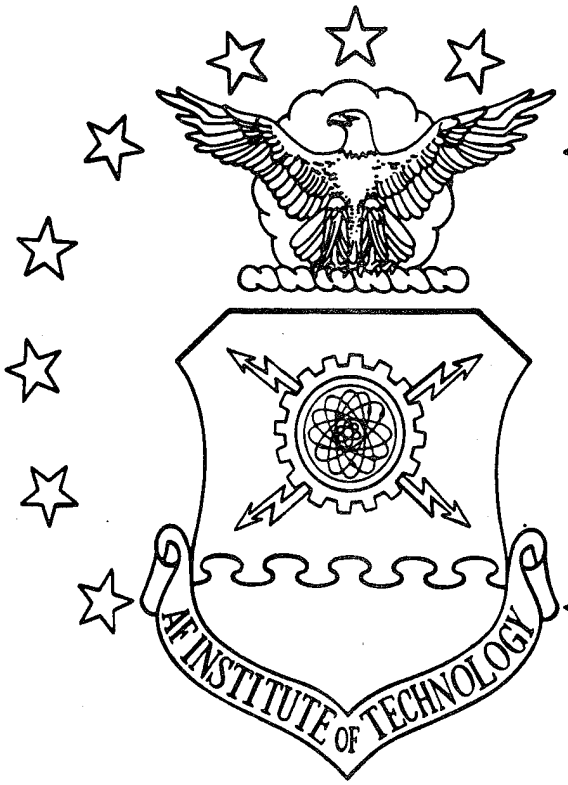

IDENTIFYING SITUATIONAL FACTORS CONTRIBUTING TO COMBAT PERFORMANCE DURING DESERT SHIELD AND DESERT STORM

THESIS

Gary E. Jandzinski, Captain, USAF

AFIT/GAL/LAR/95S-5

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

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THESIS

Presented to the Faculty of the Graduate School of Logistics

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Gary E. Jandzinski, B.A.

Captain, USAF

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Gary E. Jandzinski

Table of Contents

Page

List of Tables

Abstract

Previous research into morale, cohesion, and motivation as determinants of performance during combat concentrates primarily on front-line ground troops. This research focuses on determinants of high performance involving United States Air Force (USAF) aircraft maintenance personnel in rear-echelon contingency bases during Desert Shield and Desert Storm. The significant amount of combat force projected from USAF contingency bases and the likely continued use of such force justifies analysis of determinants of performance for this environment. Basic *situational factors* (information, food, living conditions, Morale, Welfare, and Recreation (MWR) activities, mail and phone service, and entertainment) are potentially influential in motivating maintenance personnel to perform. These factors were evaluated via survey to Gulf War participants to determine each factors impact on morale, cohesion, and motivation. Correlations were determined and hierarchical set regression was used to determine the level of factor influence. Results showed situational factors did influence the maintainers morale, cohesion, and motivation to varying degrees and, as a whole, the situational factors explain more variance in these concepts than did attitudinal factors.

IDENTIFYING SITUATIONAL FACTORS CONTRIBUTING TO COMBAT PERFORMANCE DURING DESERT SHIELD AND DESERT STORM

I. Introduction

General Issue

United States Air Force airpower made an important contribution to a swift and decisive victory for the US-led coalition against the military forces of Iraq in 1991. Tactical aircraft maintenance crew chiefs, hydraulic specialists, electronics systems specialists, munitions builders and loaders, fuel system specialists, and guidance and control specialists played a key role in sustaining the air campaign. They demonstrated tremendous effort and stamina by overcoming an austere environment to generate sortie after sortie. Their performance in producing sorties exceeded Air Staff and planner expectations (Winnefeld, Niblack, and Johnson, 1994: 236-237).

In August of 1991, the USAF began deploying combat aircraft to the Saudi Arabian peninsula in response to Iraqi military forces occupation of the country of Kuwait. Over 17,000 USAF aircraft maintenance personnel deployed to the theater of operations. They accounted for 38 percent of the entire USAF contingent for Desert Shield and Desert Storm (Keaney and Cohen, 1993:153). By the end of formal hostilities, 739 US tactical aircraft were operating in the theater. These aircraft were generated and launched more

than 35,500 times between late August 1991 and March 1992 (Winnefeld et al., 1994: 305). Aircraft generation and recovery operations were conducted around the clock. Despite long logistics pipelines and the tremendous complexity of aircraft technology, generation rates exceeded peacetime surge rates, and mission-capable rates were 92 percent compared to 85 percent on average in peace-time (Winnefeld et al., 1994: 237). Despite their impressive results, little is known about what motivates aircraft maintainers to sustain high levels of performance. The purpose of this research is to investigate situational factors that may have affected performance of these individuals. Especially interesting is the role of sustainment and quality of life factors such as the quality of food, living conditions, recreational activities, timely information on the conflict situation, mail and phone service, and personal entertainment. Understanding which of these factors might be associated with morale, cohesion, and motivation is important because the factors selected are generally under the control of the combat leader and can be varied to produce a desired effect.

Background

Morale, motivation, and cohesion are often mentioned as determinants of wartime performance. Military planners and leaders view them as important in helping to sustain high performance under difficult conditions (Borman, Johnson, Motowildo, and Dunnette, 1979). Accounts of the Gulf War suggest high levels of morale, cohesion, and motivation were present (Winnefeld et al., 1994). But there is little hard data to explain how sustaining and quality of life factors present in the Gulf War environment

contributed to the high levels of morale, cohesion, and motivation of the individuals that made Desert Shield and Desert Storm a success.

Research suggests that both internal and external variables can affect cohesion, morale , and motivation (Kellett, 1982). This study focuses on external factors that may have affected the morale, cohesion, and motivation of USAF aircraft maintenance personnel. Factors that seem likely to influence cohesion, morale, and motivation include housing, food, sanitary conditions, availability of information, and recreation. These factors provide the physical needs to sustain life, and provide creature-comforts that make life in the combat situation less stressful.

Problem Statement

There has been little empirical research to identify the determinants of cohesion, morale, and motivation involving Gulf War personnel. If quality of life factors, that can be controlled by combat leaders, are associated with these conditions, it may be possible to increase performance and reduce combat stress in future conflicts. This study investigates the impact of situational factors -- information, living conditions, food quality, mail and phone service, Morale, Welfare, and Recreation (MWR), and entertainment -- on cohesion, morale, and motivation.

Research Objective

The objective of this research is to determine the contribution six categories of situational factors made to the morale, cohesion and motivation for aircraft maintenance

personnel participating in Desert Shield / Desert Storm operations. To meet this objective, four specific questions must be answered.

1. What are the accepted definitions of morale, cohesion, and motivation as they pertain to support personnel in the wartime environment?

2. Which situational factors seem most likely to have influence on the support person's morale, cohesion, and motivation while in the wartime environment?

3. Can situational factors be distinguished from attitudinal factors impacting the support person in a wartime environment?

4. If distinguishable, is there a measurable difference between situational factors and attitudinal factors?

Situational Factor Selection

Quality-of-life resources were used by US forces in the Gulf War to make life more bearable. The quality of life resource factors described in this study are primarily associated with rear-echelon, combat/support organizations where the environment is fairly secure. Basic needs of combat and support personnel (shelter, food, medical attention) are generally met through military means during a deployment. However, many additional resources are included in the deployment or acquired while deployed to increase the quality of life for the participants. These resources are added to reduce stress in the environment and to either reward personnel for their efforts, or to increase morale and performance. Kellett (1982) historically reviewed effects that various factors had on diverse military organizations in conflicts. The factors studied included cohesion, manpower policies, socialization, training, discipline, leadership, beliefs, values and

commitment, and rewards. However, more basic factors like housing, meals, hygiene facilities, and recreation, are part of the typical military deployment and their effects have not been addressed.

To select situational factors that are relevant to the Gulf War environment, individuals with some Gulf War experience were interviewed. From these interviews and from my personal experience during the Gulf War, six situational factors were selected. The factors are: living conditions, food, mail and phone service, information, Morale, Welfare, and Recreation, and entertainment. The factors were chosen because they either represent primary needs for sustainment or they represent quality of life resources that may have been used to help reduce stress and enhance cohesion, morale, and motivation of the support personnel.

Scope

The selected six situational factors and the attitudinal factors of cohesion, morale, and motivation are the focus in this research. Other factors were likely present in the defined environment; however, they are left to other research efforts. Additionally, other environments (for example, those experienced by Army, Marine Corps, and Navy organizations) were present but are not addressed in this study. The time frame of August 1990 to July 1991 includes the majority of the activities involving USAF personnel. This time frame forms the limits used for administering surveys to participants.

Thesis Overview

Chapter II provides an overview of literature pertaining to the subjects of morale, motivation, and cohesion in the combat environment. Chapter III addresses the methodology used to acquire data from participants of the Gulf War. Chapter IV addresses the data obtained, describing their validity and the statistical processes used to evaluate the data. Chapter V discusses the findings and conclusions.

II. Literature Review

Introduction

Previous research does little to identify sustainment and quality of life factors that might contribute to individuals' cohesion, morale, and motivation. The literature provides some evidence that factors in the individual's environment are likely to influence cohesion, morale, and motivation; however, their influence has not been tested empirically.

Background

The concept of morale has been used as early as the fourth century BC. The Greek military leader Xenophon wrote "You know, I am sure that not numbers or strength bring victory in war; but whichever army goes into battle stronger in soul, their enemies generally cannot withstand them" (quoted in Gal, 1986:551). Ingraham and Manning define individual morale as "a psychological state of mind, characterized by a sense of well-being based on confidence in the self and in primary groups" (Ingraham and Manning, 1981:6). An important aspect of their definition is the "sense of well-being" of the individual. What factors might contribute to a sense of well-being for a support person in conflict? Probably the most relevant definition of morale comes from Motowildo and others who wrote that "apparently any mental state which bears on a soldier's performance reflects his morale, anything at all in his environment can effect his morale, and any aspect of his performance indicates his quality of morale" (Motowildo and others, 1976:49). Thus, morale is seen as an internal state that is

influenced by the environment and is reflected in performance. Morale is also generally associated with membership in a group, whereas motivation is associated with an individual.

Motivation, has been defined as "the conscious or unconscious calculation by the combat soldier of the material and spiritual benefits and cost likely to be attached to various courses of action arising from his assigned combat tasks" (Kellett, 1982:6). Motivation can be described as a level or range of internal feeling toward performing duties in a given environment. Levels of motivation vary among individuals and can depend on a variety of factors. These factors can be grouped into three major categories: "(1) environmental determinants; (2) internal urges, instincts, feelings, emotions, desires, aspirations, and needs, conscious or otherwise, that give rise to an action; and (3) the incentive or goal that attracts or repels the actor" (Kellett, 1982:6).

As Kellett points out, the physical environment plays a key role in morale and motivation. Most of the research in area of morale and the environment refers to the ground combat soldier's environment. The ground soldier may be motivated by life or death and the action he or she takes to preserve life. Motivation in Air Force support activities may be somewhat different from Kellett's description because ground combat soldiers and rear-echelon Air Force organizations experience different environments. Yet, the basic notion of the immediate environment's influence on the combatant's motivation is compatible with Kellett's view.

Cohesion is an important part of teamwork. High levels of cohesion may encourage team members to place the welfare of the team and its goals above personal needs or goals. The Defense Management Study Group (DMSG) on Military Cohesion defined cohesion as:

> the degree to which members of a group or organization are willing to subordinate their individual welfare to that of the group and to conform to the standards of behavior, or norms, of the group. This condition is often referred to as 'national will' or 'patriotism' when the reference group is a nation and 'group morale,' 'esprit,' or 'elan' when referring to the military. (DMSG Cohesion in the US Military, 1984:1)

The DMSG also offer a more specific definition of cohesion for military members. For them, military cohesion is "the bonding together of members of an organization or unit in such a way as to sustain their will and commitment to each other, their unit, and the mission" (DMSG Cohesion in the US military, 1984:4). This definition describes an aspect of cohesion that is relevant to this research: the need to bond individuals together.

Combat Environment

Combat generally evokes the idea of ground forces, artillery, tank brigades, and face-to-face encounters. Kellett argues that the soldier's preconceptions of risks, discomforts, and duration of combat are likely to be worse than those experienced in the actual situation. The soldier is generally surprised by the rise and fall of combat intensity, and how quickly the intensity changes (Kellett, 1982).

The environment faced by USAF support personnel is different because of two factors associated with the use of airpower in conflict. The first is the lethality of the delivery platform. Modern warplanes are so lethal that only a limited number of pilots

are required to carry out the mission. Thus, only a small percentage of Air Force members participate in combat. The second factor is the distance from the battlefield from which the support personnel are able to work. This increased distance from front lines reduces many of the physical risks and traumatic stress of performing combat duties. However, the psychological impact of the conflict may still be significant. The ever-increasing reliance on air power makes this rear environment increasingly important. The environment (surroundings, local threat, defensive posture) affects an individual's ability to deal with the stress and fears that accompany modern warfare. In modern Air Force organizations, the future combat/support environment will be relatively secure and stable. This environment allows situational factors to be changed in ways that can increase cohesion, morale, and motivation.

Combat Intensity and Morale

Walker and Burkhardt (1965) attempted to evaluate the affect of combat stress on performance involving complex weapons systems. Results showed that as the stress scenario grew more dangerous, the subjects made more errors in operations. However, the evidence indicates that other factors in the combat environment such as fatigue, pain, hunger, and varying degrees of motivation may have influenced the pattern of performance deterioration. Additionally, they found combat participants' perception of danger varies with previous battle experience, length of time in the combat theater, and his or her intelligence (Belenky, 1987:129).

Combat intensity during the Arab-Israeli war of 1973 is also representative of the conditions experienced in modern warfare. During the Arab-Israeli war in 1973, a spectrum of performance ranging from heroism to effective performance and from ineffective performance to psychiatric breakdown was recorded. Studies found that "in general, any factor that increased combat effectiveness decreased psychiatric casualties, and, conversely, any factor that increased psychiatric casualties decreased combat effectiveness" (Belenky, 1987:11). The Israeli Defense Forces (IDF) retrospective studies of the 1973 war found psychiatric breakdown became more likely as battle intensity increased (Belenky, 1987).

Israeli Defense Forces (IDF) Reserve Colonel Reuven Gal said "morale is the secret weapon of the Israeli Defense Forces" (Gal, 1986:371). In 1981, the IDF conducted a survey of 1,200 combat soldiers in an attempt to identify factors contributing to morale. The components of personal morale were identified as:

> trust in the company commander, confidence in one's own skills as a soldier, one's feelings about the legitimacy of the war, trust in one's weapons, trust in one's self, confidence in one's comrades' readiness to fight, the unit's cohesiveness, and the quality of one's relationship with one's commanders. (Belenkey, 1987:15)

Interrelationship of Morale, Motivation, and Cohesion

Morale, cohesion, and motivation each contribute to high performance but differ from each other. Particularly, morale and motivation have been frequently confused. The two terms are often used interchangeably, but in actuality, represent points on a spectrum (Kellett, 1982:6). Morale can be defined as an individual's mental and emotional attitudes toward the duties expected by his or her group and his or her loyalty

to the group (Shalit, 1988:135-137). Morale can also be defined as an individual's sense of common purpose with respect to a group, esprit de corps, or a state of individual psychological well-being based on such factors involving a sense of purpose and confidence in the future. Studies have shown that key morale factors are present in high achieving organizations both in and out of war (Gal, 1987:369).

Atkinson defines motivation as "the contemporary (immediate) influences on the direction, vigor, and persistence of action" (quoted in Kellett, 1987:6). Atkinson highlights the idea that influences on motivation are the antecedents of the action. Kellett summarized motivation as

> the "why" of behavior; its study comprises a search for the determinants of human activity and for an explanation of the processes that underlie individuals overt actions and are not apparently attributable to sensory processes or to habits. (Kellett, 1982:6)

Other studies have identified these aspects as important in developing and maintaining morale in combat situations. One study found that an individual's trust in his weapon (either individual or system) has become increasingly important in personal morale over the past three decades (Belenky, 1987:15). This factor helps explain the confidence maintenance units in Desert Storm had in the combat aircraft systems they maintained (Winnefeld et al., 1994:235). The Israeli Defense Forces findings also support that confidence in the weapon system leads to elevated levels of morale. An IDF study in 1981 attempted to identify factors representing various aspects of morale within the military context. Results indicated that morale is perceived as a supporting factor to performance rather than the product of other factors found in the survey responses. This

view of morale supports the hypothesis that morale, cohesion, motivation, and confidence are interdependent and that morale may be an antecedent to motivation. Gal suggests that a higher order concept called "unit climate" may exist, made up of a combination of the identified factors including morale (Gal, 1986:549). Gal combined factors that previously were considered to be distinct.

Unit cohesion plays a large part in bolstering individuals' self-confidence in a battle situation. Identifying with a unit and sharing values, beliefs, and goals, helps an individual feel he or she is not alone in pursuing an objective. Identifying with the unit allows the individual to draw on the strengths of its members, realizing he or she is not alone in facing uncertainty or discomfort. Kellett offers a distinction between unit cohesion and esprit (as in esprit de corps). This difference is important in that esprit is associated with belonging to a profession or large organization and the sense of pride connected with belonging. Cohesion is more directly tied to the individual's immediate surroundings and perceived situation shared with others present in the same situation. Kellett points out that

> cohesion denotes the feelings of belonging and solidarity that occur mostly at the primary group level and result from sustained interactions, both formal and informal, among group members on the basis of common experiences, interdependence, and shared goals and values. Esprit denotes feelings of pride, unity of purpose, and adherence to an ideal represented by the unit, and it generally applies to larger units with more formal boundaries than those of the primary group. (Kellett, 1982:46)

Unit cohesion can be thought of as bounded by a triangle of three controlling forces. The first controlling force is the individual's traits and knowledge of unit cohesion. The second force is the group's traits and knowledge of unit cohesion. The third force is the

unit leader's ability to influence unit cohesion. Military leaders in conflicts such as the Gulf War often have the flexibility to provide resources needed to influence morale and cohesion in their units. Two key forces at the disposal of the military leader are their knowledge of unit cohesion (leader training) and their latitude in resource allocation for influencing morale (Gal, 1987:388). Thus, it seems likely Air Force leaders could manipulate various factors of participants environment that could lead to improved morale, cohesion, and improved motivation. Schneider writes "the positive impact of good leadership and the building of cohesion are vitally important leadership responsibilities to reduce or delay such manpower loss [due to combat stress and fatigue]" (quoted in Belenky, 1987:98). If the climate for unit cohesion is not created, rapid attrition and high error rates can be expected. Thus, identifying resources that can be changed in ways that improve morale and cohesion in combat units would give the military leader an additional tool to accomplish the mission.

Conclusion

The literature reviewed covered the definitions of the three performance contributors sought in this research; morale, cohesion, and motivation. The literature highlighted morale from the individual's standpoint. The literature also provides evidence that factors in the combat (or support) environment are influential in evoking morale, cohesion, and motivation. However, little current research has been accomplished to determine which situational factors in the support personnel's environment contribute to experienced level's of morale, cohesion, and motivation. Previous research provides a foundation for investigating these issues. Because Air Force leaders control resources

which may directly or indirectly enhance individual or group morale (facilitating combat performance), this research is both relevant and important. To meet the research objective I will; (1) develop an instrument to gather data on situational factors using participants of the Gulf War; (2) use hierarchical regression to identify independent contributions to cohesion, morale, and motivation; and (3) provide conclusions based on the findings.

III. Methodology

The Instrument

Participants of Desert Shield and Desert Storm operations were surveyed to gather data on situational factors present in the participants' working environment. An informal pre-test of the survey was conducted using Air Force Institute of Technology faculty and students. The primary goal of the pre-test was to ensure questions were logical and internally consistent with the subject. The survey (see Appendix A) contained 58 questions on six situational factors and confidence, morale, cohesion, and motivation. It included information on sex, race, age, time in Air Force, time in current work center, time in aircraft maintenance, current skill level, method of participation in Desert Shield or Desert Storm, and primary means of housing during deployment.

All maintenance individuals contacted volunteered to take the survey. Informal interviews were accomplished to ensure they had adequate length of service in the Gulf War, and to gather additional insights on factors that may have been influential while deployed. Many individuals expressed deep feelings about the events and conditions of the Gulf War and were eager to offer their experiences. Based on discussions with them, and the author's personal experiences of the Gulf War, their recollections appeared vivid and genuine.

Population

The research required that participants have first-hand knowledge and experience of the Gulf War environment. Consequently, administration of the survey was restricted to participants in Desert Shield / Desert Storm. Since the war officially ended in Spring of 1991, finding a sufficient sample to conduct a survey of participants was difficult. Additionally, it was decided that field duty must have been performed during the August 1990 to July 1991 period to qualify the individuals to complete a survey. This period was selected to ensure coverage of both Desert Shield and Desert Storm operations.

The best source of participants completing duty during the period was found at the 33 Fighter Wing (FW) located at Eglin AFB, Florida. In the 33 FW, the 58th, 59th, and 60th Fighter Squadrons, as well as the 33rd Maintenance Squadron, all participated in both Desert Shield and Desert Storm operations. However, with the conflict now four years old, the number of participants still present at Eglin AFB was lower than desired. Approximately 92 individuals were determined to be eligible to complete a survey. Of the 92 eligible, 74 individuals were contacted and completed a survey, resulting in 80 percent of the eligible participants being administered the survey. Eighteen individuals were unavailable due to leave or temporary duty. The total population consisted of 71 males and 3 females, 70 enlisted and 4 officers.

Measures

Questions were designed to encompass the six situational factors as much as possible. Each situational factor is supported by a scale of questions. Questions 11 through 58 represented both the situational factors and the attitudinal concepts of morale, cohesion, confidence, and motivation. Due to the size of the sample (N=74) the questions were grouped into categorical themes (sets). The composite sets are *Social-Work*, *Hygiene*, and *Social-Personal.* The combination of factors into these scales reduces the accuracy of measuring the impact each factor may have on a dependent variable (morale, cohesion, motivation) but, due to the size of the sample, the combined sets better estimate the impact situational factors as a whole have on select dependent variables. *Social-Work* (Set 1) contains the variables morale, cohesion, motivation, and confidence. This set was established to measure the interdependence of morale, cohesion, motivation, and confidence for the sample population. *Social-Work* was measured by 16 items. The second set, *Hygiene* (Set 2), contains the variables living conditions and food. This set measures the individuals' satisfaction with the living conditions they experienced and the food quality they experienced. *Hygiene* was measured by 8 items. The third set, *Social-Personal* (Set 3), contained the variables information, MWR, mail/phone service, and entertainment. This set measures the individuals' satisfaction with these factors while deployed. *Social-Personal* was measured by 18 items.

Internal consistency of the scales in described in Chapter IV. A correlations matrix in Table 1 shows intercorrelations and Cronbach Alpha values for the study variables.

Hierarchical set regression analysis (Cohen and Cohen, 1983) was used to determine the level of significance when multiple variables are combined with a chosen dependent variable. Regression analysis is shown in Tables 2, 3, and 4.

IV. Data Description and Analysis

Question Reliability

Internal consistency reliability (Cronbach Alpha values, Cronbach, 1951) of the composite sets *Social-Work, Hygiene,* and *Social-Personal* are .80, .69, and .74 respectively. Values greater than .30 are considered acceptable with higher values indicating higher internal consistency of the set (Cronbach, 1951). Intercorrelations among the study's variables are shown in Table 1. The Cronbach Alpha values for the variables, shown on diagonal, indicate the situational factor scales and the independent variables morale, cohesion, motivation, and confidence, have adequate internal consistency. The pattern of correlations indicates strong association among the attitudinal factors confidence, morale, cohesion, and motivation. Additionally, the general pattern indicates several situational factors are strongly associated with these attitudinal factors.

The data clearly indicate a strong association among the Set 1 variables (confidence, morale, cohesion, and motivation). The association can be seen in Table 1 by the intercorrelation values calculated for these variables. The intercorrelation value found at the intersection of the variables of interest indicates the relative correlation among these variables. Again, values greater than .30 indicate correlation between variables while larger values indicate greater correlation of the variables. Internal correlations for Set 1 range from r =.49 to r =.61 (N = 74). This association supports the hypothesis that the concepts of confidence, cohesion, morale, and motivation are interdependent. Gal (1986) found a similar association he called "unit climate" where differentiating morale,

cohesion, confidence, and motivation was difficult, concluding that they are sub-categories of each other (Gal, 1986:549). Although a direction of influence cannot be determined, studies discussed in Chapter II indicate morale, cohesion, and confidence are likely to be supporting factors of motivation, rather than the other way around.

Other factors also show high correlation with the Set 1 variables. Information is highly correlated with all four variables in Set 1 (reference Table 1, intersection of information with morale, cohesion, confidence, and motivation). Living conditions and food variables (Set 2) are correlated with three of the four variables in Set 1 but are not significantly associated with motivation. This lack of association suggests that living conditions and food may indirectly influence motivation through morale or cohesion. Morale, Welfare, and Recreation (MWR) is also correlated with all Set 1 variables and might indirectly influence motivation through morale or cohesion as well. Set 3 variables (information, mail, MWR, and entertainment) also have stronger relationships with morale than with motivation.

A fourth set of variables is defined using post Gulf War questions. This set includes measures of the Desert Storm participants' present morale, cohesion, and motivation. The high correlation among post-morale, post-cohesion, and post-motivation in Table 1 (.74, .73, and .77) suggests they represent a common theme. However, their correlation with morale, cohesion, and motivation *during* the conflict is quite low. This supports the assumption that the subjects could clearly distinguish between Gulf War experiences and other experiences. Additionally, the pattern of correlation among these variables and

other situational factors is also low, indicating that the situational factor variables were primarily associated with Gulf War experiences and not with current conditions.

TABLE 1

INTERCORRELATIONS AMONG STUDY VARIABLES

	1	2	3	4	5	6
1. WKC	--					
2. AFM	-.12	--				
3. INFO	-.28*	.10	(.84)			
4. LIVCON	-.44**	.11	.67**	(.86)		
5. MAIL	-.14	.08	.48**	.57**	(.76)	
6. ENT	-.09	.00	.44**	.37**	.42**	(.74)
7. MWR	-.06	-.09	.40**	.39**	.40**	.55**
8. FOOD	-.39**	-.06	.61**	.58**	.54**	.45**
9. CONF	-.06	.09	.56**	.39**	.31**	.04
10. MORALE	-.20	.14	.60**	.48**	.32**	.43**
11. COHES	-.04	-.06	.48**	.27*	.27*	.19
12. MOTIV	-.12	.18	.36**	.21	.31**	.10
13. POSTMOR	.05	-.18	.07	.09	.05	.23
14. POSTCOH	-.03	-.01	.15	.19	.10	.25
15. POSTMOT	.12	-.11	.16	.09	.17	.28*

	7	8	9	10	11	12
7. MWR	(.91)					
8. FOOD	.47**	(.87)				
9. CONF	.39**	.36**	(.70)			
10. MORALE	.47**	.45**	.49**	(.93)		
11. COHES	.36**	.30**	.51**	.58**	(.92)	
12. MOTIV	.34**	.19	.50**	.61**	.58**	(.91)
13. POSTMOR	.05	.12	.12	-.13	.05	-.25*
14. POSTCOH	.06	.16	.17	.01	-.01	-.16
15. POSTMOT	.08	.09	.18	.04	.03	-.05

	13	14	15
13. POSTMOR	(.87)		
14. POSTCOH	.74**	(.92)	
15. POSTMOT	.73**	.77**	(.87)

Notes:
- Abbreviations: WKC (months in workcenter); AFM (months in Air Force); INFO (information); LIVCON (living conditions); MAIL (mail & phone service); ENT (entertainment); MWR (Morale, Welfare, and Recreation); FOOD (meals); CONF (confidence); MORALE (morale); COHES (cohesion); MOTIV (motivation); POSTMOR (post war morale); POSTCOH (post war cohesion); POSTMOT (post war motivation)

- Coefficient Alphas are in parentheses on diagonal

- "*" $p < .05$, "**" $p < .01$ (2-tailed)

Regression Analysis

Cohen and Cohen's (1983) hierarchical set regression procedures were used to examine the influence the variable sets representing *Social-Personal, Social-Work,* and *Hygiene,* had on the dependent variables morale, motivation, and cohesion. In this method, sets of independent variables are introduced into the regression equation in successive stages.

The importance of each set of variables in predicting the dependent variable is reflected in the size of the increase or decrease in R^2 (multiple coefficient of correlation, McClave and Benson, 1994) that results from the regression process. Values of R^2 will range from 0 to 1.0. The greater the ΔR^2 (change in R^2), the greater the significance of the addition of the selected set to the dependent variable. A probability value (Significant F) calculated for each regression model tests the contribution of each set of independent variables (in this case the sets of situational factors) on the amount of variance explained in the dependent variable. Due to the size of the sample (N=74), an alpha test value of 0.10 (α=0.10) was selected as an appropriate criteria for significance (McClave and Benson, 1994). Significance values ("Sig F" in the tables) *less than* α=0.10 indicate the new set of independent variables contributes significantly to the dependent variable of interest. The same situation occurs when sets are removed from the regression model. Significance values shown for removed sets also indicate the level of impact on the dependent variable. Significance values *less than* α=0.10 when the set is removed indicate the set was a significant contributor to the explained variance of the

dependent variable. Hierarchical set regression results are shown in Tables 2, 3, and 4. Within the tables, Set 1 is *Social-work,* Set 2 is *Hygiene,* and Set 3 is *Social-Personal.*

The regression analyses using the sets of situational factors previously described with each of the three dependent variables (morale, motivation, and cohesion) indicate that some of the sets make more important contributions to the dependent variables than others. Each significant set/dependent variable combination is described below. In Table 2, *Social-Work* relationships (Set 1) accounted for approximately 10 percent of the variance in morale ($\Delta R^2 = .10$, $p<.01$) over and above what was accounted for by other predictors.

TABLE 2

HIERARCHICAL SET REGRESSIONS FOR MORALE

Dependent Variable: Morale

Model	Independent	R^2	ΔR^2	Sig F change
1	Set 1 (confidence, cohesion, morale)	0.38	---	0.0000
2	Set 2 (food, living conditions)	0.49	0.11	0.0039 *
3	Set 3 (entertainment, MWR, mail, information)	0.60	0.11	0.0190 *
4	Remove Set 1	0.50	-0.10	0.0042 *
5	Remove Set 2	0.48	-0.02	0.3482

Note. n =74. *p<.10

Hygiene factors (Set 2) did not account for a significant portion of the variance in morale ($\Delta R^2 = .02$, $p>.10$) when the effects of the other predictors were considered. Thus, the situational factors in Set 2, living conditions and food, explain little unique variance in the subject's morale. The apparent lack of significance for these factors indicates the sampled support personnel did not see food or the housing they were using as contributors or distracters from their morale directly. On the other hand, *Social-Personal* (Set 3, model 3) uniquely accounted for an additional 11 percent of the variance in morale ($\Delta R^2 = .11$, $p<.02$). Apparently, the combination of Set 3's situational factors has an impact on morale. Sets 2 and 3 uniquely contributed 22 percent of the ($\Delta R^2 = .11 + .11$, $p<.01$) variance in morale over what was explained by Set 1. Additionally, a significant finding for morale is the total explained variance caused by removing Set 1 and observing Sets 2 and 3 in combination. Approximately 50 percent (Set 1 + 2 + 3 = .60 - .10 = .50, model 4) of the variance in morale is accounted for (not uniquely) by the situational factors in Sets 2 and 3 combined. This large percentage indicates that these variables are important as a composite group of situational factors and, consequently, tend to explain the same variance in morale.

Table 3 shows that only *Social-Work* (Set 1, model 4) accounted for significant incremental variance in motivation; approximately 21 percent ($\Delta R^2 = -.21$, $p<.01$). However, 26 percent (Sets 1 + 2 + 3 = .47 - .21 = .26) of the variance in motivation was accounted for by Set 2 (food and living conditions) and Set 3 (information, MWR, mail, and entertainment) together when Set 1 is removed.

TABLE 3

HIERARCHICAL SET REGRESSIONS FOR MOTIVATION

Dependent Variable: Motivation

Model	Independent	R^2	ΔR^2	Sig F change
1	Set 1 (confidence, cohesion, morale)	0.40	---	0.0000
2	Set 2 (food, living conditions)	0.41	0.01	0.5922
3	Set 3 (entertainment, MWR, mail, information)	0.47	0.06	0.2092
4	Remove Set 1	0.26	-0.21	0.0002*
5	Remove Set 2	0.23	-0.03	0.3318

Notes. n=74. *p<.10

As with morale, this large percentage indicates that these variables are important as a composite group of situational factors and, consequently, tend to explain the same variance in motivation.

TABLE 4

HIERARCHICAL SET REGRESSIONS FOR COHESION

Dependent Variable: Cohesion

Model	Independent	R^2	ΔR^2	Sig F change
1	Set 1 (confidence, cohesion, morale)	0.35	---	0.0000
2	Set 2 (food, living conditions)	0.37	0.02	0.3750
3	Set 3 (entertainment, MWR, mail, information)	0.39	0.02	0.8709
4	Remove Set 1	0.26	-0.13	0.0082 *
5	Remove Set 2	0.24	-0.02	0.3720

Note. n=74. *p<.10

Table 4 shows again that only *Social-Work* (Set 1, model 4) accounted for a significant variance in cohesion ($\Delta R^2 = -.13$, $p<.01$). Thus, morale, confidence, and motivation explained approximately 13 percent of the variance in cohesion. However, more interesting is that the other two sets (Sets 2 and 3) accounted for an additional 26 percent (Sets 1 + 2 + 3 = .39 - .13 = .26, model 4) of the variance in cohesion but, as with the other dependent variables, were not statistically distinguishable from each other. This large percentage of explained variance strongly indicates the possible influence the situational factors have on the attitudinal factors of morale, cohesion, and motivation.

Summary

The results of the regression analyses provide evidence that each of the situational factor sets had unique effects on morale, but only the *Social-Work* variables (Set 1) had a unique impact on cohesion or motivation. However, Sets 2 and 3 (the situational factors) in combination accounted for a substantial amount in the variance of morale, motivation, and cohesion. Thus, Set 1(*Social-Work*) explained a significant portion of variance in all three dependent variables (ΔR^2 ranged from .10 to .21) and the other variables in Sets 2 and 3 explained an added 26 to 50 percent (ΔR^2 ranged from .26 to .50).

V. Discussion and Conclusions

Discussion

The results strongly support the hypothesis that sustenance and quality of life factors influence morale over and above the influence of attitudinal factors. In Table 2, we see that both Set 2 and Set 3 add unique variance to morale (11 percent respectively in models 2 and 3). Effectively, this finding shows the impact information, entertainment, MWR activities, mail, living conditions, and food had on morale, suggesting that these situational factors might be useful in increasing the morale for US troops. Additionally, in Table 2 we can see the effect cohesion, confidence, and motivation (Set 1) had on morale (10 percent in model 4), suggesting that these attitudinal factors reflect a different type of influence on morale than the situational factors. Likewise, in Tables 3 and 4 we can see that the attitudinal factors (Set 1) impact motivation (Table 3, model 4) and cohesion (Table 4, model 4). Because the attitudinal factors contribute unique variance to the regression models and, after being removed, the remaining situational factors account for significant variance in each regression model, the attitudinal factors can be clearly distinguished from the situational factors of living conditions, mail, entertainment, MWR, food, and information. More importantly, each of the two groups explained substantial unique variance in the dependent variables of interest.

The most significant finding stemming from the regression analysis is the surprisingly strong effect the situational factors as a whole had on the dependent variables of morale, motivation, and cohesion. The regression model, using morale as the dependent variable (Table 2), shows that Set 1 (attitudinal factors) accounts for 10

percent of the explained variance in morale; however, Sets 2 and 3 (containing situational factors food, living conditions, entertainment, MWR, mail, and information) account for 50 percent of the explained variance. The regression model using motivation as the dependent variable (Table 3) shows that Set 1 accounts for 21 percent of the explained variance in motivation; however, Sets 2 and 3 (the situational factors) account for 26 percent of the explained variance. And finally, the regression model using cohesion as the dependent variable (Table 4) shows that Set 1 accounts for 13 percent of the explained variance; however, Sets 2 and 3 account for 26 percent of the explained variance. In all three cases the combination of situational factors (Sets 2 and 3) explained more of the variance for the chosen dependent variables than did the attitudinal factors of morale, cohesion, confidence, and motivation. This strongly indicates situational factors are significant contributors to morale, cohesion, and motivation in the support environment.

Conclusions

The literature reviewed provided a variety of definitions for morale, cohesion, and motivation pertaining to military organizations. The discussed definitions only partially apply to the limited environment studied in this research. However, the concepts of morale, cohesion, and motivation each contain core elements that are affective in analyzing a support environment like that considered here. Thus, the definitions found in the literature are effective for this study and answer the first research objective question (see page 4).

The situational factors used in this study were selected based on some objective observations and on subjective opinions. Although I had opportunities to observe the influence many of the selected situational factors had on Gulf War personnel, the findings from this research were not preconceived. From the findings, the selected factors appear to have strong influence on the concept of morale, which generally functions as an antecedent to motivation. Based on the findings, the selected situational factors were good choices for determining influence on morale, cohesion, and motivation. Thus, research question two, which situational factors seem most likely to have influence on the support person's morale, cohesion, and motivation while in the wartime environment, is answered.

From the hierarchical regression analysis, I found that indexing the attitudinal and situational factors into and out of the regression model highlighted the significant difference each type of factor had on the selected dependent variable. The results showed that the two types of factors (attitudinal and situational) can be distinguished for this sample. This result answers research question three; the two types of factors can be distinguished for support personnel.

The regression analysis also highlighted the differences in the unique and combined explained variance both types of factors had on selected dependent variables. The regression model with morale (Table 2) provides the greatest evidence that the two types of factors can be distinguished and by a sufficient margin to allow measurement. When combined, situational factors in Sets 2 and 3 (Table 2, models 2 and 3) account for 50 percent of the variance in morale, while attitudinal factors only account for 10 percent

when the other factors are considered. Because of the large difference in accounted variance, measuring each factor set's contribution to the dependent variable is possible. There is a sufficient difference in contributional variance with cohesion as well. Consequently, measuring the difference between types of factors for cohesion is possible also. However, the difference between factor type variance for motivation is much narrower (Table 3, model 4: 26 percent versus 21 percent). The size of the sample and rounding error make this apparent difference inconclusive. From the regression findings, and taking into account the size of the sample, it appears that the difference between attitudinal factors and situational factors can be measured, answering research question four.

Based on the results of this research, we see that the situational factors explained a greater amount of the variance in morale, motivation, and cohesion than did the attitudinal factors for personnel in the support environment. These results clearly show that situational factors can be influential in promoting morale, cohesion, and motivation. Because situational factors are controlled by military leaders as resources, greater emphasis should be placed on them as tools for high performance in support troop environments.

An important aspect of research on war is the environment. The environment for USAF support personnel and crew members is changing. The distance from the battle-zone for USAF operations will become greater with advances in technology. More reliance on rear-echelon, contingency bases like those utilized in the Gulf War will be the norm. This type of environment will become far more prominent in future conflicts and

warrants additional study. If military leaders desire to meet and exceed conflict objectives with the least loss of resources, then it is in the military's best interest to continue efforts into the determinants of performance for individuals like those sampled here. Specifically, a larger sample of Gulf War participants in multiple fields would greatly improve the conclusive evidence for or against the importance of situational factors. Additionally, other situational factors (for example host-nation interaction) were likely present in this and similar Gulf War environments. In summary, any potential determinant of high performance should be investigated in order to give the military leader the most appropriate set of tools to accomplish the mission.

Appendix A: Factor Survey

DESERT SHIELD / DESERT STORM
PERSONNEL SUPPORT FACTORS SURVEY

for

AIRCRAFT MAINTENANCE PERSONNEL

1. Please write your name, rank, and office symbol in the spaces provided below.

2. Read the INFORMATION FOR PARTICIPANTS and PRIVACY ACT information.

The success of this project depends on the accuracy of the information you provide. Please do your best. Your responses will be kept confidential.

Survey Number: _____ Name: _____

Rank: _____ Squadron/Duty Section: _____

INFORMATION ABOUT
THE PERSONNEL SUPPORT FACTORS RESEARCH STUDY

Thank you for agreeing to participate in this research project. Your participation in this survey is strictly VOLUNTARY. Your experience can make an important contribution to the goals of this research project.

Description of the Study: The success of Operations Desert Shield and Desert Storm is an important part of the Air Force's recent history. Supporting the Air Force's mission requires information, coordination, equipment, supplies, human resources, skills, personnel support, and training. The accomplishment of the mission can be hindered or helped by situational factors (i.e. various elements present or not present in the combat environment). For example, a mechanic's work may be hindered when he or she has not had sufficient sleep or adequate food. It may be helped when the individual has comfortable sleeping conditions and a good diet available. Many other situational factors may also help or hinder the work effort of the individual in a combat environment. The objective of this study is to learn how situational factors present during Desert Shield and Desert Storm may have influenced the work effort of aircraft maintenance personnel.

How your responses will be used: The information you provide will help to explain how various factors present in the combat environment affect mission accomplishment.

Confidentiality of your responses: This information is being collected for research purposes only. No one in your unit, base, or MAJCOM will ever be allowed to see your individual responses.

PRIVACY ACT STATEMENT

In accordance with AFR 12-35, paragraph 8, the following information is provided as required by the Privacy Act of 1974.

Authority: 10 U.S.C. 8012, Secretary of the Air Force; powers and duties; delegation by; implemented by AFR 30-23, Air Force Personnel Survey Program.

Purpose: To obtain information regarding the influence of different types of factors on work performance of Air Force members.

Routine Use: To increase understanding of various types of factors effecting work performance. Data will be grouped prior to analysis. No analyses of individual responses will be conducted and only members of the research team will be permitted access to the raw data. report summarizing trends in large groups of people may be published.

Participation: Participation in this study is **VOLUNTARY**. No adverse action will be taken against any member who elects not to participate in this survey or who elects not to complete any part of the survey.

BACKGROUND INFORMATION

Please answer the following questions about your background and job experience. This information is used to develop a profile of the participants in this study. Your responses will be kept completely confidential.

---

1. What is your sex? (check one): (a) _____: Male (b) _____: Female

2. What is your race? (check one):
   (a) _____: White
   (b) _____: Black
   (c) _____: Hispanic
   (d) _____: Asian
   (e) _____: Other (please specify: _____)

3. What is your age? (please fill in): _____

4. How long have you served in the Air Force? Years:_____

5. How long have you been assigned to your present work-center?
   Years:_____, Months:_____

6. How long have you worked in aircraft maintenance? Years:_____, Months:_____

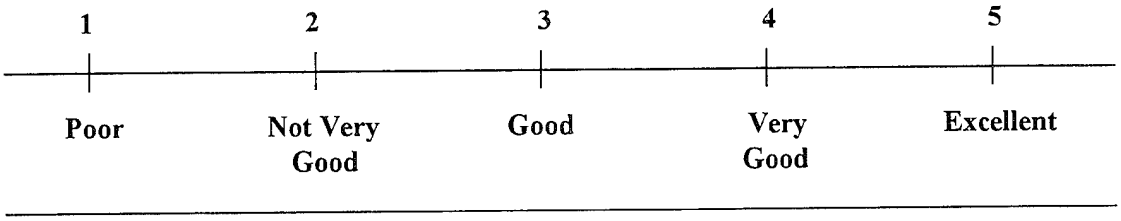
7. What is your current rank? (check one):
   (a) _____: E1-E2
   (b) _____: E3
   (c) _____: E4
   (d) _____: E5
   (e) _____: E6
   (f) _____: E7
   (g) _____: E8-E9
   (h) _____: Officer

8. What is your current skill level (if applicable)? Level:_____

9. How did you participate in Operations Desert Shield and/or Desert Storm? (check one):
   (a) _____: deployed with my unit
   (b) _____: deployed to another unit as an augmentee
   (c) _____: other (please explain _____)

10. How were you housed (primarily) while deployed to Desert Shield and/or Desert Storm? (check one):
    (a) _____: host country barracks
    (b) _____: primarily military tents
    (c) _____: commercial hotel(s)

Please indicate the *level* of the support you received while you were deployed in Operation Desert Shield and/or Desert Storm.



11. _____ the information I received about the threat of enemy attack

12. _____ the way the threat of enemy attack was explained to me

13. _____ the quality of my conditions for sleeping

14. _____ the quality of latrine facilities

15. _____ the availability of personal items (sundries, snacks, exchange services)

16. _____ the quality of shower facilities

17. _____ the quality of mail service

18. _____ the availability of telephone service

19. _____ the quality of telephone service

20. _____ the cost of telephone service

21. _____ the availability of entertainment (i.e. television, VCR's, taped movies, billiards, etc.)

22. _____ the quality of entertainment (i.e. variety of movies, equipment used)

23. _____ the availability of alcoholic beverages (if desired)

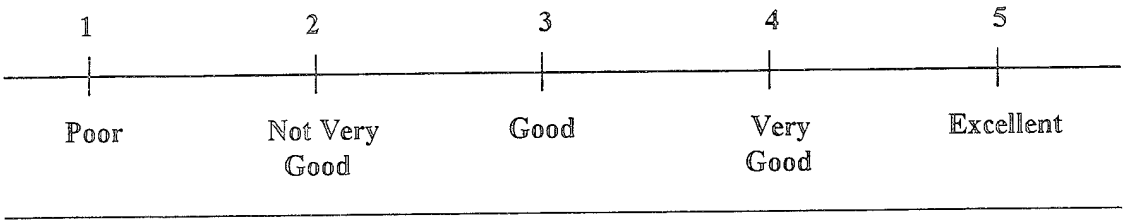
24. _____ the availability of network news service

25. _____ the amount of information on the current situation of the conflict

26. _____ the amount of information on U.S. public support of Desert Shield/Desert Storm

27. _____ the quality of Morale, Welfare, and Recreation (MWR) ***personnel*** at my unit

Please indicate the *level* of the support you received while you were deployed in Operation Desert Shield and/or Desert Storm.



28. _____ the *amount* of MWR recreational equipment

29. _____ the *quality* of MWR recreational equipment

30. _____ the *number* of MWR activities

31. _____ the *quality* of MWR activities

32. _____ the commander's support for MWR activities

33. _____ the amount of food available during meals

34. _____ the *quality* of food available

35. _____ the *variety* of food available

36. _____ the amount of effort the base commander put into improving living conditions

During Desert Shield and/or Desert Storm, how would you rate your confidence in...?

37. _____ your Desert Shield / Desert Storm commander

38. _____ the equipment you used in Desert Shield / Desert Storm

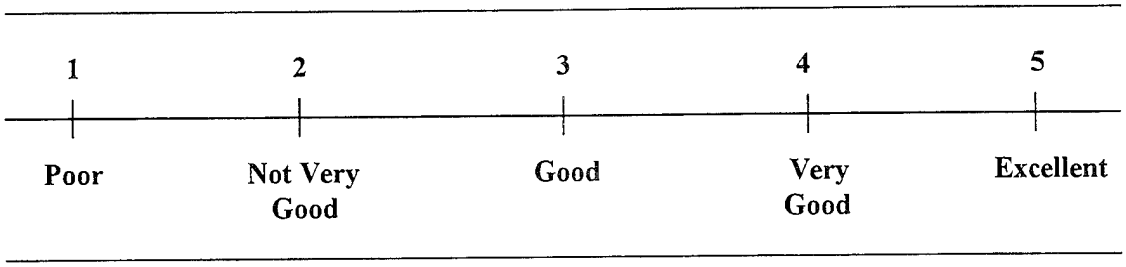
39. _____ your training for Desert Shield / Desert Storm

40. _____ your ability to accomplish your duties

41. _____ your feeling that the U.S. and allies were doing the right thing

42. _____ your coworkers' ability to accomplish the mission

43. _____ your unit's ability to accomplish the mission



How would you rate the level of morale that existed during Desert Shield / Desert Storm?

44. _____ your morale

45. _____ your coworkers' morale

46. _____ your unit's overall level of morale

During Desert Shield / Desert Storm, how would you rate the following on cohesion?

47. _____ your feeling of cohesion

48. _____ your coworkers' level of cohesion

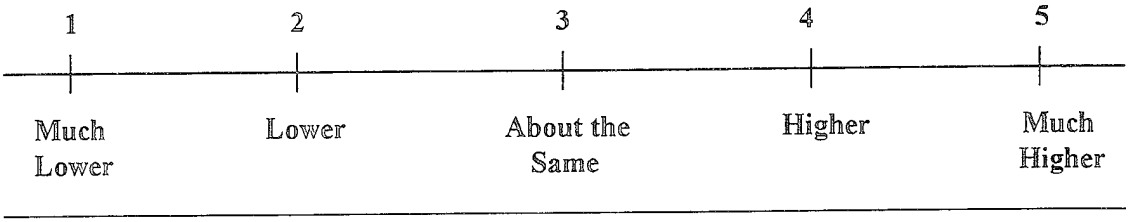
49. _____ your unit's overall level of cohesion

How would you rate the level of motivation you saw during Desert Shield / Desert Storm?

50. _____ your level of motivation

51. _____ your coworkers' level of motivation

52. _____ your unit's overall level of motivation



Compared to Desert Shield / Desert Storm, how would you rate the following today?

53. _____ your own level of morale

54. _____ your coworkers' level of morale

55. _____ your personal feeling of cohesion with your unit

56. _____ the level of cohesion and cooperation in your unit

57. _____ your motivation to accomplish the mission

58. _____ the motivation of your unit to accomplish the mission

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Vita

Captain Gary E. Jandzinski was born on 22 June 1961 in New London, Connecticut. He graduated from Central Kitsap High School in 1979 and entered undergraduate studies at Seattle University in Seattle, Washington. He graduated with a Bachelor of Arts degree in Economics in June 1983. He received his commission on 30 July 1985 upon graduation from Officers Training School. His first assignment was at McConnell AFB, Wichita Kansas, as a logistics plans officer. His second assignment was at Andersen AFB, Guam, as Chief of Logistics Plans. His third assignment was at Dyess AFB, Abilene Texas, as Chief of Logistics Plans. His fourth assignment was also at Dyess AFB as a squadron maintenance officer. In September of 1995, Captain Jandzinski graduated from the School of Logistics and Acquisition Management, Air Force Institute of Technology with an M.S. in Logistics Management.

Permanent Address: 3510 Rasmussen Lane
Bremerton, WA 98310

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13. ABSTRACT *(Maximum 200 words)*

Previous research into morale, cohesion, and motivation as determinants of performance during combat concentrates primarily on front-line ground troops. This research focuses on determinants of high performance involving United States Air Force (USAF) aircraft maintenance personnel in rear-echelon contingency bases during Desert Shield and Desert Storm operations. The significant amount of combat force projected from USAF contingency bases and the likely continued use of such force justifies analysis of determinants of performance for this environment. Basic *situational factors* (information, food, living conditions, Morale, Welfare, and Recreation (MWR) activities, mail and phone service, and entertainment) are potentially influential in motivating maintenance personnel to perform. These factors were evaluated via survey to Gulf War participants to determine each factor's impact on morale, cohesion, and motivation. Correlations were determined and hierarchical set regression was used to determine the level of factor influence. Results showed situational factors did influence the maintainers' morale, cohesion, and motivation and as a whole, the situational factors explain more variance in these concepts than did attitudinal factors.

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