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THESIS

MIDSHIPMEN MILITARY PERFORMANCE AS AN INDICATOR OF OFFICER FLEET PERFORMANCE

by

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June 2003

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This research uses detailed literature reviews to support the operationalized model of the Naval Academy's midshipman development process. The model uses secondary data from the Bowman-Mehay data files for Naval Academy classes 1980 through 1985. Evaluated in this research are the outcomes of the Linear and LOGIT regressions of the fleet success measures of Officer Performance, Promotion, and Retention. This research indicates some surprising results about the role of academics, physical education, athletics, and the Military Performance grade on the development of future Naval officers. The Military Performance grade is consistently the best predictor of fleet success measures.

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MIDSHIPMEN MILITARY PERFORMANCE AS AN INDICATOR OF OFFICER FLEET PERFORMANCE

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ABSTRACT

The United States Naval Academy is the premier source of officers for the Naval service. A Naval Academy diploma and commission into the Navy or Marine Corps requires a four-year total immersion into military culture, leadership training, and a demanding academic curriculum. The Naval Academy's unique style of leadership training prepares young men and women for service to their country is an artful combination of mental, physical, and emotional development processes. These processes culminate into a performance measure called the Military Performance grade.

This research uses detailed literature reviews to support the operationalized model of the Naval Academy's midshipman development process. The model uses secondary data from the Bowman-Mehay data files for Naval Academy classes 1980 through 1985. Evaluated in this research are the outcomes of the Linear and LOGIT regressions of the fleet success measures of Officer Performance, Promotion, and Retention. This research indicates some surprising results about the role of academics, physical education, athletics, and the Military Performance grade on the development of future Naval officers. The Military Performance grade is consistently the best predictor of fleet success measures.

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I. INTRODUCTION

A. BACKGROUND

This research is an investigation of the United States Naval Academy's military performance system. It attempts to identify the specific indicators that will predict officer performance in the fleet. The changes in the needs of the naval services have forced the curriculum and structure of the Naval Academy to adjust in order to continue to provide quality leaders to the fleet. In the 1970's, drastic changes in the curriculum caused a major focus on academics and technical skills. In the 1980's an increase in military education and skills became more important to the institution. However, despite the changes no research has been conducted on the effectiveness of the military curriculum on fleet performance.

An effective method of performance measurement is important because the Naval Academy must ensure it rewards midshipmen leadership skills that will serve them well in the fleet. Frost (2000) stated, "What gets measured, gets done." The effectiveness of Military training institutions will determine the strength of the military. In a quote from the Australian Defense Minister, Honorable Ian McLachlan, "In the next century there will be two types of military forces; those that put a high priority on education and training people, and those which are defeated in battle. The distinction will be as sharp as that" (Hall, 1998). An institution that is able to measure the desired performance will be efficient and effective.

The Naval Academy process of education and training is intensive and expensive. There is an estimated total of $250,000 invested in each graduate (Cohen, 1999). It is the responsibility of the Naval Academy administration to provide the most benefit for the nation with the resources given to train future naval officers.

The Naval Academy is a unique institution like few others as it remains steeped in tradition while also adjusting to maintain a high quality of graduate who can serve as an officer in the modern Navy and Marine Corps. The objective of this study is to find the areas of the Naval Academy curriculum that increase the probability of becoming a successful officer, and provide the Naval Academy policymakers with recommendations based on statistical analysis to improve the effectiveness of the military curriculum.

B. BEGINNING OF A NAVAL SCHOOL

The Naval Academy came about because of a need for better-trained officers:

> On September 13, 1842, the American Brig Somers set sail from the Brooklyn Navy Yard on one of the most significant cruises in American naval history. It was a school ship for the training of teenage naval apprentice volunteers who would hopefully be inspired to make the Navy a career. However, discipline deteriorated on the Somers and it was determined by a court of inquiry aboard ship that Midshipman Philip Spencer and his two chief confederates, Boatswains Mate Samuel Cromwell and Seaman Elisha Small, were guilty of a "determined attempt to commit a mutiny." The three were hanged at the yardarm and the incident cast doubt over the wisdom of sending midshipmen directly aboard ship to learn

> by doing. News of the Somers mutiny shocked the country. (USNA website, 2002)

After this incident the Naval Academy was established in 1845 to provide a permanent shore base to develop junior officers to serve in the fleet. The Naval Academy owes its existence to the Secretary of the Navy, George Bancroft, who decided that naval officer training was not producing men of good character and leadership ability. The establishment of a "naval school" would standardize the officer training that previously was performed aboard individual active duty ships in the fleet.

From its humble beginnings, the Naval Academy of today has grown in size and academic stature. The first group of midshipmen mustered 50 men and trained on 10 acres of the remnants of Fort Severn in Annapolis, Maryland. The modern Naval Academy has upwards of 4,400 midshipmen who train on 338 acres of land (Ibid, 2002). The curriculum of the Naval Academy receives high marks in education when compared to its civilian university peers. The Princeton Review (2003) website mentions that the Naval Academy consistently places in the top 20 in academic rankings of universities and colleges. In a nationwide study of 345 universities and colleges by the Princeton Review the Naval Academy receives high rankings in its professors and administration. The Naval Academy placed #12 in Best Overall Academic Experience for Undergraduates, #2 in professor accessibility and #7 in smoothness of operation.

The growth in stature of the academic program and the physical size of the Naval Academy is very important; however, what makes the Naval Academy special is that it

can immerse its students into a "leadership laboratory". The "leadership laboratory" provides an environment that allows midshipman to practice the lessons taught on subjects like leadership and discuss topics learned on ethics. This leadership training takes place at the Naval Academy dormitory, Bancroft Hall. The Hall co-locates the midshipmen with mentors and officers who can provide guidance on all matters dealing in leadership, as well as, other topics on naval service.

The laboratory also allows midshipman to learn and practice their future occupation of managing and leading others. As suggested by Schmidt and Hunter (1993) the learning of job knowledge is the major causal impact of mental ability. For the midshipmen at the Naval Academy, the acquisition of job knowledge through daily practices of being an officer starts on induction day and ends four years later on graduation day. This method of instruction is effective and has produced great results. As Parcell (2001) suggests, the Naval Academy is regarded as the premier commissioning program for officers.

Ever since 1845 the Naval Academy has been producing brilliant leaders. The United States Naval Academy Alumni and Foundation website (2003) lists the Naval Academy graduates who are leaders in the government, military, and academics:

1 President of the United States

18 Members of Congress

4 State Governors

4 Secretaries of the Navy

1 Secretary of the Air Force

3 Chairmen of the Joint Chiefs of Staff

3 Vice Chairmen of the Joint Chiefs of Staff

25 Chiefs of Naval Operations

9 Commandants of the Marine Corps

73 Medal of Honor Awardees

2 Nobel Prize Awardees

50 Astronauts

33 Rhodes Scholars

10 Marshall Scholars

74 Olmsted Scholars

619 Burke Scholars

Despite the small size of the school and only about 60,000 graduates who have or are serving in the defense of the nation they have a large impact on the nation.

C. MISSION OF THE NAVAL ACADEMY

The unique institution of the Naval Academy produces a college graduate who will receive an officer's commission. Although the Naval Academy and civilian universities draw from the same talent pools and graduate men and women of the same age the Naval Academy is expected to produce someone who can accept the responsibility of an officer's commission. To accomplish the goals of education that are similar to a civilian university and provide an atmosphere and curriculum that trains future officers requires a specialized development process. This process teaches,

measures, and ranks the midshipmen against their peers in military and academic skills.

The military focus of the Naval Academy makes it different from civilian institutions and the official mission of the institution confirms this statement. The mission of the Naval Academy is:

> To develop midshipmen morally, mentally and physically and to imbue them with the highest ideals of duty, honor and loyalty in order to provide graduates who are dedicated to a career of naval service and have potential for future development in mind and character to assume the highest responsibilities of command, citizenship and government. (United States Naval Academy website, 2002)

The mission reads like a "commanders' intent" or what any other organization would call a mission statement. The Naval Academy's mission is concise, direct, and gives each midshipman a sense of the institution's goals. The midshipmen become familiar with the mission in their first few days of indoctrination. The verbatim memorization of the mission of the Naval Academy is a Plebe Summer requirement.

In this study the mission of the Naval Academy provides basis for the operationalization of the statistical model. The three areas of midshipman development as stated in the mission are:

- Moral
- Mental
- Physical

In this study these areas are important because all analytical research performed is based on what variables contribute to one or more of the areas. As shown in Appendix D the three areas are all part of the process of making an officer.

The Naval Academy's mission separates it from its civilian university peers. However, there are still more requirements for its graduates that were established a long time ago yet still current to this day and age. John Paul Jones, the father of the United States Navy, who lived in the time of sail, penned the following:

> It is by no means enough that an officer of the Navy should be a capable mariner. He must be that, of course, but also a great deal more. He should be as well a gentleman of liberal education, refined manners, punctilious courtesy, the nicest sense of personal honor… In one word, every commander should keep constantly before him the great truth, that to be well obeyed he must be perfectly esteemed. (Reefpoints, 1992)

John Paul Jones' "Requirements for Naval Officers" was written many years before the Naval Academy was created but it still accurately states the finer side of what is needed to be a commissioned officer. It is suggested in this study that certain aspects of training at the Naval Academy is only quantifiable in a subjective manner. This manner requires the sound judgment of a naval officer who gives a performance grade that reflects a midshipman's inculcation of the many finer points of being a naval officer. Yet another point taken from the requirements is that an officer is a "gentleman of liberal education." This study is focused on military measures of performance yet it still

includes measures of academic skill in the model's process of predicting officer performance.

D. OBJECTIVE

The objective of this thesis is to measure the impact of the Naval Academy's military performance grade on the officer performance in the fleet. Included in the model are variables that measure academic, military, and physical abilities that are suggested in this study to be important to a naval officer.

This study intends to provide a statistically based analysis for the Navy and Naval Academy leadership. It also is intended to serve as a source for future researchers who are looking for more military and Naval Academy models of development.

E. SCOPE, LIMITATIONS, AND ASSUMPTIONS

The effects of Military Performance grades and other measures of military skills on officer performance are the focus of this study. Since 1980, the Order of Merit equation that ranks midshipman from 1 to the anchorman has decreased the academic weight while increasing the effect of military grades. This shift in weighting is suggested to be a sign that military skills are becoming more important to the education of junior officers than academics.

This study uses a data set of Naval Academy graduates from the classes of 1980 to 1985. Several exceptions to the data are noted in Chapter III resulting in a sample size of 1,640 officers. The model uses several independent variables that have been linked to academic, military, and athletic performance as midshipmen. The dependent

variables consist of officer performance variables are linked to fitness reports as a continuous variable and retention and promotion as dichotomous variables as described in detail in Chapter III. These variables are assumed to be accurate for describing their specific abilities based on previous research and the officers' own experiences.

F. ORGANIZATION OF THE STUDY

This study is organized into five chapters and eleven Appendices. Chapter II includes a literary review of related studies and theses. Chapter III explains the source of the quantitative data and develops the model of the measures of midshipman and officer performance. Chapter IV explains the results of the regression analysis using the empirical models. Chapter V discusses conclusions based on the results and offers areas of further research.

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II. LITERATURE REVIEW

This chapter includes research that debates the effects of academic, military, and athletic traits on officer performance. The weaponry used in war fighting is becoming increasing technical and in response the Naval Academy has increased its emphasis on technical majors and coursework. In contrast to this assertion, research suggests that many outstanding officers and leaders in the civilian world majored in a humanities or social sciences (Snyder, 1985; Zais, 1990; Bowman, 1990). Some other studies suggest that majors do not have a large factor but measures of academic success do have a positive effect on officer performance (Gremillion, 1998).

The other sources of research focused on military traits as a predictor of success. These studies research the effects of prior military background and military grades on officer and midshipmen performance. The exposure to military culture is suggested to be a positive factor in the prediction of officer and midshipman performance (Astrella, 1998; Fitzpatrick, 2001; Micheal, 1999). Another study focuses on academic and military grades and found them highly predictive of officer performance for Surface Warfare Officers (SWO) (Yammarino & Bass, 1988).

A final military study, searching for the qualities of emotional intelligence, refuted the previous findings. Trabun (2002) suggests that measures of emotional intelligence show very little relationship with squad leader performance measures. The study went on to suggest

the possibility that some grades reflecting military performance at the Naval Academy are neither objective nor valid.

The final focus of research is from studies that focus on athletic traits. These studies suggest that sports and competition foster important officer-like traits in the development of midshipmen. The lessons taught in sports and athletic activities are suggested to be a positive factor in the prediction of midshipmen and officer performance (Leskovich, 2000; Zettler, 2002).

A. ACADEMIC MEASURES

There are many civilian models of education and leadership development. These typically include academic majors and grades and compare them to salary. Unfortunately, the applicability of these academic models to the military, and to the Naval Academy specifically, requires several assumptions. The Naval Academy administration does not force graduates into occupations that will require them to use what was learned in their major. For example, a graduate with a major in ship design like Naval Architecture may select Marine Corps ground upon commissioning.

The basic model of performance uses academic grades as predictors for job performance using pay scale. However, the military pay system bases pay on a mix of basic pay, housing pay and allowances, and to a smaller degree on job selection. A strong performing officer will be paid the same as a weak performing officer of the same rank.

Therefore, the typical model of academic grades and pay scale in job performance cannot be directly adapted to the military model.

There are several studies that do model academics and job performance using military measures. These studies are broken into academic majors and academic measures of performance as predictors of fleet and midshipman performance.

1. Gremillion's Study

Gremillion (1998) hypothesizes that a midshipman's academic performance is a strong predictor of junior officer performance. As shown in Appendix 1, the academic portion of the equation receives no less than 69% in the computation of midshipman Order of Merit. The Order of Merit is composed of:

- Academic and Professional courses 69.86%
- Second Class Summer Cruise evaluation .85%
- Physical Education grades 4.51%
- Athletic Performance grade 3.66%
- Military Performance grades 14.37%
- Conduct Grade 6.76%

That much weight given to one of six factors in the equation sends a clear message that academic ability is very important to the institution.

A major portion of the Gremillion thesis consists of civilian job performance models to predict job salary with college, major, or academic grades in the civilian world.

Gremillion's study operationalized officer performance using a percentage of an officer's total fitness reports that earn a recommendation for early promotion grade. The retention model uses a measure of officers who stay beyond their initial service obligation periods. The nature of the military requires these measures in lieu of job salary.

The study found that overall academic grades are not strong predictors of fleet performance. The most significant academic variables in the model are Math-science and Humanities grade point averages. However, the strongest positive significant variable in Gremillion (1998) is the Military Performance grade. The Military Performance grade increases the probability of receiving a recommendation for early promotion by 9.7%. This result is significant to the .01 level.

The next two variables in the model are academic measures of success that result in a significance level of 01. The strongest effect by an academic measure on officer performance is the Humanities grade. The Humanities grade will increase the officer performance measure 4.8% for every grade increase. The Math-science grade yields a 4.1% decrease in the officer performance measure for every grade increase.

The results of the study suggest that additional factors need to be included in a model of officer performance. Despite these conclusions, the benefit of academics cannot be dismissed in the process for leadership development. Although academics may not be the best method for ranking midshipmen it may be the only method that can be proven. "After 85 years of research, cognitive ability

tests are among the most reliable measures available to social scientists." (Ree & Earles, 1992) The lack of any better method of measurement may have forced the Naval Academy administration to focus much of the measurement of midshipmen performance on academics vice conduct, military performance, physical education, summer training, and athletic performance.

> If an employer were to use only intelligence tests and select the highest scoring applicant for each job, training results would be predicted well regardless of the job, and overall performance from the employees selected would be maximized. (Ree & Earles, 1992)

Gremillion (1998) and Ree & Earles (1992) are combined in this research to include military and academic measures in the model for developing midshipmen at the Naval Academy.

2. Snyder and Zais Study

Snyder (1985) analyzes a survey of 50,000 executives in 38,000 public offices and private companies. The study concludes that the highest ranking executives typically come from general education and liberal arts backgrounds. Executives possessing business management degrees are less successful (Snyder, 1985). In Zais (1990), humanities and social science majors are found to be "clearly superior in all measures of overall performance and progress." Although, this study is based on a civilian model, its conclusions have found support from a famous example of military leadership. Admiral James Bond Stockdale, who is a commonly used model of transformational leadership, argues for an increase in the liberal arts in the service academy curricula and Reserve Officer Training Candidate (ROTC) programs at civilian universities (Stockdale, 1985).

The latter recommendation suggests that this specific field of academics may be underemphasized in the leadership development of naval officers. The increase in the focus of language, philosophy, history, literature, and abstract sciences is suggested to develop reason and judgment better than professional or vocational skills. The emphasis on technical skills in the Naval Academy curriculum during the 1976-1985 Era (USNA Catalogue, 1975; 1977; 1978; 1979; 1980; 1981) required few electives outside of the standard "Plebe" (freshman) curriculum in these areas for midshipmen enrolled in engineering majors. The academic programs in the Group I (Engineering) majors require many engineering and technical courses that leave very little room to fit in any extra courses. The midshipman enrolling in non-technical majors are also required to take courses in electrical engineering, naval architecture, weapon systems engineering, physics, calculus, and chemistry as part of the Naval Academy core curriculum. There is a pronounced bias on technical skills for midshipmen at the Naval Academy.

Some argue this bias is necessary because of the technical nature of the naval service. Reardon (1997) concludes that the Navy needs some highly trained technically-oriented officers. Another proponent of technical skilled naval officers is Admiral Hyman G. Rickover. Rickover is responsible for the increased technical course requirements of Naval Academy midshipmen. Admiral Rickover, the Father of the Nuclear Navy, often touted the benefit to intellectual skills from a technical education. Rickover believed that naval officers must be technically competent in order to be successful and this

has become known as the, "Rickover Hypothesis". The hypothesis believes that technical academics are predictor of success as a junior officer.

The evidence from Snyder's study and the personal experiences of Admiral James B. Stockdale suggest that midshipmen with a liberal arts focus may be better prepared for being a leader. The research conducted in this study will focus on the professional development of midshipman. This type of development agrees that the Naval Academy must continue to distinguish itself as a source of leadership development even at the expense of a certain amount of academic credibility. The Snyder study and Admiral Stockdale's statements are combined in this research to be arguments for more leadership and military development at the Naval Academy.

3. Bowman's Study

The research over the effects of academic field of study continued in 1990. Professor W. R. Bowman of the United States Naval Academy (USNA) tests the "Rickover hypothesis" using academic performance measures and major selection in a regression analysis to predict officer performance.

The "Rickover Hypothesis" came about because of the technological increases made in naval weapons and systems. Admiral Rickover is directly responsible for the advancement of nuclear power and implementation as the source of propulsion for the modern navy. His insistence for more technically competent Naval Officers who could manage these nuclear plants drastically changed the curriculum at the United States Naval Academy. He began

his efforts to change the curriculum in 1959 with a hearing before the House Appropriations Committee.

> Academies are not providing an education that is adequate to the present and future needs of our Armed Forces," and had urged McNamara "to undertake a searching appraisal of the Service Academies with respect to function, performance, and areas for improvement. (Bowman, 1990)

Admiral Rickover included some specific proposals, many of which he would later attempt to change in 1976.

> His proposals included lowering the maximum age for admission, tighten scholastic entrance requirements, relax physical admissions criteria, introduce more theoretical and liberal arts courses, while reducing the emphasis on practical training, expand the electives, rely more on civilian instructors and less on naval officers, reduce extra-curricular activities and varsity sports, as well as, a reduction in administrative routines like the Plebe system, finally subordinate the executive function of the Commandant to the academic function of the Academy. (Lovell, 1979)

Admiral Rickover continued his attacks on the Naval Academy's curriculum in 1976 during a hearing before the House Armed Services Committee; he expressed his disdain for young officers who had not majored in a technical area:

> I think teaching management as a major subject of an undergraduate is ridiculous and I can see no way that it contributes to the ability of the junior officer to do his job.... All midshipmen should take a common core of subjects taught at the same academic level. Electives should be offered if time in the program of core subjects can be found, but these electives should be rigidly limited to those which will prepare midshipmen for their role as naval officers. The

social sciences should be specifically excluded. (Bowman, 1990)

Despite the his reversal on the importance of electives, Admiral Rickover remained very interested in removing the professional aspect of the Naval Academy and modifying the academics to include a very strict core of engineering classes.

The Bowman (1990) study utilized a data sample consisting of 1,560 male graduates of the Naval Academy who selected surface and submarine warfare communities. These two communities are hypothesized to require the most technical background to be successful. The data on these graduates are compiled from the Naval Academy's admission file, registration file, the 1986 Navy Officer Master/Loss files of the Defense Manpower Data Center, and the Navy Personnel Research Development Center.

The purpose of the study is to model a relationship between performances at the Naval Academy with performance as a junior officer in the fleet. The measures of officer performance use the percentage of valid FITREPs that are recommended for early promotion and retention past initial obligation.

The results yield little if any relationship between the academic major at the Naval Academy and the junior officer performance in the fleet. There is a slight relationship between high grade point averages and fleet performance measures. The study further explains that graduates who major in humanities and social sciences are as likely to succeed in the fleet as those with a technical degree.

The results of this study suggest that the "Rickover Hypothesis" is not entirely correct. The Bowman (1990) study suggests that the academic major does not have significant effects on officer performance. Bowman (1990) supports the argument that academics and academic major have less to do in the prediction of success in the fleet than the military measures of performance.

B. MILITARY MEASURES

The first curriculum at the Naval Academy did not have the benefit of today's research on education and learning theories. In the first year the Naval Academy was a naval "trade school" that based most of the midshipman ranking on math grades with an equal amount on conduct with the remainder going to the other subjects. (Lovell, 1979) After the Civil War, the evolution of the curriculum continued in the days of steam when more technical courses and additional topics on navigation were added that finally made the Naval Academy a college. (Lovell, 1979) During national emergencies including World War I and II, Naval Academy classes were graduated early to serve in the fleet. The reduction in the curriculum during time of war suggests that the benefits of academics are not absolute requirements for being a successful naval officer.

The following studies attempt to find a statistical relation between exposure to the military culture and officer and midshipman performance. Prior experiences in the military can expose the individual to the military culture and military mentors. This exposure can be helpful to the young man or woman who desires to find a mentor to emulate. (Snider, 2001) In the education of leadership,

exposure to good examples is seen as the best method of teaching what Taylor (1977) refers to as the difficult to quantify "black art" of leadership.

1. Astrella's Study

Astrella (1998) hypothesized that being prior-enlisted is a positive influence in predicting officer performance. The study compared prior-enlisted with non prior-enlisted officers. The experience of being in the military before commissioning is thought to improve officer performance of prior enlisted officers when compared to their non prior-enlisted peers.

Although prior-enlisted officers do not receive the same amount of recommended for early promotion fitness reports as the non prior-enlisted officers they both have similar promotion rates. In Astrella (1998) the rate of promotion for prior-enlisted officers actually went down .9% from non-prior enlisted officers. Therefore, the results do not support the suggestion that inculcation in the military culture is an extension of the military performance model.

The findings of Astrella are rejected in the development of this thesis' model because of the differences in the scope of the two studies. Astrella includes all officer occupations from all sources. The inclusion of prior-enlisted servicemen and women with over ten years of service places them on a different career track than that of a Naval Academy graduate. The Naval Academy graduate is likely to have a lot less prior enlisted time because of the age limitation for entrance. This restriction places the prior-enlisted on a more

comparable career track; therefore, providing a better scope for comparing competitiveness between prior and non prior-enlisted officers.

2. Fitzpatrick's Study

The Naval Academy Preparatory School (NAPS) in Newport, Rhode Island is a one-year school for candidates who could not earn direct entrance into the Naval Academy. These candidates have the extracurricular activities, motivation, leadership skills, and athletic ability to attend but are academically deficient for admission into the Naval Academy. The Dean of Admissions reserves 230 spots for such candidates requiring a little assistance. (Fitzpatrick, 2001)

The Fitzpatrick (2001) study found that the mean NAPS graduates Academic quality point rating (QPR) of 2.44 is .17 lower than the 2.61 QPR of direct entry midshipmen. However, the NAPS graduate mean Military QPR of 2.86 is .03 higher than the direct entry midshipmen QPR of 2.84. A conclusion from Fitzpatrick's thesis is that the maturity and professional development of the NAPS graduate may better prepare the midshipmen to performance militarily. However, since the selection for NAPS varies directly with selection for admission into the Naval Academy it may also bias the military performance grade effects of midshipmen from NAPS. This bias may be caused by the focus on accepting midshipman candidates with non-academic skills such as leadership, extracurricular participation, athletics, as well as, maturation due to military service in the enlisted ranks.

The very focus of selection processes of NAPS midshipmen candidates who are strong in non-academic skills biases the results of the analysis. The lower academic performance and higher military performance compared to non-NAPS midshipmen is expected because of the NAPS mission of preparing midshipmen candidates for the difficult academic curriculum. Although, Fitzpatrick (2001) supports the theory of military culture exposure as a source of positive affects on performance, it is considered a weak one.

3. Micheal's Study

Micheal (1999) explores the effect of having a military family on fleet performance and retention. Retention is determined by the likelihood of an officer staying to the LCDR selection board. The performance is measured using promotion rates of officers who remain past initial obligation. In addition, the study explained how the admissions process at the Naval Academy uses a "Whole Man Multiple" equation. The "Whole Man Multiple" includes many different measures of a candidate's ability to succeed at the Naval Academy. The individual inputs into the equation include objective and subjective measures:

- Rank in secondary school class (26%)
- SAT/ACT math (24%)
- Recommendation of school officials (14%)
- SAT/ACT verbal (12%)
- Technical interest (12%)
- Extracurricular activities (8%)

- Military career interest (4%)

This complex admission equation is a stark contrast from the single entrance test required in 1845. (Lovell, 1979) The expansion and advancement in the admissions process for Naval Academy midshipmen is just another indication that academic ability alone is not a valid indicator of success in the military.

The analysis of Micheal (1999) searched for a correlation between military exposures in the form of a military family and performance. Micheal (1999) observed that midshipmen with military families to have lower whole man multiples by 379 points or 1% lower than those of midshipman who lived in a civilian household. In a an observation of graduation data the midshipman with military families trail their counterparts in Order of Merit by 34 places or 6% lower. However, midshipmen of military families have lower attrition rates due to academics. In order to equalize the graduation rates between the family backgrounds the civilian counterparts needed a 100 point increase in the mean SAT score. Despite the lower "Whole Man Multiple" score and Order of Merit the midshipmen with family military background had less attrition due to academics.

Additionally, based on Micheal (1999) using observed promotion and retention data for USNA class years 1980-1985 the military background officers tended to be better than their counterparts in fleet performance and retention measures. The promotion to LCDR is on average 8% higher for the officers who are raised in a military family. In addition, the retention to approximately ten years of

commissioned service, or LCDR, is also 8% higher for the officers raised in a military household.

The Micheal thesis found an interesting relationship between military families and success at the Naval Academy and ultimately in the fleet. It shows how those raised in a military household, who generally are not as academically gifted, performed better in the fleet compared to their counterparts raised in a civilian household.

The results of Micheal (1999) strongly support the hypothesis that military culture exposure is a positive factor in predicting fleet performance. Therefore, it is suggested that the cultural inculcation of military values learned at the Naval Academy and measured using the military performance system also have a positive effect in the prediction of officer performance.

4. Yammarino and Bass Study

Yammarino and Bass (1988) suggested that Naval Academy measures of performance are not only positively related to fleet success but also valid. The study consisted of 186 surface warfare officers evaluated on a model of transformational leadership. A transformational leader can articulate a vision of the future that can be shared by subordinates. This is opposite of managing or what is referred to as "transactional" leadership. A transactional leader participates in an exchange of rewards for services with subordinates. (Reardon, 1997)

The Yammarino and Bass study use data from officer and midshipman records, as well as, evaluations from subordinates and superiors. The model uses transformational leadership abilities broken into:

charisma, inspirational ability, individualized consideration, and intellectual stimulation. These abilities are quantified using midshipmen and officer records, as well as, from the sample officers themselves.

The conclusions of the study found that the Naval Academy academic selection criteria are valid in predicting academic and military success. Most importantly, military performance is found to be an accurate and positive predictor of transformational leadership. This type of leadership is not a requirement to be a leader but studies show that it has value in improving individual and unit effectiveness. (Yammarino and Bass, 1988)

The study also validates the use of fitness reports as a measure of fleet success. Yammarino and Bass discovered that both transformation and transactional qualities found in evaluations are strongly related to fitness reports.

The results of Yammarino and Bass (1988) support the measure of fitness reports as indicators of officer performance using qualitative surveys within the Surface Warfare Officer (SWO) community. The study also validates the measurement systems at the Naval Academy as predictors of success as officers in the fleet.

5. Trabun's Study

In direct contrast to Yammarino and Bass (1988), Trabun (2002) suggests that leader effectiveness ratings at the Naval Academy may be based on subjective or spurious criteria. Additionally, the results of Trabun (2002) state a concern over the validity of Naval Academy leadership evaluations for research purposes and the objectivity of the assessments in place.

The Trabun thesis use measures of emotional intelligence in a search for leadership skills in the midshipman squad leader. Trabun (2002) suggests that the midshipman squad leader position is a good source of viewing leadership abilities with subordinates, peers, and superiors. However, the variables in the model do not yield any significant results that predict squad leader performance.

The lack of any significant emotional intelligence (EQ) variables is partially accounted for by the model design and the relatively new theory of emotional intelligence. Trabun (2002) suggests that a combination of the relatively small number of 104 squad leader evaluations, the lack of training on performance measurement given to midshipmen, and the administrative burden of writing a feedback and midshipmen FITREPs contribute to confound the analysis. Trabun (2002) mentions a concern that lack of any Naval Academy measure of performance that fits his emotional intelligence model could be also be the result of spurious and subjective grading. The suggestion from Trabun (2002) is rejected because there is more evidence in the weakness of the model than in the weakness of Naval Academy performance measurement.

However, his findings do suggest a need for an effective leadership performance measure at the Naval Academy. It is the hypothesis that the measure is already in place in the form of the Military Performance grade. However, it is suggested that this grade is effective because it comes from a commissioned officer with fleet

experience. For most midshipmen, the ranking of peers and subordinates is new. Therefore, the intervention of an experienced commissioned officer is required to assist the midshipmen while ensuring that a fair and accurate grade is given for military performance.

The primary hypothesis of this study is that the military performance grade, given by a Company Officer, is valid and positively related to the midshipman's performance as an officer.

C. ATHLETIC MEASURES

Waypoints 2001 mentions that the Naval Academy produces leaders by building upon a midshipman's physical stamina. (Waypoints, 2001) The health benefits of physical training are obvious, but there is also a component of the military socialization process at the Naval Academy. Physical education provides opportunities for midshipmen to practice action and decisiveness in rapidly changing and competitive situations. These are the very traits of one who may have to act with confidence during military operations during peacetime and war. Athletic training is linked to the marital virtues and development of teamwork. (Lovell, 1979) Athletic training provides the midshipman with skills that cannot be learned in the classroom. Lovell states that,

> 'the military professional is not paralyzed by contemplation... he prefers practical problem solving to abstract theorizing, and when confronted with a task, he wants to "get on with it" and get the job done.' (Lovell, 1979)

The focus on physical education and athletics is evident in the midshipman ranking system. In Appendix B

the computation for Military Order of Merit physical education owns over 10 percent of the weight.

In the computation that calculates the midshipman's overall Order of Merit, physical education and athletic performance account for over 8 percent of the weight.

1. Zettler's Study

Zettler (2002) suggests that Naval Academy Athletic programs are predictors of midshipmen academic and military performance. The model uses academic and military quality point ratings as measures of success at the Naval Academy and compares them to the level of participation in club and varsity sports.

The results find that participation in athletics does enhance military performance of midshipman and that some evidence of academic performance enhancement exists as well. In the military performance model, the varsity letter variable is surpassed in impact by class rank and the SAT math score. Athlete midshipmen who earn varsity letters have a coefficient of .131 that is significant to .01 level. In the academic grades model, athletes who earn a varsity letter remain third in amount of impact with a coefficient of .093 that is significant to the .01 level. The benefits of being an athlete are only surpassed by a cognitive ability in math and rank in the Order of Merit.

2. Leskovitch's Study

Athletics also improve officer performance. Leskovitch (2000) found that athletes at the Naval Academy have an increased probability of officer promotion. In a marginal effect significant to the .01 level, athletes in team sports are 11% more likely to promote than non-

athletes. The only variable to surpass team sports is the Military Performance grade that increases promotion by 21% and significant to the .01 level. (Leskovitch, 2000)

These conclusions support the theory that not only is athletics important to the development of officers but also that Military Performance grades have a very large impact on the prediction of officer success in the fleet. In addition to the Military Performance grade, the benefits of athletics are included in the model of midshipman performance.

D. SUMMARY

An internet search for leadership development books resulted in 1,240,000 hits. There is no shortage of theories and basic tenets on leadership development and the few studies in this chapter also support that statement.

Although each study in this chapter focuses its research using a certain methodology, on a unique organization during a certain time period they all encompass the curriculum of leadership development. The studies focus on the traits of civilian managers and leaders, midshipman at the Naval Academy, or the development of officers. The differing conclusions of the studies, even when applied to the military and the Naval Academy in particular, show the diverse nature of leaders and leadership.

The many facets of what makes a leader may never reach agreement. However, a focused study on how the Naval Academy military performance system develops officers may provide an answer to what aspects of curriculum provide the greatest benefit to officer success in the fleet.

III. DATA AND METHODOLOGY

A. DATA DESCRIPTION

Data for this thesis were collected and compiled by Professor William R. Bowman, Economics Department, U.S. Naval Academy and Professor Stephen L. Mehay, Naval Postgraduate School. The data set integrates three separate Navy Bureau of Personnel (BUPERS) data sets, which were merged by identification numbers. The Navy Officer data sets include:

- Promotion History Files, 1981-1985
- Loss Files, 1981-1995
- Performance Fitness Reports, 1978-1995

The final data compilation consists of male Unrestricted Line Officers who graduated from the United States Naval Academy in 1980-1982 and 1984-1985. The class of 1983 is missing from the data file. The data is then merged with data taken from the United States Naval Academy Institutional Research Department that covered each individual's high school and Naval Academy career.

An additional set of variables including all midshipman courses and grades was provided by Alan Harmon of the Naval Academy Institutional Research Department. The new data for the classes of 1980-1985 are merged to the initial data set using the midshipman identification code.

Table 1 lists variable names and descriptions. The all-male Naval Academy data set has 257 variables and 7,576 records. It is assumed in this study that only officers in the Surface Warfare, Submarine, Pilot, and Naval Flight Officer communities at the rank of Lieutenant could be accurately modeled in this thesis. After filtering out records with missing data and officers who are not in the main four warfare communities only 3,033 records remained.

TABLE 1. VARIABLE DICTIONARY

CONDQPR	CUMULATIVE MILITARY CONDUCT GRADE QPR
PEQPR	CUMULATIVE PHYSICAL EDUCATION QPR
NLQPR	QPR for Naval Leadership courses
NSQPR	QPR for Naval Science courses
NNQPR	QPR for Navigation courses
ETHNIC	ETHNIC CODE (0,1,2) white, nonwhite, other
YR81	Graduation year
YR82	Graduation year
YR84	Graduation year
YR85	Graduation year
PERFQPR	CUMULATIVE MILITARY PERFORMANCE GRADE QPR
HONORG	USNA GRADUATE WITH DISTINCTION-TOP10% ORDER OF MERIT
STRIPER	USNA BRIGADE LEADER (4 STRIPES & COMPANY COMMANDERS)
NLETTER	USNA VARSITY LETTER-WINNER (1/C MIDSHIPMAN YEAR)
PRAP3	PCT OF VALID LT FITNESS REPORTS RECOMMENDED FOR ACCELERATED PROMOTION
LCPROM	PROMOTE TO LCDR IF STAY TO GRADE 04 BOARD (0,1)
LCSTAY	STAY TO LCDR BOARD (0,1)

B. MODEL SPECIFICATION

The baseline linear and LOGIT models use three different dependent variables to measure officer success in the fleet. The three dependent variables are:

- Performance
- Promotion
- Retention

The baseline model for each outcome incorporates 17 explanatory variables to predict the outcome, as shown in the following equation:

$$\textbf{OUTCOMES}=\alpha_0+\beta_1 YR81+\beta_2 YR82+\beta_3 YR84+\beta_4 YR85+\beta_5 ETHNIC+\beta_6 PERFQPR+\beta_7 HONORG+\beta_8 STRIPER+\beta_9 NLETTER+\beta_{10} CONDQPR+\beta_{11} PEQPR+\beta_{12} NLQPR+\beta_{13} NSQPR+\beta_{14} NNQPR+\beta_{15} ENGQPR+\beta_{16} MTSCQPR+\beta_{17} HUMSQPR$$

Table 2 provides correlation coefficients between the Military Performance grade and all the other independent variables in the models. Table 2 shows in bold the variables that have relatively high correlations with the Military Performance grade, PERFQPR. This high correlation required a secondary model that omitted PERFQPR. The models that include the Military Performance grade are called the primary models and the models run without are called the secondary models. Interpretation of the results of all models will be discussed in Chapters IV and V of this thesis.

TABLE 2. PEARSON CORRELATIONS BETWEEN PERQPR AND THE OTHER INDEPENDENT VARIABLES

VARIABLE	PERFQPR
YR81	-0.021
YR82	0.004
YR84	0.033
YR85	0.025
ETHNIC	-0.088**
HONORG	**0.381****
STRIPER	**0.409****
NLETTER	-0.050**
CONDQPR	**0.464****
PEQPR	0.252**
NLQPR	**0.388****
NSQPR	**0.420****
NNQPR	**0.367****
ENGQPR	**0.479****
HUMSQPR	**0.483****
MTSCQPR	**0.476****
N	3033
*=Correlation is significant at the 0.05 level (2-tailed). **=Correlation is significant at the 0.01 level (2-tailed).	

C. VARIABLE DESCRIPTION

Variables specified in the fleet performance models are grouped into the following categories:

- Outcome (Dependent) Variables
- Independent Variables
  - Control Variables
  - Military Performance at USNA
  - Academic Performance at USNA

Table 3 lists each variable name, its full description, and its coding.

TABLE 3. VARIABLE DESCRIPTION

	Outcome Variables	
PRAP3	PCT OF VALID LT FITNESS REPORTS RAP	range (0-100)
LCPROM	PROMOTE TO LCDR IF STAY TO GRADE 04 BOARD	0=do not promote 1=promote
LCSTAY	STAY TO LCDR BOARD	0=do not stay 1=stay
	Control Variables	
YR81	Class year 81	1=class year 1981 0=otherwise
YR82	Class year 82	1=class year 1982 0=otherwise
YR84	Class year 84	1=class year 1984 0=otherwise
YR85	Class year 85	1=class year 1985 0=otherwise
ETHNIC	ETHNICITY	0=white, 1=nonwhite 2=other
	Military Performance Variables	
PERFQPR	CUMULATIVE MILITARY PERFORMANCE GRADE QPR	range (0-4.0)
HONORG	USNA GRADUATE WITH DISTINCTION-TOP10% OM	0=no 1=yes
STRIPER	USNA BRIGADE LEADER (4 STRIPES & COCDRS)	0=no 1=yes
NLETTER	USNA VARSITY LETTER-WINNER (1/C YEAR)	0=no 1=yes
CONDQPR	CUMULATIVE MIL CONDUCT GRADE QPR	range (0-4.0)
PEQPR	CUMULATIVE PHYSICAL EDUCATION QPR	range (0-4.0)
NLQPR	QPR for NL courses	range (0-4.0)
NSQPR	QPR for NS courses	range (0-4.0)
NNQPR	QPR for NN courses	range (0-4.0)
	Academic Performance Variables	
ENGQPR	ENGINEERING COURSEWORK QPR	range (0-4.0)
MTSCQPR	MATH/SCIENCE COURSEWORK QPR	range (0-4.0)
HUMSQPR	HUMAN/SOCIAL SCIENCES COURSEWORK QPR	range (0-4.0)

1. Dependent Variables

The three dependent variables used in this study are:

- Officer performance (PRAP3)
- Promotion to LCDR (LCPROM)
- Retention to the LCDR board (LCSTAY).

Table 4 provides descriptive statistics for the outcome (dependent).

TABLE 4. DESCRIPTIVE STATISTICS OF DEPENDENT VARIABLES

VARIABLE	CASES	MEAN VALUE	STD DEVIATION
PRAP3 (%)	3033	72.31	30.62
LCPROM (Promotion rate)	1623	0.78	0.41
LCSTAY (Retention rate)	3033	0.54	0.50

Table 4 shows that 72% of all O-3 FITREPs received a "recommended for early promotion" grade. Also, 54% of new officers stay to the O-4 promotion board and 78% of those who stay are promoted.

a. Officer Performance Variable (PRAP3)

PRAP3 is the first dependent variable used to specify officer performance and it is based upon the Navy's system of fitness reports (FITREP). A FITREP is very similar to a "report card" that is basically used to provide officers with feedback on their performance from senior reporting officers.

The Navy FITREP system requires that an officer have his or her entire career documented. This mandate and reports that are due annually can often occur during times that do not encourage the most accurate report of an

officer's performance. In order to make FITREPs a more accurate measure of performance, certain assumptions are made.

The FITREPs that are considered valid and included in the analysis of PRAP3 must meet the following criteria:

- Officer in the command greater than 30 days
- Reporting Senior has frequent contact
- Two or more peers being ranked
- Reason for FITREP:
    - o Annual
    - o Departing reporting senior

In this study it is suggested that only a reporting senior who observes an officer for longer than 30 days has had enough time to make an accurate assessment of performance. Additionally, a FITREP must also indicate that the reporting senior has frequent contact with the officer being ranked. This close contact increases the chances that the FITREP is an accurate assessment of performance. A FITREP that has two or more officers ranked requires one to be better than the other. This ranking is assumed to be competitive and helps reduce the effect of grade inflation.

TABLE 5. FITREP DATA AS A LIEUTENANT

VARIABLE DESCRIPTION	MINIMUM	MAXIMUM	MEAN
NUMBER OF VALID FITNESS REPORT RECORDS IN GRADE 03	0	11	4.82
TOTAL NUMBER OF FITNESS REPORT RECORDS IN GRADE 03	4	20	11.34
AVERAGE NUMBER OF OFFICERS COMPARED AGAINST ON GRADE 03 FITNESS REPORTS	0	49	8.71

PCT OF TOTAL FITNESS REPORTS NOT OBSERVED: GRADE 03	0	66.67	11.87

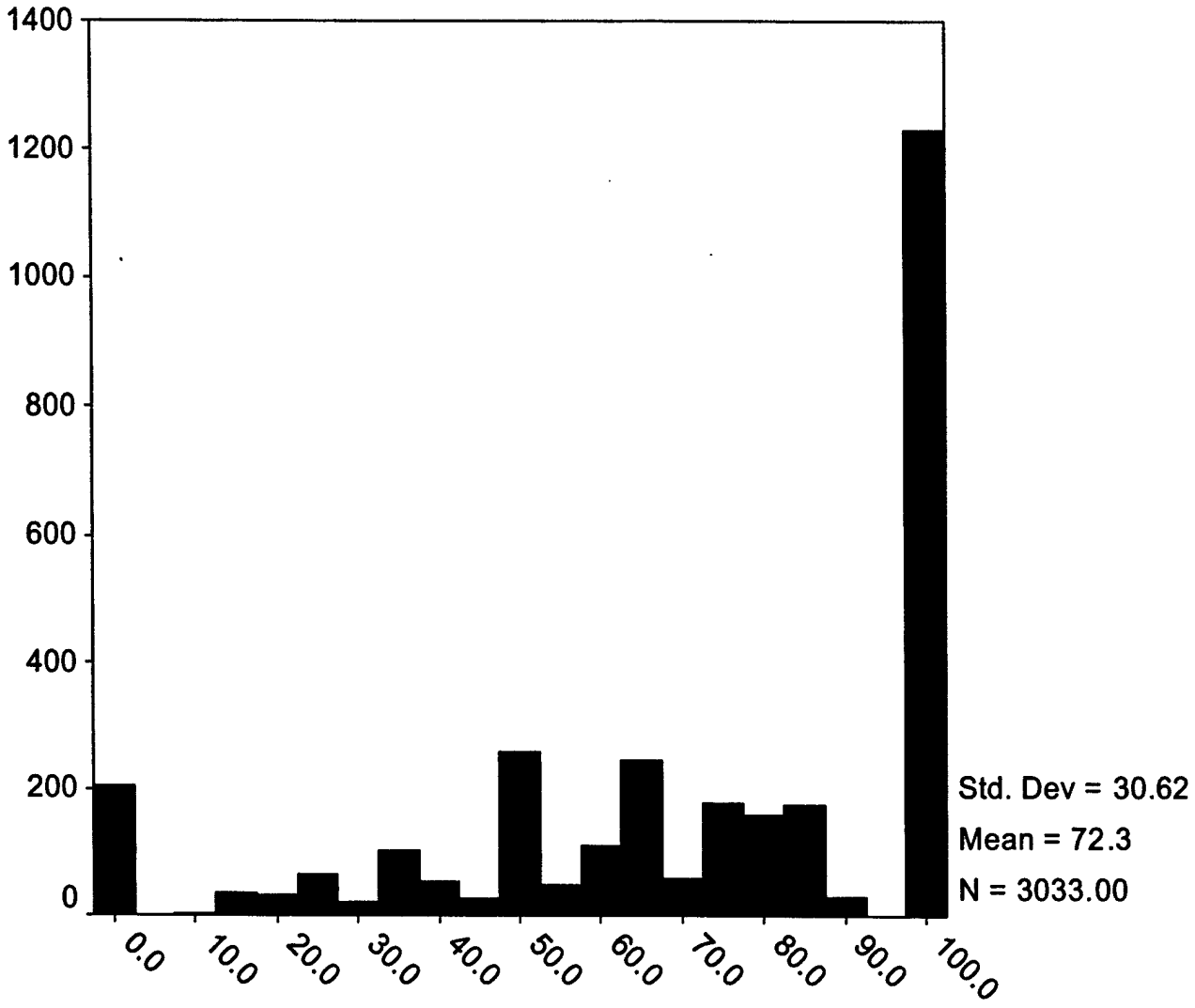
As displayed in Table 5, more than four valid FITREPs are included, on average, in the PRAP3 variable and the reviewed officer is compared to more than eight peers in each report. A FITREP that is written as part of an annual report or the departure of a reporting senior must meet all the previous criteria to be included in the sample.

Based on personal observation, it is assumed that a Lieutenant is trained sufficiently to operate tactically in his warfare specialty. Regardless of warfare community, a Lieutenant has been sufficiently molded by senior enlisted, peers, and senior officers to become a highly productive member of the command. It is at this rank that officers achieve a level of skill that can be accurately measured and compared to their peers on FITREPs. The earlier ranks of Ensign and Lieutenant junior grade are spent in training commands or in the fleet in a "learning mode." Therefore, the final assumption on the officer performance variable is that FITREPs at the grade of Lieutenant are more reflective of true performance than those received in grades O-1 and O-2.

Once the useful and valid FITREPs are chosen, the PRAP3 variable is configured to provide a measure that is continuous. PRAP3 is constructed as a percentage of how many of the valid fitness reports are labeled as Recommended for Accelerated Promotion (RAP) by an officer's reporting senior. For example, an officer who is RAP five times out of five valid FITREPs has a PRAP3 score of 100. Figure 1 shows that over 1200 out of 3033 valid records

received the recommendation for accelerated promotion (RAP) grade on all FITREPs, whereas 200 records never received a RAP.

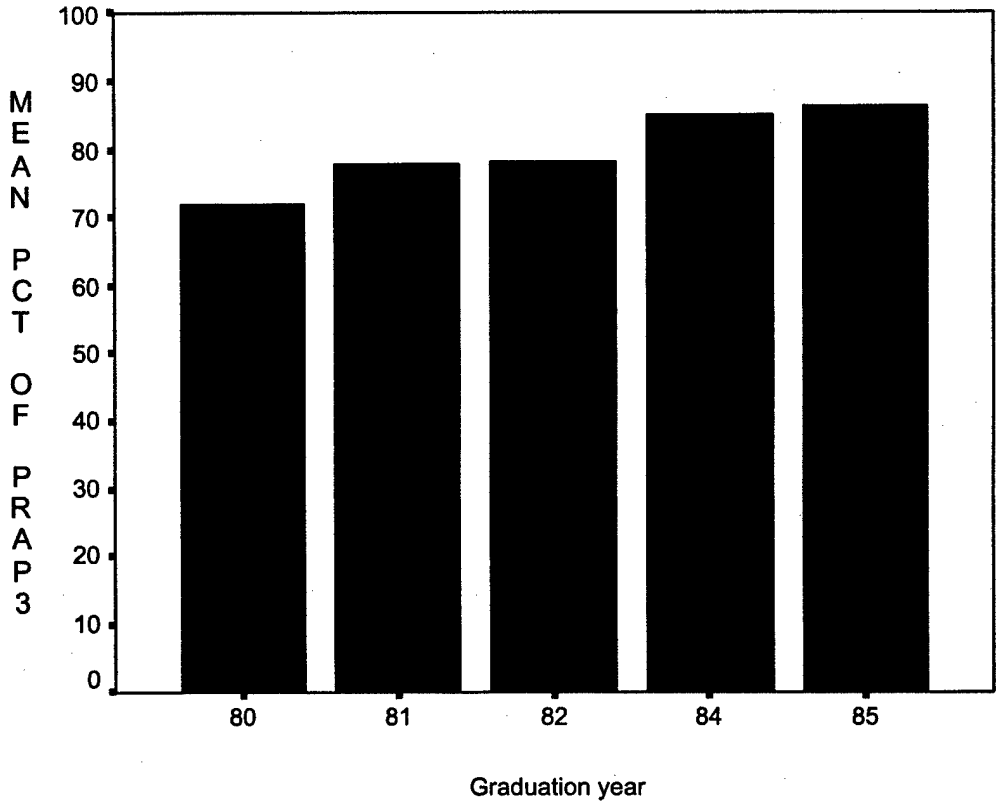
FIGURE 1. PRAP3 HISTOGRAM



Although it is possible that over 1200 out of 3033 officers receive 100% RAP FITREPs, the uneven distribution is more likely an indication of FITREP grade inflation.

In a bar graph of the mean PRAP3 variable by class year it appears that the inflation of FITREPs increases with the progression of time. The graduating class of 1985 has a mean PRAP3 score that is almost 15% points higher than the class of 1981.

FIGURE 2. PRAP3 BY GRADUATION YEAR



The PRAP3 variable provides a continuous officer performance measure. However, if PRAP3 number is not related to promotion its validity may be in question. Therefore, a PRAP3 is recoded into three groups. Officers who did not receive any RAP FITREPs are placed in group one. The middle group consisted of a PRAP3 score of 1% to 99% while the third group is the officers who received 100%

RAP FITREPs. The recoded variable is then compared to the promotion to LCDR variable. The results are shown in Table 6.

TABLE 6. PROMOTION RATE BY PRAP3 SCORE

OFFICERS WHO PROMOTE TO LCDR		
PCT OF LT FITREPS RAP	PROMOTION RATE	PROMOTION CASE
0	54.5%	18
1-99	65.3%	546
100	93.5%	721

As shown in Table 6, 93% of those who received 100% RAP scores on their valid O-3 FITREPs are promoted to LCDR if they stayed in the Navy to the LCDR board. The middle group (RAP scores 1% to 99%) dropped to a 65% promotion rate, and the final group who did not receive any RAP FITREPs fell to 54.5% promotion rate. The results shown in the table support a strong positive relationship between the PRAP3 score and a naval officer performance in the fleet.

b. Officer Promotion Variable (LCPROM)

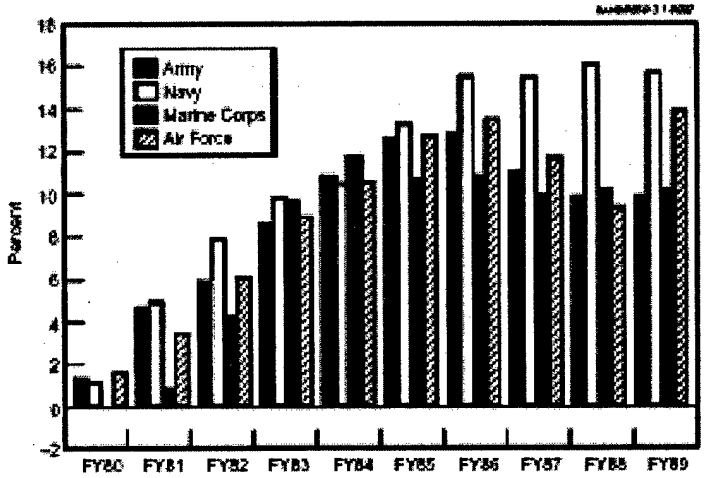
The second fleet performance variable is computed for Lieutenants who stay to the Lieutenant Commander (O-4) promotion board, which occurs at approximately 10 years of commissioned service. This variable is used as an alternative indicator of productivity. It is assumed that the members of the LCDR (O-4) promotion boards are successful at selecting only the highest quality officers for promotion. Thus, LCPROM as a dependent variable adds specific warfare community performance measures and other items that are not captured in the FITREP. The promotion outcomes are valuable in measuring an officer's total value to the Navy.

However, despite the benefits of using promotion as a measure of performance there are other factors that

determine military promotions. Therefore, the effects of promotion as a measure of officer performance must be tempered by an understanding of the promotion system. The number of promotions allowed is determined by the number of billets that need to be filled vacancies. As shown in Figure 3 the officer corps grew steadily from 1979 to 1989. From fiscal year 1979 to 1981 the Navy saw a 5% increase in the number of officer billets and continued to grow steadily to 13% by 1985.

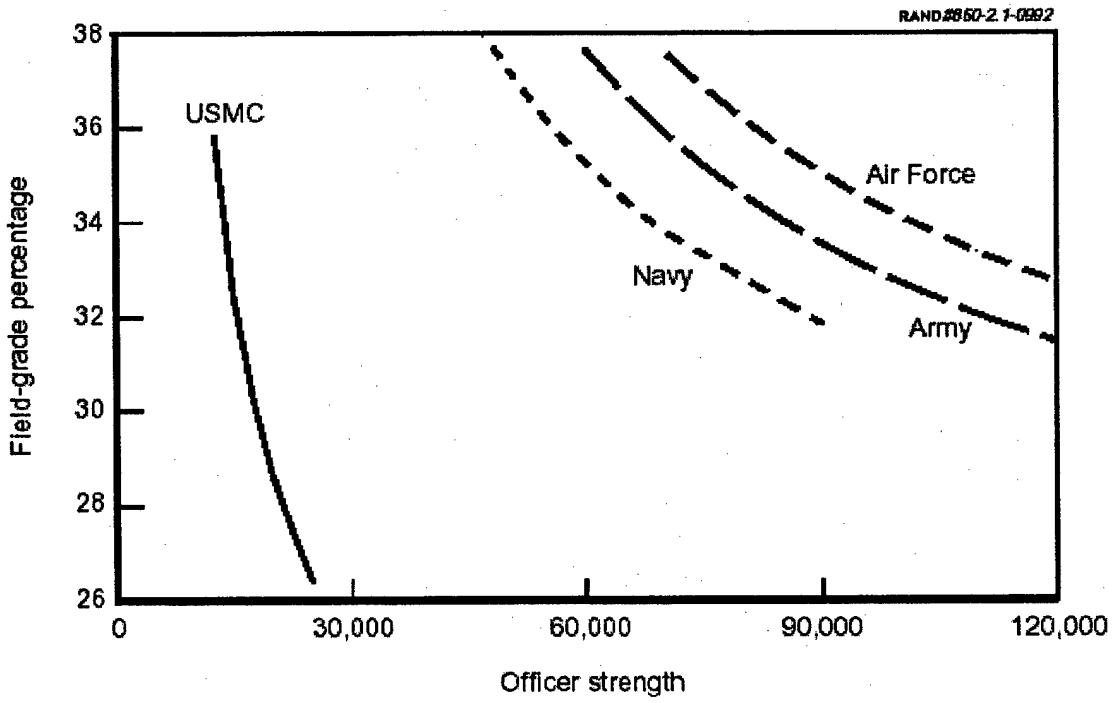
As such, the merits of an officer's performance are not the sole reasons for his or her promotion. The Congressionally mandated allocation of total officers is a large factor affecting the probability of promotion. Every year for each service, Congress authorizes the total officer force strength based on officer-to-enlisted ratios, stated manpower requirements, and other goals (Rand, 1993). A Grade Table similar to Figure 4 is produced to set a quota on promotions. This table establishes the number of field grade officers allowed by Congress in the total officer corps for all military services. For example if the Navy has 60,000 officer the grade table in Figure 4 mandates that 35% of them are field grade officers. This quota sets the number of promotions the Navy can give to Navy Lieutenants (O-3).

FIGURE 3. OFFICER STRENGTH CHANGE BASE FY 1979 AS BASE YEAR



Source: Rand (1993)

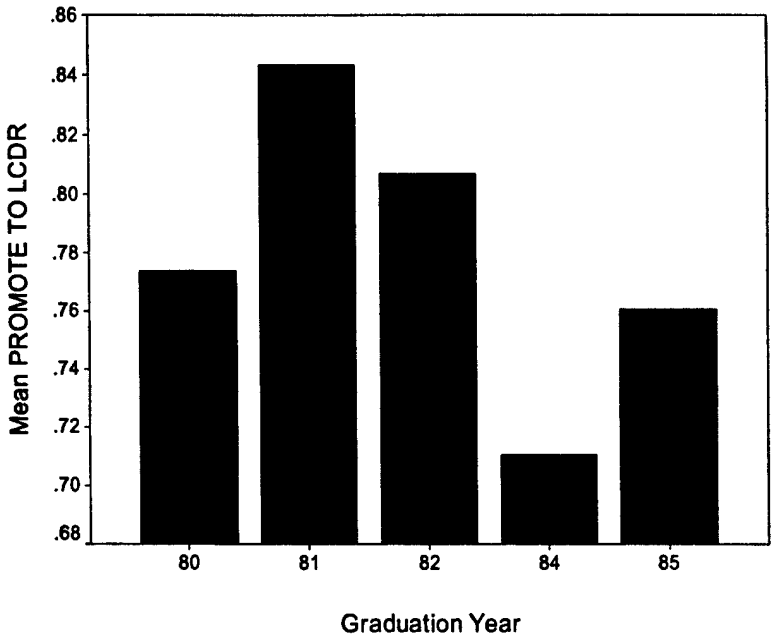
FIGURE 4. CONGRESSIONAL GRADE TABLE



Source: Rand (1993)

The graph in Figure 5 uses the promotion rates in the data set by graduation year, and shows a significant variation across the years. The class of 1981 had the highest promotion rate at approximately 85% while the class of 1984 had the lowest at approximately 71%. The model controls for the differences in FITREP grades using the dummy variables YR81, YR82, YR84, and YR85.

FIGURE 5. LCPROM VS GRAD YEAR



The Defense Officer Personnel Management Act (DOPMA) of 1981 formalized the system for determining the number of promotions allowed each year. The DOPMA also continued the military's competitive "up-or-out" system that force Lieutenants (O-3) and Lieutenant Commanders (O-4) to promote during their window of opportunity or leave the service. As shown in Figure 6, DOPMA gives promotion quotas for the Department of Defense to use as a guide to determine when the officer is in the window of opportunity for promotion. Figure 6 shows the promotion window or

"zones" for LCDR (O-4) promotion occur between the ninth and eleventh year of commissioned service.

FIGURE 6. AVERAGE OFFICER PROMOTION OPPORTUNITY AND TIMING (1981-1985)

	O-6	O-5	O-4
	Promotion Opportunity		
	DOPMA = 50%	DOPMA = 70%	DOPMA = 80%
Army	57.8%	81.4%	84.4%
Navy	63.8%	79.6%	88.0%
USMC	60.2%	74.6%	81.0%
Air Force	55.4%	75.4%	90.2%
	Promotion Point		
	DOPMA = 22±1	DOPMA = 16±1	DOPMA = 10±1
Army	21-11	16-4	11-4
Navy	21-3	14-11	9-3
USMC	21-10	15-7	10-6
Air Force	20-7	15-11	11-7

SOURCE: Director of Officer and Enlisted Personnel Management (O&EPM) in the Office of the Assistant Secretary of Defense for Force Management and Personnel (FM&P). August 19, 1991.

NOTE: Average promotion point for all competitive categories is the number of years and months of active commissioned service plus entry-grade credit at which officers are promoted to a particular grade. Average opportunity, for all competitive categories, is computed by totaling all officers due course, above, and below zone promotions, and dividing by the number of officers in zone.

c. Officer Retention Variable (LCSTAY)

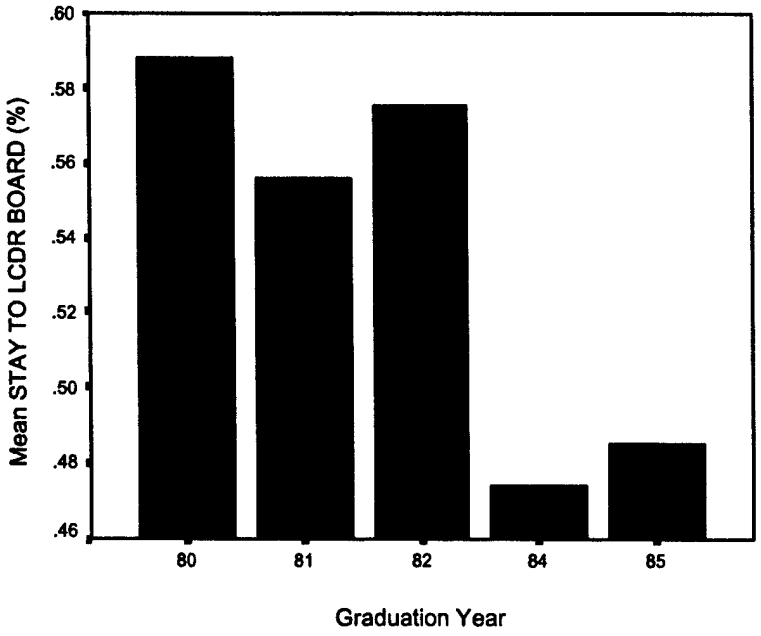
Retention is the third and final dependent variable used in this thesis. It is a dichotomous variable with a value of "1" for those officers who stay and a "0" for those who leave before the LCDR (O-4) promotion board. Although many good performers may leave the service for better civilian jobs or for personal and family reasons, officer retention, can be used as an indication of performance. It is reasonable to assume that an officer who has high FITREP scores and remains in the service has found an appreciation for the job of being a Naval Officer. This propensity for the profession comes from many things including a level of competency in the tasks required in that profession. Therefore, retention is another method of

locating officer performance qualities that might not be picked up from FITREPs or promotions.

However, the construction of the LCSTAY variable assumes that most officers who stay to the LCDR board have chosen to stay past all commitments to the Navy. Most initial service commitments, as well as additional commitments from graduate school or flight school, should have expired and those who remain to the LCDR board do so because they desire to remain a naval officer.

Figure 7 displays the retention rates in the data by graduation year. The class of 1980 had the highest retention rate at approximately 59% while the class of 1984 had the lowest at approximately 47%. It is possible that the military drawdown of the early to mid-1990's had an effect on the retention of the classes of 1984 and 1985, which were in the window for promotion to LCDR during the reduction in force. The multivariate model controls for the differences in retention across graduation years by using class year dummy variables.

FIGURE 7. RETENTION RATES BY GRADUATION YEAR



2. Independent Variables

These variables are used in the model as predictors of military performance, promotion, and retention of military officers. The variables are categorized into control, military performance, and academic performance variables.

a. Control Variables

Graduation year dummies are included to control for differences in promotion opportunities, economic forces affecting retention, and other factors that may affect performance. As previously mentioned, the FITREP grade inflates from the beginning of the data set in class year 1981 to the end of the data in 1985. It is also important to control for each cohort due to differences associated with performance as midshipmen.

The effects of minority status are controlled because of numerous prior studies that find differences in performance between whites and minorities. A nationwide

disparity of education levels between whites and minorities is a considerable obstacle for minorities who wish to matriculate into the Naval Academy. A study by OUSD (1997) shows that many minority members start their careers at a disadvantage because of pre-entry differences in academic achievement and lower representation in the technical fields of study of most interest to the military. Even after acceptance into the Naval Academy there are many academic difficulties that must be overcome by blacks who scored nearly 120 points lower than whites on math and verbal tests as shown below in Table 7. Table 7 shows national differences in SAT scores, which are an indicator of overall academic background, among the sexes and different races.

TABLE 7. SAT SCORES BY RACE AND YEAR GROUP

Year	All Students	White	Black	Mexican	Puerto Rican	Asian	Am. Indian	Other	Male	Female
Verbal Score										
1979-80	424	442	330	372	350	396	390	394	428	420
1984-85	431	449	346	382	368	404	392	391	437	425
1989-90	424	442	352	380	359	410	388	410	429	419
1994-95	428	448	356	376	372	418	403	432	429	426
Mathematical Score										
1979-80	466	482	360	413	394	509	426	449	491	443
1984-85	475	490	376	426	409	518	428	448	499	452
1989-90	476	491	385	429	405	528	437	467	499	455
1994-95	482	498	388	426	411	538	447	486	503	463

Source: U.S. Department of Education, National Center for Education Statistics, *Digest of Educational Statistics*, 1997 and special tabulations provided by the College Board.

Not only is race/ethnicity a factor in performance at the Naval Academy it may also affect retention and performance in the fleet. OUSD (2003) also suggests that the lack of minorities in the military is a

source of perpetual retention and performance problems due to junior officers not having enough same-race mentors. Table 8 displays the breakdown of the occupation distribution of military officers by race. There are very few minority officers that new officers can use as role models. In FY 1980, black and Hispanics are only 4% of all officers in the tactical operations category, which is the focus of officer occupations in this study.

TABLE 8. DISTRIBUTION OF OFFICERS OF ALL SERVICES

Occupational Area	White	Black	Hispanic	Other/ Unknown	Male	Female	Total Percent	Total Number
			1980					
General Officer/Executives*	97	1	0	1	98	2	100	5,386
Tactical Operations	94	3	1	2	99	1	100	80,845
Intelligence	93	3	1	2	89	11	100	9,037
Engineering/Maintenance	92	5	1	2	95	5	100	38,776
Scientist and Professionals	92	4	1	3	94	6	100	14,519
Health Care	84	5	2	9	68	31	100	30,418
Administration	89	7	1	2	87	13	100	30,263
Supply, Procurement, and Allied	90	7	1	2	94	6	100	11,972
Non-Occupational**	89	6	1	3	93	7	100	39,248
All Occupations	91	5	1	3	92	8	100	260,464
			1997					
General Officer/Executives*	95	4	1	1	98	2	100	2,014
Tactical Operations	89	5	3	3	97	3	100	81,515
Intelligence	85	7	4	4	84	16	100	10,562
Engineering/Maintenance	83	9	3	5	88	12	100	24,880
Scientist and Professionals	87	7	3	4	86	14	100	10,299
Health Care	83	8	3	6	65	35	100	39,751
Administration	78	14	4	4	70	30	100	12,532
Supply, Procurement, and Allied	79	13	4	4	86	14	100	18,427
Non-Occupational**	84	6	5	5	92	8	100	12,362
All Occupations	86	7	3	4	86	14	100	212,362

Source: Defense Manpower Data Center.

* This category includes officers other than general and flag officers.

** This category includes patients, students, and other.

b. Military Performance Variables

The variables in the military performance category are all taken from midshipmen grades and performance measures. These are grades given to midshipmen based on their military skills. The cumulative grades of military, conduct, and physical education performance are cumulated over all four years at the Naval Academy. Table 9 provides descriptive statistics including mean, standard deviation and expected effect of each variable.

TABLE 9. MILITARY VARIABLE DESCRIPTIVE STATISTICS

VARIABLE	MEAN VALUE	STD DEVIATION	EXPECTED SIGN
PERFQPR	3.18	0.56	+
HONORG	0.12	0.32	+
STRIPER	0.11	0.32	+
NLETTER	0.13	0.34	+
CONDQPR	3.76	0.37	+
PEQPR	2.54	0.66	+
NLQPR	3.10	0.44	+
NSQPR	3.00	0.50	+
NNQPR	2.78	0.76	+

(1) PERFQPR

The Cumulative Military Performance Grade (PERFQPR) is a multiple calculated from all four years at the Naval Academy and is based upon the typical 4.0 scale. This particular grade is assigned by the company's commissioned officer. As Table 9 shows the mean value for the Military grade is 3.18.

Every Company Officer serves as a mentor who oversees the Brigade's midshipmen chain of command. He or she is also the midshipman's link to the fleet who can measure midshipmen military performance and leadership through his or her interaction. A military performance

grade awarded by a Company Officer who is still closely associated with the fleet is an invaluable source of measurement of a midshipman's performance. The grade is an objective measure of inspections and company functions. It also provides a subjective measure of leadership qualities exercised with subordinate, peer, and higher-ranking midshipmen.

The Company Officer provides a "fresh from the fleet" view on performance measurement. This officer with experience in the fleet can provide insight and advice to midshipmen who will soon be commissioned officers. The special experiences of the Company Officer help him or her to guide the leadership exercises of midshipmen in Bancroft Hall. Also known as the "Leadership Laboratory," Bancroft Hall is the midshipmen dormitory. It is in this "Leadership Laboratory" that midshipmen use their skills to become junior officers. The Company Officer witnesses and can quantify performance that occurs inside Bancroft Hall.

It is the hypothesis of this thesis that one of the most all-encompassing predictors of fleet performance is the midshipmen military performance grade. The expected predictive accuracy in the Military Performance grade, PERFQPR, is due mainly from the diverse areas that it covers. The grade assigned by the Company Officer is expected to be a measure of the midshipman's overall performance. The grade is not supposed to reflect any single outcome but rather to be a compilation of many academic, physical, and military outcomes. The Military Performance grade is a measure of midshipman's ability to be an officer.

(2) CONDQPR

The Conduct Performance grade (CONDQPR) variable reflects adherence to the Midshipmen regulations and reflects the amount of demerits accumulated. The cumulative amount of demerits determines the letter grade given. This grade is used as a measure of military values.

It is suggested in this study that midshipman who do not accumulate excessive demerits are more able to problem solve and make good decisions that are not affected by emotion. Trabun (2002) suggested that separating emotion from decision-making is a positive military trait. Therefore, the CONDQPR variable is used to determine the leadership traits of discipline and decision making skills. As Table 9 shows the mean of CONDQPR is 3.76.

(3) PEQPR

Physical education grades (PEQPR) measure a midshipman's performance in physical education courses. The military culture values fitness and a "fit" appearance in uniform. Physical education courses are not suggested to be as rigorous as earning a varsity letter in a collegiate sport. However, it is valuable in the model because, unlike receipt of a varsity letter (NLETTER) it is a physical measure of performance that encompasses the entire Brigade.

The PEQPR variable is expected to have a positive sign in the fleet performance models. As Table 9 shows the mean of PEQPR is 2.56.

(4) NLQPR

The next three cumulative measures of military performance come from the Naval Academy's Professional Development department. The department is responsible for teaching courses in Naval Leadership, Naval Science, and Navigation. Naval Leadership grades (NLQPR) are given every year and cover the basics of the tenets of leadership that apply to the naval service.

The cumulative grades of all four of the Naval Leadership courses are used as a measure of knowledge on:

- Leadership principles (taken 1st year and 3rd year)
- Military Psychology
- Law for the Junior Officer

It is suggested that the basics learned in this course of study will be exercised as a midshipman and as a junior officer in the fleet. The expected sign of NLQPR is positive in the fleet performance models. As Table 9 shows the mean of NLQPR is 3.10.

(5) NSQPR

Naval Science courses cover the basics of:

- Fundamentals of Naval Science
- Ship handling and Tactics
- Operations and Tactics

The Naval Science grade variable (NSQPR) is a cumulative indicator of all the course grades given during four years at the Naval Academy. It is suggested that learning the basics of naval sciences is a determinant of successful performance in the military service. Therefore, NSQPR is expected to have a positive sign in the fleet performance models. As Table 9 shows the mean of NSQPR is 3.00.

(6) NNQPR

Navigation courses cover the basics of:

- Rules of the Road for vessels

- Celestial navigation
- Chart navigation
- Use of electronic aids to navigation

The Navigation course grade variables (NNQPR) are cumulative of all the course grades given at the Naval Academy. It is suggested that learning navigation will have a positive effect on fleet performance. As Table 9 shows the mean of NNQPR is 2.78.

(7) HONORG

A binary variable is created to reflect whether a graduate is in the top 10% of the class variable (HONORG), which measures the placement of the midshipman in the Order of Merit. Graduates with distinction based on Order of Merit are coded as HONORG=1. The Order of Merit includes the Cumulative Military Performance Grade but as shown in Appendix A it is heavily weighted towards academics. Ree & Earles (1992) suggest that cognitive ability is a very accurate means of predicting job performance. Therefore, the HONORG variable is expected to have a positive sign in the fleet performance models. As Table 9 shows the mean of HONORG is .12.

(8) STRIPER

The Brigade Leader variable (STRIPER) reflects a Midshipman three striper or above. The midshipmen who have a value of "1" in the STRIPER variable achieved a high position of authority during their senior (first-class) midshipman year at the Naval Academy. These positions are unique and often distinguish the midshipman from his or her peers. The "stripers" are selected by a

selection board that includes inputs from the midshipman chain-of-command and the officer chain-of-command. It is expected that the STRIPER variable will have a positive sign in the fleet performance models. As Table 9 shows, the mean of STRIPER is .11.

(9) NLETTER

A midshipman who excels in athletics may letter in a varsity sport. The varsity letter winner variable (NLETTER) determines if the midshipman achieved the letter by their first class year. An NLETTER value of "1" indicates that the midshipman completed the requirements for their particular sport to have a varsity letter. As suggested in Leskovich (2000) athletes have higher promotion rates. The effects on promotion seem to point to athletics and sport contributing positively to the development of officer-like traits. Funk (1995) suggests that athletics develop determination, self-sacrifice, teamwork, self-discipline, and concentration. The teamwork and competitive values learned in sports are both highly valued in the naval service. The NLETTER variable is expected to have a positive sign in the fleet performance models. As Table 9 shows the mean of NLETTER is .13.

c. Academic Performance Variables

Three academic variables are created measure mental or cognitive ability. Academic coursework is broken into three groups based on content of instruction. The grades are calculated and averaged in order to attain a Quality Point Rating (QPR). The three groups are:

- Engineering (ENGQPR)
- Humanities/Social Sciences (HUMSQPR)
- Math/Science (MTSCQPR)

These variables use the 4.0 scales that include the midshipman's cumulative academic career at the Naval Academy. These three groupings of variables focus on the

different academic topics at the Naval Academy and this study suggests that the signs of all three variables will be positive in the fleet performance model. Table 10 shows the means, standard deviations, and expected signs of the academic variables in the models.

TABLE 10. ACADEMIC VARIABLE DESCRIPTIVE STATISTICS

VARIABLES	MEAN VALUE	STD DEVIATION	EXPECTED SIGN
ENGQPR	2.62	0.62	+
HUMSQPR	2.81	0.47	+
MTSCQPR	2.83	0.57	+

D. HYPOTHESIS AND METHODOLOGY FOR TESTING

This research explores the relationship between military performance at the United States Naval Academy and officer performance in the fleet. The primary question asked in this thesis is: What factors of the Midshipman military performance system contribute to overall success as an officer? The sub-set of questions are:

- Does military performance at USNA predict retention?
- Does military performance at USNA predict promotion?
- Does military performance predict career progression?

The models in this study include variables that measure the three pillars of Midshipman development: Mental; Moral; and Physical. These areas of development are mandated in the Mission of the Naval Academy as necessary to graduate officers of the highest quality.

A graphical interpretation of the Naval Academy's model of midshipman development is shown in Figure 8.

USNA's model uses a three-tiered approach to developing midshipmen. The model chosen in this study to operationalize the Naval Academy's model is portrayed in the Venn diagram in Figure 9. The model shows all three areas of midshipman development. The Venn diagram is chosen because it shows how the diverse inputs to midshipman development often overlap with each other.

FIGURE 8. USNA'S MODEL OF MIDSHIPMAN DEVELOPMENT

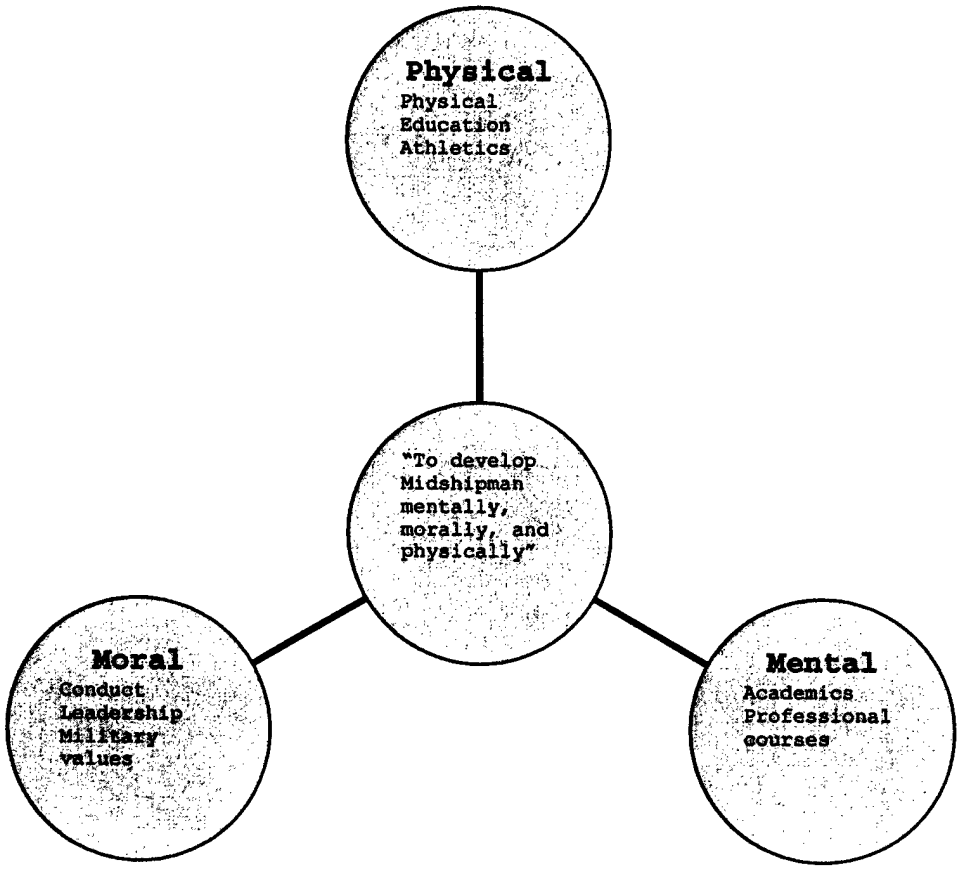
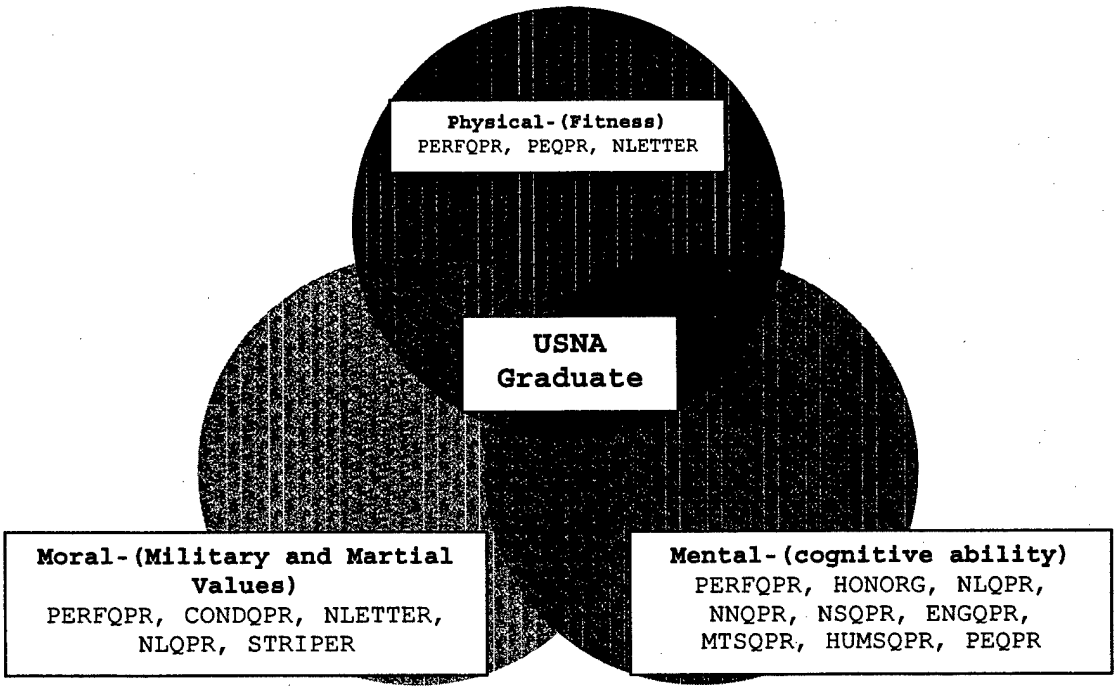


FIGURE 9. MODEL OF MIDSHIPMAN DEVELOPMENT



The methodology used to test the three main hypotheses is based upon multivariate regression analysis. Initially, simple model specifications that include only the major military performance measures of midshipmen are developed to explain officer fleet performance. Then additional characteristics related to individual midshipmen are added to the models to obtain improved estimates of the effect of military performance on officer fleet performance.

IV. RESULTS

This chapter will discuss the results of the linear regression analysis of officer performance and the LOGIT analysis of promotion and retention. Although the models include all the explanatory variables, the results for each variable are discussed individually. The complete results for each regression model can be reviewed in Appendices I, J, and K.

A secondary model is estimated after the baseline regressions. The Military Performance grade is highly correlated with many of the other variables. This correlation may mask the effects of the other performance variables. Therefore, a secondary model that does not include the Military Performance grade is estimated to determine the importance of the measures that are masked in the baseline models. The results of the regressions in the secondary model are used to determine the robustness of the effect of the Midshipmen Military performance grade.

The accuracy of the LOGIT models is shown in Appendices G and H. Table 11 shows the Model fit statistics for all the models.

TABLE 11. MODEL FIT STATISTICS

MODEL NAME		R^2	F	Obs.	-2 log likelihood	Pseudo R^2	Model chi^2	sig.
Officer Performance PRAP3	Primary	0.103	20.445	3033				
	Secondary	0.078	15.937	3033				
Officer Promotion LCPROM	Primary			1623	1518.339	0.157	173.953	0.000
	Secondary			1623	1574.598	0.108	117.694	0.000
Officer Retention LCSTAY	Primary			3033	4124.684	0.028	64.976	0.000
	Secondary			3033	4130.185	0.026	59.475	0.000

A. CONTROL VARIABLES

Control variables are included in every model in order to ensure any effects of class year and ethnicity are controlled. Table 12 lists the estimated coefficients and marginal effects of the control variables. The marginal effects in the LOGIT models are evaluated at the mean of each explanatory variable. The table in Appendix I displays a more comprehensive view of all variables included in the models and relevant statistics in the officer performance model.

TABLE 12. CONTROL VARIABLE COEFFICIENTS

Officer Performance Model (PRAP3)				
	Primary Model (w/PERFQPR)		**Secondary Model (w/oPERFQPR)**	
Variables	**Coefficient**		**Coefficient**	
GRAD YR 1981 (YR81)	0.045		**0.046****	
GRAD YR 1982 (YR82)	**0.080****		**0.079****	
GRAD YR 1984 (YR84)	**0.139****		**0.141****	
GRAD YR 1985 (YR85)	**0.182****		**0.175****	
RACE (ETHNIC)	-0.032		-0.032	
Officer Promotion Model (LCPROM)				
	Primary Model (w/PERFQPR)		**Secondary Model (w/oPERFQPR)**	
Variables	**Coefficient**	**M.E.**	**Coefficient**	**M.E.**
GRAD YR 1981 (YR81)	**0.443***	**.067**	**0.474***	**.074**
GRAD YR 1982 (YR82)	0.202	.031	0.170	.027
GRAD YR 1984 (YR84)	-0.381	-.058	-0.369	-.058
GRAD YR 1985 (YR85)	-0.12	-.018	-0.145	-.023
RACE (ETHNIC)	-0.181	-.027	-0.165	-.026
Officer Retention Model (LCSTAY)				
	Primary Model (w/PERFQPR)		**Secondary Model (w/oPERFQPR)**	
Variables	**Coefficient**	**M.E.**	**Coefficient**	**M.E.**
GRAD YR 1981 (YR81)	-0.117	-.018	-0.116	-.018
GRAD YR 1982 (YR82)	-0.027	-.004	-0.029	-.004
GRAD YR 1984 (YR84)	**-0.522****	**-.079**	**-0.519****	**-.079**
GRAD YR 1985 (YR85)	**-0.457****	**-.069**	**-0.466****	**-.071**
RACE (ETHNIC)	0.006	.001	0.006	.001
*=significant to the .05 level **=significant to the .01 level				

1. Effects of Class Year

1980 is the reference year for the class year variables. The data from 1983 is not included because of missing data. The coefficients for YR81, YR82, and YR84 year groups are consistently positive and significant. The deletion of the military performance grade variable in the secondary models has no major impact on the coefficients. This suggests that Military Performance grades are unaffected by class year and ethnic background.

In comparison to the base year 1980, this study finds graduates of later years have 8% to 18% more of their FITREPs with the RAP grade. This could be evidence of FITREP grade inflation.

In the LOGIT regression of the officer promotion model, YR81 is the only significant variable. The marginal effects show that 1981 graduates are 6.7% above the mean in promotion rates. In Appendix J, a comprehensive table of the promotion model statistics results is displayed.

The LOGIT regression of retention finds that YR84 and YR85 have significant and negative on retention to the LCDR board. Both year groups had approximately 7% lower retention rates. In Appendix K, a more comprehensive table of the Retention model statistics is displayed.

The class years of 1984 and 1985 could have experienced lower retention rates because the graduates would have completed their initial commitments in 5 years if they selected submarines or surface warfare or up to an 8 year commitment upon graduation from flight school if they selected aviation (jets). Depending on graduation

year and warfare community, the initial commitment would end between the years 1989 and 1995. It is during this time that large cutbacks in the military budget and manpower were implemented. The negative statistical findings on retention for those cohorts appear to be consistent with the downsizing of the military.

2. Effects of ETHNIC

As discussed in Chapter III, the hypothesized effect of race is controlled in all the models. However, the ethnicity variable is not significant in any of the models. It is interesting to note that race is not found to be a statistically significant factor in the performance, promotion or, retention models.

B. MILITARY PERFORMANCE VARIABLE EFFECTS

Military Performance variables include subjective and objective measures of physical and military skill. Essentially, this category of performance measurement is considered to be the area of development that differentiates the Naval Academy from civilian universities. The unique curriculum and facilities of the Naval Academy enable midshipmen to practice their coursework lessons and training on other midshipmen to hone leadership skills.

Table 13 lists estimated regression coefficients and significance levels for selected Military Performance variables. The reader may refer to Appendices I, J, and K for a complete listing of the model results.

TABLE 13. MILITARY PERFORMANCE VARIABLE COEFFICIENTS IN PERFORMANCE MODELS

Officer Performance OLS Model, PRAP3				
	Primary Model (w/PERFQPR)		Secondary Model (w/oPERFQPR)	
Variables	**Coefficient**		**Coefficient**	
MILITARY PERF. GRADE (PERFQPR)	**0.229****			
TOP 10% OOM (HONORG)	0.031		0.029	
3 STRIPER OR ABOVE (STRIPER)	**0.035**		**0.088****	
VARSITY LETTER (NLETTER)	0.022		0.017	
CONDUCT GRADE (CONDQPR)	**-0.021**		**0.053****	
PHYS. ED. GRADE (PEQPR)	-0.005		0.033	
NAVAL LEADERSHIP GRADE (NLQPR)	0.011		0.013	
NAVAL SCIENCE GRADE (NSQPR)	**0.036**		**0.060****	
NAVIGATION GRADE (NNQPR)	0.017		0.024	
Officer Promotion LOGIT Model, LCPROM				
	Primary Model (w/PERFQPR)		Secondary Model (w/oPERFQPR)	
Variables	**Coefficient**	**M.E.**	**Coefficient**	**M.E.**
MILITARY PERF. GRADE (PERFQPR)	**1.204****	**0.183**		
TOP 10% OOM (HONORG)	0.229	0.035	0.301	0.047
3 STRIPER OR ABOVE (STRIPER)	0.429	0.065	**0.999****	**0.156**
VARSITY LETTER (NLETTER)	**0.457***	**0.069**	0.387	0.06
CONDUCT GRADE (CONDQPR)	-0.208	-0.032	**0.352***	**0.055**
PHYS. ED. GRADE (PEQPR)	**0.259***	**0.039**	**0.440****	**0.069**
NAVAL LEADERSHIP GRADE (NLQPR)	-0.020	-0.003	-0.032	-0.005
NAVAL SCIENCE GRADE (NSQPR)	-0.024	-0.004	0.091	0.014
NAVIGATION GRADE (NNQPR)	-0.079	-0.012	-0.03	-0.005
Officer Retention LOGIT Model, LCSTAY				
	Primary Model (w/PERFQPR)		Secondary Model (w/oPERFQPR)	
Variables	**Coefficient**	**M.E.**	**Coefficient**	**M.E.**
MILITARY PERF. GRADE (PERFQPR)	**0.225***	**0.034**		
TOP 10% OOM (HONORG)	**0.440****	**0.067**	**0.436****	**0.066**
3 STRIPER OR ABOVE (STRIPER)	-0.098	-0.015	-0.007	-0.001
VARSITY LETTER (NLETTER)	-0.069	-0.011	-0.076	-0.012
CONDUCT GRADE (CONDQPR)	0.131	0.02	**0.242***	**0.037**
PHYS. ED. GRADE (PEQPR)	**-0.132***	**-0.02**	-0.101	-0.015
NAVAL LEADERSHIP GRADE (NLQPR)	-0.126	-0.019	-0.122	-0.019
NAVAL SCIENCE GRADE (NSQPR)	**0.293****	**0.044**	**0.320****	**0.049**
NAVIGATION GRADE (NNQPR)	-0.018	-0.003	-0.013	-0.002

*=significant to the .05 level
**=significant to the .01 level

1. Effects of PERFQPR

PERFQPR is consistently significant and positive in all three models. As hypothesized the grade assigned by a commissioned naval officer is positively associated with all of the officer performance measures. An increase of one point in the Military Performance grade increases the percentage of RAP 0-3 FITREPs by almost 23%. This result is significant to the .01 level.

The effects of the skills captured in the PERFQPR grade are also significant and positive in the Promotion model. For example, it is estimated that having a one point higher Military Performance grade at the Naval Academy results in an 18% greater probability of promoting to LCDR. Apparently, the Military Performance grade from the Naval Academy is still strongly related to fleet performance ten years after commissioning.

The PERFQPR variable in the retention model yielded significant and positive effects. However, a 3% increase in retention for every letter grade increase in the PERFQPR grades is a very small effect. The strong effects in the Officer Performance and Promotion models are not repeated in the Retention model.

2. Effects of HONORG

The variable that indicates whether a midshipman ranks in the top ten percent of the graduating class does not have any significance in predicting officer performance or promotion. This conclusion does not support the hypothesized positive effect that Order of Merit would have

on fleet performance. The insignificant outcomes may result from multi-collinearity with other variables included in the model.

The HONORG variable is positive and significant in both the primary and secondary Retention models. Apparently, the effect of the Military Performance grade did not mask the HONORG variable. A midshipman who graduates in the top ten percent of the class based on Order of Merit is about 6% more likely to stay in the Navy to the LCDR selection board than the rest of the graduating class. The Navy officer corps is retaining some of the officers past their initial service obligations who were high performers as Naval Academy midshipmen.

3. Effects of STRIPER

The effect of the STRIPER variable is positive and significant in the secondary performance and promotion models. The high correlation between STRIPER and PERFQPR is the likely reason why the STRIPER variable is insignificant in the baseline models. The members of a "Striper" board are likely to depend heavily on the Military Performance grade when deciding who is assigned a leadership position in the Brigade.

A midshipman "striper" will receive 8.8% more valid RAP FITREPs as an O-3 than his peers. This positive effect is repeated in the Promotion model. The marginal effects in the Promotion Model yielded a 15.6% increase in promotion rates for Midshipmen who were Company Commanders or above in their final year at the Naval Academy. These statistical results concur with the hypothesized positive effects of being a midshipman "striper" on officer

performance and promotion. This effect on performance and promotion is strong evidence that the Naval Academy provides a curriculum and leadership laboratory that is a good source of leadership development.

The retention model yields an interesting lack of evidence to support that being a leader of future leaders has a positive effect on staying in the Navy. As shown in the Officer Retention Prediction table only correctly predicted 57% of the officers who remained to the LCDR board. If weaknesses in the model are not the cause for the insignificant results, then it is possible that Stripers possess the same skills and drive as midshipmen and officers who are also highly sought after by civilian firms.

4. Effects of NLETTER

The only model in which NLETTER is found to be significant is the baseline promotion model. Officers who excelled in competition at the National Collegiate Athletic Association (NCAA) level and earned a varsity letter as midshipmen are found to be 6.9% more likely to promote than other officers.

Midshipmen who are involved in this level of competition must devote large amounts of time to practices and competitions. Not only does this divert time away from studying academic material, but it also reduces the time the midshipman has to practice leadership skills in Bancroft Hall. The athletic midshipman's opportunities to be observed by the Company Officer are also severely limited. Despite this possible negative bias in the

assigning of Military Performance and Academic grades at the Naval Academy athletes have a better chance of promoting as officers.

5. Effects of CONDQPR

The effects of CONDQPR, Conduct grades, are significant and positive predictors in all of the secondary models of performance, promotion, and retention. It is likely that the high correlation between a midshipman's conduct grade and the grade assigned by a Company Officer make the CONDQPR variable insignificant when included with PERFQPR in the baseline model. The Company Officer has few very specific military measures of performance and thus the CONDQPR will often be highly correlated with the PERFQR. This consistently significant and positive impact on the fleet performance measures is an interesting finding.

The Conduct grade is an objective summation of the number of a midshipman's accumulated demerits. A midshipman's adherence to Midshipmen regulations in the form of a Conduct grade is found to have a positive impact on officer performance in the fleet. Every grade increase in the Conduct grade increases the percentage of valid RAP O-3 FITREPs by 5.3%.

In the Promotion model every grade increase in the CONDQPR increases the probability of promotion by 5.5%. In the Retention model a similar CONDQPR grade increases the probability of staying in the Navy to the LCDR board by 3.7%. The midshipmen who have good Conduct grades are consistently good performers, are more likely to promote,

and are also more likely to remain in the Navy. These results are consistent with the hypothesized effect of this variable.

6. Effects of PEQPR

Physical Education grades have positive effects on promotion in both the primary and secondary models. The retention model yielded a negative and significant coefficient for the PEQPR variable. In the primary Promotion model that included the Military Performance grade, the PEQPR yields an increase in the promotion rate by 4%. When the Military Performance grade is excluded the marginal effect increases in the promotion rate to 7%. The higher marginal effect in the secondary model suggests that the PERFQPR is also positively correlated with grades received in physical education courses.

The Retention model has a negative coefficient for PEQPR. Every grade increase in the PEQPR reduces the probability of retention by 2%. This does not agree with the hypothesis that PEQPR will have a positive effect on retention.

7. Effects of NLQPR

None of the models yielded any significant results for NLQPR. This area of study is hypothesized to be the most important course taught in the Professional Development curriculum at the United States Naval Academy. The lack of any significant results on officer performance is not expected for the Naval Leadership courses. The lessons in these courses are expected to be the building blocks for the practical leadership that occurs in Bancroft Hall. The success in these courses is hypothesized to be highly predictive of fleet performance. The surprising lack of any lasting effects of this course on Naval Academy graduates is surprising. A more thorough review of the Naval Leadership curriculum is required before the course can be discounted as a source of officer development.

8. Effects of NSQPR

Despite the hypothesis that Naval Science courses have a positive effect on fleet performance the strength of the Naval Science courses is very surprising. The NSQPR variable has positive effects on performance and retention, but no effect on promotion.

A one grade increase in NSQPR will increase the number of valid RAP O-3 FITREPs by 6%. The results concur with the hypothesis that high grades in Naval Science courses will translate into higher performance in the fleet as an officer. The lessons learned in Naval Science include many practical exercises in shiphandling and naval tactics. This foundation in the basics may provide the junior officer with the basic tools to enhance his FITREP score.

When the PERFQPR is included in the model the variable NSQPR becomes insignificant. This suggests that the grades in Professional Development may be correlated with the PERFQPR grades assigned by the Company Officer.

In the primary Retention model an increase in a Naval Science grade of one point would result in a 4.4% higher retention. When PERFQPR is removed in the secondary Retention model the percentage increases to 4.9%. The grades received in courses that instruct midshipmen in basics of naval tactics, engineering, and shiphandling concur with the hypothesis that an interest in Naval Science, as well as, performance in the courses will have a positive effect officer promotion and retention.

9. Effects of NNQPR

The effects of courses in the Navigation curriculum of the Professional Development department are hypothesized to have at least a minor effect on officer performance, promotion, and retention. However, the NNQPR variable did not result in any significant predictors in any of the three models. Unlike the lessons learned in Naval Science courses the basics of navigation did not have an impact on any of the fleet performance models.

C. ACADEMIC PERFORMANCE VARIABLE EFFECTS

Academic Performance variables include grades for three different areas of study: engineering, math/science, and humanities/social sciences. The academic curriculum is hypothesized to have a positive effect on the development of midshipmen. The splitting into three fields of study will help to determine the areas of study that have the

strongest impact on the fleet performance models of performance, promotion, and retention.

Table 14 lists the all the estimated coefficients and marginal effects of the Academic Performance variables chosen to measure leadership abilities. Additionally, the Military Performance grade variable is added to the table. The full models are shown in Appendices I, J, and K.

The coefficients remain consistent in the primary and secondary models with the exception of the Humanities course grades that increase from .67 and .107 when the Military Performance grade is removed from the regression. A similar masking of the effects occurs in the secondary Promotion model when the Humanities course grades lose their significance when included with the Military Performance grades.

TABLE 14. ACADEMIC PERFORMANCE VARIABLE COEFFICIENTS IN PERFORMANCE MODELS

Officer Performance Model OLS, PRAP3				
	Primary Model (w/PERFQPR)		Secondary Model (w/oPERFQPR)	
Variables	Coefficient		Coefficient	
MILITARY PERF. GRADE (PERFQPR)	**0.229****			
ENGINEERING GRADES (ENGQPR)	-0.019		0.004	
MATH AND SCIENCE GRADES (MTSCQPR)	**-0.089****		**-0.071***	
HUMANITIES AND SOC SCI GRADES (HUMSQPR)	**0.067****		**0.107****	
Officer Promotion Model LOGIT, LCPROM				
	Primary Model (w/PERFQPR)		Secondary Model (w/oPERFQPR)	
Variables	Coefficient	M.E.	Coefficient	M.E.
MILITARY PERF. GRADE (PERFQPR)	**1.204****	**0.183**		
ENGINEERING GRADES (ENGQPR)	0.21	0.032	0.289	0.045
MATH AND SCIENCE GRADES (MTSCQPR)	-0.287	-0.044	-0.155	-0.024
HUMANITIES AND SOC SCI GRADES (HUMSQPR)	0.192	0.029	**0.444***	**0.069**
Officer Retention Model LOGIT, LCSTAY				
	Primary Model (w/PERFQPR)		Secondary Model (w/oPERFQPR)	
Variables	Coefficient	M.E.	Coefficient	M.E.
MILITARY PERF. GRADE (PERFQPR)	**0.225***	**0.034**		
ENGINEERING GRADES (ENGQPR)	**-0.246***	**-0.037**	**-0.225***	**-0.034**
MATH AND SCIENCE GRADES (MTSCQPR)	-0.139	-0.021	-0.121	-0.018
HUMANITIES AND SOC SCI GRADES (HUMSQPR)	-0.145	-0.022	-0.098	-0.015

*=significant to the .05 level
**=significant to the .01 level

1. Effects of ENGQPR

The only significant effects of engineering grades appear in the retention model. The ENGQPR variable has a negative impact on the retention to the LCDR board. The marginal effects show that for every one-point increase in the cumulative engineering course grade there is a 3% decrease in the probability of staying in the Navy to the LCDR board. This negative effect is consistent for both the primary and secondary retention models. This may reflect that graduates with superior engineering skills are more marketable in the private sector.

2. Effects of MTSCQPR

The only significant effects of math and science course grades occurred in the Officer Performance model. The MTSCQPR grades have a consistently significant and negative impact in the Officer Performance model. The model found that an increase in the cumulative Math and Science courses by one grade decreased the number of valid RAP O-3 FITREPs by 7%. When the Military Performance grade is removed the percentage increased to -9%. The negative effects do not concur with the hypothesis that the academic skills are an important role in the development of leadership. This surprising result suggests that skills in sciences and math are likely to be inversely related to the skills that are needed by junior officers.

3. Effects of HUMSQPR

The effects of Humanities and Social Science course grades on the performance yield results that are positive and significant at the .01 level in the Performance and Promotion models. A grade increase of one point in HUMSQPR

increases the amount of valid O-3 FITREPs RAP by 6.7% in the primary model and by 10.7% in the secondary model. Once again the secondary model, which does not include the PERFQPR grade, unmasks a greater contribution of other performance variables. The Promotion model also supports the contribution of the HUMSQPR variable to fleet success. The effect in the primary model is insignificant; however, in the secondary model a result that is significant at the .05 level has a very strong impact the model. A grade increase of one point in HUMSQPR increases the probability of promotion by 6.9%.

The HUMSQPR grade is consistent with the hypothesis in both the Performance and the Promotion models. The effect increases when the PERFQPR grade is removed. This suggests that the Military Performance grade and Humanities and Social Science courses have something in common. Despite the lack of significant findings in the Retention model the effects of Humanities and Social Sciences in the prediction of performance and promotion cannot be overlooked.

D. SUMMARY OF FINDINGS

The regression and LOGIT analysis find that the Military Performance grade, PERFQPR, is correlated with a host of the other independent variables. The performance, promotion, and retention models have more significant explanatory variables when PERFQPR is not included. The relationship between Military Performance and a midshipman's performance in other areas prompted the need for a secondary model that did not include the PERFQPR grade. This section of Chapter IV summarizes all of the results in the linear and LOGIT regressions.

1. Positive Effects

In the Officer Performance model PERFQPR has the greatest effect followed by HUMSQPR, STRIPER, NSQPR, and CONDQPR. The Officer Performance model uses a linear regression of 17 variables to determine the strength of each variable in predicting officer performance measured at the percentage of valid O-3 FITREPs that are RAP.

The strength of the PERFQPR grade in the prediction of officer performance is consistent with the findings of Gremillion (1998) and Yammarino and Bass (1988) and disputes the findings of Trabun (2002). The use of military measures to grade the leadership development of midshipmen is also supported in the studies on military family background (Micheal, 1999) and NAPS background (Fitzpatrick, 2001). The military-specific training at the Naval Academy is found to be a very good predictor of success in officer performance, promotion, and retention.

The next strongest factor in the prediction of officer performance is the HUMSQPR grade. This academic measure of success is found to have a slope coefficient of .107 when the PERFQPR grade is omitted from the model. This significant and positive effect on officer performance by humanities and social science course grades is supported by the Gremillion (1998) and Zais (1990) studies. Bowman (1990) also suggests that midshipmen who graduate with a humanities or social science degree have at least the same probability of success in the fleet as midshipmen with a technical degree. Admiral Stockdale, who is often modeled as the example of a transformational leader, argues for an

increase in liberal arts teaching in all Naval Officer ascension programs. (Stockdale, 1985)

The midshipmen selected to lead the Brigade in various jobs as a three striper or above are considered to have the next highest effect on the prediction of success in the Officer Performance model. This finding supports the Naval Academy's measures of performance. The selectivity of the "Striper" selection board tasked to pick midshipman who will lead their peers is a strong predictor of officer performance.

The cumulative grade received in Naval Science courses in the Professional Development curriculum is also a strong predictor of officer performance. The courses in Naval Science focus on the basics of the naval services, as well as, the first laboratories and practical exercises aboard Yard Patrol (YP) craft. Therefore, these findings support the hypothesis that superior performance in exercises of basic military skills and values are powerful predictors of Officer performance.

A midshipman's cumulative Conduct grade is the next strongest factor in the regression. Although this finding agrees with the hypothesis, a midshipman who adheres to Midshipmen regulations is the "weakest factor" in predicting officer performance with an increase of promotion of 5.5% for every single grade increase in the Conduct grade.

The Promotion model also found that PERFFQR was the strongest positive predictor in the equation. The PERFQPR grade is immediately followed by the STRIPER variable. These results support the hypothesis that a measure of

performance for a midshipman that is assigned by a commissioned officer is highly predictive of success in the fleet.

Midshipmen who earn a varsity letter in a NCAA level sport increase their probability for promotion. Zettler (2002) and Leskovitch (2000) found similar findings in the value of physical abilities in the development of midshipmen and success of officers.

The HUMSQPR variable is significant in the secondary model. This is another statistical finding that supports the positive effect of Humanities and Social Science courses in the Officer Performance model.

The next strongest effect is found in another physical measure of performance. A midshipmen's cumulative Physical Education grade also has a positive effect in the promotion model. In the secondary Promotion model, PEQPR increases the probability of promotion to LCDR by 6.9%.

The Retention model yields positive effects from PERFQPR, NSQPR, and CONDQPR but the largest effect came from the HONORG variable. A midshipman who graduates in the top ten percent of the class has a 6.6% greater probability of staying in the Navy to the LCDR board. These results suggest that officers who are superior midshipmen are finding reasons to remain in the Navy to the LCDR board.

2. Negative Effects

The cumulative Math-Sciences grade, MTSCQPR, is slightly negative in the Officer Performance regression. In this case, high grades in Math and Science courses predict lower FITREP scores. The models include math and

science course grades because they are hypothesized to be indicators of reasoning and job performance. No other performance measure variables have negative effects in the Officer Promotion model.

The Retention Model has two variables with negative coefficients. A midshipman who excels in engineering courses (ENGQPR) is less likely to remain in the Navy. The consistent negative result suggests a retention problem with the "Rickover Hypothesis."

The PEQPR had a negative coefficient in the primary Retention Model. Every grade increase of one point in the PEQPR decreases the probability of retention by 2%. The PEQPR variable becomes insignificant in the secondary model of retention. A possible explanation worth further study is the inherent difficulty of remaining in good physical condition in the tight confines of a naval vessel. Those midshipmen who enjoy and excel in physical activities may become frustrated with the busy schedule of a junior officer and lack of workout facilities aboard a Navy ship.

3. No Significant Effects

The lack of any significance of the NLQPR grade in any of the models is interesting. The basics taught in the courses are hypothesized to have a positive effect on all three of the models. The courses should establish a foundation for the development of leadership. The base knowledge of naval leadership and psychology taught in these courses revisited by graduates throughout their careers.

The NNQPR variable is also found to be insignificant in any of the models. The practical exercises in

navigation are hypothesized to be a positive factor of performance as well as a minor positive indicator of retention. The ability to navigate well early in the officer's career should be a benefit to the performance rankings. The use of 0-3 FITREPs might have completely negated any benefit of Navigation training at the Naval Academy. The majority of Lieutenants have been practicing navigation skills for at least four years by the time they are graded in their 0-3 FITREPs.

The applicability of the NNQPR to predict retention may have been lost because of the method chosen to measure retention. The hypothesis that NNQPR grades are a good predictor of retention may still be valid if used in a different model. Exceptional skills of nautical navigation as reflected in NN course grades could be a sign of interest in a naval career for the Surface Warfare and Submarine officers.

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V. CONCLUSIONS AND RECOMMENDATIONS

This study investigated the effect of the United States Naval Academy's Military Performance grade on officer performance, promotion, and retention. This chapter will summarize the conclusions, offer policy recommendations, and make recommendations for additional research.

A. CONCLUSIONS

Based on the findings in Chapter IV, and as shown in Appendix I, the Officer Performance model is strongly influenced by the Military Performance grade (PERFQPR). The remaining significant variables in decreasing order of importance based on standardized coefficients are: Humanities and Science grades (HUMSQPR), Company Commanders and above stripers (STRIPER), Naval Science grades (NSQPR), and Conduct grades (CONDQPR). These results suggest that the military measures are valid predictors of officer performance in the fleet. With the interesting exception of the Humanities courses the rest of the variables are indicators of military skills and traits.

In the Officer Promotion model PERFQPR, STRIPER, CONDQPR, and HUMSQPR once again are significant. They have a consistently positive impact on the Officer Performance and Promotion models and provide even more support for the claim that these measures are important to the development of midshipmen. The athletic measures of Varsity letter winner (NLETTER) and Physical Education grades (PEQPR) are significant only in the Promotion model. The PEQPR is significant in both the primary and secondary models while

the NLETTER is only significant when the PERFQPR variable is included in the model. These measures of athletic skills suggest a connection between the lessons learned in sports and competition and the traits of officers desired at the LCDR selection boards. Zettler (2002) suggests that the lessons of maturity, stamina, aggressiveness, and goal achievement learned on the playing fields are carried off the field benefit performance at the Naval Academy. The findings of the Promotion model not only support Zettler (2002) but also suggest that athletics have a lasting impact on fleet measures of performance as well.

In the Officer Retention model PERFQPR, CONDQPR, and NSQPR continue to have a significant and positive impact. However, being in the top 10% of the class variable (HONORG) is also significant with a strong effect on retention. It is significant in both the primary and secondary models with only a minor increase in effect when the PERFQPR variable is not included in the regression. The HONORG is not significant in any of the Officer Performance or Promotion models but has the second largest impact in the retention variable behind PERFQPR.

The Retention model has several significant negative coefficients. The most notable significant negative variable is PEQPR because it is significant and has a positive impact on promotion. Although the results occur in different models it is interesting to note that the measures of athletic performance, PEQPR and NLETTER, are both significant only when included with the PERFQPR variable in the primary models of retention and promotion. These findings may suggest that athletes receive lower

military performance grades assigned by the Company officer. These lower grades in Military Performance work against the positive impact of athleticism on officer performance. Once the midshipmen Military Performance grade is controlled, the independent effect of athleticism on officer performance becomes positive and significant. Additionally, there is weak support for the suggestion that athletic individuals may have a higher likelihood of leaving the Navy.

Unlike PEQRP the cumulative Engineering course grades variable (ENGQPR) is consistently negative in both the primary and secondary Retention models. Based on a comparison of the standardized coefficients the ENGQPR variable is also more negative than the PEQPR. This finding suggests that good performance in technical skills may present a retention issue.

B. POLICY RECOMMENDATIONS

In all three models the Military Performance grade (PERFQPR) is consistently positive and significant in the prediction of officer performance, promotion, and retention. For the Officer Performance model the highly correlated measures of performance are STRIPER, CONDQPR, and NSQPR. A likely reason for the high correlation is the common use of these objective grades in the calculation of the Military Performance grade. Despite the objective measures that are included, the Military Performance grade is highly subjective. Therefore, it is important that the Company Officer remain responsible for assigning the grade. Although it is important for the midshipman to have some say in the ranking of performance, the commissioned officer

with fleet experience must retain the ability to keep the subjective grade fair and balanced.

It is apparent that the Naval Academy curriculum is not only unique but also a great source of development of leadership skills for midshipmen. However, an increase in the effect of the Military Performance grade on the Order of Merit is recommended. It is the military curriculum that sets the Naval Academy apart and it appears to be the key to producing outstanding leaders. Only if the Military Performance grade weight in the Order of Merit equation is increased will the Naval Academy truly reward its graduates who are the most likely to become good naval officers.

A change in the leadership training inside of Bancroft Hall is also recommended. The impact of the STRIPER variable on the Officer Performance model suggests that more leadership positions or opportunities for being a leader be made available for 1st Class midshipmen. Increasing billets for midshipmen to assume leadership would enhance the practical exercise of the lessons learned in leadership courses and lectures. An increase in the number of units will increase the number of 1st class midshipman leadership billets. The benefit of giving all 1st Class midshipmen a leadership billet should outweigh any losses in the training benefit of having smaller numbers of subordinates in each unit.

Additionally, an increase in the weight of the Conduct grades in the Order of Merit equation is also recommended. The increased importance of the Conduct grade will reward midshipmen who can adhere to military regulations. The Naval Academy increases the probability that its graduates

will be better officers when it places more emphasis on rewarding disciplined behavior.

Athletics and physical education must not be overlooked. The results of the measures of physical abilities and athleticism are not strong enough for any specific recommendations. However, the findings do suggest that the availability of intramural, club and varsity sports at the collegiate level, and required physical education courses be maintained at its current level.

C. RECOMMENDATIONS FOR FURTHER RESEARCH

The documented weaknesses of this study include the Retention model and the data set. A retention model that includes other factors that may have an effect on the decision to remain in the Navy would likely improve the fit of the model. Although the data set spans the classes of 1980 to 1985, additional records up to the class of 1992 could be added. These newer cohorts not only would increase the number of cases but they would span several White House administrations. It is suggested that the recent changes in the Naval Academy curriculum must be included in the models by including more recent data.

The negative impact of ENGQPR grades on retention requires further study. Additional research on field of study or academic major on the propensity of an officer's decision to leave the Navy would clear up the findings in this study. More research is important because the Naval Academy could find out which fields of study will increase the probability of retention.

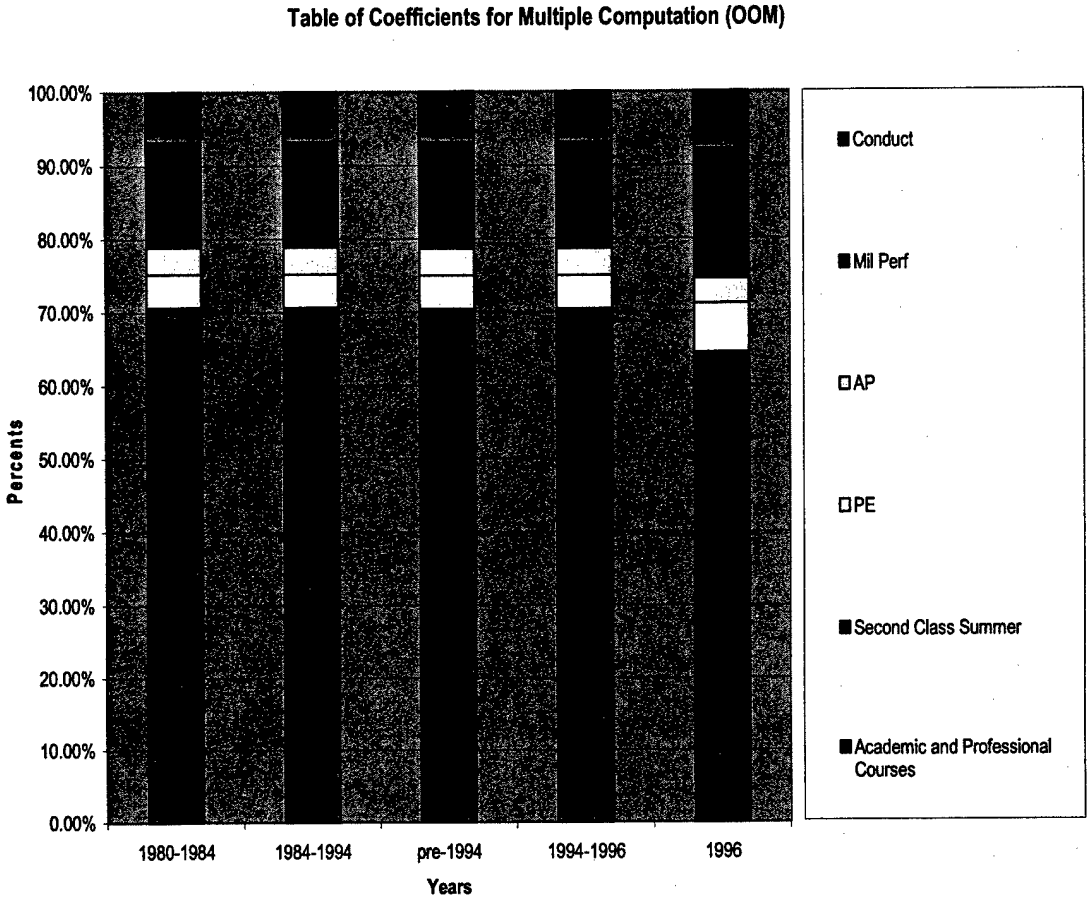
The effect of the Naval Science courses on fleet performance measures is clear; however, the reason for the

effect requires more research. A more focused analysis of the Naval Science curriculum is required to determine what makes this course so influential in predicting officer performance.

The lack of any significant positive impact of Naval Leadership and Navigation courses is very interesting. Additional research using more recent cases may find that changes in the curriculum since 1985 do, in fact, affect fleet performance measures.

The Humanities and Social Science grades are not expected to be as strongly positive in the Officer Performance and Promotion models. The results of this study suggest that something about Humanities courses prepares midshipmen to be good officers in the fleet. However, as Bowman (1990) suggests this enhancement in performance is not due to the academic major. There are a lot of research and leadership experts that push the value of an education in Humanities and Social Sciences (Snyder, 1985; Zais, 1990; Stockdale, 1985); however, very little research on why these courses are so beneficial to a leadership education curriculum have been performed. A more in-depth study of the benefits of a Humanities and Social sciences courses is required to get a better understanding of what makes Humanities and Social sciences such good areas of study for leaders.

APPENDIX A. MULTIPLE COMPUTATION (OOM)



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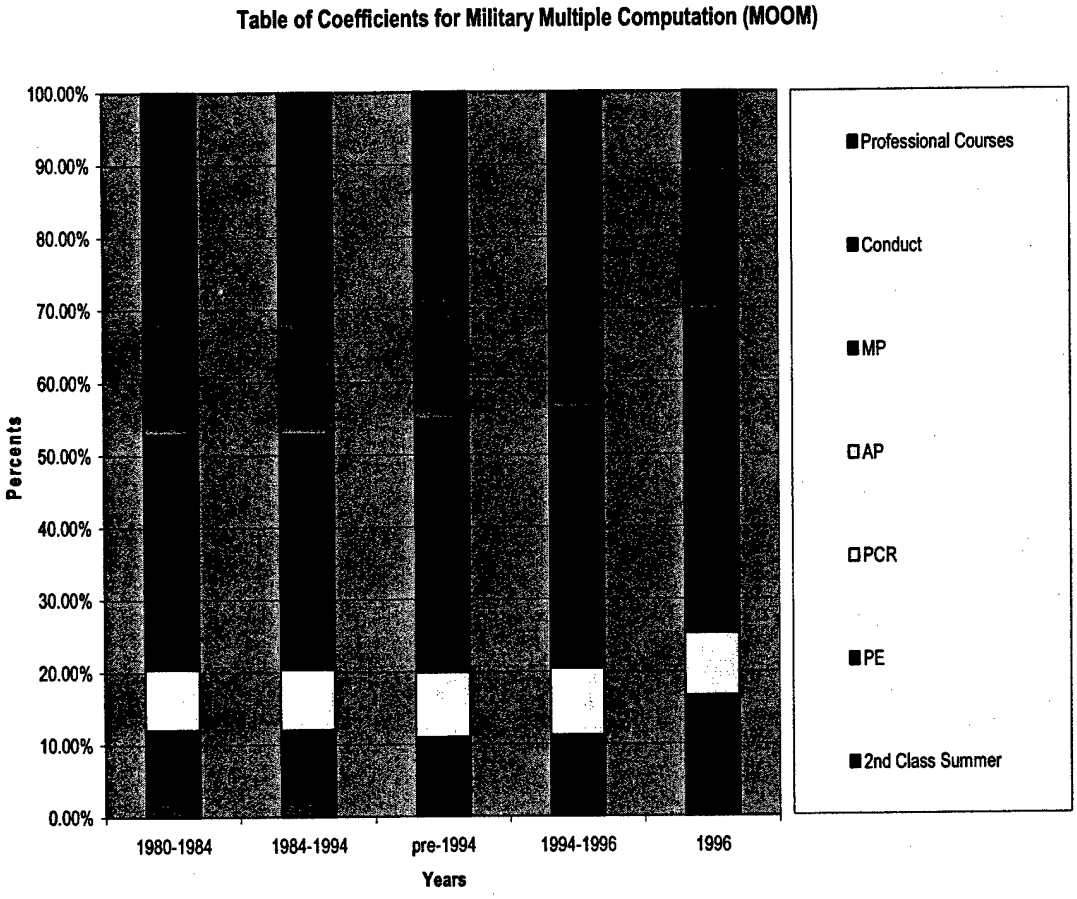
APPENDIX B. MILITARY MULTIPLE COMPUTATION (MOOM)



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APPENDIX C. VARIABLE NAME AND DESCRIPTION

	Outcome Variables	
PRAP3	PCT OF VALID LT FITNESS REPORTS RAP	
LCPROM	PROMOTE TO LCDR IF STAY TO GRADE 04 BOARD	0=do not promote 1=promote
LCSTAY	STAY TO LCDR BOARD	0=do not stay 1=stay
	Control Variables	
YR81	Class year 81	
YR82	Class year 82	
YR84	Class year 84	
YR85	Class year 85	
ETHNIC		0=white 1=nonwhite 2=other
	Military Performance Variables	
PERFQPR	CUMULATIVE MILITARY PERFORMANCE GRADE QPR	
HONORG	USNA GRADUATE WITH DISTINCTION-TOP10% OM	0=no 1=yes
STRIPER	USNA BRIGADE LEADER (4 STRIPES & COCDRS)	0=no 1=yes
NLETTER	USNA VARSITY LETTER-WINNER (1/C YEAR)	0=no 1=yes
CONDQPR	CUMULATIVE MIL CONDUCT GRADE QPR	
PEQPR	CUMULATIVE PHYSICAL EDUCATION QPR	
NLQPR	QPR for NL courses	
NSQPR	QPR for NS courses	
NNQPR	QPR for NN courses	
	Academic Performance Variables	
ENGQPR	ENGINEERING COURSEWORK QPR	
MTSCQPR	MATH/SCIENCE COURSEWORK QPR	
HUMSQPR	HUMAN/SOCIAL SCIENCES COURSEWORK QPR	

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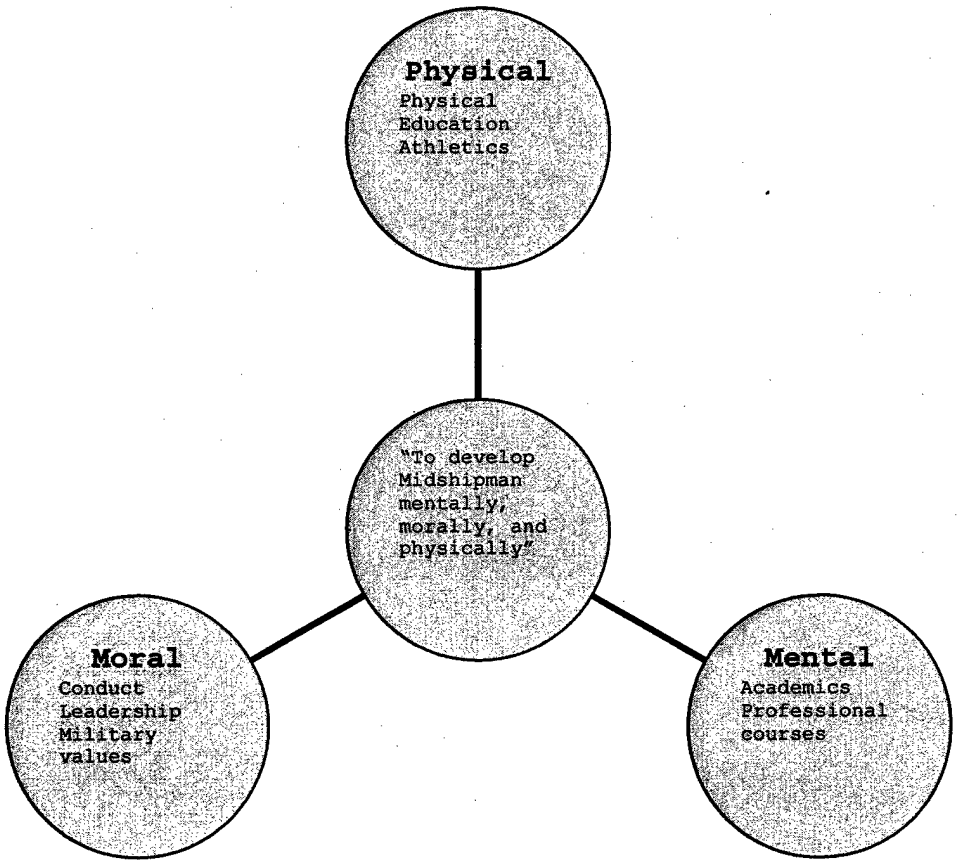
APPENDIX D. USNA MODEL OF MIDSHIPMAN DEVELOPMENT



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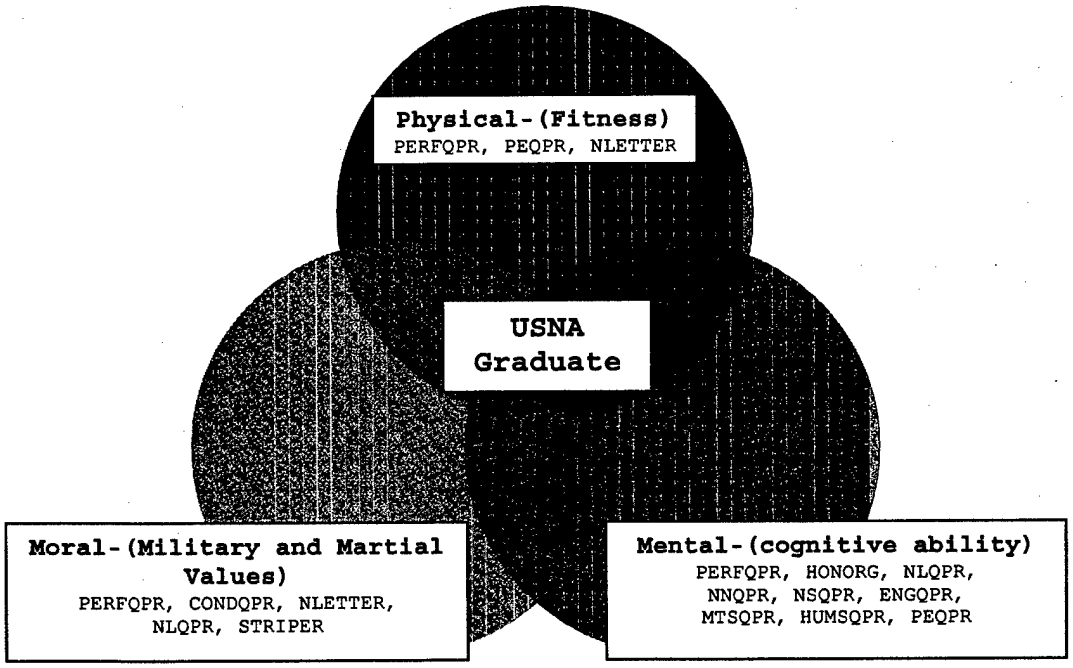
APPENDIX E. VARIABLES INVOLVED IN MIDSHIPMAN DEVELOPMENT



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APPENDIX F. OFFICER PROMOTION DATA FOR FY 79-90

Officer Promotion Point

Service	Year	O-6 DOPMA = 22±1	O-5 DOPMA = 16±1	O-4 DOPMA = 10±1	Service	Year	O-6 DOPMA = 22±1	O-5 DOPMA = 16±1	O-4 DOPMA = 10±1
Army	90	22-7	17-2	11-4	USMC	90	21-9	16-10	12-1
	89	22-7	17-7	11-10		89	21-10	16-11	12-2
	88	22-4	17-8	11-2		88	21-10	16-6	11-1
	87	22-1	17-2	11-7		87	21-11	16-4	10-10
	86	22-6	17-6	11-1		86	21-8	16-8	10-11
	85	22-0	16-8	11-4		85	21-6	16-0	11-3
	84	22-3	16-8	11-2		84	22-0	16-0	11-1
	83	21-11	16-5	11-7		83	21-9	15-10	10-4
	82	21-8	15-11	11-5		82	21-11	15-0	10-9
	81	21-7	15-10	11-2		81	22-2	15-3	9-8
	80	21-7	15-11	10-11		80	22-4	15-3	10-0
	79	21-9	16-2	11-0		79	22-5	16-4	10-5
Navy	90	21-9	15-4	10-2	Air Force	90	21-9	16-2	11-0
	89	21-4	15-4	10-0		89	21-5	16-3	NB
	88	21-1	15-2	9-10		88	NB	15-11	9-10
	87	21-0	15-1	9-8		87	21-0	16-2	10-8
	86	20-11	15-6	9-6		86	21-1	16-5	10-8
	85	21-0	15-3	9-5		85	20-5	16-4	11-0
	84	21-3	15-1	9-4		84	20-8	16-3	11-7
	83	21-5	14-9	9-2		83	20-6	15-9	11-8
	82	21-6	14-9	9-2		82	20-6	15-9	11-10
	81	21-5	14-8	9-0		81	20-8	15-9	11-9
	80	21-5	14-9	9-3		80	20-8	15-8	11-7
	79	21-9	14-10	9-3		79	21-2	16-0	11-9

SOURCE: OASD (FM&P) (MM&PP) (O&EPM), August 18, 1991. Average promotion point for all competitive categories is the number of years and months of active commissioned service plus entry-grade credit at which officers are promoted to a particular grade.

Officer Promotion Opportunity

Service	Year	O-6 DOPMA = 50%	O-5 DOPMA = 70%	O-4 DOPMA = 80%	Service	Year	O-6 DOPMA = 50%	O-5 DOPMA = 70%	O-4 DOPMA = 80%
Army	90	46%	73%	79%	USMC	90	51%	65%	71%
	89	45%	70%	80%		89	48%	66%	70%
	88	47%	73%	78%		88	49%	70%	79%
	87	49%	77%	82%		87	55%	69%	79%
	86	51%	NB[a]	75%		86	60%	75%	80%
	85	62%	86%	87%		85	61%	73%	80%
	84	59%	85%	86%		84	60%	75%	80%
	83	57%	87%	87%		83	60%	75%	80%
	82	60%	77%	87%		82	60%	75%	80%
	81	51%	72%	75%		81	60%	75%	85%
	80	53%	72%	74%		80	60%	75%	85%
	79	59%	75%	79%		79	55%	70%	80%
Navy	90	56%	72%	86%	Air Force	90	55%	74%	89%
	89	55%	70%	80%		89	55%	75%	NB[a]
	88	56%	72%	82%		88	NB[a]	75%	80%
	87	57%	74%	83%		87	56%	75%	89%
	86	57%	74%	83%		86	60%	73%	90%
	85	58%	76%	86%		85	57%	77%	91%
	84	60%	75%	84%		84	55%	75%	90%
	83	61%	80%	85%		83	55%	75%	90%
	82	70%	82%	90%		82	55%	75%	90%
	81	70%	85%	95%		81	55%	75%	90%
	80	63%	80%	90%		80	50%	75%	90%
	79	60%	70%	97%		79	50%	70%	80%

SOURCE: OASD (FM&P) (MM&PP) (O&EPM), August 19, 1991. Average opportunity for all competitive categories, computed by totaling all officers due course, above, and below zone promotions and dividing by the number of officers in zone.

[a]NB—no board.

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APPENDIX G. OFFICER PROMOTION PREDICTION RESULTS

			Primary Model			Secondary Model		
			Predicted			Predicted		
			PROMOTE TO LCDR		Percentage Correct	PROMOTE TO LCDR		Percentage Correct
			NO	YES		NO	YES	
Observed	PROMOTE TO LCDR	NO	32	318	9.143	8	342	2.286
		YES	28	1245	97.800	8	1265	99.372
	Overall Percentage				78.681			78.435

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APPENDIX H. OFFICER RETENTION PREDICTION RESULTS

			Primary Model			Secondary Model		
			Predicted			Predicted		
			STAY TO LCDR BOARD		Percentage Correct	STAY TO LCDR BOARD		Percentage Correct
			NO	YES		NO	YES	
Observed	STAY TO LCDR BOARD	NO	539	871	38.227	543	867	38.511
		YES	430	1193	73.506	435	1188	73.198
	Overall Percentage				57.105			57.072

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APPENDIX I. OFFICER PERFORMANCE MODEL STATISTICS

PRAP3	Primary Model (w/PERFQPR)			Secondary Model (w/oPERFQPR)		
Control Variables	**en**	**t**	**sig.**	**Coefficient**	**t**	**sig.**
YR81	0.045	1.954	.051	0.046	1.967	.049
YR82	0.080	3.510	.000	0.079	3.399	.001
YR84	0.139	6.056	.000	0.141	6.048	.000
YR85	0.182	7.792	.000	0.175	7.403	.000
ETHNIC	-0.032	-1.831	.067	-0.032	-1.812	.070
Military Performance Variables						
PERFQPR	0.229	9.243	.000			
HONORG	0.031	1.352	.176	0.029	1.251	.211
STRIPER	0.035	1.847	.065	0.088	4.795	.000
NLETTER	0.022	1.229	.219	0.017	0.961	.377
CONDQPR	-0.021	-1.049	.294	0.053	2.794	.005
PEQPR	-0.005	-0.268	.789	0.033	1.790	.074
NLQPR	0.011	0.422	.673	0.013	0.524	.600
NSQPR	0.036	1.550	.121	0.060	2.601	.009
NNQPR	0.017	0.769	.442	0.024	1.063	.288
Academic Performance Variables						
ENGQPR	-0.019	-0.613	.540	0.004	0.139	.890
MTSCQPR	-0.089	-2.962	.003	-0.071	-2.336	.020
HUMSQPR	0.067	2.648	.008	0.107	4.252	.000
R^2	0.103			0.078		
F	20.445			15.937		
Obs.	3033			3033		
*=significant to the .05 level **=significant to the .01 level						

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APPENDIX J. OFFICER PROMOTION MODEL STATISTICS

LCPROM	Primary Model (w/PERFQPR)				Secondary Model (w/oPERFQPR)			
Control Variables	**Coeff.**	**M.E.**	**Wald**	**sig.**	**Coeff.**	**M.E.**	**Wald**	**sig.**
YR81	0.443	0.067	4.301	.038	0.474	0.074	5.121	.024
YR82	0.202	0.031	1.009	.315	0.170	0.027	0.748	.387
YR84	-0.381	-0.058	3.412	.065	-0.369	-0.058	3.322	.068
YR85	-0.120	-0.018	0.330	.566	-0.145	-0.023	0.503	.478
ETHNIC	-0.181	-0.027	1.730	.188	-0.165	-0.026	1.517	.218
Military Performance Variables								
PERFQPR	1.204	0.183	53.683	.000				
HONORG	0.229	0.035	0.495	.482	0.301	0.047	0.873	.350
STRIPER	0.429	0.065	1.715	.190	0.999	0.156	10.048	.002
NLETTER	0.457	0.069	4.697	.030	0.387	0.060	3.496	.062
CONDQPR	-0.208	-0.032	1.169	.280	0.352	0.055	4.103	.043
PEQPR	0.259	0.039	6.273	.012	0.440	0.069	19.345	.000
NLQPR	-0.020	-0.003	0.009	.923	-0.032	-0.005	0.024	.876
NSQPR	-0.024	-0.004	0.019	.891	0.091	0.014	0.286	.593
NNQPR	-0.079	-0.012	0.458	.499	-0.030	-0.005	0.067	.796
Academic Performance Variables								
ENGQPR	0.210	0.032	1.186	.276	0.289	5	2.374	.123
MTSCQPR	-0.287	-0.044	2.024	.155	-0.155	4	0.623	.430
HUMSQPR	0.192	0.029	0.942	.332	0.444	9	5.391	.020
-2 Log likelihood	1518.339				1574.598			
Pseudo R^2	0.157				0.108			
Model chi^2	173.953				117.694			
sig.	0.000				0.000			
*=significant to the .05 level **=significant to the .01 level								

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APPENDIX K. OFFICER RETENTION MODEL STATISTICS

LCSTAY	Primary Model (w/PERFQPR)				Secondary Model (w/oPERFQPR)			
Control Variables	**Coeff.**	**M.E.**	**Wald**	**sig.**	**Coeff.**	**M.E.**	**Wald**	**sig.**
YR81	-0.117	-0.	0.941	.332	-0.116	-0.	0.915	.339
YR82	-0.027	-0.	0.050	.823	-0.029	-0.	0.059	.809
YR84	-0.522	-0.079	17.643	.000	-0.519	-0.	17.450	.000
YR85	-0.457	-0.069	13.775	.000	-0.466	-0.	14.306	.000
ETHNIC	0.006	0.001	0.004	.950	0.006	0.0	0.004	.951
Military Performance Variables								
PERFQPR	0.225	0.0	5.489	.019				
HONORG	0.440	0.0	8.331	.004	0.436	0.0	8.202	.004
STRIPER	-0.098	-0.	0.584	.445	-0.007	-0.001	0.003	.953
NLETTER	-0.069	-0.	0.387	.534	-0.076	-0.	0.469	.493
CONDQPR	0.131	0.0	1.166	.280	0.242	0.0	4.751	.029
PEQPR	-0.132	-0.	4.791	.029	-0.101	-0.	2.938	.087
NLQPR	-0.126	-0.019	1.047	.306	-0.122	-0.019	0.992	.319
NSQPR	0.293	0.0	7.798	.005	0.320	0.0	9.476	.002
NNQPR	-0.018	-0.	0.074	.786	-0.013	-0.	0.037	.848
Academic Performance Variables								
ENGQPR	-0.246	-0.037	5.198	.023	-0.225	-0.034	4.388	.036
MTSCQPR	-0.139	-0.	1.448	.229	-0.121	-0.	1.108	.293
HUMSQPR	-0.145	-0.	1.587	.208	-0.098	-0.	0.753	.386
-2 Log likelihood	4124.684				4130.185			
Pseudo R^2	0.028				0.026			
Model chi^2	64.976				59.475			
sig.	0.000				0.000			

*=significant to the .05 level
**=significant to the .01 level

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