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**UNIT COHESION AND THE SURFACE NAVY:
DOES COHESION AFFECT PERFORMANCE?**

by

Anthony H. Dropp

December 1989

Thesis Co-Advisors:

Richard S. Elster
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**Unit Cohesion and the Navy:
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by

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Lieutenant, United States Navy
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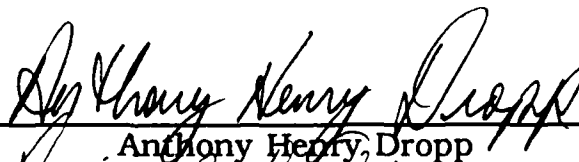
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MASTER OF SCIENCE IN MANAGEMENT

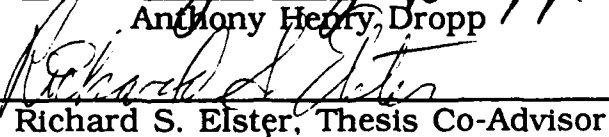
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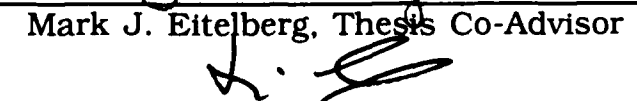
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ABSTRACT

This study was undertaken to discover whether unit cohesion is systematically related to unit effectiveness in a Navy context. To this end, correlation analysis was conducted on personnel turnover rates and several measure of effectiveness (MOE) variables from various tests and inspections on ships in the Naval Surface Force, U.S. Pacific Fleet. The MOE variables included retention rates, Supply Management Assessment scores, Maintenance and Material Management (3M) Inspection scores, Training Readiness Evaluations, and Operational Propulsion Plant Examination (OPPE) scores. The results showed few statistically significant relationships between the turnover and MOE variables. Recommendations are offered for further study on unit cohesion and its possible relationship to unit effectiveness.

These findings



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I. INTRODUCTION

The purpose of this thesis is to discover whether unit cohesion is systematically related to unit effectiveness in a Navy context. This thesis discusses the nature of unit cohesion, its importance to military institutions over the years, and how it might be measured to assess its impact on unit performance. Further, it proposes that unit cohesion, which has received much attention in Army and Marine Corps contexts, is also important to the Navy. The focal question of interest is: Do cohesion levels affect the performance of U.S. Navy surface ships? A methodology is proposed for analyzing personnel turnover rates and unit performance measures for possible relationships; these relationships may suggest that cohesion levels indeed affect performance.

A. ORGANIZATION OF THE THESIS

The first chapter discusses the purpose of the thesis and describes the major elements of this study. Chapter II offers examples of previous writings and research on cohesion and effectiveness. The literature surveyed includes some of the "classics" in the field as well as current analytical research. Concluding this chapter is a discussion of a major component of unit cohesion: personnel turbulence. A methodology is proposed in Chapter III for using personnel turnover as a cohesion measure to assess its impact on unit performance criteria. Data analysis is the subject of Chapter IV. Results are presented in the form of correlations between turnover rates and various unit performance measures. Chapter

V deals with the author's interpretations of the data. Are significant relationships evident? What are the uses and limitations of the data? Chapter V closes with conclusions and recommendations for further research. If research results point to measurable relationships among cohesion, turnover, and performance, there may be ways the U.S. Navy can manipulate personnel systems to foster healthy, and perhaps more effective, unit environments.

B. BACKGROUND AND BASIS FOR RESEARCH

Unit cohesion has been widely studied for years within the Army and the Marine Corps. There have been volumes written on the importance of cohesion in warfighting units. These volumes range from pieces by classical military thinkers to analytical studies of current U.S. Army units. Generally, cohesion has been defined as the extent to which an individual desires to remain a part of an organization as well as the extent to which the individual will place the organization's welfare above his own.

It has been generally accepted that cohesive units fight better than units that are not (discussed in Chapter II). Many stories out of World War Two, the Korean War, and the Vietnam War have demonstrated how effective cohesive units can be. It has been sadly observed how poorly U.S. Army units performed against the German Wehrmacht and North Vietnamese. Although the Allies eventually won the war in Europe, for example, man for man, German soldiers outperformed American soldiers. Many historians owe this fact to the tightly cohesive nature of German army units.

There has been precious little study of cohesion within the Navy. Typical research has focused on the ground or infantry brand of warfare—the “hand-to-hand combat” aspect of battle. Due to the technical nature of naval warfare, as well as the independent nature of naval operations, it is easy to see why navy cohesion studies may not have been undertaken.

It is submitted that studies of unit cohesion within a Navy context would indeed yield important results. If unit cohesion in one brand of warfighting is as important as the literature suggests, then the effects of cohesion within other warfighting contexts deserves exploration.

C. SCOPE

To begin a study of unit cohesion within the Navy, the scope is narrowed to cohesion of crews of surface ships of the U.S. Pacific Fleet. The research questions above are posed and assessed in this context. Within this surface ship framework, a turnover measure first is used to assess levels of cohesion aboard the ships. Once measures are obtained for each ship, they are used as a basis for comparison against each ship's performance criteria. Relationships between turnover rates and performance measures are then analyzed for possible interpretive conclusions about the effects of unit cohesion.

II. LITERATURE REVIEW

The term "cohesion" has found its way into the language of military thinkers for years. Nearly all the classical writers, many of whom were battle veterans, either alluded to the phenomenon or specifically addressed it. Over time, a literature has evolved ranging from strictly anecdotal accountings of combat-unit battlefield behavior to more recent attempts at pursuing analytical explanations as to why men fight. The basic questions include: Why do some military combat units continue to fight (and often win) against extraordinary odds? What is it that causes members of cohesive military units to subordinate their own safety to the welfare of their unit? How can peacetime military establishments create an atmosphere in those units that in times of crisis will be called upon to place themselves in harm's way?

Common themes can be found in many of the writings on cohesion. What follows is a review of the literature that includes many of these themes, such as definitions of cohesion, some of the internal and external components of cohesion, historical aspects, and the relationship between cohesion and effectiveness.

A. HUMAN ELEMENTS

These voices, these quiet words, these footsteps in the trench behind me recall me at a bound from the terrible loneliness and fear of death by which I had been almost destroyed. They are more to me than life, those voices, they are more than motherliness and more than fear; they are the strongest, most comforting thing there is anywhere, they are the voices of my comrades. (Erich Remarque, pp. 181-182)

Erich Remarque's words from *All Quiet on the Western Front* make an important point about modern warfare: although so much attention is paid to the hardware of war—the guns, airplanes, and bombs—it is the fighting men with their attendant fighting spirit who ultimately win or lose a battle or war.

The fact that it is the human element that wins wars has not been lost on generations of military leaders and historians. Indeed, Carl Von Clausewitz believed that the spirit of fighting forces was of paramount significance and that "...moral forces [were] amongst the most important subjects in War." (Clausewitz, 1918, p. 177) Even today, military leaders who are confronted with accelerating technological advances continue to realize the critical importance of men who are willing to fight. General Edward C. Meyer, writing during his tenure as Chief of Staff of the U.S. Army, stated that "the most modern equipment in the world is useless without motivated individuals drilled into cohesive units with sound leadership at all levels." (Meyer, 1980, p. 4) The U. S. Navy's Chief of Naval Operations, Admiral Carlisle A. H. Trost (1987), has also called for renewed emphasis on the human element in the military.

This human element in warfare has been distilled over the years as the will to fight. Hauser (1980) asks from where this *will* comes, how it is measured, and, if found lacking, how it is acquired. He proposes a number of psychosocial factors that compel men to fight: submission to authority, fear, loyalty, and pride. One might quickly conclude that these factors cannot be directly measured; however, there have been some

attempts at developing useful measures to differentiate between those who will fight and those who will not.

During the Korean War, Egbert, et al. (1958) used questionnaires and inventories to identify various traits common to soldiers who would be labeled as fighters or non-fighters. The soldiers were asked about their background histories, interests, and their attitudes towards various ideas and activities; they were also given intelligence and aptitude tests. In their findings, Egbert, et al. reported that, among other things, a "fighter" tended to be more intelligent, be emotionally stable, healthy, masculine, have a stable home life, be socially responsible and tolerant, and be accepted by his peers.

Further work on developing human element measures was offered by Juri Toomepuu (1981). The purpose of his work was to find quantitative relationships between soldier capabilities and the combat and cost-effectiveness of weapons, units, and forces. He found that there is a strong relationship between the social adaptation of soldiers and their combat effectiveness.

Others have noted the importance of social factors common to successful fighting units. Havron (1984) criticizes modern combat readiness reporting by noting that today's measures are objective counts of assets in which subjective measures are ignored. These subjective measures should include competence, trained performance, effects of disintegrative factors (drug abuse, indiscipline, racial disharmony, alienation), and commitment. The ways in which these factors interact "have spelled the difference between military victory and defeat...throughout history."

(Havron, 1984, p. 3) Havron believes that these social dimensions, in addition to leadership and morale, "reflect the spiritual strength of a unit and thus limit or enhance the unit's warfighting capability." (Havron, 1984, p. 12)

Thus far in this review, the soldier and the unit have been identified. An investigation into the link between the two should reveal the important dynamics that make the unit greater than the sum of its parts.

B. COHESION: WHAT IS IT?

I hold it to be one of the simplest truths of war that the thing which enabled an infantry soldier to keep going with his weapons is the near presence or presumed presence of a comrade. (Marshall, 1947, p. 42)

It has been shown that the human element is of paramount importance in the winning of battles. But what is it that ties the individual to his unit? Clausewitz attempted to identify factors in a military unit which he saw as clear indicators that the link between the unit and its men was healthy, strong, and disposed toward common goals. Focusing on the soldier, Clausewitz believed that fundamental change must occur in the man: the soldier "must lose that impulse to unbridled activity and exercise of force which is...characteristic in the individual, and submit [himself] to demands of a higher kind, to obedience, order, rule, and method." (Clausewitz, 1918, p. 181) Clausewitz's work is replete with grand references like an "esprit de corps," a "corporate spirit," and a "bond of union." He understood that fighting troops were not "held together merely by the glue of service-regulations and a drill book." (Clausewitz, 1918, p. 185) However close to identifying that "glue" that

keeps units together, Clausewitz could not throw off the fact that this force would "escape from all book-analysis." (Clausewitz, 1918, p. 177) His challenge would be accepted, and over the years military thinkers have been attempting to pin down what this "glue" is.

S. L. A. Marshall wrote of cohesion following World War II. He disputed the claims of others that World War II soldiers were strengthened by "battle-seasoning" and "mental toughening." Believing that deterioration of a unit's mental and moral fiber resulted from the constant cycle of battle and rest, Marshall felt that the difference between successful and unsuccessful units was a steady growth in unit confidence and tactical cohesion. He points out:

With the growth of experience troops learn to apply the lessons of contact and communicating, and out of these things comes the tactical cohesion which enables a group of individuals to make the most of their united strength and stand steady in the face of sudden emergency. (Marshall, 1947, p. 124)¹

The years following Marshall's landmark work saw many attempts at massaging this "cohesion" concept in order to define it more clearly, break it down into component parts, and then generalize it to the extent that its applicability would be more universal.

¹There are doubts regarding General Marshall's work. Hackworth (1989) disputes many of the general's claims about his combat experience, saying that most of them were simply untrue or at least exaggerated. He calls Marshall a braggart who tended to embellish war stories for the sake of the possible commercial success of his books. In short, Hackworth felt Marshall was a voyeur warrior for whom "the truth never got in the way of a good story." (Hackworth, 1989, p. 585)

Bickel, et al. have 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." (Bickel, et al., 1984, p. 1) Further, the authors define cohesion in a military context as "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." (Bickel, et al., 1984, p. 4) Hauser puts cohesion in even a more "military" context in his definition: "the ability of a military unit to hold together, to sustain mission effectiveness despite combat stress." (Hauser, 1980, p. 204)

Giving some form to a definition of cohesion, Nelson and Berry offer that cohesion is "a group property...with some degree of informal structure reflecting interpersonal sentiments...and characterized by feelings of 'we-ness'...and 'esprit de corps'." (Nelson and Berry, 1968, p. 63) Sarkesian, making a connection between the individual and the society in which he may find himself, derives his definition of cohesion: "the attitudes and commitment of individual soldiers to the integrity of the unit, the 'will' to fight, and the degree to which these are in accord with societal values and expectations." (Sarkesian, 1980, p. 11) Stressing further the importance of the larger society, Lewy believes cohesion is a function "of the political and social fabric and of the willingness of...society to support the military." (Lewy, 1980, p. 105)

Griffen has suggested that cohesion is the same as a unit's potential and that it is a function of bonding and leadership. He believes that bonding and cohesion are different and separate constructs—the link

between the two is purpose. Thus, his definition of cohesion: "the unity of effort of individuals in an organization toward the accomplishment of organizational goals." (Griffen, 1989, p. 2) Griffen echoes Hoiberg, who also breaks cohesion from bonding: "to be cohesive, a group must have a mission or objective." (Hoiberg, 1980, p. 231)

Although many have offered varying definitions of cohesion, there are several common themes. The essence of cohesion is that there is a link, or bond, between the individual and a group. This bond is then translated into a will or commitment to pursue the group's objectives. Cohesion is of interest to anyone involved in an organizational environment, but it is of particular concern to military leaders. What are the components of cohesion? Does cohesion positively affect performance or effectiveness? And if it does, how do military organizations create cohesion? Before considering these questions, a brief historical review is in order. Here, one can plainly see that cohesion has played a significant role in military conflict through the years.

C. HISTORICAL PERSPECTIVES

This section raises the issue of how powerful cohesion can be during crises. There are countless anecdotal instances in which unit cohesiveness played decisive roles. Many times it was this human element, or a lack of it, which determined the outcome of conflict.

During the winter of 1939-1940, Russia invaded Finland. What followed was some of the most vicious fighting ever in the cruelest of environments. The Russians had no idea that the tenaciousness with which the Finns fought would cost them more than 10 Russian lives for each

Finn. As the Russians made their way up the Karelian Isthmus and across the Finnish frontier, lumbering in heavy tanks in a rigid, methodical advance, the Finns were relentless. The mostly reservist Finnish Army, faced with insurmountable odds, employed small, cohesive units on snow skis or in light vehicles. By March, when the Finns had to surrender, this engagement was one of the most costly and bloody campaigns in Russian history. The Russians were stunned by how coordinated and committed the Finnish defensive forces were. This was a lesson in unit cohesion: invasion forces must include in their assessments of opposing forces more than numbers of tanks, planes, and rifles. (Shirer, 1960, and Stokesbury, 1980)

World War II history is full of episodes in which cohesion translated into tenacity, commitment, dedication to cause, and willingness to sacrifice. From the Warsaw ghetto to Corregidor, cohesion allowed groups of individuals to perform at levels greater than would be expected of similarly manned, but non-cohesive, organizations. For an example, one can turn to the German Wehrmacht. In their important work, Shils and Janowitz examined cohesion in that World War II military institution. They asked why, with the odds mounting against them near the end of the war, did German forces not disintegrate? Further, why did many German units become even more effective fighting forces as the German collapse appeared imminent? Shils and Janowitz attributed the Wehrmacht's ability to continue the struggle to unit cohesion. Though they believed Wehrmacht cohesion was a construct of many factors, the authors treated it as the primary reason for many German successes.

Shils and Janowitz summarized their findings as to why a German soldier fought: "...[A]s long as he felt himself to be a member of his primary group," bound to its behavioral norms and demands, "...his soldierly achievement was likely to be good." (Shils and Janowitz, 1975, p. 181) These findings are consistent with definitions of cohesion discussed earlier in this chapter.²

Twentieth-century American military history is a repeated tale of the failure to recognize the importance of unit cohesion to the success of engaged combat units. During the Korean War, in which recognition for individual (rather than unit) performance became the rule, and in which personnel were rotated on an individual basis, unit cohesion suffered. Straub (1988) writes of the frustrations of Army leaders with personnel policies that served to exacerbate their efforts to effectively train and fight during the war. The bonds among men and between men and their units were not taking hold.

The Vietnam war provides the most recent example of how the lack of military cohesion results in a military unit's inability to perform. Hoiberg (1980) writes that cohesion and effectiveness were high in the early years; however, as the conflict wore on, both cohesion and effectiveness deteriorated. She attributes this deterioration to several factors,

²When considering the experiences of the Finns and Germans, one could assert that they had no choice but to fight with such abandon—their backs were against a wall. However, one might also find that it was those frightful pressures that in fact strengthened unit cohesion. Soldiers may have felt that their chances for survival were better if they maintained unit integrity.

including changes in leadership styles, the increase in the number of officers, and the Army's rotation policy. Using the Vietnam war as a case study in their comprehensive commentary on the organizational nature of the U. S. Army, Gabriel and Savage (1978) blame much of the Army's inability to carry out operations on the loss of cohesion at the unit level.

Through the years, other militaries have recognized the vital significance of unit cohesion. In fact, cohesion is an important part of the tradition in which many militaries are entrenched. For example, the British military has been admired for "tightly knit, highly skilled units that rely on cohesion to generate the fighting power needed to overcome numerically superior but less cohesive opponents." (Straub, 1988, p. 7) Stewart, in her examination of the South Atlantic conflict of 1982, reported that British troops exhibited high morale, esprit and cohesion which were "born of a four-hundred year tradition of overseas engagements involving long supply lines, joint operations and amphibious landings." (Stewart, 1988, p. 111) On the other hand, when Stewart studied the Argentines, she found that, for the most part, they lacked the societal factors, training, and confidence that the British so successfully employed to develop cohesion.

The most recent demonstration of the power of cohesion is occurring today in the Middle East. Ya'ari discusses how the seeds of the Palestinian *intifada*, or uprising, were sown within Israel's own prisons. He reports that tens of thousands of Palestinians have passed through Israeli prisons as terrorists, and that

over the years, in full view of their Israeli jailers, Palestinian security prisoners...built an independent network whose cohesion, intellectual verve, and rich store of experience would manifest themselves in all their power during the Palestinian uprising. (Ya'ari, 1989, p. 22)

The prison experience was used as an opportunity for growth; the prisoners came out more self-assured and committed to the Palestinian cause. Indeed, of the 20 or so of the intifada's highest leaders (as opposed to the frenzied streetfighters), only two or three did not serve time in Israeli prisons. The shared experiences and mutual risks taken during incarceration resulted in a nearly invincible will on the part of the new cohesive and resolved Palestinian movement inside the occupied territories.

D. COMPONENTS OF COHESION

A substantial literature has evolved that studies the components of cohesion. What are cohesion's building blocks? How do military organizations assemble these blocks to create viable fighting units? What are threats to cohesion? The answers to these and related questions can be found in many areas, including sociology, psychology, leadership, management, personnel practices, political science, and military theory.

1. Primary Groups

Shortly following World War II, the concept of the primary group on the battlefield was introduced. Followers of this concept believe that strong primary group solidarity results in effective fighting units. Shils and Janowitz hypothesize that the German soldier during the war fought not so much because of ideology, but because he was part of a "social unit which satisfied some of his primary needs." (Shils and Janowitz,

1975, p. 181) Keegan also believes in this very rudimentary explanation for tightly knit units devoid of political or cultural orientation: "...ordinary soldiers do not think of themselves, in life-and-death situations, as subordinate members of whatever formal military organization it is to which authority has assigned them, but as equals within a very tiny group...." (Keegan, 1976, p. 53)

Little (1964) sees the primary group as a network of interpersonal relationships formed by buddies. These buddy relationships were based on an expectation of mutual loyalty, on understanding, and on offering or acceptance of help. According to Wesbrook (1980), these networks, or groups, developed an atmosphere in which soldiers would be willing to fight in terms of their involvement with each other. Typically, the primary group was made up of those who liked each other, were dependent on one another, and who had similar values and goals.

In order for the primary group, in which individuals are bonded to each other, to become bonded to the unit, a commonly cited determinant is shared experiences. Wesbrook (1980) echoes Marshall when he writes that where primary group bonds occur naturally, unit bonds often must be created. Janowitz and Little would agree: "Cohesive primary groups do not just occur but are fashioned and developed by complex military institutions." (Janowitz and Little, 1974, p. 94) The shared experience seems to be that which the military can easily use to create cohesion. Janowitz and Little stress that it "may be crucial...that the members (of the primary group)...have gone through some group

experiences which demonstrate to them the value of social solidarity.” (Janowitz and Little, 1974, p. 96)

2. Society

The extent to which societal factors affect unit cohesion seems to have been somewhat ignored by those studying the primary group. However, some do believe that society at large does affect cohesion on the battlefield.

Clausewitz (1918) includes as one of his chief moral powers the national feeling of the state that was at war. He believes that this “feeling” did affect the ability of armies to fight. Others through the years have followed Clausewitz in this belief. Charles Moskos, in Beaumont and Snyder, believes in society’s role in formulating a winning military force: “...primary groups maintain the soldier in his combat role only when he has an underlying commitment to the worth of the larger social system for which he is fighting.” (Beaumont and Snyder, 1980, p. 33)

What are the social factors that a culture employs (consciously or otherwise) to compel men to fight? Hauser (1980) has suggested that a man will fight because he is enculturated to do so. The soldier submits himself to authority, rules, and regimen not so much because he enjoys them but because of social pressures. In addition to being loyal to his buddies, as discussed above, the fighting man has been indoctrinated to be loyal to his leaders, his unit, and his country. He is also taught to be proud of his country and unit. A final societal factor presented by Hauser is fear: the soldier will be naturally fearful of physical danger, but it is the fear of disgrace that is a social pressure. Hauser believes that units

manned by soldiers most or all of whom have been truly raised to conduct themselves within a society's behavioral norms will be cohesive.

Others have cited the importance of the relationships among soldiers, militaries, and societies. Soldiers need to feel that they are supported by the society from which they come. Ya'ari discusses how the 40,000 prisoners (not quite soldiers, but fighting men nonetheless) who passed through the Israeli jails were greeted as heroes when they returned home: they "were a whole new class of Palestinian society." (Ya'ari, 1989, p. 28) Toomepuu also believes that men fight more effectively when it is clear where the larger society stands. He is less generous to today's larger society when he offers his recipe for fighting which "is legitimated by hardly anything less than a severe, clearly perceived threat...to the fundamental tenets of [a] way of life." (Toomepuu, 1981, p. 41)

One may be alarmed by the fact that the will to fight is inherent in society at large; however, one only needs to recall domestic events in the United States during the Vietnam war to understand the relationship between society and the soldier. Lewy (1980) writes about America's Vietnam War experience and aptly describes the relationship between cohesion and society: "Military cohesion is a consequence of the cohesion of the political and social fabric and of the willingness of that society to support the military." (Lewy, 1980, p. 105)

The responsibility of tying society at large to the soldier in an effort to build a cohesive fighting force falls on the military establishment. How does a military organization create cohesive units? What does

the military need from society? What does it not need from society? What are the societal attributes the military should recognize?

3. The Military Establishment and Cohesion

Military organizations are tasked with taking society's youths and fashioning them into cohesive fighting units which will endure under stress. Keeping in mind how the larger society affects the outcome of this endeavor, it is instructive to examine how changes in American societal norms have created new challenges to a military organization's ability to create cohesion.

Many writers, especially those who have examined the Vietnam and post-Vietnam War eras, have lamented the fact that there has been a steady degradation in military cohesion in the American Armed Forces. They tend to blame changing societal norms, technology, and economics. Their arguments are couched in the language of professional orientation models and leadership/management theory. Bickel, et al. (1984), for example, in their cohesion study, discuss service members' migration from institutional to occupational models of service. The service member characterized as serving within the institutional model answers, according to Moskos, to a calling or "a purpose transcending individual self-interest in favor of a presumed higher good." (Moskos, 1977, p. 2) On the other hand, the occupational model is characterized by remunerative controls; it works like a marketplace in which contractual relationships are established and the enterprising interest will prevail. (Bickel, et al., 1984)

There are two major reasons for the shift to the occupational model of service. The technological revolution has altered the way in which military people relate to each other and their units. People are technically trained to perform specific operations on specific equipment; functional units are broken down into smaller groups along technical lines, thus reducing face-to-face interaction and threatening unit integrity (Bickel, et al., 1984). Remington (1986) discusses these relatively new organizational phenomena in a "generalist versus specialist" framework. As homogeneous units are fractured into subgroups of technical experts, the "greater good" is subordinated to the occupational interests of the subgroups.

The second factor responsible for the shift to the occupational model of service is what Straub (1988) calls the notion of the primacy of the individual. Rooted in American heritage, the United States' experiment in democracy is attempting to empower, above all, the individual. That a society is protecting individual rights above all else presents challenges to a military establishment which must homogenize its fighting forces into cohesive units.

The Armed Forces must work in this changing social environment. Many have suggested that some of the changes described above are related to a degradation in cohesion. One can examine how the Armed Forces have responded over the years to their changing world to discover whether, in fact, this degradation is occurring. The answers lie in leadership, management, and personnel practices.

During World War II, U.S. Army General George C. Marshall knew the war was going to be long. America's relatively new management practices to which General Marshall had to turn (analysis, decision modeling, etc.) had serious consequences in terms of military cohesion (Gabriel and Savage, 1978). Marshall's manpower planners viewed manpower as a resource; individual men could be replaced or accounted for like parts of a tank or an airplane (Straub, 1988). A military unit was viewed as a group of individuals rather than as a like-minded whole. This notion of treating manpower as a resource gave rise to the individual replacement system. In this system, combat casualties were replaced individually. A new soldier would be introduced to a combat unit already in the field made up of men he had never seen before. On average, he, one of the new soldiers, was more likely to suffer a combat casualty during his first few days on the battlefield than were the other members of the unit into which he was being assimilated. (Straub, 1988)

The trend of weakening cohesion continued during the Korean and Vietnam wars. Again, one can look to military personnel practices for clues about how this weakening occurred. These centralized practices served to destroy unit cohesiveness by placing the importance of an individual's safety or career over the unit's ability to endure. During Korea, in the interest of fairness to the individual, a combat soldier would earn points which eventually would get him removed from the combat zone (Straub, 1988). He would leave and another soldier, unknown to the rest of the unit, would be ordered in as a replacement; not surprisingly, cohesion suffered (Straub, 1988).

The Vietnam war found the Army trying to be fair once again. The individual replacement system remained intact. To make matters worse, as many officers as possible were rotated through combat duties including command; their tours were designed to enhance an officer's career and were as short as six months. The consequence was that the enlisted soldier could not identify with his leadership; cohesion suffered as the combat troops perceived that their officers were not willing to fight and die with them. (Gabriel and Savage, 1978)

Consistent with the move toward the occupational model of service and the notion of primacy of the individual, Gabriel and Savage blame much of what occurred in Vietnam on changing values. The ethos of service personnel had apparently moved from selfless "gladitorial" stereotypes to self-centered managerial imperatives. A military unit consisting of individuals, each engaged in self-serving activities, is not going to enjoy the fruits of cohesion, as Gabriel and Savage observe:

It is this sense of belonging, of sharing common values, and of being unique (the group) that defines a truly cohesive military unit. It is these factors which... motivate the individual soldier to stand and fight and to risk death in the service of his comrades. (Gabriel and Savage, 1978, p. 21)

How can a military organization create an atmosphere in which soldiers feel a sense of belonging? How are a unit's values transferred to the soldiers? How is it that the military can foster an environment in which soldiers share common experiences? Lessons from the past point to personnel turnover within a unit. A unit in which officers are rotated frequently or men are replaced in a random fashion has a difficult time creating cohesion. In short, unit personnel stability has been shown to be

a central theme in promoting cohesion. The remainder of this section focuses on unit stability and its relationship to cohesion and performance.

4. Personnel Turbulence

It has been shown that there are several components to cohesion; a review of these has ranged from such broad topics as the larger society's norms to narrower subjects such as a man's psychological profile as he enters service. Most of these factors are out of the military's control. However, the military can effect changes within its own personnel system. The following is a review of the literature on turnover and its relationship to cohesion and performance.

In Lewis Sorley's call for an overhaul in military performance criteria, he points to personnel turnover as the major determinant in degraded unit performance. Sorley stresses that there is great value in building among men shared values and outlooks to lead them in tasks which are difficult, dangerous, and demanding. He notes that achieving these ends takes time and stability; therefore, "turbulence of personnel in a unit must be seen as a primary indicator of weakened coherence." (Sorley, 1980, p. 77) When turnover is high enough, a full-time job is made of assimilating and integrating new arrivals to a unit. This expanded job weakens the unit's ability to perform.

Other writers agree. Phipps, for example, observes that in a stable unit, over time, "inspiration comes from a relationship of mutual trust and self-confidence, of strong group loyalty, and discipline." (Phipps, 1982, p. 2) In an environment of personnel turbulence, fighting

men lose confidence in their leaders and in themselves. Kellett notes that generally there is "a relationship between long service within a certain unit and high morale." (Kellett, 1982, p. 42)

The short tours of duty during Vietnam (discussed above) had beneficial effects on individual morale, but the military paid a high price in terms of personnel stability. Lewy (1980) is one of many who have discussed how this turbulence weakened unit cohesion and effectiveness. In a paper on military disintegration, Wesbrook (1980) cites personnel stability as one of the most important conditions for strong unit cohesion and the avoidance of disintegration in the face of danger. Thiemann, in Sorley (1980), very adroitly ties these ideas together:

Building confidence takes time, as does building the competence from which confidence derives. Neither can be achieved in an organization...whose people move like tumbleweeds in the desert wind. (Sorley, 1980, p. 76)

The U. S. Army has responded to the overwhelming evidence that personnel turnover is related to cohesion. In 1981, it established the New Manning System, which consists of the Cohesion, Operational Readiness and Training (COHORT) unit movement system and the Regimental System. The COHORT system was designed to tighten cohesion through unit movements, as opposed to individual replacements. The Regimental System would unify soldiers and their battalions; the soldiers would be affiliated with the same stable regiment throughout their careers. COHORT would begin at enlistment, when the soldier could select the Regimental/COHORT option. The recruits would undergo their initial training (boot camp) together and upon completion would be

assigned to a COHORT unit, where they would join their chain of command. Eventually, they would deploy overseas together. This new system was designed to promote cohesion by promoting stability and reducing turnover. The soldiers could align their allegiance to their units over the long term; they now could permanently identify with their units, which would be rotated in toto with other cohesive units. (Wong, 1985)

Results have been good. Strong bonding has occurred in these units. Wong (1985) reports that COHORT units do indeed have more stability, perform better than non-COHORT units, and reenlist more of their soldiers. In short, "COHORT soldiers are more competitive, possess strong family feelings in their units, have lower attrition rates and strong horizontal bonding." (Wong, 1985, p. 13) Unfortunately, as Straub (1988) reports, the system has begun to weaken as the Army tries to balance the needs of individual career progression and unit cohesion.

5. The U.S. Navy and Personnel Turbulence

Almost all the cohesion literature from the classics to the present deals with army units. Most who have studied the phenomenon have done so in what they perceive as the most human of the warfighting environments—the infantry unit on the battlefield. But what about naval forces? For instance, is it unreasonable to expect that the same societal, technological, and psychological factors discussed in the literature would apply to cohesion in the U.S. Navy? There is no reason to expect that sailors and soldiers on the day of their enlistments into the U.S. Armed Forces have significantly different social and psychological profiles. This thesis assumes that cohesion in Navy units is affected by many of the

same determinants as in the Army. More specifically, the focus is on the controllable factor of personnel turnover and its relationship to unit performance on naval surface ships.

Thorndyke and Weiner (1980) have identified turnover as a major obstacle in keeping Navy teams together. Embarking on a major research effort to find ways to improve Navy team training, they believe that Navy personnel policies limit team performance. They note the paucity of research in this area and suggest that turnover must be costly to overall performance beyond levels predicted by simple aggregation of individual skills.

The Center for Naval Analyses has made preliminary efforts at recognizing turnover and its use as an indicator of the strength of cohesion in a naval context. To begin, Domabyl, et al. (1987) defined turnover as a rate based on the number of new personnel, or gains, reporting aboard a ship. With this measurement technique, they then found that mean annual turnover rates for all ships is about 44 percent. They also found that turnover does not vary substantially over time, by ship type, or even over deployment cycle. Continuing on her own, Domabyl (Sept. 1987) suggests that there is a relationship between unit cohesion and readiness. She asserts that the individual replacement system in effect today causes continuous turnover and degrades unit training readiness, an idea consistent with the literature thus far examined.

Reeves (1982) attempted to find whether personnel turbulence affected performance. He hypothesized that personnel turbulence influences the performance or output of members of a unit. For the purposes

of his study, Reeves defined performance in terms of Navy Casualty Report (CASREP) data converted to maintenance downtime. His turnover rate was determined using the Navy Personnel Research and Development Center's Survival Tracking File. Descriptive data included length of service, years of education, age, etc. of personnel on 40 ships. The data did not support any correlations between turnover and his particular performance measure.

Although Reeves' data did not support a relationship between turnover and a measure of ship performance, it is proposed that his hypothesis, as well as similar hypotheses by others, is not without merit. A methodology by which relationships between turnover and performance are assessed can be developed without great difficulty; given the above literature survey, it should be intuitively appealing. However, the difficulty lies in identifying performance measures. Researchers have been pulling their collective hair out for years in attempts to find performance measures that are truly useful in identifying those attributes which make one effort more effective than the other. The remainder of this paper continues this pursuit with the idea that turnover, as a determinant of cohesion, affects unit performance.

III. METHODOLOGY

A review of the literature has shown that many hypothesize that personnel turnover is an indicator of weakened unit cohesion and that degraded unit performance results from lowered cohesion. In this thesis, an attempt is made to quantitatively express this hypothesis.

A. SELECTION OF MEASURES OF EFFECTIVENESS

After a review of the literature, discussions with type commander staff officials, and a review of the author's at-sea experiences, measures of shipboard effectiveness were selected. Because no *one* measure has yet been identified as representing a unit's effectiveness, in this thesis seven measures have been selected. They cover shipboard activities including personnel matters, training, engineering, supply, and maintenance.

1. Personnel Retention Rates

A retention rate measures how many sailors aboard a unit reenlist for another term of service or extend their current term.³ A career counselling structure exists aboard each ship that is designed to inform sailors about career opportunities, in-service benefits, and training and education programs available to them. A successful ship's

³Service members generally have the option to reenlist for another full term of service or to extend their current term. Extending a current term of service (usually up to one year) allows the member more time to further assess his career options. He may need to extend to be eligible for additional training, or he may have to extend to be eligible for rotation. In short, extensions allow for flexibility.

retention program is thought to reflect a healthy and effective command climate.

The rates used for this study are gross retention rates over an 18-month cycle. Gross rate equals the number of sailors who reenlisted or extended their term of enlistment divided by the total number of service members who reached their End of Active Obligated Service (EAOS). The rates are given for first term, second term, and career categories. "Term of service" refers to the enlistment period in which the service member is serving when he or she decides to reenlist or extend.

Semi-annual retention rates are maintained by the type commander. For this study, one rate for each retention category was required for the 18-month period; the 18-month period constitutes the type commander's competitive cycle. Therefore, three semi-annual retention rates for each category were averaged. Cases that were missing one of the three rates were kept and averaged using two rates. Cases that were missing two or three reported rates were deleted from the study. It is expected that personnel retention rates will be negatively correlated with turnover.

2. Supply Management Assessment (SMA)

The Supply Management Assessment measures the extent to which a unit can effectively manage its resources. A ship's supply department is responsible for acquiring, storing, and distributing spare parts. It is also the crew's paymaster and hotel service provider. In a warfare sense, the supply department is the ship's logistics support.

During the 18-month competitive cycle, the ship's supply department undergoes a rigorous assessment of its ability to carry out its

missions. The department receives scores in four mission areas: level of knowledge, sustainability, accountability, and combat support. For this study, one score is desired. The four verbal scores provided for each ship have been converted to numerical measures (Failure=1, Marginal=2, Good=3, Excellent=4, Outstanding=5) and averaged for a single supply management assessment score. It is expected that Supply Management Assessment scores will be negatively correlated with turnover rates.

3. Maintenance and Material Management (3M) Inspection

The 3M Inspection is used to evaluate the effectiveness of each unit's 3M program and, when deficiencies are noted, to provide commanding officers and cognizant commanders the information needed to initiate corrective action. The evaluation is based on maintenance scheduling and accomplishment over the 13-week period just prior to the inspection.

The inspection team looks at the Recorded Accomplishment Rate (RAR) for each work station; it then performs spot checks on two percent of the scheduled maintenance items recorded as complete and derives an Accomplishment Confidence Factor (ACF). The 3M performance score is derived by multiplying the RAR by the ACF. The score is provided on a 100 percent scale and can be used in this study as is. It is expected that 3M inspection results will negatively correlate with turnover.

4. Training Readiness Evaluation (TRE)

All surface units participate in training exercises in preparation for upcoming overseas deployments. Training and readiness

requirements are organized into a syllabus that lists in-port and at-sea exercises in a graduated sequential order of completion.

The cycle begins during a ship's overhaul when the crew attends formal schools. The second phase occurs after the overhaul and includes equipment checks, operator training, and mission area team training. The second phase is completed when the ship and crew successfully complete the Training Readiness Evaluation. This evaluation assesses how well the ship has completed the first two phases and determines whether it is ready to enter phase three (intermediate) training.

The purpose of phase three training is to integrate individual and team performance into a fully developed operational entity. The training, called Refresher Training (REFTRA), is done underway in various readiness conditions and concludes when the ship's watch teams are prepared for the battle group environment. The fourth, or advanced, phase integrates team training in a fully coordinated, multiple threat environment. This occurs as a pre-deploying battle group goes to sea and engages in major fleet exercises.

For this study, a training/readiness measure is needed that will vary across units. During phases one and two, a unit trains alone; it is expected that there would be differences across ships. The problem with using measures from phases three or four is that the goals of the latter two phases are to train ships' crews to a standard. Data reflecting time-to-reach-goal are not available. Therefore, for this paper, the Training Readiness Evaluation, which represents a culmination of a crew's efforts during phases one and two, is used.

The Training Readiness Evaluation is performed by a team which examines a crew's qualification records, the ship's safety program, and the physical readiness of the ship to go to sea and engage in Refresher Training. The evaluation team determines whether the ship can be allowed to continue with phase three training and provides the ship a list of discrepancies that need to be corrected.

Because all ships sooner or later will be certified ready to continue training, this study uses the number of deficiencies cited by the inspection team as a measure of training effectiveness. Because a higher measure indicates poorer performance, it is expected that Training Readiness Evaluation measures will positively correlate with turnover.

5. Operational Propulsion Plant Examination (OPPE)

The Operational Propulsion Plant Examination score measures the extent to which a crew is able to safely operate its engineering plant. The inspection is administered by the Propulsion Examining Board at least once during each competitive cycle. Watch standers take written tests tailored to the watch station for which they are reportedly qualified. Following the written test and an equipment inspection, the ship gets underway so that the engineering team can be observed during routine operations, imposed casualties, and damage control drills. Upon completion of the OPPE, the ship receives either a satisfactory or an unsatisfactory grade.

Each ship must pass the OPPE; therefore, the Propulsion Examining Board conducts re-inspections until a satisfactory score is earned. To reveal variation across ships, this study uses each ship's first

OPPE score received in the 18-month period. The verbal scores have been converted to numerical measures: unsatisfactory=0, satisfactory=1. It is expected that OPPE scores will be negatively correlated with turnover rates.

B. SELECTION OF A TURNOVER MEASURE

For this thesis, a turnover measure is desired that has the broadest of meanings. There have been studies that have examined the determinants of turnover; these studies typically point to issues like demographic, job satisfaction, tenure, and economic variables. This study acknowledges that these are the many possible factors subsumed by a broad turnover definition.

However, setting these factors aside for this study allows the research to focus on the hypothesized relationship between turnover and effectiveness.

Turnover is defined in this study as a rate computed by dividing the number of individuals assigned to a unit at any point during the 18 months by the number of billets authorized for budget purposes. This measure does not reveal under what circumstances service members arrived at or left a command. It can, however, reveal to what extent personnel movement occurred aboard a unit during the period in question.

C. SCOPE

The sample consists of 169 surface ships under the command of Commander, Naval Surface Force, U.S. Pacific Fleet. All are included except those for which data are unavailable due to missing or

non-existent reports. The latest 18-month period for which data are available for all variables in this thesis is October 1987 through March 1989. An 18-month period has been chosen consistent with the length of a competitive cycle.

D. DATA SOURCES

The raw data on all performance measures have been provided by the staff of Commander, Naval Surface Force, U.S. Pacific Fleet, headquartered in San Diego, California. A list of Unit Identification Codes (UICs) was supplied to the Defense Manpower Data Center (DMDC) in Monterey, California. Technicians at DMDC extracted from the six pertinent quarterly Enlisted Master Records (EMRs) the total number of enlisted social security numbers associated with each UIC at any point in time during the 18-month period. If a social security number appeared in one of the quarterly reports, it was included in the output supplied to the author. Additionally, DMDC provided the number of authorized billets for each UIC for 1988. It is assumed for this study that the 1988 authorized billet structure is relatively constant during the period in question; authorized billet numbers change only once a year and changes are not usually significant. It is also assumed that differences between the number of authorized billets and actual manning on board each ship during the period are systematic across the sample and will not introduce significant error in the analysis.

E. ANALYSIS TECHNIQUE

Although several performance measures have been chosen for this thesis, it cannot be presumed that they represent all the variables that indicate a unit's effectiveness. Further, it cannot be assumed that turnover is the only variable that affects unit performance. Preliminary analysis thus cannot include models of causality. The variables themselves are unsuitable for some classical statistical procedures. However, one may hypothesize how the variables might be related.

To measure the degree of association between turnover rates and the effectiveness variables, Pearson Correlation Coefficients (r) have been computed. This test is useful for making inferences about the association between two variables (Neter, et al., 1989). Correlation coefficients range from -1 (perfectly negative relationship between variables) to 1 (perfectly positive relationship between variables). Correlation coefficients have been computed between turnover rates and the measures of effectiveness as well as among the measures of effectiveness themselves.

Conclusions made from this technique are cursory at best. However, relationships discovered among the variables during this effort can be considered a first step toward a better understanding of the links that may exist between cohesion, personnel turnover, and effectiveness.

IV. RESULTS

Pearson Correlation tests are shown in Table 1 for turnover rates and measures of effectiveness. The following is an explanation of the values in the table.

The table is divided into cells; each cell corresponds to a test of correlation between turnover rates and each measure of effectiveness (read down the left side of table). The top numbers in each cell are the Pearson Correlation Coefficients (r). They measure the strength of the relationships between two variables and range from -1 to 1 . A correlation coefficient of 1 indicates a perfectly positive relationship between two variables; if one variable has a high value, so does the second variable. Similarly, a correlation coefficient of -1 indicates a perfectly negative relationship between two variables. A correlation coefficient of 0 means that there is no systematic relationship between the values of the two variables. Correlation coefficients between these extremes indicate relatively strong to weak bivariate relationships.

The second number is the significance level. Each coefficient of correlation has an associated significance level that indicates the probability that the coefficient was generated by chance. The closer the significance level is to 0 , the more likely one can conclude that the correlation coefficient was not generated randomly; therefore, some other meaning may be ascribed to the coefficient. For this thesis, attention will be focused on cells with significance levels between 0 and $.1$.

TABLE 1
PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS*
NAVAL SURFACE FORCE, U.S. PACIFIC FLEET

	Turnover Rate
First-Term Retention	.18497** sig .0167 N = 167
Second-Term Retention	-.09304 sig .2389 N = 162
Career Retention	-.29810** sig .0001 N = 166
Supply Management Inspection	.16550 sig .1588 N = 74
Maintenance and Material Management Inspection (3M)	-.17393** sig .0705 N = 109
Training Readiness Evaluation	.13549 sig .1857 N = 97
Operational Propulsion Plant Examination (OPPE)	-.08799 sig .3455 N = 117

*Each cell represents a test of correlation between turnover rates and each measure of effectiveness (MOE) (read down the left side of the table) for the period of October 1987 through March 1989. The first number of each cell is the correlation coefficient. The second number is the significance level. The third number is the sample size on which the correlation coefficient was computed.

**Significant at .10 level

The third number in each cell is the sample size on which the correlation coefficient was computed. Variation in sample size occurs across the measures of effectiveness because not all ships undergo all the tests and inspections during a given cycle (for reasons including overhauls, deployments, and so on).

A. NAVAL SURFACE FORCE, U. S. PACIFIC FLEET RESULTS

Across the entire sample, three of the seven effectiveness variables correlated significantly with the turnover rate variable. First-term retention rates, however, are positively correlated with turnover rates, a result that is counterintuitive. This may be because many first-term reenlistees sign reenlistment contracts in return for further schooling or guaranteed reassignment.

Turnover rates and career retention rates are negatively correlated, as expected. This indicates that, to a certain extent, a high turnover rate corresponds to a lower career retention rate. The third significant and expected relationship is found between turnover rates and 3M Inspection scores. Higher turnover rates correspond with lower performance in this maintenance evaluation.

The sample was broken down by ship class to further assess the relationships between turnover and measures of performance. In Table 2, it can be seen that for guided missile destroyers (DDGs), there is a significant negative correlation between the Supply Management Assessment and turnover. However, due to the small sample size of this cell (N=4), it would be imprudent to draw conclusions about the relationship. An

TABLE 2
PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS*
GUIDED MISSILE DESTROYERS (DDGs)

	Turnover Rate
First-Term Retention	.21414 sig .4435 N = 15
Second-Term Retention	.10932 sig .6981 N = 15
Career Retention	-.16636 sig .5535 N = 15
Supply Management Inspection	-.93047** sig .0695 N = 4
Maintenance and Material Management Inspection (3M)	-.30756 sig .4587 N = 8
Training Readiness Evaluation	-.55446** sig .0767 N = 11
Operational Propulsion Plant Examination (OPPE)	-.05482 sig .8804 N = 10

*Each cell represents a test of correlation between turnover rates and each measure of effectiveness (MOE) (read down the left side of the table) for the period of October 1987 through March 1989. The first number of each cell is the correlation coefficient. The second number is the significance level. The third number is the sample size on which the correlation coefficient was computed.

**Significant at .10 level

unexpected relationship is found between the Training Readiness Evaluation and turnover. This cell indicates that high turnover correlates with good performance (recall that a positive sign was expected for this relationship).

Table 3 shows the correlation coefficients for the destroyers (DDs). Two significant relationships are found. As with the large sample, turnover and first-term retention rates correlate significantly in the unexpected direction. Turnover and OPPE scores show a coefficient that is negatively signed, as expected.

Table 4 reveals that for the guided missile cruisers (CGs), only one correlation coefficient is significant; however, it is positively signed, which is inconsistent with expectations and with the coefficient in the large sample.

B. SUMMARY

The majority of the cells did not indicate significant relationships between turnover and measures of effectiveness. Further, those cells that were significant often only offered correlation coefficients indicating weak to moderate relationships (high coefficients came from very small samples). Some of the relationships were contrary to expectation and counterintuitive. Given these weaknesses and inconsistencies, one must be very cautious when drawing conclusions about the relationships.

TABLE 3
PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS*
DESTROYERS (DDs)

	Turnover Rate
First-Term Retention	.59389** sig .0417 N = 12
Second-Term Retention	.22045 sig .5148 N = 11
Career Retention	.28049 sig .3772 N = 12
Supply Management Inspection	.21322 sig .6462 N = 7
Maintenance and Material Management Inspection (3M)	.39949 sig .3268 N = 8
Training Readiness Evaluation	-.04615 sig .9217 N = 7
Operational Propulsion Plant Examination (OPPE)	-.74248** sig .0219 N = 9

*Each cell represents a test of correlation between turnover rates and each measure of effectiveness (MOE) (read down the left side of the table) for the period of October 1987 through March 1989. The first number of each cell is the correlation coefficient. The second number is the significance level. The third number is the sample size on which the correlation coefficient was computed.

**Significant at .10 level

TABLE 4
PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS*
GUIDED MISSILE CRUISERS (CGs)

	Turnover Rate
First-Term Retention	.51082 sig .1083 N = 11
Second-Term Retention	-.33692 sig .2842 N = 12
Career Retention	-.21267 sig .5301 N = 11
Supply Management Inspection	.80271 sig .1020 N = 5
Maintenance and Material Management Inspection (3M)	.65296 sig .1118 N = 7
Training Readiness Evaluation	-.23064 sig .6188 N = 7
Operational Propulsion Plant Examination (OPPE)	.61158** sig .0801 N = 9

*Each cell represents a test of correlation between turnover rates and each measure of effectiveness (MOE) (read down the left side of the table) for the period of October 1987 through March 1989. The first number of each cell is the correlation coefficient. The second number is the significance level. The third number is the sample size on which the correlation coefficient was computed.

**Significant at .10 level

C. ADDITIONAL INFORMATION

Statistics describing turnover and the measures of effectiveness for the large sample and the ship type samples are provided in Appendix A. Correlation coefficient tables similar to those examined in this chapter are included in Appendix B for additional ship types. Appendix C offers correlation tables for the measures of effectiveness themselves. Although not a specific issue addressed in this thesis, studies of intercorrelations among the effectiveness measures might reveal interesting results.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

One must be cautious when ascribing meaning to bivariate relationships such as correlation coefficients. Much more information than can be revealed using bivariate analysis is hidden in the variables. Multivariate techniques would reveal more about the intricate relationships among the variables, but the data used for this thesis do not readily lend themselves to use of multivariate procedures. A discussion of the relationships found during this study, however, should provide a starting point for assessing the links between measures of effectiveness, turnover, and cohesion.

Across the large sample, only two significant expected relationships were found between turnover and the measure of effectiveness variables (Career Retention, 3M Inspection). The coefficients can be said to imply that, to a certain extent, as personnel turnover rates grow, career retention and material maintenance efforts suffer. One might interpret the degraded retention performance as the result of an unstable personnel atmosphere aboard ship; this environment may hurt a command's ability to convince those personnel who are at the end of their second term of service to reenlist. The statistical relationship found between the 3M inspection and turnover may imply that personnel turbulence prevents work station personnel from receiving proper maintenance training or equipment indoctrination. These inadequacies may then prevent

maintenance personnel from spending the necessary time on the job actually performing the preventive maintenance.

The remaining relationships across the large sample were either unexpected or not statistically significant. Across all the samples, the relationships were often small, inconsistent, or counterintuitive. There are many possible reasons for these weaknesses. For example:

- The turnover rate derived from the DMDC files may not accurately reflect the actual turnover that is occurring aboard the ships. The difference between the ships' billet authorizations and their actual manning may introduce error into the calculated turnover rate. This error would skew the results if it were not systematic across the sample.
- The measures of effectiveness may lack reliability and validity. Muchinsky (1987) discusses measures as predictors of future criteria. In a military setting, one important criterion for which predictive measures should be developed is combat readiness. The notion of reliability of effectiveness measures means that they should yield the same estimates of criteria on repeated use. Validity refers to accuracy and precision: Does the measure yield a correct estimate of what is being assessed? Is the measure appropriate for drawing inferences about readiness? If the measures of effectiveness chosen for this thesis are not reliable and valid, then one cannot draw accurate inferences from them; systematically, they would be flawed.
- The measures of effectiveness may not be administered consistently and in a systematic fashion. Ships do not undergo the various evaluations in the same sequence. Ships are evaluated by different inspectors who may or may not be biased in some way toward a particular ship. The inspectors each may rate performance differently; they may grade leniently, they may respond to the "halo effect," or they may have a tendency to avoid assigning extreme grades to a ship (Muchinsky, 1987).
- The effectiveness measures chosen may not reflect ship-wide performance (the turnover rate reflects ship-wide turnover). For example, Supply Department personnel would be more interested in the Supply Management Assessment than would Engineering personnel.
- There may be no systematic relationship between personnel turnover and shipboard effectiveness.

It is the author's opinion that nearly all weaknesses of the empirical portion of this paper can be attributed to the effectiveness measures. Having been assigned aboard surface units and participated in many inspections, the author has observed that, without exception, all evaluations suffer from many of the problems described above. Other considerations when examining measures of effectiveness must include the inspector's subjective notions and preconceptions about a unit, parochialism, a command's climate, and many others.

Some other considerations should be taken into account when assessing the results of the analysis. There is wide variation across ship types and across ships within a class. The individual ships have different schedules, are home-ported in different harbors, have had their equipment modified in various ways, have had their manning levels altered over the years due to changes in equipment or mission, and possess many other unknown or undocumented characteristics introducing variability into the data used in this thesis. These variations make it difficult to homogenize a sample for analysis of specific variables and their relationships.

B. RECOMMENDATIONS

Continuing research in the area of turnover and effectiveness should yield benefit to the Navy. If a definitive link can be found, then the Navy can take steps to improve the personnel atmosphere. Some directions research can take may include:

- Using other performance measures and examining the relationships between them and turnover. There are numerous other measures

that are available and could be used. Some examples are maintenance down time, percentage of time ships are reported at various readiness levels, unit award designees, weapons inspections, overall squadron staff assessments, and many others. There are certainly other effectiveness indicators that have yet to be identified. As discussed above, there are those who believe subjective measures of effectiveness should be identified. (Havron, 1984)

- Trying different methods to construct or aggregate measures. For example, factor analysis could be used to derive a "single score" performance measure for future turnover studies.
- Trying other methods to define turnover. One can calculate turnover using methods that include or exclude different individuals from the resulting figure. Future studies may need a turnover measure that has a narrower meaning. For example, the extent to which first-term attrition affects turnover rates may be interesting.
- (Related to the above recommendation) Examining the determinants of turnover. Possible reasons include attrition, job rotation, further training, separation at EAOS, illness, and so on.
- Examining the relationships among the performance measures themselves. What are the intercorrelations? Does the result of one engineering-related inspection predict the outcome of another one?
- Trying other ways of defining a sample population. Looking for units with similar schedules, examining turnover across different occupational ratings, or finding units that were assessed by the same individual during a given inspection should yield useful results.
- Using a shorter interval of time than the 18 months used here. This might reduce the effects of many non-turnover variables on ship performance.

The link between cohesion, turnover, and effectiveness should be studied further. If a link were found, the possibilities for improving performance through tighter cohesion could be explored by the Navy. Future research in this direction can attempt to answer the following questions:

- What are the indicators of a cohesive unit? Can a cohesion measure be developed for Navy leadership to use?
- Are there levels in Navy organizations in which cohesion is important? Does a sailor identify most strongly with his watch section, his

division, his department, his ship, his squadron, or the Navy as a whole? If an organizational level can be identified, is it appropriate? If it is not, can organizational behavior be manipulated to the extent that individuals will bond at the appropriate level?

- How long does it take a unit with personnel stability to reach a "state of cohesion"—a state that might provide for improved effectiveness?
- Is there a relationship between naval technology and unit cohesion? As technical complexity increases and individuals specialize, how do unit norms change? Are organizational goals subordinated to individual goals?⁴
- Is there a relationship between leadership styles and unit cohesion? Can the behavior of the commanding officer be measured with respect to his or her unit's cohesiveness?
- Assuming the above questions can be answered, how might the Navy's personnel system be manipulated to create a more cohesive atmosphere? Can the Navy adopt a system similar to the Army's COHORT or Regimental Systems? Can the Navy create, for example, a cohesive squadron of surface units—a squadron in which a sailor remains for an entire career? Hypothetically, the sailor could be promoted up the ranks within the squadron, could be rotated to various jobs within a group of ships, and could spend shore tours at the squadron headquarters engaged in activities that directly support his squadron.

The Navy faces an uncertain future with respect to its resources. As of this writing, deep budget cuts appear imminent. How the Navy responds to these pressures surely will affect the personnel climate. The more tools Navy personnel policy planners have at their disposal, the better the resulting policies should be. Useful tools that should be developed include those which will reveal the importance of turnover to the overall

⁴These questions come to mind when considering recent incidents, including the USS VINCENNES missile attack on the Iranian airliner and the USS IOWA turret explosion.

climate on a ship. Manpower planners already know that turnover is expensive in the context of a military budget. If they find that an additional cost of high turnover is reduced unit cohesion and effectiveness, then the planners might be more likely to consider fundamental changes to the Navy's personnel rotation system.

APPENDIX A

DESCRIPTIVE STATISTICS FOR TURNOVER AND MOE VARIABLES

Variable	Mean	Minimum	Maximum	N
Naval Surface Force, U. S. Pacific Fleet				
First Term Retention	32.62	0.00	83.33	171
Second Term Retention	64.09	7.14	100.00	166
Career Retention	74.86	0.00	100.00	170
Supply Assessment	3.52	1.75	5.00	78
3M Inspection	87.80	75.00	95.00	109
Training Evaluation	106.89	23.00	255.00	98
Propulsion Examination	0.73	0.00	1.00	120
Turnover Rate	1.54	0.99	2.46	169
Guided Missile Destroyers (DDGs)				
First Term Retention	30.87	13.61	56.55	15
Second Term Retention	64.95	11.11	100.00	15
Career Retention	76.22	48.89	96.97	15
Supply Assessment	3.25	2.75	3.75	4
3M Inspection	89.00	80.00	94.00	8
Training Evaluation	123.45	26.00	254.00	11
Propulsion Examination	0.70	0.00	1.00	10
Turnover Rate	1.51	1.44	1.58	15
Destroyers (DDs)				
First Term Retention	34.13	21.56	73.99	15
Second Term Retention	61.32	33.94	76.67	14
Career Retention	72.96	7.46	100.00	15
Supply Assessment	3.63	2.50	4.25	10
3M Inspection	88.13	83.00	95.00	8
Training Evaluation	99.25	29.00	188.00	8
Propulsion Examination	0.82	0.00	1.00	11
Turnover Rate	1.51	1.45	1.60	12

Variable	Mean	Minimum	Maximum	N
Cruisers (CGs)				
First Term Retention	35.04	25.62	50.25	11
Second Term Retention	73.53	10.00	100.00	12
Career Retention	75.81	57.94	83.07	11
Supply Assessment	3.27	3.00	3.67	5
3M Inspection	89.00	86.00	95.00	7
Training Evaluation	97.43	50.00	139.00	7
Propulsion Examination	0.88	0.00	1.00	9
Turnover Rate	1.46	1.09	1.59	12
Guided Missile Frigates (FFGs)				
First Term Retention	30.81	0.00	54.29	20
Second Term Retention	53.80	16.67	85.71	20
Career Retention	75.68	48.02	100.00	20
Supply Assessment	3.87	2.75	5.00	13
3M Inspection	88.00	79.00	95.00	13
Training Evaluation	98.23	45.00	181.00	13
Propulsion Examination	0.73	0.00	1.00	15
Turnover Rate	1.65	1.42	2.27	19
Frigates (FFs)				
First Term Retention	32.89	18.54	63.58	25
Second Term Retention	61.90	7.14	100.00	25
Career Retention	77.65	57.41	100.00	25
Supply Assessment	3.10	1.75	4.25	10
3M Inspection	86.66	80.00	94.00	21
Training Evaluation	131.10	72.00	213.00	10
Propulsion Examination	0.59	0.00	1.00	22
Turnover Rate	1.58	1.45	2.26	25
Landing Ship Tank (LSTs)				
First Term Retention	27.35	14.26	59.41	10
Second Term Retention	65.47	33.33	91.67	10
Career Retention	74.30	51.67	89.29	10
Supply Assessment	3.53	3.00	4.00	9
3M Inspection	89.60	82.00	95.00	5
Training Evaluation	79.13	45.00	122.00	8
Propulsion Examination	0.67	0.00	1.00	6
Turnover Rate	1.59	1.41	2.46	10

APPENDIX B

CORRELATION TABLES FOR ADDITIONAL SHIP TYPES

TABLE B-1

PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS*
GUIDED MISSILE FRIGATES (FFGs)

	Turnover Rate
First-Term Retention	.17885 sig .4638 N = 19
Second-Term Retention	.11642 sig .6351 N = 19
Career Retention	.01375 sig .9555 N = 19
Supply Management Inspection	.36530 sig .2429 N = 12
Maintenance and Material Management Inspection (3M)	-.30785 sig .3062 N = 13
Training Readiness Evaluation	.44106 sig .1314 N = 13
Operational Propulsion Plant Examination (OPPE)	-.33542 sig .2411 N = 14

*Each cell represents a test of correlation between turnover rates and each measure of effectiveness (MOE) (read down the left side of the table) for the period of October 1987 through March 1989. The first number of each cell is the correlation coefficient. The second number is the significance level. The third number is the sample size on which the correlation coefficient was computed.

TABLE B-2
PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS*
FRIGATES (FFs)

	Turnover Rate
First-Term Retention	.01840 sig .9304 N = 25
Second-Term Retention	.23519 sig .2578 N = 25
Career Retention	.01737 sig .9343 N = 25
Supply Management Inspection	-.13748 sig .7049 N = 10
Maintenance and Material Management Inspection (3M)	.31262 sig .1677 N = 21
Training Readiness Evaluation	.20623 sig .5676 N = 10
Operational Propulsion Plant Examination (OPPE)	-.09720 sig .6670 N = 22

*Each cell represents a test of correlation between turnover rates and each measure of effectiveness (MOE) (read down the left side of the table) for the period of October 1987 through March 1989. The first number of each cell is the correlation coefficient. The second number is the significance level. The third number is the sample size on which the correlation coefficient was computed.

TABLE B-3
PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS*
LANDING SHIP TANK (LSTS)

	Turnover Rate
First-Term Retention	.15570 sig .6675 N = 10
Second-Term Retention	-.34486 sig .3291 N = 10
Career Retention	-.38749 sig .2686 N = 10
Supply Management Inspection	-.06803 sig .8620 N = 9
Maintenance and Material Management Inspection (3M)	-.80375 sig .1012 N = 5
Training Readiness Evaluation	.58623 sig .1267 N = 8
Operational Propulsion Plant Examination (OPPE)	.24673 sig .6374 N = 6

*Each cell represents a test of correlation between turnover rates and each measure of effectiveness (MOE) (read down the left side of the table) for the period of October 1987 through March 1989. The first number of each cell is the correlation coefficient. The second number is the significance level. The third number is the sample size on which the correlation coefficient was computed.

APPENDIX C

PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS* NAVAL SURFACE FORCE, U.S. PACIFIC FLEET MEASURES OF EFFECTIVENESS

	First- Term Retention	Second- Term Retention	Career Retention	Supply Assess- ment	3M Inspec- tion	Train- ing Eval.	OPPE Exam
First Term Retention	1.0000	.16156** .0382 N=165	-.00070 .9927 N=170	.06106 .5954 N=78	-.03164 .7439 N=109	.16969 .0966** N=97	-.02919 .7517 N=120
Second Term Retention		1.0000	.26207 .0007** N=164	-.13594 .2385 N=77	.14436 .1379 N=107	.14557 .1593 N=95	.02078 .8233 N=118
Career Retention			1.0000	.09205 .4228 N=78	.12375 .2020 N=108	.04589 .6571 N=96	-.07060 .4436 N=120
Supply Assessment				1.0000	.11705 .3947 N=55	-.16124 .2900 N=45	.06855 .6028 N=60
3M Inspection					1.0000	-.21614 .0838** N=65	.14610 .1931 N=81
Training Readiness Evaluation						1.0000	-.03644 .7612 N=72
Propulsion Plant Examination							1.0000

*Each cell represents a test of correlation between two measures of effectiveness (MOE). The first number of each cell is the correlation coefficient. The second number is the significance level. The third number is the sample size on which the correlation coefficient was computed.

**Significant at .10 level.

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