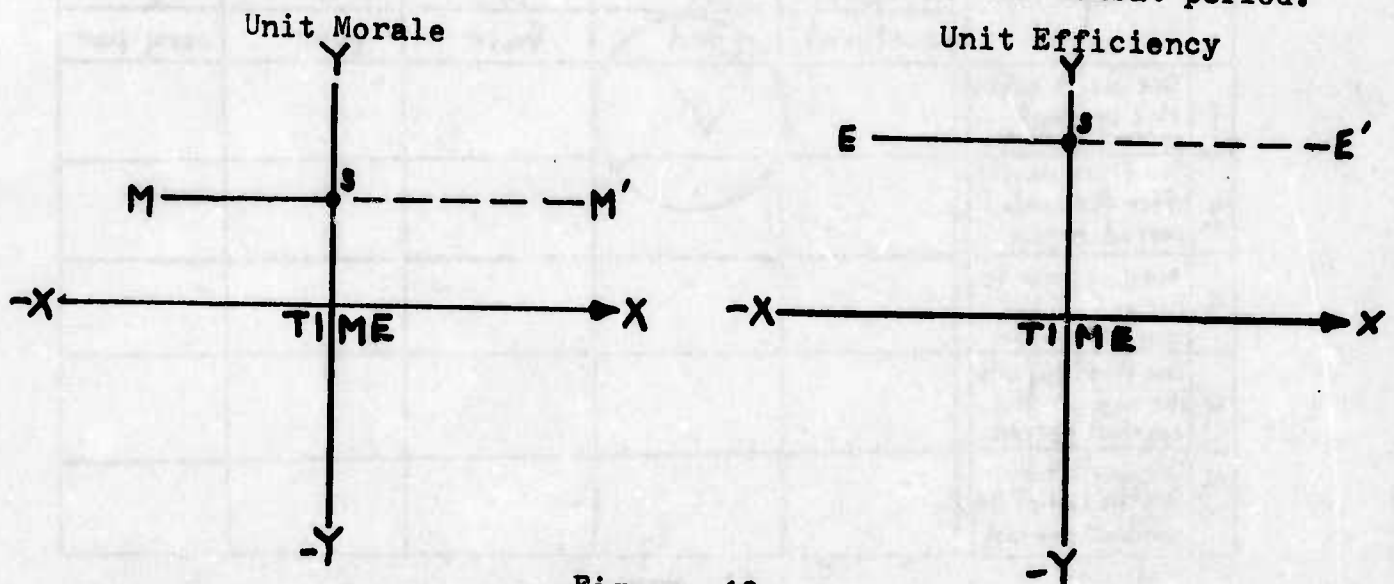


Figure 12.

Had the manager assigned to the subject maintenance unit (Table 4) been required to answer the two key questions shown on page 6 of the questionnaire, he might have placed check marks in the boxes as indicated in Figures 12a and 12b, below.

Q. Describe the morale of unit personnel, in your opinion.

	T	L	M	N	O	P
		very high	high	moderate	low	very low
1	The week before the combat period began			✓		
2	The first day(s) after the combat period began					
3	The day prior to the end of the combat period					
4	The first day after the end of the combat period					
5	The week following the end of the combat period					

Figure 12a.

Q. Describe the unit's overall efficiency and ability to perform its mission.

	T	L	M	N	O	P
		excellent	good	fair	poor	very poor
1	The week before the combat period began		✓			
2	The first day(s) after the combat period began					
3	The day prior to the end of the combat period					
4	The first day after the end of the combat period					
5	The week following the end of the combat period					

Figure 12b.

- Step 9 - For the moment, consider the Unit Morale diagram in isolation. Placing a pencil on the point marked "S", draw a line downward and to-the-right in a southeasterly direction as shown in Figure 13.

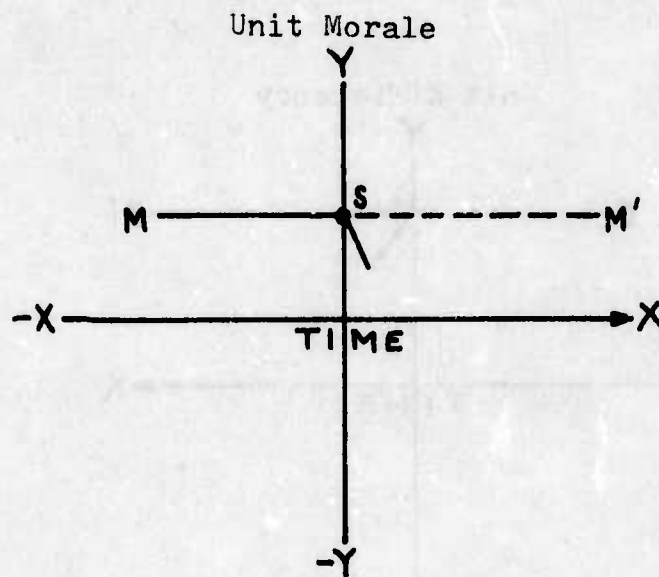


Figure 13.

The draftsman need not concern himself with the specific angle at which the line is drawn, nor with the exact length of the line; as the model does not require that lines be drawn to scale. The line just sketched moves to the right in order to represent the passage of time: the latter being represented by movement from left to right along the X axis.

- Step 10 - Repeat the process explained in Step 9; this time applying the line to the Unit Efficiency diagram (see Figure 14). The lines drawn in Steps 9 and 10 (Figures 13 and 14) represent

changes in organizational behavior patterns: as indicated by Observation 2, Table 4. Since the maintenance unit's initial reaction to enemy bombardment was a decrease in both unit morale and unit efficiency, the line added to the diagram in Figures 13 and 14 can be used to indicate that decrease.

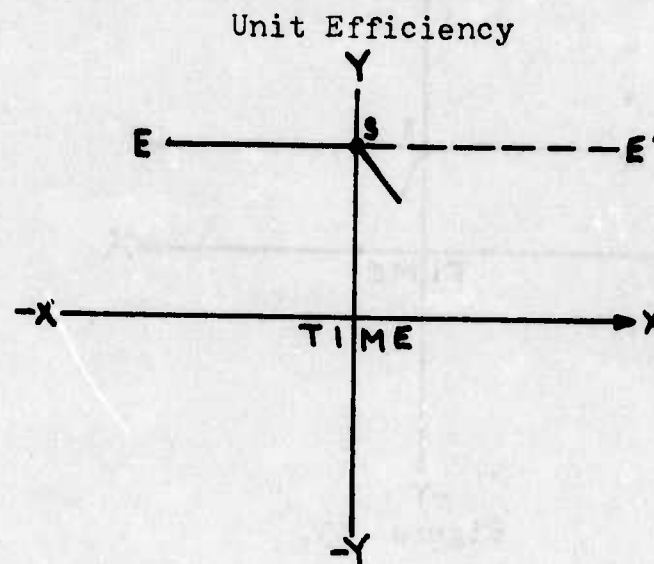


Figure 14.

It is important to point out at this juncture in the current research effort that the initial reaction of combat service support personnel to an enemy attack (as shown in Figures 13 and 14) is not specifically addressed in the questionnaire. The justification for this omission lies in the following rationale: (1) The initial decline in unit morale (indicated in Figure 13) as a direct result of enemy action, is presupposed by the author. This presupposition is founded upon personal experience in three such heavy enemy attacks, as well as upon conclusions drawn from interviews and discussions conducted with scores of

maintenance managers, over a number of years. This initial decline in unit morale is usually short-lived; terminating as soon as the combat situation becomes clearly defined in the minds of the maintenance unit personnel.¹⁵

(2) Logic dictates that when a combat service support unit is subjected to an enemy attack, its initial reaction will not be to continue with business-as-usual. Maintenance personnel who are being subjected to enemy shelling, for example, will invariably obtain their weapons, and/or seek shelter, as an initial reaction to that shelling. Following this initial reaction, maintenance personnel will usually initiate whatever procedure has been pre-established by the unit commander. In such instances, unit efficiency will tend to decline -- that is, 'efficiency' as defined in Footnote 14. This initial decrease in the level of unit efficiency may last for only a few minutes, or it could possibly last for several days; depending on the intensity of the enemy attack. Recovery from this decline in unit efficiency usually occurs once unit personnel have shaken-off the initial

¹⁵It is important to note that Figure 13 addresses unit morale and not motivation. Morale is defined herein as a state of individual, psychological well-being. The author contends that this state of psychological well-being suffers an initial decline when maintenance personnel first come under enemy attack.

Motivation, on the other hand, is usually high among maintenance personnel, concomitant with the initiation of enemy action. Motivation is defined herein as the stimulation of active interests on the part of maintenance personnel -- such as participating in a pre-established combat plan -- through the appeal to associated interests; the latter interests being the preservation of one's life.

shock of the enemy attack.

• Step 11 -- From the bottom point of each of the lines added in Figures 13 and 14, sketch a line upward and to-the-right in a northeasterly direction (see Figure 15). This line should terminate where it intersects with the $M M'$ line and the $E E'$ line, respectively.

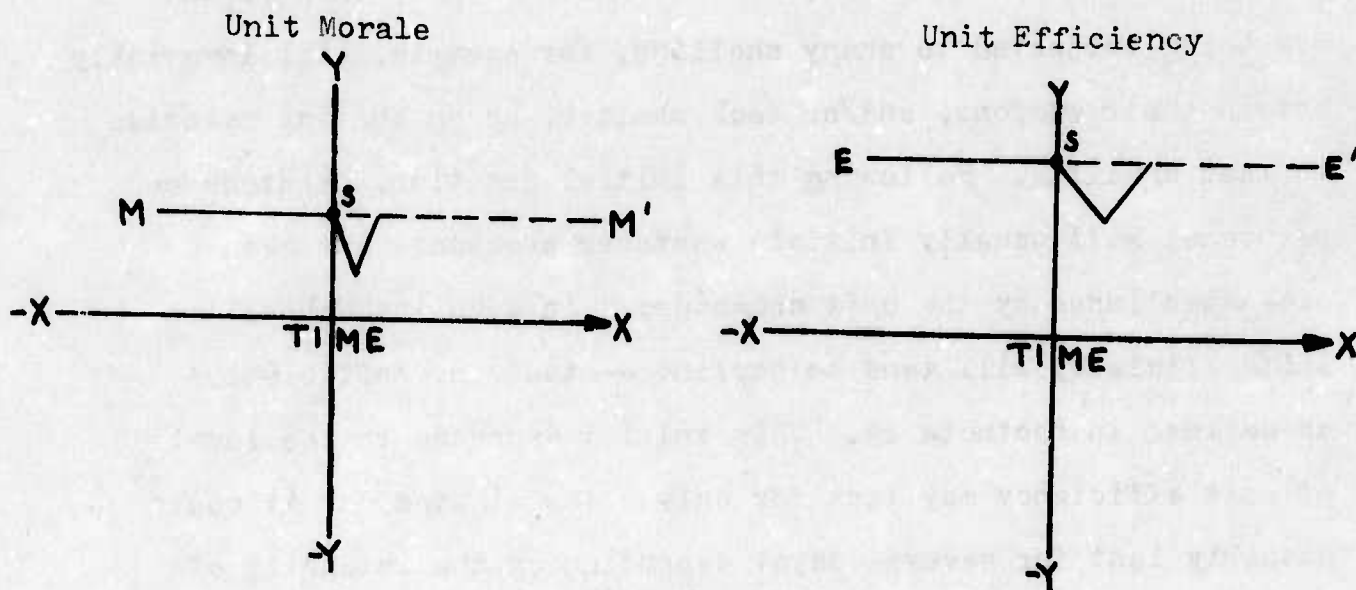


Figure 15.

The line added in Step 11 (Figure 15) represents a change in the behavior exhibited by maintenance unit personnel in the subject case study (Table 4). This change is cited in Observation 4, Table 4, which explains that unit personnel -- after having recovered from the initial effects of the enemy attack -- returned to their normal mission work; and that by late afternoon of the first day, they appeared to have returned to their average levels of morale and efficiency, respectively.¹⁶

- Step 12 - On each of the two diagrams, sketch a continuation of the line added in Step 11 (see Figure 16).

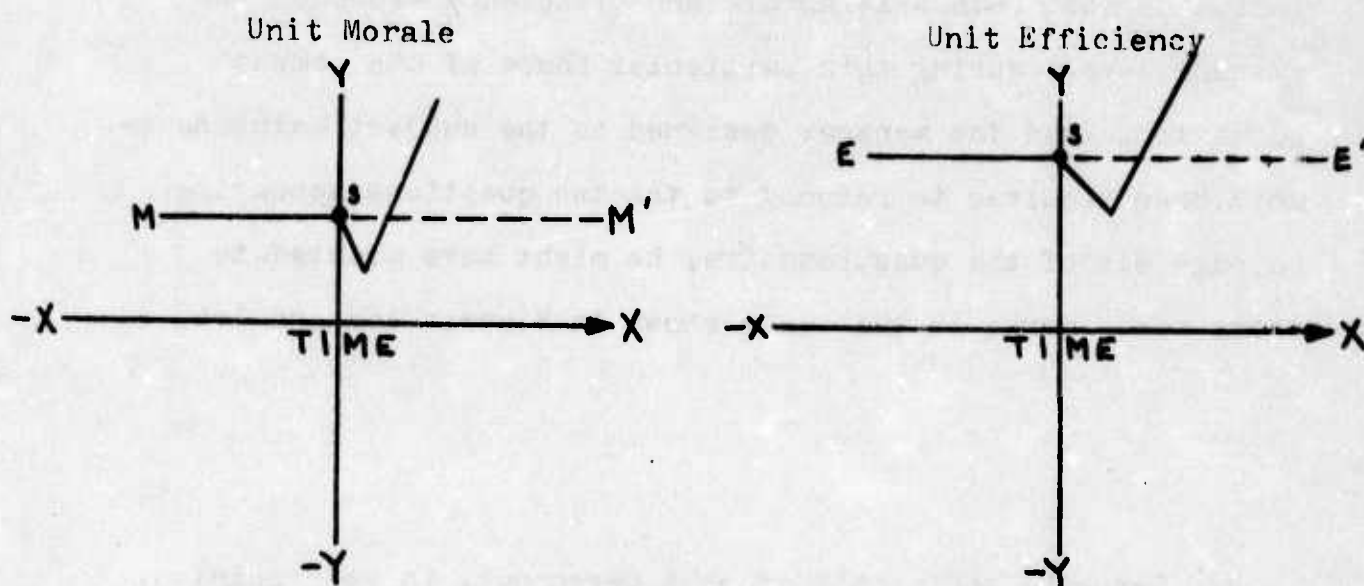


Figure 16.

¹⁶The failure to include a series of questions in the final questionnaire which would address this initial decline and recovery in both unit morale and efficiency (Figures 13, 14, and 15) is admittedly a shortcoming in the construction of the model. It was discovered by the author during early testing of the first two iterations of the draft questionnaire, that while such a decline and recovery does in fact occur, it quite often takes place over so brief a span of time as to be almost imperceptible when addressed in retrospect by questionnaire respondents. When individually confronted by the author -- after they had completed a test questionnaire -- three test respondents admitted that such a decline and recovery had occurred within their own maintenance unit. The explanation for their not indicating this phenomenon on their test questionnaire was: (1) the period of decline and recovery transpired so quickly as not to have made a dramatic impression upon their recollection of the particular combat situation; (2) the author of the test questionnaire had not been definitive in his addressing of that early period in the combat situation.

The wording of a series of questions in the questionnaire so as to obtain the desired data reference the initial decline and recovery in unit morale and efficiency, continued to elude the author through completion of the final draft of the questionnaire. It is hoped that the rationale for including this phenomenon in the diagrams -- as offered in the preceding pages -- provides an acceptable, and logical explanation for depicting the behavioral trend of decline and recovery in morale/efficiency.

The lines added to the two diagrams in Figure 16, reflect a behavioral trend pointed out in Observation 5, Table 4; and indicates that both unit morale and efficiency exceeded the average level, during this particular phase of the combat situation. Had the manager assigned to the subject maintenance unit been required to respond to the two questions appearing on page six of the questionnaire, he might have elected to place check marks in the boxes shown in Figures 16a and 16b.

Q. Describe the morale of unit personnel, in your opinion.

	T	L	M	N	O	P
		very high	high	moderate	low	very low
1	The week before the combat period began			✓		
2	The first day(s) after the combat period began		⊙ ✓			
3	The day prior to the end of the combat period					
4	The first day after the end of the combat period					
5	The week following the end of the combat period					
6	other (explain)					

Figure 16a.

Q. Describe the unit's overall efficiency and ability to perform its mission.

	T	L	M	N	O	P
		excellent	good	fair	poor	very poor
1	The week before the combat period began		✓			
2	The first day(s) after the combat period began	✓				
3	The day prior to the end of the combat period					
4	The first day after the end of the combat period					
5	The week following the end of the combat period					
6	other (explain)					

Figure 16b.

• Step 13 - To each of the diagrams add a line drawn parallel to the X axis, as is shown in Figure 17. This line has been added to each diagram in order to represent additional data extracted from Observation 5, Table 4: data which is indicative of a period of exceptionally high morale and efficiency. A similar conclusion may be drawn from observing the check marks placed on the hypothetical questionnaire (Figures 17a and 17b).

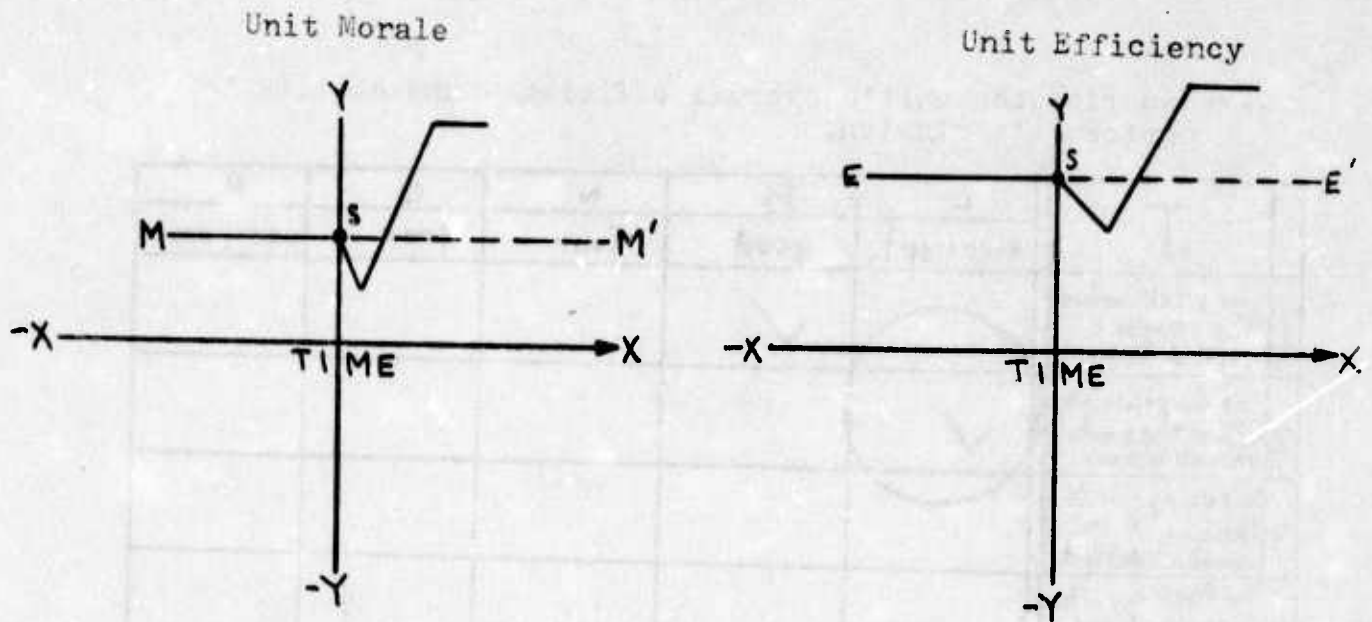


Figure 17.

Q. Describe the morale of unit personnel, in your opinion.

	T	L	M	N	O	P
		very high	high	moderate	low	very low
1	The week before the combat period began			✓		
2	The first day(s) after the combat period began		✓			
3	The day prior to the end of the combat period		⊙ ✓			
4	The first day after the end of the combat period					
5	The week following the end of the combat period					
6	other (explain)					

Figure 17a.

Q. Describe the unit's overall efficiency and ability to perform its mission.

	T	L	M	N	O	P
		excellent	good	fair	poor	very poor
1	The week before the combat period began		✓			
2	The first day(s) after the combat period began	✓				
3	The day prior to the end of the combat period	⊙ ✓				
4	The first day after the end of the combat period					
5	The week following the end of the combat period					
6	other(explain)					

Figure 17b.

• Step 14 - To each of the diagrams, add a line drawn downward and to-the-right, in a southeasterly direction (see Figure 18). Note that this line does not touch the M M' or the E E' lines. An explanation will be offered in the next step. The lines added in Figure 18 correspond to Observation 6, Table 4, wherein both unit morale and efficiency dropped concomitantly with the halting of the enemy attack. The letter "H" (Figure 18) represents that point in time when the enemy halted its attack. Additional check marks added to the hypothetical questionnaire (Figures 18a and 18b) also reflect this decline in morale and efficiency.

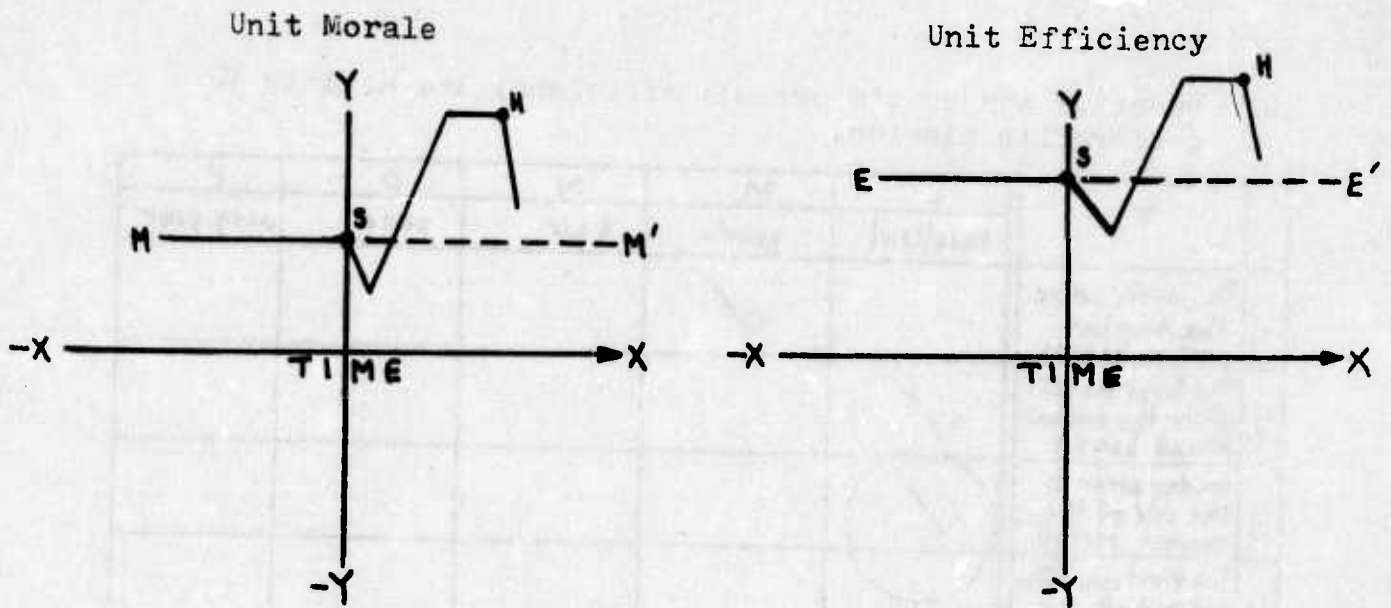


Figure 18.

Q. Describe the morale of unit personnel, in your opinion.

T	L	M	N	O	P
	very high	high	moderate	low	very low
1 The week before the combat period began			✓		
2 The first day(s) after the combat period began		✓			
3 The day prior to the end of the combat period		✓			
4 The first day after the end of the combat period			⊙		
5 The week following the end of the combat period					
6 other (explain)					

Figure 18a.

Q. Describe the unit's overall efficiency and ability to perform its mission.

	T	L	M	N	O	P
		excellent	good	fair	poor	very poor
1	The week before the combat period began		✓			
2	The first day(s) after the combat period began	✓				
3	The day prior to the end of the combat period	✓				
4	The first day after the end of the combat period		⊙			
5	The week following the end of the combat period					
6	Other (explain)					

Figure 18b.

• Step 15 - Add a line to each diagram, as shown in Figure 19. The point labeled "A" in Figure 19, indicates the point in time when the unit commander 'arrested' the rapid decline in both unit morale and efficiency: Observation 7, Table 4. The commander's action allowed for a gradual return to behavioral normalcy within the subject maintenance support unit. The normal, or average, levels of morale and efficiency in the subject maintenance unit were represented by the M M' and E E' lines, respectively.

Had the unit commander not arrested the decline in morale and efficiency which accompanied the end of the combat situation, it is conceivable that both morale and efficiency could have dropped below the base line (i.e., below M M' and

E E'). Figures 19a and 19b are continuations of the questionnaire.

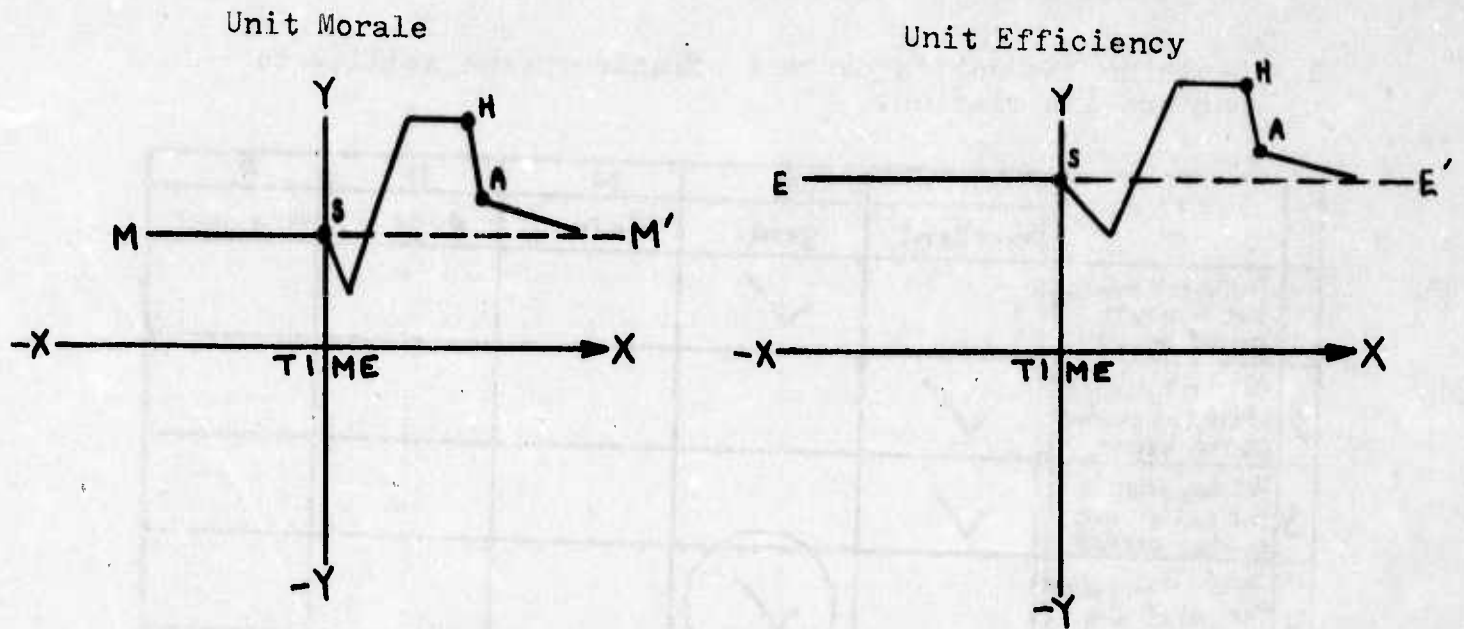


Figure 19.

Q. Describe the morale of unit personnel, in your opinion.

T	L	M	N	O	P
	very high	high	moderate	low	very low
1 The week before the combat period began			✓		
2 The first day(s) after the combat period began		✓			
3 The day prior to the end of the combat period		✓			
4 The first day after the end of the combat period			✓		
5 The week following the end of the combat period.			⊙ ✓		
6 other(explain)					

Figure 19a.

Q. Describe the unit's overall efficiency and ability to perform its mission.

	T	L	M	N	O	P
		excellent	good	fair	poor	very poor
1	The week before the combat period began		✓			
2	The first day(s) after the combat period began	✓				
3	The day prior to the end of the combat period	✓				
4	The first day after the end of the combat period		✓			
5	The week following the end of the combat period.		⊙ ✓			
6	Other (explain)					

Figure 19b.

• Step 16 - For purposes of this example, the author will assume that a linear relationship exists between unit morale and efficiency as depicted on the dual diagrams.¹⁷ The assumption of a linear relationship will enable the author to combine the two diagrams (i.e., morale and efficiency) into a single, composite diagram (see Figure 20). With this final assumption, a metamorphosis occurs transforming the two diagrams into a conceptual version of an analytical model of organizational behavior (Figure 21).

¹⁷Up until this point in the study, the author has offered no proof of the existence of a linear relationship between unit morale and efficiency. Such a relationship -- indicative of a behavioral trend -- has been artificially created in an effort designed to simplify the explanation of how the complete analytical model was constructed.

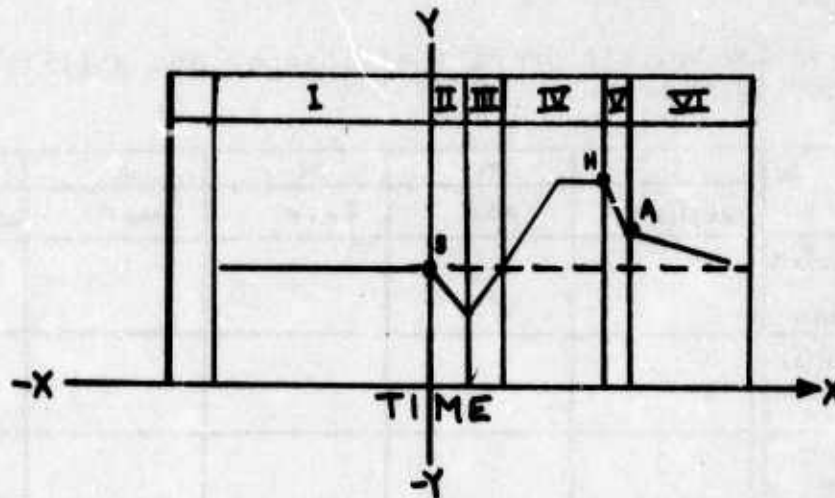
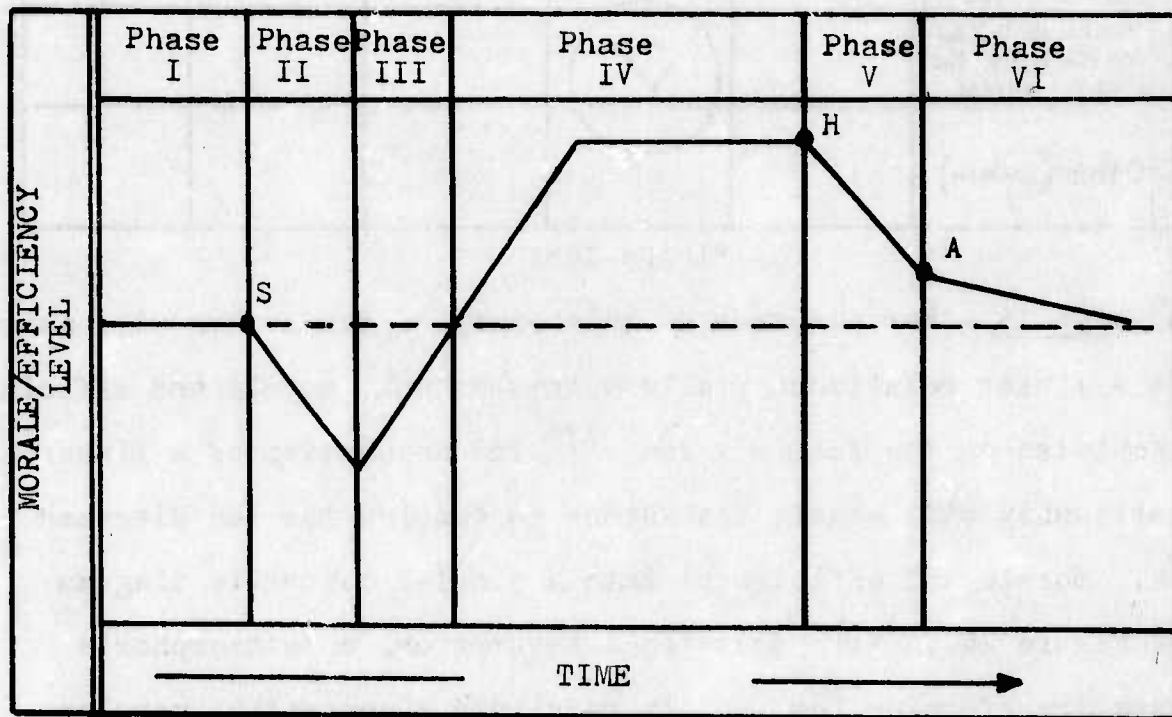


Figure 20. Composite Diagram of Unit Morale and Efficiency



- Phase I Pre-Combat Period.
- Phase II Initial Impact Period.
- Phase III Recovery Period.
- Phase IV Hyper-efficiency Period.
- Phase V Deceleration Period
- Phase VI Post-Combat Period

Figure 21. An Analytical Model of Organizational Behavior (example only)

Employing the Model

The methodology involved in employing the model is intentionally simplistic. This is in keeping with the philosophy stated earlier in this chapter, that an analytical model designed for use in a combat environment should be intrinsically manageable and intuitively understandable.

The manager assigned to a small maintenance support unit will not be required to go through the machinations of constructing the model. The analytical model could be provided to the maintenance unit manager on a small, wallet-size, card as shown in Figure 22. When a combat situation erupts, the manager need only glance at the model from time-to-time in order to determine which phase of organizational behavior his unit is experiencing at the moment. Possession of this knowledge will enable the manager to determine which phase of organizational behavior his unit will experience in the immediate future; consequently, enabling him to make better decisions relative to both personnel and production management.

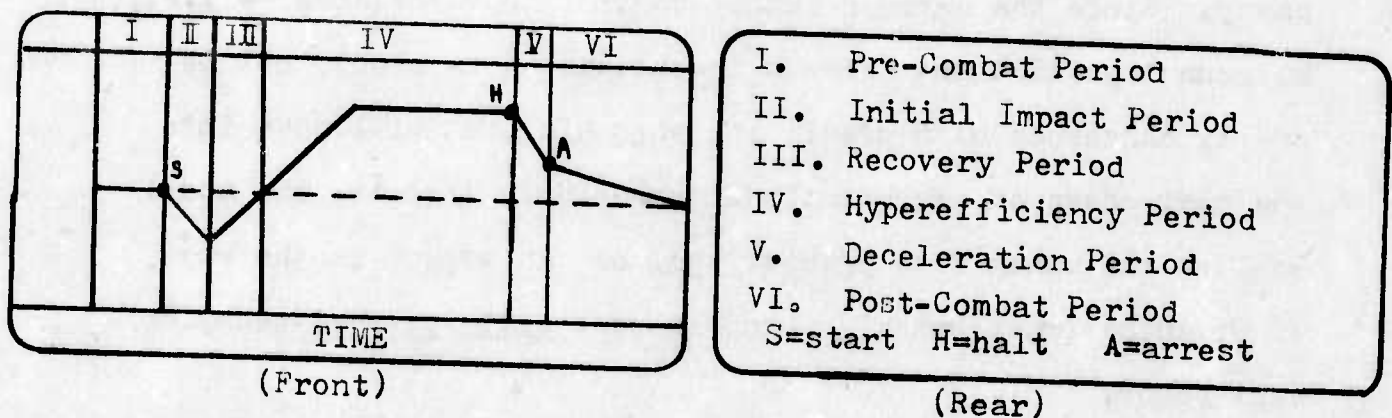


Figure 21a. Analytical Model
(example only)

An example of improved decision making capability through use of the analytical model, is offered below.

EXAMPLE: (1) A two-day enemy attack has just ended. The manager notes that since the combat intensity began to decrease, his personnel have begun neglecting their mission work.

(2) The manager glances at his analytical model and determines to his own satisfaction, that his unit is experiencing behavioral tendencies similar to those shown in Phase V.

(3) Based upon this conclusion, the manager realizes that his next decision must be directed toward arresting the decrease in unit morale and efficiency indicated in Phase VI of the model; lest both morale and efficiency drop below the base line.

--- END OF EXAMPLE ---

The model addresses the element of time along its horizontal axis, however, it cannot be employed to predict the duration of each phase, nor the amount of time that will elapse between the start of a given phase and its transition into the next phase of organizational behavior. The primary variable impacting on the duration of time that a given unit will remain in each phase of organizational behavior is the enemy. Since the manager cannot control this variable -- i.e., he cannot predict the enemy's intentions -- he should not be overly concerned with predicting when his unit will move into the next phase of organizational behavior. Instead, the model enables the manager to predict what he can expect in the way of organizational behavior, and in what sequence that behavior will occur.

Summary and Conclusions

The preceding pages have outlined a research methodology designed to resolve the problem statement, and oriented toward proving the hypothesis. A number of additional assumptions were introduced in this chapter, chief among which is the assumption that questionnaire responses obtained from the 701st Maintenance Battalion (the primary group) will be representative of the total, Army-wide, population of maintenance officers and noncommissioned officers who served with maintenance units while in the Republic of Vietnam.

Finally, methodological limitations, such as accepting a "+" or "-" 0.15 margin of error, were identified and addressed in detail.

Chapter IV consists of an analysis and evaluation of data extracted from questionnaires returned by primary and secondary group respondents.

CHAPTER IV

ANALYSIS AND EVALUATION

In recent years it has been recognized in public statements (as well as in textbooks) that analysis is not a scientific procedure for reaching decisions which avoid intuitive elements, but rather a mechanism for sharpening the intuitions of the decisionmaker.¹

Contained within this chapter are an analysis and evaluation of the responses to the questionnaire as received from the primary and secondary groups.

Analysis

A quantified analysis of responses to questions presented on the questionnaire can be found in Tables 9, 9a, 10, 10a, and Figures 22, 22a, 23, and 23a in Chapter V. Additional quantified analytical data is included in Appendix B to this study. In determining the amount of significance to be applied to each coefficient of correlation presented in Chapter V and in Appendix B, the reader is reminded that a level of significance has been established (in Chapter III) at 80%, and above.

¹James R. Schlesinger, Uses and Abuses of Analysis. Memorandum prepared at the request of the Subcommittee on National Security and International Operations, of the Committee on Government Operations, United States Senate (U.S. Government Printing Office: Washington, D.C., 22 April 1968).

Evaluation

The following inferences can be drawn as a result of analyzing questionnaire responses:

- Personnel assigned to divisional maintenance support organizations experienced basically the same organizational behavior pattern as did personnel assigned to nondivisional maintenance support organizations when subjected to an enemy attack. This conclusion is evidenced by findings cited in Chapter V, Tables 9, 9a, 10, 10a, and in Figures 22, 22a, 23, and 23a.
- Organizational behavior exhibited by combat service support troops under combat conditions was found to be consistent within maintenance support units examined. As attested to in the tables and figures referenced in the preceding paragraph, as well as by the dual maps shown on page B-2, Appendix B, organizational behavior trends remained consistent whether a particular unit was located in the Mekong Delta, in the Central Highlands, or near the demilitarized zone.
- Apparently the assigned strength of the small maintenance support unit, as reflected in questionnaire responses, has little effect on the organizational behavior of those units during combat. Appendix B, Table B/2 reflects unit strength figures ranging from under 90% to well over 100%; the disparity having no apparent effect on behavioral tendencies as shown in tables and figures in Chapter V.

- Nor was combat organizational behavior found to be readily affected by the size of the force being supported by the small maintenance support unit. Appendix B, Table B/3 reflects unit support loads varying from company-sized units to a full brigade plus attached units; yet with no apparent affect upon unit behavioral trends.

- A clear majority of respondents experienced between 5 and 10 enemy attacks (see Appendix B, Table B/4). The combat experience gained by personnel within these units did not, however, significantly alter the pattern of their organizational behavior as depicted in tables and figures in Chapter V. This would seem to support the premise that combat experience alone is insufficient to attenuate the negative psychophysiological reactions to combat experienced by combat service support personnel.²

- Nearly 80% of the attacks experienced by questionnaire respondents (primary group) were rocket and/or mortar attacks. This factor must be cited here as a limitation to any predictive claims made within the current study, as future battlefields will no doubt find the U.S. soldier subjected to attack by armored vehicles and aircraft in addition to conventional indirect fire bombardment. Whether or not these additional threats will result in a behavior pattern different from

²In Table 3, page 44A, reference is made to the medical observation that fear of combat actually increases with experience.

that presented in Chapter V, is a matter for speculation.³

- The duration of the typical enemy attack experienced by questionnaire respondents was from several hours to one day. See Table B/6, Appendix B. It is of significance in light of data presented in Table B/6, that whether a combat experience was of brief duration or lasted for several days, the identical pattern of organizational behavior emerged: the pattern reflected in Figures 22, 22a, 23, and 23a in Chapter V.

- Tables and figures shown on page B-5, Appendix B, indicate that in most cases the maintenance backlog of jobs decreased initially with the start of the combat situation, then increased due to combat damage. This increased level of maintenance backlog remained fairly stable throughout the remainder of the combat situation; decreasing at some point after the combat period had ended.

- Of the seven behavioral characteristics listed in Table B/15, four were overwhelmingly selected by questionnaire respondents. These four characteristics of organizational

³It should be noted here that the consideration of armored vehicle and aircraft attack were not included in the questionnaire. The rationale for this omission lies in the fact that: (1) the U.S. Army has not experienced a significant armored attack against its forces in almost 30 years; and (2) the U.S. military, with very few exceptions, has historically enjoyed air superiority on the battlefield. These two considerations made it very unlikely that good data could be obtained in answer to questions asked relative to armored and aircraft attack. The very real possibility of U.S. Army personnel being subjected to these threats on future battlefields makes them (i.e., the armored and aircraft threats) important matters for future research. Their omission from the present study must be recognized as a shortcoming.

behavior under conditions of combat have one common denominator: they are each identified with the additional work effort which accompanies a combat situation. This particular behavioral characteristic of maintenance support personnel in combat is capsulized in the author's terminology as hyperefficiency. This hyperefficiency usually occurs during the early stages of a given combat situation after unit personnel have experienced and recovered from the initial impact of the enemy attack (see tables and figures on pages 102 and 103, Chapter V). This period is short-lived. Should the combat period last for only two or three days, hyperefficiency will probably continue until the end of the enemy attack. In a prolonged enemy attack (three days or longer) sleep deprivation will begin to impair the individual soldier's job performance (see Table 2, page 43A). If the unit managers take measures to conserve the energy of their personnel, this hyperefficiency will continue until the end of the combat period, irrespective of the duration of enemy action.

- Only two of the 21 questions in the questionnaire have been identified as key questions. These questions are analyzed in tables and figures appearing on pages 102 and 103, Chapter V. The aforementioned questions deal with unit morale and efficiency: seemingly nebulous terms, but nevertheless discovered to be the two indicators of organizational

behavior that questionnaire respondents could consistently identify with. It is for this reason that "morale" and "efficiency" are employed as behavioral yardsticks in the construction of a model of organizational behavior -- presented in Chapter V.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The end of study should be to direct the mind towards the enunciation of sound and correct judgments on all matters that come before it.



René Descartes

The material contained within this chapter represents the culmination of eight months of behavioral research. Revealed within the next few pages will be: (1) the "actual" Analytical Model of Organizational Behavior; (2) the resolution of the Problem Statement; and (3) proof of the Hypothesis.

Two Key Questions

The two key questions appearing on page 6 of the questionnaire have repeatedly been referred to as the linchpins of this research effort, in so far as they impact directly upon the construction of an analytical model. Tables 9, 9a, 10, 10a, and Figures 22, 22a, 23, and 23a provide a detailed look at responses received to the aforementioned key questions.

Each of the Tables mentioned above contains three elements: (1) the actual question appearing on the questionnaire; (2) the number of responses recorded for each answer pertaining to that question; and (3) the percentage of respondents who selected each answer pertaining to a given question. A coefficient of correlation, comparing the responses selected by the primary group (X) to those of the secondary group (Y) is also

offered in the next few pages. Each of the individual boxes shown in Tables 9, 9a, 10, and 10a contains two elements: (1) recorded in the upper-left portion of each box is the number of respondents who selected a given response (); (2) recorded in the lower-right portion of each box is the percentage of respondents who selected a given question response... ().

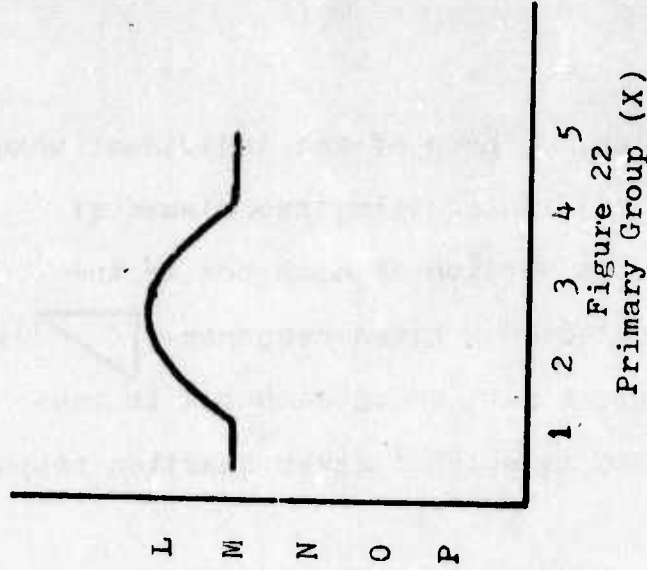
Diagrams corresponding to each table, appear to the right of their respective tables. In each of these diagrams, the vertical axis (i.e., L,M,N,O, and P) corresponds to columns L,M,N,O, and P of the related question. Similarly, the horizontal axis of the diagrams (i.e., 1,2,3,4, and 5) correspond to the subsection of each question labeled 1,2,3,4, and 5. No provision has been made in any of the diagrams for a number "6" along the horizontal axis, as none of the questionnaire respondents selected block number 6.

Go to next page.

Q. Describe the morale of unit personnel, in your opinion.

T	L very high	M high	N moderate	O low	P very low
1 The week before the combat period began	7 .17	21 .51	13 .32	0 .00	0 .00
2 The first day(s) after the combat period began	28 .68	8 .20	2 .05	3 .07	0 .00
3 The day prior to the end of the combat period	24 .59	13 .32	3 .07	1 .02	0 .00
4 The first day after the end of the combat period	9 .22	29 .71	1 .02	2 .05	0 .00
5 The week follow- ing the end of the combat period	10 .24	24 .59	5 .12	2 .05	0 .00
6 other (explain)					

Table 9. Primary Group (X)

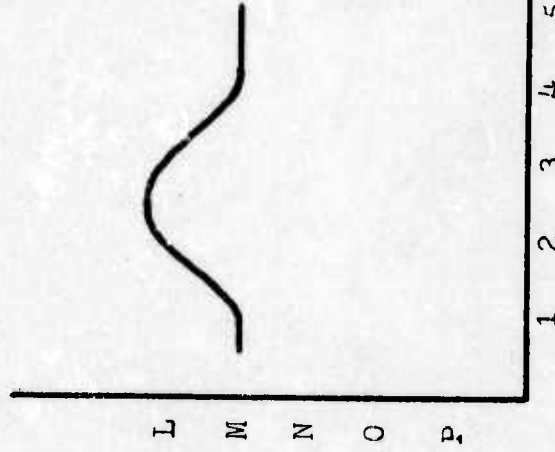


Q. Describe the morale of unit personnel, in your opinion.

T	L very high	M high	N moderate	O low	P very low
1 The week before the combat period began	1 .10	6 .60	2 .20	1 .10	0 .00
2 The first day(s) after the combat period began	7 .70	2 .20	1 .10	0 .00	0 .00
3 The day prior to the end of the combat period	6 .60	3 .30	1 .10	0 .00	0 .00
4 The first day after the end of the combat period	4 .40	5 .50	1 .10	0 .00	0 .00
5 The week following the end of the combat period	2 .20	5 .50	2 .20	1 .10	0 .00
6 Other (explain)					

Table 9a. Secondary Group (Y)

Coefficient of correlation = .942413

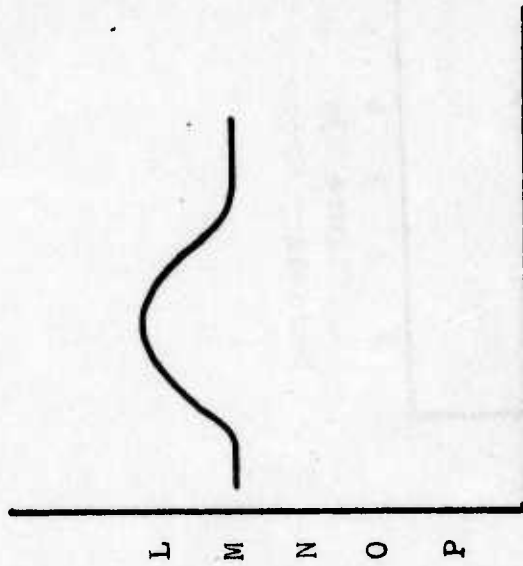


1 2 3 4 5
Figure 22a
Secondary Group (Y)

Q. Describe the unit's overall efficiency and ability to perform its mission.

T	L excellent	M good	N fair	O poor	P very poor
1 The week before the combat period began	11 .27	21 .51	6 .15	3 .07	0 .00
2 The first day(s) after the combat period began	33 .81	6 .15	1 .02	1 .02	0 .00
3 The day prior to the end of the combat period	29 .71	8 .20	3 .07	1 .02	0 .00
4 The first day after the end of the combat period.	16 .39	19 .46	4 .10	2 .05	0 .00
5 The week following the end of the combat period.	11 .27	28 .68	2 .05	0 .00	0 .00
6 other (explain)					

Table 10. Primary Group (X)



1 2 3 4 5

Figure 23
Primary Group (X)

Q. Describe the unit's overall efficiency and ability to perform its mission.

Coefficient of Correlation = .847005

T	L excellent	M good	N fair	O poor	P very poor
1 The week before the combat period began	0 .00	8 .80	1 .10	1 .10	0 .00
2 The first day(s) after the combat period began	7 .70	2 .20	1 .10	1 .10	0 .00
3 The day prior to the end of the combat period	6 .60	2 .20	2 .20	0 .00	0 .00
4 The first day after the end of the combat period	0 .00	6 .60	3 .30	1 .10	0 .00
5 The week following the end of the combat period	1 .10	7 .70	2 .20	0 .00	0 .00
6 Other(explain)					

Table 10a. Secondary Group (Y)

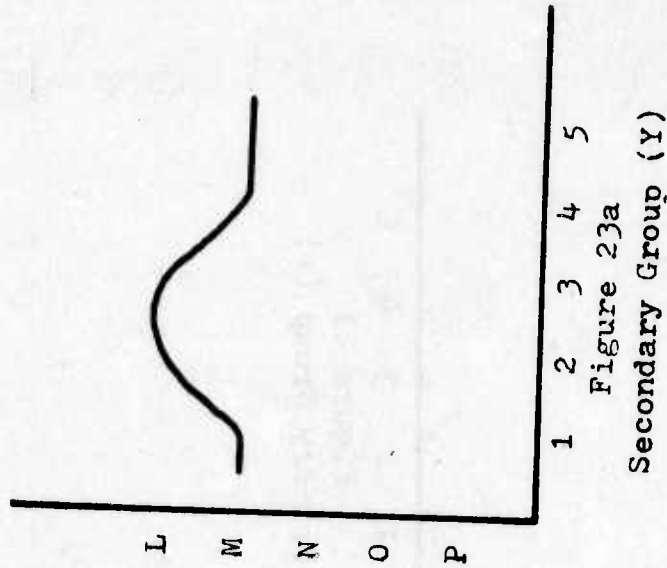


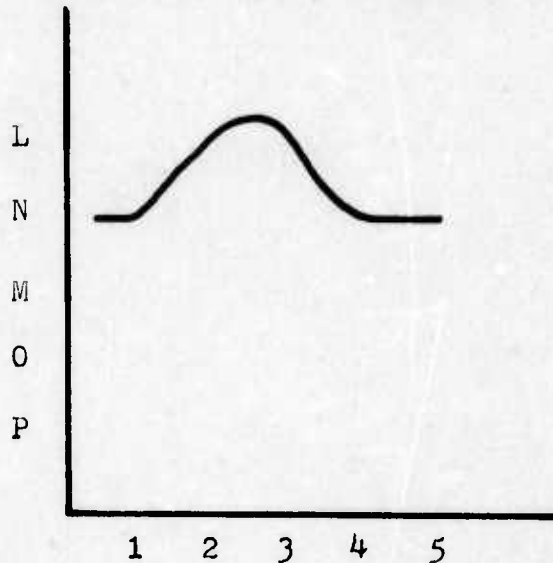
Figure 23a
Secondary Group (Y)

Derivation of the Analytical Model

● Step 1 - It can be inferred from the responses appearing on page 102, and from the associated diagrams appearing on that same page, that a definite pattern of unit morale exists within a maintenance unit during a combat situation. Morale has previously been defined as an indicator of organizational behavior. As Figures 22 and 22a (page 102) are identical -- and as the data which they represent has a .94 coefficient of correlation -- it is suggested that these two diagrams be combined into a single diagram as shown in Figure 24, below.

● Step 2 - It can also be inferred from the responses appear-

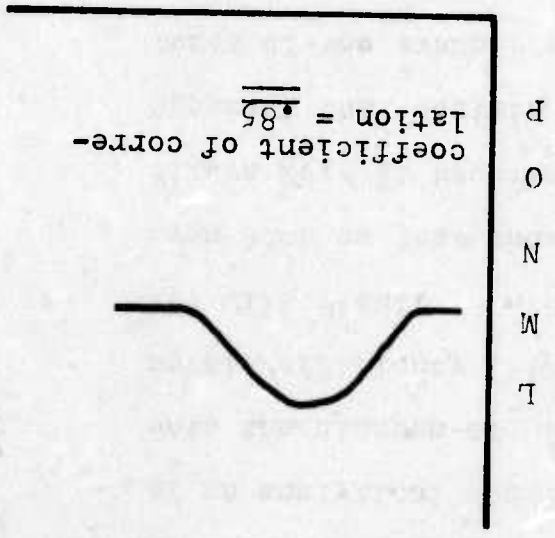
Figure 24. Unit Morale
(A composite of primary and
secondary group diagrams).



ing on page 103, and from the associated diagrams appearing on that same page, that a definite pattern of unit efficiency exists within a maintenance unit during a combat period. As Figures 23 and 23a (page 103) are identical -- and as the data which they represent has a .85 (approximate)

coefficient of correlation -- it is suggested that these two diagrams be combined to form a single, composite diagram as shown in Figure 25.

Figure 25. Unit Efficiency (A composite of primary and secondary group diagrams).



• Step 3 - The coefficient of correlation between the morale and unit efficiency data was determined -- via use of the LINREG program -- to be .91 (approximate) for the primary group, and .84 (approximate) for the secondary group. The author suggests that the relatively high coefficient of correlation (shown above), in conjunction with the identical nature of the curves appearing in Figures 24 and 25, justifies their consolidation into a single, composite diagram (see Figure 26).

• Step 4 - In Chapter III an example of an analytical model was presented (Figure 21). An exponential smoothing of the straight lines shown in that conceptual version of an analytical model will result in a diagram such as the one shown in Figure 27.

Figure 26. Unit Morale/Efficiency (A composite of primary and secondary group diagrams).

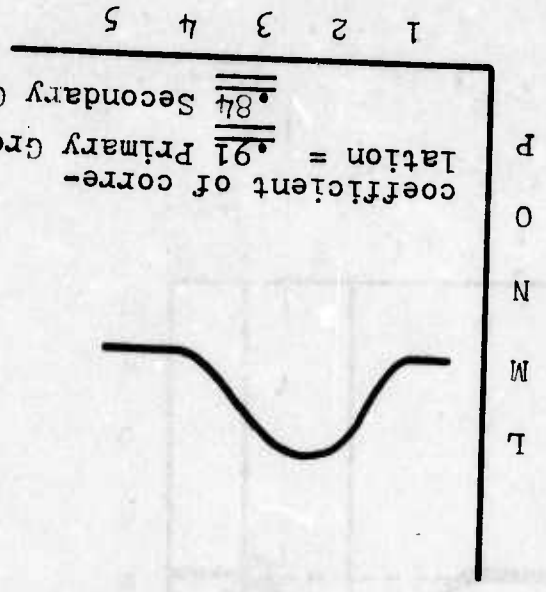


Figure 27. Exponential Smoothing
PHASES

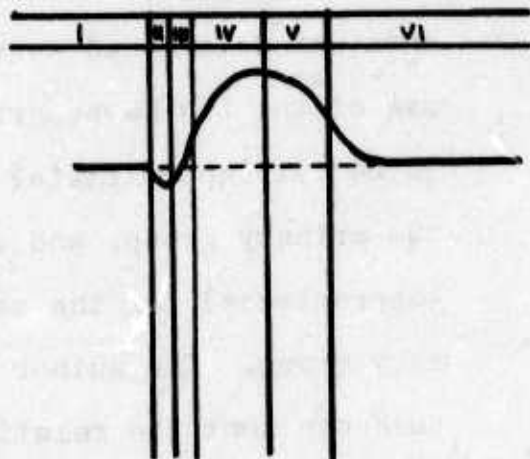
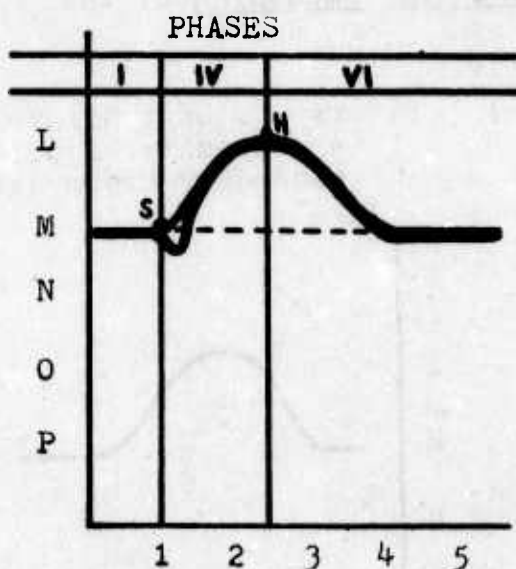


Figure 28. Superimposed Diagram



Superimposing the exponentially-smoothed example of an analytical model onto the diagram of unit morale/efficiency (Figure 26) will result in a diagram such as that shown in Figure 28. It becomes apparent that certain features of the example analytical model coincide with

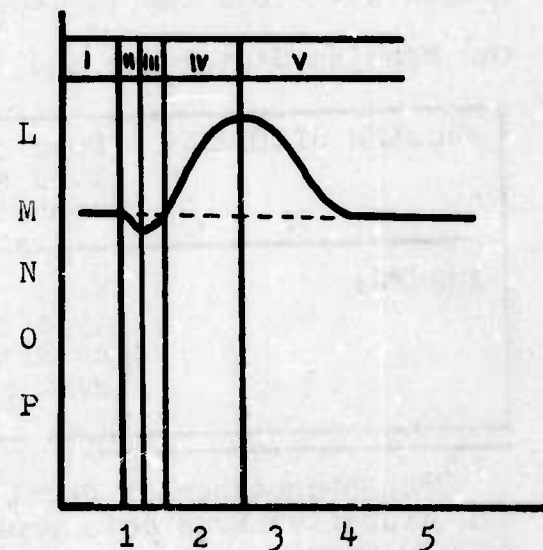
certain features of the unit morale/efficiency diagram. Specifically, one can readily identify: (1) Phase I, a Pre-Combat Period; (2) "S", the point in time when the combat period started; (3) Phase IV, the Hyperefficiency Period; (4) "H", the point in time when the enemy attack halted; (5) Phase VI, a Post-Combat Period; and (6) a base line (broken line) depicting the normal level of unit morale and efficiency.

● Step 5 - The only features not readily identifiable in Figure 28 are: (1) Phase II, an Initial Impact Period, during which time unit morale and efficiency decline somewhat for a brief period; (2) Phase III, a Recovery Period, during which time unit personnel psychologically adjust to the enemy attack (explained in Chapter III, pages 77 through 81) and return to their normal (base line) levels of morale and efficiency; (3) a point "A" indicating an action taken by unit managers to arrest the decline in unit morale and efficiency which accompanies the end of a combat period; and (4) a Phase V, Deceleration Period, indicative of a rapid dropping-off in unit morale and efficiency concomitant with the end of the combat period.

At this time, add Phases II and III to the diagram, as is shown in Figure 29. The rationale for adding these features to the diagram was originally offered on pages 78 through 81; to include Footnote 15 (page 79) and Footnote 16 (page 81).

The phenomenon of a rapid decline ("deceleration") in both unit morale and efficiency immediately following the end of the combat period, was not discovered by the author until late in the current research effort. This element of organizational behavior came to the author's attention

Figure 29.



after the questionnaire had already been distributed.¹ As a result, no conclusive evidence was obtained to quantifiably support the existence of this phase of organizational behavior. For this reason it has been omitted from the final analytical model (Figure 30) lest it detract from the credibility of the model. A point "A" has nevertheless been incorporated into the final analytical model, as an indicator to the maintenance unit manager that -- once unit morale and efficiency begin to decline from their hyperefficiency level -- there may exist a necessity for "arresting" that decline.

Resolution of the Problem Statement
and
Affirmation of the Hypothesis

Early in the research effort, unit morale and efficiency were identified as key elements with respect to resolving the Problem Statement (page 13) and proving the Hypothesis (page 23). The author submits that within Steps 1 through 5 (pages 104 -107) can be found sufficient evidence to: (1) answer the Problem Statement; and (2) affirm the Hypothesis.

PROBLEM STATEMENT	Does the organizational behavior exhibited by a small maintenance support unit, in a combat environment, form a distinct pattern?
ANSWER:	Yes! The organizational behavior exhibited by a small maintenance support unit, in a combat environment, does in fact form a distinct behavior pattern.

¹The phenomenon of deceleration in unit morale and efficiency, was extracted from data presented in Tables 4 and 5, as well as from comments added to several of the questionnaires returned to the author.

HYPOTHESIS	An examination of organizational behavior in a small maintenance support unit -- in a combat situation -- will reveal a distinct behavior pattern.
AFFIRMATION:	Figure 29, as derived from data extracted from the two key questions in the questionnaire, as well as from suppositions detailed on pages 78 through 81 of this study, provides the basis for claiming that organizational behavior within a small maintenance support unit (in a combat situation) does in fact form a distinct pattern.

The task remaining for the author is to develop an analytical model of organizational behavior that will graphically represent this distinct behavior pattern. The figure shown below represents such a graphic representation. This complete and final version of an analytical model was constructed by employing the methodological techniques outlined in Chapter III, and by incorporating data extracted from Tables 9, 9a, 10, and 10a.

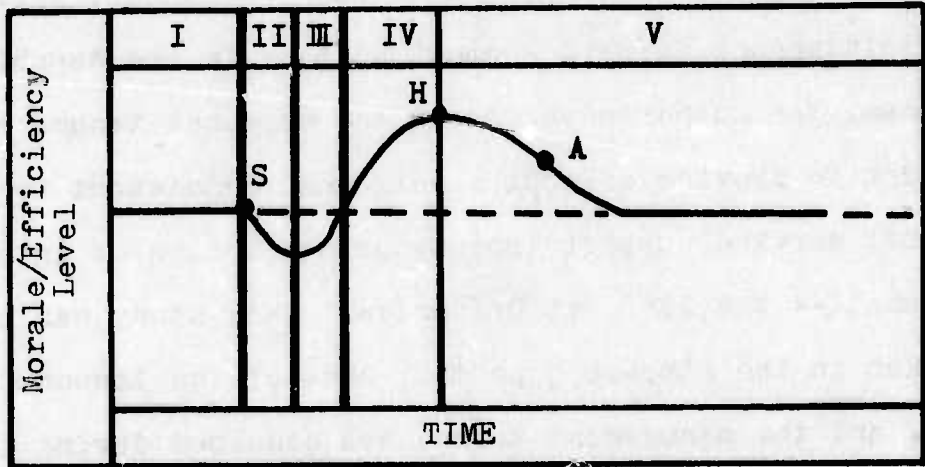


Figure 30. An Analytical Model of Organizational Behavior

- Phase I. Pre-Combat Period
- Phase II. Initial Impact Period
- Phase III. Recovery Period
- Phase IV. Hyperefficiency Period
- Phase V. Post-Combat Period

Recommendations

Based upon the conclusions drawn in this and in other chapters, the author recommends that the U.S. Army Ordnance School: (1) introduce the subject of "personnel management under combat conditions" into its Management block of instruction for officers and noncommissioned officers; (2) that the Ordnance School sponsor an in-depth investigation into the problems encountered in personnel management within a maintenance company in a combat environment; and (3) that the Ordnance School subject the author's Analytical Model of Organizational Behavior to additional scrutiny with the objective of introducing that model into the Management course of study -- should the model prove to be an acceptable and valid tool.

As a 1st Lieutenant, and company commander, serving with a maintenance forward support company in the Republic of Vietnam, the author experienced the personal trauma of attempting to provide effective personnel management for 145 combat service support troops during 30 days of intensive combat -- the 1968 Tet Offensive. This study has been undertaken in the sincere hope that some of the lessons learned, and the management techniques acquired during those trying days will serve to assist maintenance unit managers on some future and as yet undefined battlefield.



APPENDIX A



21 November 1974

SUBJECT: MMAS Questionnaire

I am gathering research material as part of my academic studies at the U.S. Army Command and General Staff College, and request your assistance in completing the attached questionnaire. This questionnaire has been designed to gather behavioral information regarding the reactions of maintenance personnel to the stresses of combat. There is no intention of finding fault with specific organizations or individuals. The reader is asked not to attempt to "read into" each question, but rather to answer the questions in accordance with your recollections of the conflict in Vietnam.

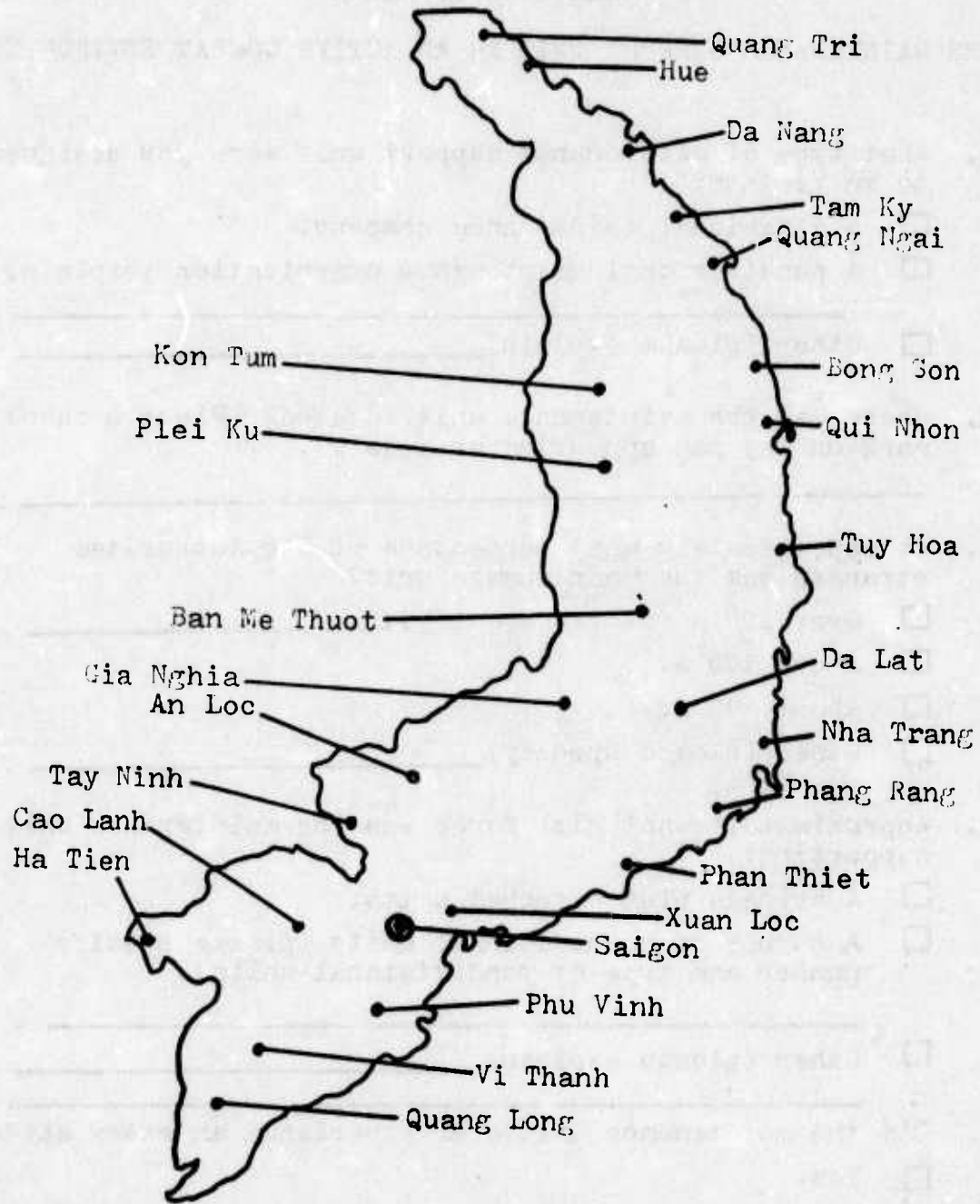
As maintenance officers and noncommissioned officers who have served with maintenance units in Vietnam, we are aware that the enemy occasionally launched attacks against installations on which a maintenance unit was located. Sometimes these were brief mortar attacks. On other occasions, as in the Tet Offensive of 1968, the combat period lasted for several weeks and included enemy ground assaults. During these combat periods maintenance support personnel often lived and worked in an active combat environment -- an environment that differed considerably from the normal day-to-day life on a typical base camp.

In answering the attached questions please try to recall your experiences with maintenance units in Vietnam. I am aware that a questionnaire of this nature represents an imposition upon your time; however, it has been conceived in the sincere hope that subsequent findings will contribute to the Army's knowledge about organizational management of combat service support organizations.

Thank you in advance for your courtesy and attention in this matter. Please return completed questionnaire to me in Section 17.

JOHN S. COWINGS
CPT (P), OD
Student Detachment, Section 17
US Army Command and General Staff College
Fort Leavenworth, Kansas 66027

REPUBLIC OF VIETNAM



MMAS QUESTIONNAIRE

THE MAINTENANCE SUPPORT UNIT IN AN ACTIVE COMBAT ENVIRONMENT

- Q. What type of maintenance support unit were you assigned to in Vietnam?
- A divisional maintenance company.
 - A nondivisional maintenance organization (explain).

 - Other (please explain) _____
- Q. Where was the maintenance unit located? (Place a check mark on the map appearing on page 2).

- Q. At approximately what percentage of its authorized strength was the maintenance unit?
- Over 100 % (please specify) _____
 - About 100 %.
 - About 90 %.
 - Other (please specify) _____
- Q. Approximately what size force was the maintenance unit supporting?
- A brigade plus attached units.
 - A number of nondivisional units (please specify number and type of nondivisional units).

 - Other (please explain) _____
- Q. Did the maintenance unit ever experience an enemy attack?
- Yes.
 - No.

If the answer to the previous question is yes; please continue. If the answer is no, please stop at this point. Thank you for your assistance.

Q. How many enemy attacks did you witness as a member of the maintenance unit?

- Less than five attacks (please specify) _____
- About five enemy attacks.
- Between five and ten enemy attacks.
- Other (please specify number) _____

Q. Describe the nature of a typical enemy attack. (Select one or more).

- A large ground assault.
- A small probing ground assault.
- A rocket and/or mortar attack.
- Other (please explain) _____

In answering the following questions please try to recall the longest combat period that you experienced while serving with a maintenance unit in Vietnam. Whether the combat period lasted for a single day, for several days, or for several weeks, your recollections can provide valuable insight for this study.

Q. Of what duration was the longest combat period (enemy attack) that you witnessed as a member of the maintenance unit?

- Approximately one day.
- Approximately _____ days.
- Approximately _____ weeks.
- Other (please explain) _____

Q. Did any of the unit's officers or key noncommissioned officers arrive in the maintenance unit just prior to, or during, the combat period?

- Yes. (Please give job title and date of arrival).
- No. _____

Q. During the combat period did the number of units supported by the maintenance unit increase, decrease, or remain the same?

- Increased.
- Decreased.
- Remained the same.

Q. During the combat period did the maintenance unit receive assistance for mission-related tasks from any other organization(s)?

- Yes. (Please explain) _____
- No.

The next three questions concern five time periods shown in Column T. Columns L, M, N, O and P list different descriptions or weights. Please read each statement in Column T and then select the description from Columns L, M, N, O or P which best matches the statement in Column T. Place a check mark in the appropriate grid square. An example is shown below:

EXAMPLE - Q. Describe the maintenance unit's backlog.

	T	L	M	N	O	P
		much above average	slightly above average	average	slightly below average	much below average
1	The week before the combat period began.			✓		
2	The first day(s) after the combat period began.				✓	

Q. Describe the maintenance unit's backlog of jobs at the end of a work day.

	T	L	M	N	O	P
		much above average	slightly above average	average	slightly below average	much below average
1	The week before the combat period began.					
2	The first day(s) after the combat period began.					
3	The day prior to the end of the combat period.					
4	The first day after the end of the combat period.					
5	The week following the end of the combat period.					
6	OTHER (explain)					

Q. Describe the morale of unit personnel, in your opinion.

	T	L	M	N	O	P
		very high	high	moderate	low	very low
1	The week before the combat period began.					
2	The first day(s) after the combat period began.					
3	The day prior to the end of the combat period.					
4	The first day after the end of the combat period.					
5	The week following the end of the combat period.					
6	OTHER (explain).					

Q. Describe the unit's overall efficiency and ability to perform its mission.

	T	L	M	N	O	P
		excellent	good	fair	poor	very poor
1	The week before the combat period began.					
2	The first day(s) after the combat period began.					
3	The day prior to the end of the combat period.					
4	The first day after the end of the combat period.					
5	The week following the end of the combat period.					
6	OTHER (explain).					

Q. Had the maintenance unit ever been under enemy fire before?

Yes.

No.

If the answer to the previous question is no, please skip the next question and continue.

Q. When had the maintenance unit previously been under enemy fire?

A few days earlier.

One week earlier.

Several weeks earlier.

One month earlier.

Other (Please explain). _____

Q. Were maintenance unit personnel required to perform non-maintenance type jobs during the combat period, such as perimeter guard duty?

Yes. (Please explain). _____

No.

Q. During the combat period did maintenance unit personnel do any of the following? (Select one or more).

Willingly worked longer hours than usual.

Avoided working longer hours when possible.

Worked in spite of fatigue and/or injuries.

Worked without the need for supervision.

Required extra supervision while on the job.

Volunteered for contact team duty.

Avoided contact team duty.

Other (Please explain). _____

Q. If, in your opinion, maintenance unit personnel put on an extra work effort, when did this period of extra effort occur?

During the early stages of the combat period.

During the middle of the combat period.

Toward the end of the combat period.

After the end of the combat period.

Other (Please explain). _____

Q. In your opinion, had maintenance unit personnel received adequate combat training (in Vietnam) prior to the start of the combat period?

- Yes.
- No.

Q. During the combat period did you observe any of the following changes in the unit's lifestyle? (Select one or more).

- Unit personnel had to sleep in bunkers.
- Personnel were unable to rest or sleep.
- Personnel neglected their personal hygiene (i.e., they did not shave, bathe or change clothing regularly).
- Personnel did not have hot meals available.
- Other (Please explain) _____

Thank you for your courtesy in answering these questions. If you desire followup information regarding the outcome of this survey, please include your name and address in the space provided below.

- I desire to know the outcome of this survey.

NAME/RANK/SSN _____



ADDRESS _____

APPENDIX B

Appendix B

Each table included within this appendix consists of four elements:

- (1) The actual questions appearing on the questionnaire;
- (2) the number of responses recorded for each answer pertaining to that question;
- (3) the percentage of respondents who selected each answer pertaining to a given question; and
- (4) the coefficient of correlation comparing the responses selected by the primary group (X) to those of the secondary group (Y).

Each of the individual boxes shown in the table on page B-5, contains two elements. Recorded in the upper-left portion of each box is the number of respondents who selected a given question response (). Recorded in the lower-right portion of each box is the percentage of respondents who selected a given response ().

Also included on page B-5 are two graphic diagrams, each of which relates to the table to its immediate left. In each of these diagrams, the vertical axis (i.e., L,M,N,O, and P) corresponds to columns L,M,N,O, and P of the related table. Similarly, the horizontal axis of the diagrams (i.e., 1,2,3,4, and 5) correspond to the subsections of each table labeled 1,2,3,4, and 5. Note that no provision has been made for a number "6" in either of the diagrams, as none of the questionnaire respondents selected block number 6.

The reader is asked to remember that the only coefficients of correlation categorized as significant as those equal to, or exceeding 80%.

Primary Group		Secondary Group		Q. What type of maintenance unit assigned to in Vietnam?
No.	%	No.	%	
23	.56	5	.50	• A divisional maintenance company.
15	.37	2	.20	• A nondivisional maintenance organization.
3	.07	3	.30	• Other.
41	1.00	10	1.00	Total

Coefficient of correlation = .563621

Table B/1

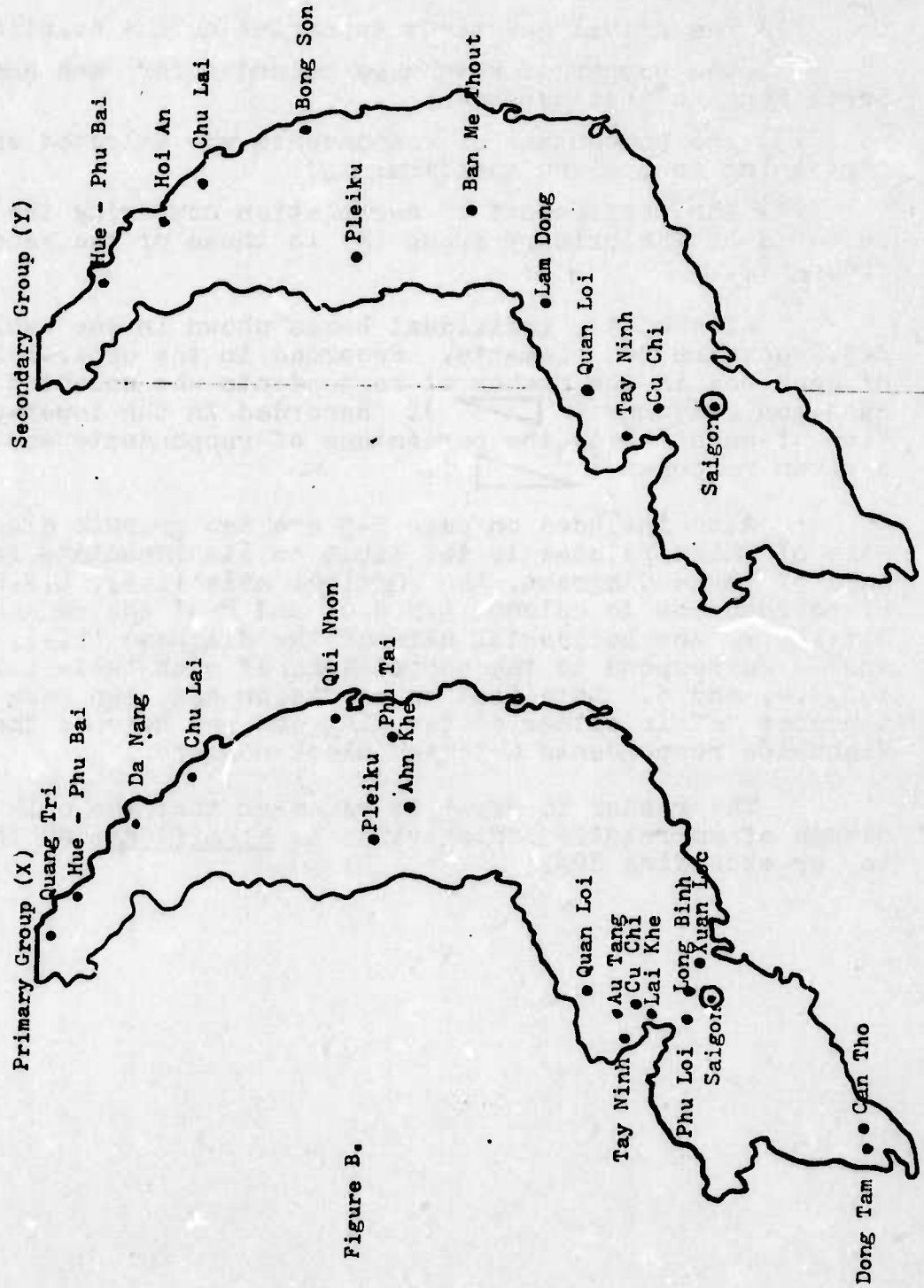


Figure B.

Primary Group		Secondary Group		Q. At approximately what percentage of its authorized strength was the maintenance unit?
No.	%	No.	%	
2	.05	2	.20	• Over 100%
11	.27	3	.30	• About 100%
27	.66	2	.20	• About 90%
1	.02	3	.30	• Other.
41	1.00	10	1.00	Total
				Coefficient of correlation = -.407661

Table B/2

Primary Group		Secondary Group		Q. Approximately what size force was the maintenance unit supporting?
No.	%	No.	%	
20	.49	6	.60	• A brigade plus attached units.
10	.24	1	.10	• A number of nondivisional units.
11	.27	3	.30	• Other.
41	1.00	10	1.00	Total
				Coefficient of correlation = .949947

Table B/3

Primary Group		Secondary Group		Q. How many enemy attacks did you witness as a member of the maintenance unit?
No.	%	No.	%	
7	.17	0	.00	• Less than five attacks.
9	.22	2	.20	• About five enemy attacks.
19	.46	7	.70	• Between five and ten enemy attacks.
6	.15	1	.10	• Other.
41	1.00	10	1.00	Total
				Coefficient of correlation = .979521

Table B/4

Primary Group		Secondary Group		Q. Describe the nature of a typical enemy attack.
No.	%	No.	%	
0	.00	0	.00	• A large ground assault.
6	.15	1	.10	• A small probing ground assault.
32	.78	8	.80	• A rocket and/or mortar attack.
3	.07	1	.10	• Other.
41	1.00	10	1.00	Total
				Coefficient of correlation = .996375

Table B/5

Table B/6

Primary Group		Secondary Group		Q. Of what duration was the longest combat period (enemy attack) that you witnessed as a member of the maintenance unit?
No.	%	No.	%	
21	.51	5	.50	<ul style="list-style-type: none"> • Approximately one day. • Approximately 3 days • Approximately 1 week(s) • Other.
14	.34	1	.10	
2	.05	3	.30	
4	.10	1	.10	
41	1.00	10	1.00	
Total				Coefficient of correlation = .519284

Table B/7

Primary Group		Secondary Group		Q. Did any of the unit's officers or key noncommissioned officers arrive in the maintenance unit just prior to, or during, the combat period?
No.	%	No.	%	
3	.07	3	.30	<ul style="list-style-type: none"> • Yes. • No.
38	.93	7	.70	
41	1.00	10	1.00	
Total				Coefficient of correlation = 1

Table B/8

Primary Group		Secondary Group		Q. During the combat period did the number of units supported by the maintenance unit increase, decrease, or remain the same?
No.	%	No.	%	
6	.15	2	.20	<ul style="list-style-type: none"> • Increased. • Decreased. • Remained the same.
1	.02	2	.20	
34	.83	6	.60	
41	1.00	10	1.00	Total
Total				Coefficient of correlation = .990072

Table B/9

Primary Group		Secondary Group		Q. During the combat period did the maintenance unit receive assistance for mission-related tasks from any other organization(s)?
No.	%	No.	%	
4	.10	3	.30	<ul style="list-style-type: none"> • Yes. • No.
37	.90	7	.70	
41	1.00	10	1.00	
Total				Coefficient of correlation = 1

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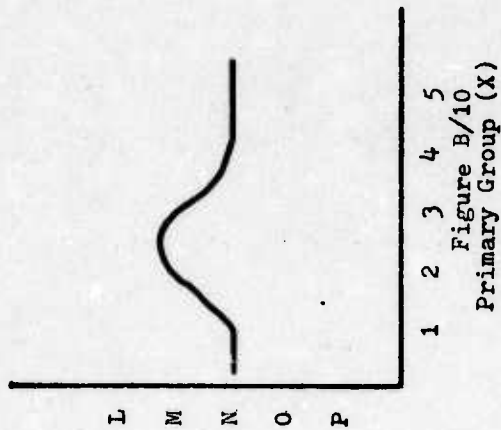
B-5

Q. Describe the maintenance unit's backlog of jobs at the end of a work day.

T	L much above average	M slightly above average	N average	O slightly below average	P much below average
1 The week before the combat period began	1 .02	4 .10	34 .81	2 .05	1 .02
2 The first day(s) after the combat period began	2 .05	23 .56	9 .22	6 .15	1 .02
3 The day prior to the end of the combat period.	3 .07	24 .59	8 .20	5 .12	1 .02
4 The first day after the end of the combat period.	5 .12	11 .27	21 .51	2 .05	2 .05
5 The week follow- ing the end of the combat period	3 .07	8 .20	29 .71	1 .02	0 .00
6 other(explain)					

Table B/10. Primary Group (X)

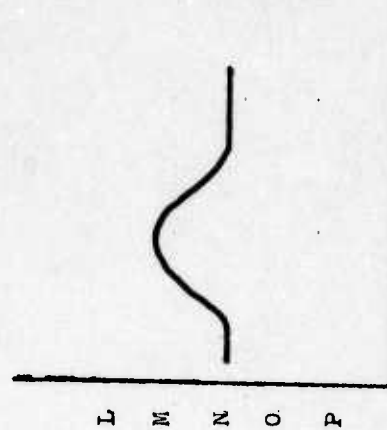
Coefficient of correlation = .8704



Q. Describe the maintenance unit's backlog of jobs at the end of a work day.

T	L much above average	M slightly above average	N average	O slightly below average	P much below average
1 The week before the combat period began	2 .20	3 .30	5 .50	0 .00	0 .00
2 The first day(s) after the combat period began	1 .10	6 .60	3 .30	0 .00	0 .00
3 The day prior to the end of the combat period	2 .20	6 .60	2 .20	0 .00	0 .00
4 The first day after the end of the combat period	2 .20	1 .10	7 .70	0 .00	0 .00
5 The week follow- ing the end of the combat period.	1 .10	3 .30	6 .60	0 .00	0 .00
6 other(explain)					

Figure B/11
Secondary Group (Y)



NOTE: Tables and graphs relative to the key questions included on page 6 of the questionnaire, are contained in Chapter V, Conclusions and Recommendations.

Primary Group		Secondary Group		Q. Had the maintenance unit ever been under enemy fire before?
No.	%	No.	%	
38	.93	7	.70	• Yes.
3	.07	3	.30	• No.
41	1.00	10	1.00	Total
				Coefficient of correlation = 1

Table B/12

Primary Group		Secondary Group		Q. When had the maintenance unit previously been under enemy fire?
No.	%	No.	%	
7	.17	1	.10	• A few days earlier.
5	.12	1	.10	• One week earlier.
19	.46	5	.50	• Several weeks earlier.
6	.15	3	.30	• One month earlier.
4	.10	0	.00	• Other.
41	1.00	10	1.00	Total
				Coefficient of correlation = .875403

Table B/13

Primary Group		Secondary Group		Q. Were maintenance unit personnel required to perform non-maintenance type jobs during the combat period, such as perimeter guard duty?
No.	%	No.	%	
35	.85	8	.80	• Yes.
6	.15	2	.20	• No.
41	1.00	10	1.00	Total
				Coefficient of correlation = 1

Table B/14

Primary Group		Secondary Group		Q. During the combat period did maintenance unit personnel do any of the following? (Select one or more)
No.	%	No.	%	
39	N/A	9	N/A	• Willingly worked longer hours than usual.
0	N/A	0	N/A	• Avoided working longer hours when possible.
27	N/A	7	N/A	• Worked in spite of fatigue or injuries.
22	N/A	8	N/A	• Worked without the need for supervision.
1	N/A	0	N/A	• Required extra supervision while on the job.
21	N/A	9	N/A	• Volunteered for contact team duty.
0	N/A	0	N/A	• Avoided contact team duty.
0	N/A	0	N/A	• Other.
				Coefficient of correlation = .938845

Table B/15

Primary Group		Secondary Group		Q. If, in your opinion, maintenance unit personnel put on an extra work effort, when did this period of extra work effort occur?
No.	%	No.	%	
24	.59	6	.60	<input type="radio"/> During the early stages of the combat period.
3	.07	1	.10	<input type="radio"/> During the middle of the combat period.
1	.02	0	.00	<input type="radio"/> Toward the end of the combat period.
8	.20	2	.20	<input type="radio"/> After the end of the combat period.
5	.12	1	.10	<input type="radio"/> Other.
41	1.00	10	1.00	Total

Coefficient of correlation = .996129

Table B/16

Primary Group		Secondary Group		Q. In your opinion, had maintenance unit personnel received adequate combat training (in Vietnam) prior to the start of the combat period?
No.	%	No.	%	
23	.68	6	.60	<input type="radio"/> Yes.
13	.32	4	.40	<input type="radio"/> No.
41	1.00	10	1.00	Total

Coefficient of correlation = 1

Table B/17

Primary Group		Secondary Group		Q. During the combat period did you observe any of the following changes in the unit's lifestyle? (select one or more)
No.	%	No.	%	
12	N/A	7	N/A	<input type="radio"/> Unit personnel had to sleep in bunkers.
19	N/A	9	N/A	<input type="radio"/> Personnel were unable to rest or sleep.
5	N/A	1	N/A	<input type="radio"/> Personnel neglected their personal hygiene (i.e., they did not shave, bathe, or change clothing regularly).
4	N/A	3	N/A	<input type="radio"/> Personnel did not have hot meals available.
11	N/A	3	N/A	<input type="radio"/> Other.

Coefficient of correlation = .884032

Table B/18

BIBLIOGRAPHY

BIBLIOGRAPHY

- Attitude Branch, Armed Forces Information and Education Division, Office of the Secretary of Defense. New Soldier's Attitudes. An official Department of Defense study conducted in 1951.
- Banks, James H. The author was privileged to correspond with Dr. Banks, a research psychologist at the Army Research Institute (ARI), on the subject of behavioral science research in the Army.
- Bass, Bernard M. Leadership, Psychology, and Organizational Behavior. New York: Harper and Row, 1965. The text places greatest emphasis on the role of leadership when addressing organizational problems encountered in the military, in government, and in civilian business. Of special merit is Chapter 20, entitled, "Leadership During Emergencies."
- Coch, L., and R.P. French, Jr. "Overcoming Resistance to Change," Readings In Social Psychology. 3rd Edition. New York: Henry Holt and Company, 1958. Article focuses upon the Harwood Manufacturing Corporation, and deals with the reasons that workers resist change in their working environment; as well as what can be done to overcome that resistance to change.
- Cohen, M. A Preface To Logic. New York: Meridian, 1956. p. 148.
- Deese, James E. "Skilled Behavior Under Conditions of Stress," Symposium on Medical Aspects of Stress in the Military Climate. Washington, D.C., June 1951.
- Drucker, Eugege H., and L.D. Cannon. The Effects of Sleep Deprivation on Performance Over A 48-Hour Period. HumRRO, Fighter Series: Technical Report 6908, May 1969.
- Drucker, Peter F. The Effective Executive. London: Pan Books, Ltd., 1970. A work written for the business executive. The author emphasizes that effectiveness is not an inherent quality, but rather a quality which can be acquired. This text employs the case study method as applied to Theodore Vail of Bell Telephone System, Alfred P. Sloan, Jr., of General Motors, et al. Chapters 6 and 7 are especially pertinent to the topic at hand.
- Drucker, P.F. The Practice of Management. London: Pan Books, Ltd., 1968. Written for the organizational manager. Contains several worthwhile case studies, including: Sears, Ford, and IBM. Chapters 22, 23, and 28 are applicable to this research effort. In the latter three chapters, Drucker addresses Human Organization For Peak Performance, Motivating For Peak Performance, and Making Decisions (respectively).

- Egbert, Robert L., Tor Meeland, Victor B. Cline, Edward W. Forgy, Martin W. Spickler, and Charles Brown. An Analysis Of Combat Fighters and Nonfighters. HumRRO, Fighter Series: Technical Report 44, December 1957. Primarily deals with the emotional and psychological characteristics which differentiate aggressive combat soldiers from soldiers who lack aggressive zeal in combat.
- Egbert, Robert L., Tor Meeland, Victor B. Cline, Edward W. Forgy, Martin W. Spickler, and Charles Brown. A Study of Effective and Ineffective Combat Performers. HumRRO, Fighter Series: Technical Report 13, March 1958.
- Franzblau, Abraham N. A Primer of Statistics For Non-Statisticians. New York: Harcourt, Brace, 1958.
- French, John R.P., Jr. "The Bases of Social Power," Studies In Social Power. Edited by Darwin Cartwright, Institute for Social Research, the University of Michigan; Ann Arbor, Mich., 1959. pp. 150-167. Text is concerned with changes in human behavior over time as a result of environmental influence.
- Greer, George D., Jr., and Martha Myers. Basic Military Information and Combat Effectiveness. HumRRO, Fighter Series: 4 July 1955.
- Han Fei-Tse. Parable of the Absurd Man of Cheng. c. 234 B.C. Translated by Lin Yutang.
- Human Resources Research Organization (HumRRO). Bibliography of Publications. June 1971. Any student of social anthropology and human behavior, as encountered in the military, should review the list of behavioral science studies delineated in this bibliography.
- Karlin, Jules. Man's Behavior: An Introduction To Social Science. New York: The MacMillan Company, 1967. p. 129. The author expresses the inter-relationship between mankind and the physical environment.
- Kerlinger, Fred N. Foundations of Behavioral Research. New York: Holt, Rinehart, and Winston, Inc., 1964. p. 290.
- Kern, Richard P. A Conceptual Model of Behavior Under Stress. HumRRO, Fighter Series, Technical Report 66-12, June 1966. This study has considerable application for the manager who wishes to attenuate the stresses caused by combat, via an intensive training and indoctrination program for his personnel.
- Mandelbaum, David G. "Group Dynamics of Military Units," Report of Working Group On Human Behavior Under Conditions of Military Service. Washington, D.C., June 1951. pp. 375, 376. Author reveals the influence played by the social environment (i.e., by primary and peer group allegiance) in contributing to organizational behavior.

- National Research Council. Psychology For The Armed Services. Edited by Edwin G. Boring, Harvard University. Washington, D.C., 1945. Theme of the text, which is a collection of articles written by psychologists and medical doctors, is the application of the science of psychology to all facets of military life. Of special significance are pp. 167-192, entitled "Efficiency and Fatigue," and pages 348-350, and 383-389 which cover the topics of "Adjustment to Combat" and "Fear," respectively.
- Operational Report: Lessons Learned. 3rd Brigade, 1st Infantry Division. For the period ending 30 April 1968.
- Operational Report: Lessons Learned. 62d Maintenance Battalion (DS). For the period ending 31 July 1967. pp. 1,2.
- Operational Report: Lessons Learned. 62d Maintenance Battalion (DS). For the period ending 31 December 1969. p.3.
- Operational Report: Lessons Learned. 63rd Maintenance Battalion. For the period ending 30 April 1968. pp. 4,5.
- Operational Report: Lessons Learned. 79th Maintenance Battalion (GS). For the period ending 30 April 1968. pp. 3, 10, 11.
- Operational Report: Lessons Learned. Headquarters, 86th GSG. For the period ending 31 January 1970. p. 2.
- Operational Report: Lessons Learned. Headquarters, 86th Maintenance Battalion (GS). For the period ending 31 January 1967. p. 5.
- Operational Report: Lessons Learned. 185th Maintenance Battalion (DS). For the period ending 31 January 1967. pp. 4, 11.
- Operational Report: Lessons Learned. 185th Maintenance Battalion (DS). For the period ending 31 July 1967. p. 3.
- Operational Report: Lessons Learned. Headquarters, 188th Maintenance Battalion (DS). For the period ending 31 July 1967. pp. 3,6.
- Operational Report: Lessons Learned. 509th Maintenance Company, Headquarters, Bearcat Support Activity. For the period ending 30 April 1969. p. 3.
- Operational Report: Lessons Learned. Headquarters, 513th Maintenance Battalion. For the period ending 30 April 1969. p. 6.
- Operational Report: Lessons Learned. Headquarters, 513th Maintenance Battalion. For the period ending 31 December 1969. pp. 4,5.
- Operational Report: Lessons Learned. 610th Maintenance Battalion (DS). For the period ending 30 April 1967. pp. 2,5,6,7.
- Pre-Programmed Application Library, USACGSC, July 1973. A library of computer application programs. Specifically, the author employed the linear regression (LINREG) software package.

Program of Instruction For 4-9-C22: Ordnance/Chemical Officer Advanced Course. Approved by TRADOC, July 1974. p. A-2.

Program of Instruction For 4-9-C20: Ordnance Officer Basic Course. Approved by TRADOC, 12 April 1974. p. E-1.

Reference Book (RB) 100-2, Vol 1. "The Ardennes Defensive of 1944," Selected Readings In Tactics. US Army Command and General Staff College, Fort Leavenworth, Kansas. April 1974. p. 2-57.

Schacter, Stanley. The Psychology of Affiliation: Experimental Studies of the Sources of Gregariousness. California, Stanford University Press, 1959. p. 72-77. Article was recommended to the author by Dr. James Banks of the Army Research Institute. The study concerns the effectiveness of fighter pilots.

Schein, Edgar H. Organizational Psychology. New Jersey: Prentice, Hall, Inc., 1970. Author is a professor at the Sloan School of Management, MIT. The text is oriented toward curing organizational ills via an understanding of the psychological composition of an organization. Especially pertinent are chapters 2, 6, and 7, which deal with the following topics: "Psychological Problems In Formal Organizations," "The Organization In Relationship To Its Environment," and "Organizational Effectiveness."

Schlesinger, James R. Uses and Abuses Of Analysis. US Government Printing Office, Washington, D.C., 22 April 1968. This document is a memorandum prepared at the request of the Subcommittee on National Security and International Operations, United States Senate. In the article, the author addresses what systems management is and is not. A knowledge of basic OR/SA will assist the reader in gaining full appreciation of this article.

Scott, William G., and Terence R. Mitchel. Organizational Theory: A Structural and Behavioral Analysis. Illinois: The Dorsey Press. Revised edition. 1972. A text book for the student of business organizational management. The authors provide the reader with an historical development of organizational theory, an overview of classical and neo-classical organizational theory, and a look at recent trends in organizational development.

Seiler, John A. Systems Analysis In Organizational Behavior. Illinois: The Dorsey Press, 1967. The book has practical application for organizational managers. The theme of the text is the application of systems analysis in resolving organizational problems. Author claims that organizational behavior can be thought of as occurring in a system of interdependent forces, each of which can be analyzed.

Sims, Lynn L. The author conducted an interview with Dr. Sims on 7 November 1974. The subject of the interview was "the individual's ability to remember past occurrences of historical significance." Dr. Sims is the U.S. Military Historian in the Department of Tactics, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas.

Skinner, B.F. Beyond Freedom and Dignity. New York: Random House, 1971. The author is a behavioral psychologist of the "environmentalist" school. He believes that man's actions can ultimately be traced to some environmental influence.

TRADOC Pamphlet No. 310-4. Reference Digest of Tables of Organization and Equipment. November 1973.

Walter Reed Army Institute of Research. Symposium on Medical Aspects of Stress in the Military Climate. Washington, D.C., 22-25 April 1964. A collection of highly technical medical research articles. Material contained herein deals with the psychological and physiological reactions of servicemen to environmentally-induced stressor.

Welch, Bruce L. "Psychophysiological Response to the Mean Level of Environmental Stimulation: A Theory of Environmental Integration." Symposium on Medical Aspects of Stress in the Military Climate. Washington, D.C., 22-24 April 1964. Article concerns the subtle effects upon human behavior engendered by the social and physical environment in stressful situations.

What The Soldier Thinks, An official publication of the War Department, during the period 1941-1945. The publication consists of behavioral science studies -- professionally conducted -- concentrating upon the attitudes of servicemen. Specific articles include:

- "Combat Time and Combat Efficiency," 25 July 1945.
- "Mental Reconditioning After Battle," 25 August 1944.
- "Service Troops In Combat," 25 September 1944.
- "Soldiers Who Have Seen Battle Realize The Toughness of The Job Ahead," 25 January 1944.
- "What Combat Veterans Think Of Army Training," 25 March 1944.
- "Worries of Combat Troops," 25 April 1944.

Wilkinson, Robert T. "Changes In Performance Due To Environmental Factors," Symposium On Medical Aspects of Stress In The Military Climate. Washington, D.C., 22-24 April 1964. The author was one of seventy guest lecturers to attend the symposium, which was sponsored by the Walter Reed Army Institute of Research.

Williams, Harold L. "Decrement In Performance Due To Sleep Deprivation." Symposium on Medical Aspects of Stress in the Military Climate. Washington, D.C., 22-24 April 1964. The author was one of seventy guest lecturers to speak at the symposium sponsored by the Walter Reed Army Institute of Research.

Yamane, Taro. Statistics: An Introductory Analysis. New York: Harper and Row, 1968. p. 528.