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THESIS

AN ANALYSIS OF THE EFFECTS OF PRIOR ENLISTED SERVICE ON MIDSHIPMAN PERFORMANCE, GRADUATION, AND FLEET RETENTION AT THE U.S. NAVAL ACADEMY

by

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June 2000

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The performance analysis is based on data collected by Admissions to compile USNA's Candidate Multiple with additional variables to account for attributes of each individual's prior enlisted service. USNA performance was measured in terms of leadership potential (striper selection), academics, overall class standing, and graduation rates. Officer retention is depicted by retention rates to the O-4 promotion board. The results suggest that prior enlisted experience is significant in determining success at the Academy and fleet retention.

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I. INTRODUCTION

A. BACKGROUND

The United States Naval Academy admits students from various backgrounds in order to supply the naval service with a diverse officer corps. With diversity in mind, the Naval Academy's Admissions Board must select the most qualified candidates who have a desire to make the naval service a career. This thesis explores the whole-man multiple's usefulness in selecting enlisted applicants for admission to the Naval Academy. It is a follow-on of Michael's earlier study of military family background (military enculturation)[1], and Reardon's study of candidate admissions criteria.[2]

Both authors found that military enculturation has a positive effect on USNA graduation rate and fleet retention. However, this thesis investigates specifically the effect of enlisted military service on performance, graduation, and fleet retention. Another difference is that the data analyzed in this thesis are from the classes of 1990 to 1999. The use of a larger and more current data file ensures this study will cover a larger group of midshipmen and allows for the opportunity to determine any current trends. To determine fleet retention of prior enlisted Naval Academy graduates a different data set,

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[1] Michael, J. (1999). The Effect of Military Family Background on Midshipmen Performance at the United States Naval Academy and USNA Graduate Performance in the Fleet. Unpublished Master's Thesis, Naval Postgraduate School, Monterey, CA.

[2] Reardon, M. (1997). The Development of Career Naval Officers from the U.S. Naval Academy: A Statistical Analysis of the Effects of Selectivity and Human Capital. Master's Thesis, Naval Postgraduate School, Monterey, CA.

using data from 1980 to 1985, will be used to ensure subjects have had enough commissioned service time to be screened by the O-4 selection board.

The Department of the Navy (DON) seeks to build an officer corps that matches the diversity of its enlisted force with respect to minorities and women. Based on analysis of the data for this research 42% of minorities and 15 % of the women at the Naval Academy enroll from enlisted military sources. Therefore, given the diversity goal, the enlisted candidate pool seems to have the additional benefit of providing a significant number of minorities and women. In this study diversity is a secondary concern but deserves mention in the context of the contribution of enlisted candidates to further diversification of the Academy.

Without regard to diversity goals, educating a midshipman at USNA is an expensive undertaking. The cost amounts to approximately $250,000 over four years. With this hefty price tag the Admissions Board is essentially tasked with ensuring DON receives a "return" on its investment. Ideally, a good return manifests itself as midshipmen who will perform solidly, graduate from the Naval Academy, and make the naval service their career. Because no single trait predicts success as a midshipman and as an officer, the Naval Academy uses a whole-man multiple system in its selection process. The whole-man multiple is designed to incorporate a broad range of qualities that are indicative of success at the Academy and in the fleet as Navy and Marine Corps Officers.[3]

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[3] Michael, J. p.23.

Academic qualifications are gauged from a candidate's SAT scores and high school class rank: Together they comprise more than 60% of the multiple. To determine interest in a naval career the Admissions Board uses teacher recommendations, personal statements and the Strong-Campbell Interest Inventory (SCII)[4]. The whole-man multiple has proven to be an effective tool. However, the Naval Academy continues to have a 24% attrition rate and approximately 50% fleet retention rate after the initial obligation. The theses of Michael and Reardon in one respect are attempts to determine what career naval officers have in common. If further research in this area reveals that there are qualitative commonalities among career officers, then perhaps crises in retention could be averted in the selection process.

Michael found that midshipmen from career military families, who thus had lifelong military enculturation, had a higher graduation rate than the average midshipman at USNA. If military enculturation is the reason for the higher graduation rate then one may deduce that those midshipmen with enlisted military experience should also graduate at a higher rate. Additionally, it is a hypothesis in this study that midshipmen who have already invested time in the military will have "the advantage" of first-hand knowledge of military life and its requirements. As a result, prior enlisted midshipmen, excluding certain participants in the Naval Academy Preparatory School (NAPS) and Broadened Opportunity for Officer Selection and Training (BOOST) programs, should have higher retention rates at the Naval Academy. Chapter III will provide an explanation of the different classifications of NAPS and BOOST participants.

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[4] Michael, J. p. 24.

Perhaps the more difficult part of selecting qualified candidates for admission to the Naval Academy is ensuring candidates desire to become career naval officers. The SCII questionnaire is designed to measure a person's career interest and it produces a score that is used in the whole-man multiple. The idea that one's interest in a naval career can be measured by a set of questions seems feasible, however there are too many incalculables such as family, the economy, and opportunity costs that weigh heavily on this decision. This research hypothesizes that prior enlisted midshipmen and officers have in some way come to terms with the aforementioned factors because of their initial decision to join the military. Secondly, their application to the Naval Academy may be an expression of their desire for upward mobility and consequently a career in the naval service.

Reardon's thesis focused on the effects of selectivity and human capital on career naval officer development.[5] Michael's thesis expanded on Reardon's idea of selectivity to include candidates from military families because of their military socialization and enculturation.[6] He concluded that these candidates may self-select naval careers due to a better understanding of military lifestyle and hence have higher retention rates. This thesis follows the same logic as Michael's except that those with enlisted experience are the focus. As in Michael's thesis, the human capital is personal familiarity with military

[5] Reardon, M. p. 5.

[6] Michael, J. p. 18.

culture that may translate into higher graduation rates from the Academy and higher retention rates in the fleet Navy and Marine Corps.[7]

Time invested, first-hand knowledge, positive experiences, and desire for upward mobility may provide sufficient impetus to help enlisted candidates decide whether or not a military career is right for them. The aforementioned factors in addition to positive traits expected of military enlisted such as maturity, dedication, and motivation, may manifest themselves as a stronger desire to succeed at the Academy and in the fleet. In the end, the enlisted ranks may be a much more valuable source of candidates than previously recognized.

B. PURPOSE

In recent years the Department of Defense has been pressured to find more cost-efficient ways than the service academies to educate and commission officers. However, defenders of the institutions routinely cite studies that reveal higher officer retention rates among service academy graduates when compared to other officer accession sources. The Navy recognizes that minimizing attrition from the Naval Academy saves money by getting the most out every dollar spent on training midshipmen. Logic suggests that if admission of better suited candidates could be maximized, the Naval Academy and fleet Navy would increase retention rates and could save money.

This thesis will examine the effects of prior enlisted service on the performance of Naval Academy Midshipmen and their subsequent retention in the Navy and Marine

[7] Michael, J. p. 18.

Corps. Furthermore, it will examine the hypothesis that midshipmen with prior military experience have better military and academic grades, higher graduation rates, and higher fleet retention rates than midshipman who have no prior service experience.

C. SCOPE AND METHODOLOGY

1. Research Questions

This research will explore whether or not a midshipman's enlisted military experience is a determinant of USNA performance, graduation, and subsequent retention in the naval service. Analysis will be conducted to determine whether military performance, academic performance, striper selections, order of merit, and graduation rates are different for prior enlisted and non-prior enlisted midshipmen. Also, differences in fleet retention at the Lieutenant Commander promotion boards will be studied.[8] Finally, attributes found in midshipmen's prior enlisted service records will be examined to determine whether or not there are any quantifiable indicators of success for enlisted candidates applying to the Naval Academy.

2. Scope

This thesis does not attempt to "rule out" other candidates as not suitable while promoting the suitability of enlisted candidates for admission to the Naval Academy. Neither does it seek to replace the existing method for screening qualified applicants for the Academy. Rather, the thesis explores additional factors that may be valuable in the

[8] Michael, J. p. 22.

screening process to ensure those qualified candidates who have already chosen naval service, are accepted to the Naval Academy.

Midshipmen in graduation year groups 1990 to 1999 are studied to ascertain differences in performance at USNA. Career intentions are determined by an officer's choice to stay on active duty until at least their first screening on the Lieutenant Commander selection board. This juncture represents approximately the ten-year mark of commissioned service. Past research suggests that the majority of officers who wish to be screened on the O-4 board intend to make the naval service a career. Performance indicators of enlisted candidates will be a trial and error test at best. The indicators used will be performance-based measures such as meritorious promotions, rate of promotion, ASVAB scores, and military occupational specialty. Hopefully, these indicators will provide some additional insight to the Admissions Board on the capability of an enlisted candidate being screened for appointment.

3. Methodology

Both linear regressions and logit probability models will be used to analyze determinants of performance grades. The explanatory variables include the indicators used in the whole-man multiple computation. Inserting a dummy variable in the model to account for enlisted military service will test the validity of the hypothesis. For graduation, the same explanatory variables are included but it will be tested using the binary logistic method.

In the search for indicators that predict success of prior enlisted midshipmen, the explanatory variables in this model will be those from the enlisted service record in

addition to those in the original probability models for graduation and performance. Only prior enlisted midshipmen will be included in the sample to test these two models.

Finally, to determine fleet retention rates, a binary logit model will be used to analyze the determinants of one's intentions to become a career naval officer. Retention rates of Naval Academy graduates with prior military service are compared to those with no prior service.

D. ORGANIZATION OF STUDY

This thesis is organized into five chapters. The next chapter cites various studies that document the rationale for applying the system currently used to select candidates to the service academies. It will also discuss the "typical" applicant, minorities and women, and value differences between the military personnel and civilians. Chapter III discusses the current admissions practices of the Naval Academy and reviews the whole-man multiple computation. Additionally, there will be a brief discussion of the sources of enlisted candidates to the Naval Academy (i.e. BOOST, NAPS, Fleet Navy, etc.). Finally, current performance measures will be discussed. Chapter IV explains the data used in this research, the formulation of models, and the statistical findings. Finally, Chapter V provides conclusions about the usefulness of prior military service as a determinant of good performance, graduation from the Naval Academy, and fleet retention. Recommendations for further research are also provided.

II. LITERATURE REVIEW

Naval Academy midshipmen with prior enlisted experience have rarely been analyzed in prior literature; as a result, few studies have been concerned with their performance and subsequent fleet retention. Despite the limited availability of literature, this chapter reviews prior research that suggests value differences exist between military personnel and civilians. It is a hypothesis of this study that value differences may account for performance and fleet retention differences between midshipmen with prior enlisted service and those with no prior military experience.

This chapter has four major sections. The first two sections discuss the Naval Academy's Candidate Multiple (CM) appointment system and the specific variables used to predict success at USNA, retention and career officer potential. Additionally, this chapter will review literature that supports the notion of self-selection and the characteristics of students, including minorities and women, who will most likely attend and succeed at service academies. The final two sections introduce studies of differences between high school graduates who enlist in the military and those who do not and the intergenerational linkage in one's decision to serve. It concludes with a summary of implications for prior enlisted midshipmen and those with no prior military experience.

Section A explains the CM, which uses a whole-man concept to determine the relative quality of each candidate applying for admission. This section also discusses annual revisions of the CM that ensure it is reliably predicting the likelihood of

graduation and fleet retention. Section B reviews literature on self-selection to service academies. This literature supports the notion that students who choose to attend service academies have values more like military officers than the average civilian college freshman.

Section C explores the characteristics of enlisted military personnel and the type of person they become as a result of serving. The literature in this section suggests that those who choose to enlist are intellectually less capable than the traditional service academy applicant but their socialized military values may manifest themselves as a desire to succeed. Section D summarizes the chapter by discussing the implications of the literature on appointments to the Naval Academy.

The objectives and methods used in previous studies are fundamentally different from this thesis. Nevertheless, the ideas expressed by other researchers provide a reasonable starting point for a study that attempts to explore statistically the impact of prior enlisted service on Naval Academy midshipmen. While this study focuses primarily on midshipman performance and officer retention, a review of some sociological studies will provide some insight on the effect that socialized military values might have on midshipmen.

A. DETERMINING CANDIDATE POTENTIAL

1. Refining the Candidate Multiple

In a 1988 Naval Personnel Research and Development Center (NPRDC) study, Edward Alf, Idell Neuman, and Joyce Mattson, suggested that the Naval Academy

modify the selection composite it used to predict academic suitability and likelihood of graduation. This study, Revision of the United States Naval Academy Selection Composite, was conducted in response to a request by USNA to continuously monitor, validate, and if necessary improve midshipman selection procedures. Although the Candidate Multiple has proven itself to be useful tool, there were still differences in individual performance and relatively high attrition rates. The study yielded four alternative selection models. "All four of the experimental composites improved on the prediction of Academic Quality Point Rating (AQPR), Military Quality Point Rating (MQPR), and academic disenrollment when compared to previous operational composites."[9] As a result of the study, USNA adopted a modification of one of the proposed models and applied it to the admissions process for 1990. With minor adjustments, that basic model is still used today.

The NPRDC study also concluded that extracurricular activities, teacher recommendations, and SCII scores were not significant predictors of academic outcomes.[10] The non-academic predictors were assessed later in a 1989 NPRDC study, which was conducted to devise an Officer Potential Composite (OPC).[11] The composite specified was successful at predicting the promotion of officers after commissioning. However, as Reardon points out in his research, there are two key weaknesses to the OPC

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[9] Alf, E.F., Neumann, I., and Mattson, J.D. (1988). Revision of the United States Naval Academy Selection Composite. (NPRDC Tech. Rep. 88-61). San Diego: Naval Personnel Research and Development Center.

[10] *Ibid.*

[11] Reardon, M. p. 43.

study.[12] First the only indicator of officer potential is the largely subjective Recommendation for Accelerated Promotion (RAP) on the officers' fitness reports.[13] Second, the study relies on first order correlations as its statistical methodology, which ignores any interaction among variables.[14] Therefore, the results of the NPRDC studies are valid but they should be used with some caution.

Each year the NPRDC studies seek to improve the effectiveness of the candidate selection process at the Naval Academy. The research does not endeavor to change the predictors of the CM, only the weights. To get a better idea of the significance of current selection criteria a brief description of their validity in determining potential is presented below.

2. Selection Criteria

a. Academic Suitability

The Naval Academy is, among other things, an undergraduate institution. Therefore, there is a need for the Academy to determine whether its candidates can successfully satisfy the academic requirements placed on them as college students.

Among American universities, the most popular predictor of academic suitability is the Scholastic Aptitude Test (SAT). The Educational Testing Service administers the SAT with oversight provided by the College Entrance Examination Board

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[12] *Ibid.*

[13] *Ibid.*

[14] *Ibid.*

(CEEB). The original purpose of the test, commissioned in 1926, was to act as a "cutoff mechanism for the most competitive schools."[15] More recently, SAT and American College Test (ACT) scores have been used as an indicator of academic skills. In fact, the CEEB reports that there is 95% probability that a combination of high school grades and college entrance examination scores will accurately predict college freshman grades.[16] Despite CEEB's acknowledgement that the tests are only statistically significant for freshman academic performance, many institutions continue to use SAT scores as a key indicator of college academic performance and graduation.

Like other universities the Naval Academy uses the SAT to predict academic suitability. For the purpose of admissions processing the individual math and verbal scores represent quantitative and qualitative aptitude, respectively. For the data set used in this study the average combined SAT score for Naval Academy candidates was 1231. This average score reflects a 660 math score and a 571 verbal score. As confirmed by researchers at NPRDC, both the math and verbal scores are highly significant predictors of AQPR and MQPR. Eventually, NPRDC's research conducted in the late eighties led to heavier weights being given to SAT scores in the CM.

Another measure used to determine potential academic performance of prospective midshipmen is high school class rank (RC). The premise for using RC is simple. One's academic ranking among peers provides a relative measure of the person's

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[15] Hawks, J., & Lindquist, D.W. (1995). SAT,ACT, and Test Prep. In What's the Score on Entrance Exams? [On-line]. Available Internet: http://www.jayi.com/ACG/articles/sat_act.html.

[16] *Ibid.*

academic talent. The average class rank for the admitted candidates in the data file (class years 1990-1999) used for this study is the top 12% of their high school class.

If a candidate's scores fall significantly below the mean, he or she must have some other redeeming quality (e.g., athletes or son or daughter of alumnus) to be competitive in the admissions process. SAT scores and high school rank account for 64% of the CM for the class of 2003. If one viewed teacher recommendations as an additional testament to the candidate's ability, then 72% of the current CM is based on academics. However, academics are not the only admission criteria.

b. Leadership Potential

According to the USNA Office of Admissions "The Naval Academy is looking to admit well-rounded individuals who will develop in to the leaders of tomorrow's Navy and Marine Corps."[17] Selection on the basis of leadership potential has long been a goal of the Naval Academy and senior government officials. Though academic potential is important, the need to evaluate one's leadership potential is an essential requirement for all the service academies. For example, in 1950 the Service Academy Board working under the direction of the Stearns-Eisenhower Board concluded the following:

> In the final selection of men for the service academies, appropriate weight should be attached to the personal qualities that indicate potentiality for

[17] U.S. Naval Acadmey Admissions Office. (1999). Key Ingredients for Successful Academy Admission. In Naval Academy Web Page [On-line]. Available Internet: http://www.usna.edu/wpeval.html.

> leadership. Otherwise, some men will be selected who, while intellectually adequate, will lack aptitude for leadership.[18]

Additionally, the gist of the Naval Academy's mission statement is to develop the qualities of leadership that midshipmen already possess in preparation for future responsibilities as naval officers. Despite the obvious emphasis on ensuring one has leadership potential, there is no uniformly accepted way to measure leadership.

The Naval Academy essentially depends on someone else's determination of leadership potential when admitting candidates. The indicators utilized for leadership potential in the candidate multiple are teacher recommendations, a personal essay, and involvement in extra-curricular activities (ECAs) in high school. Through careful study of the aforementioned indicators the admissions board members intuitively derive the candidates' leadership potential. The way leadership potential is derived is valid to the extent that a teacher's recommendation, an essay, and extra-curricular activities accurately reflect one's potential. Determining leadership potential is undoubtedly the most subjective part of the entire admissions process. Although this process has proven its validity, members of the Admissions Board know it has limitations.

The 1989 NPRDC study by Neuman, Mattson and Abrahams successfully derived an Officer Potential Composite (OPC) using ECAs, teacher recommendations, and the career interest score of the Strong Campbell Interest Inventory. The OPC is a rudimentary measure of leadership potential that USNA never implemented. The purpose

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[18] Stearns-Eisenhower Board. (1950). Service Academy Board Report. In Reardon, M. The Development of Career Naval Officers from the U.S. Naval Academy: A Statistical Analysis of the Effects of Selectivity and Human Capital. Master's thesis, Naval Postgraduate School, Monterey, CA.

of the composite was to act in conjunction with the CM to better identify the type of candidates the Naval Academy wanted to attract.[19] The OPC's utility was validated against USNA midshipman performance. "A significant positive relationship was found between the OPC and both MQPR and attrition though less positive than the operational USNA selectors."[20] An OPC seems valid and useful but it is not significantly different from the current process of determining leadership potential.

c. Career Officer Potential

"Prior to 1967 the [Naval Academy's] mission focused on graduating junior officers ready to assume duties at sea."[21] From inception until that time the Naval Academy was widely considered a maritime trade school. But literary works such as Janowitz's 1960 publication, The Professional Soldier, had an astounding effect on the way the Navy viewed its academy. Janowitz summed up the importance of the academies in the following statement:

> Education at a service academy is the first and most crucial experience of a professional soldier; and although attendance at a service academy is not universal for generals and admirals, the academies set the standards of behavior for the whole military profession.[22]

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[19] Neumann, Mattson,and Abrahams. (1989). The Development of an Officer Potential Composite. In Reardon, M.G. The Development of Career Naval Officers from the U.S. Naval Academy: A Statistical Analysis of the Effects of Selectivity and Human Capital. Master's thesis, Naval Postgraduate School, Monterey, CA.

[20] Reardon, M. p. 41.

[21] *Ibid.*

[22] Janowitz, M. (1960). The Professional Soldier. New York: The Free Press p. 127.

Janowitz also wrote, "to speak of professionalism clearly means that the conduct of warfare is given over to men who have committed themselves to a *career* of service, men who are recognized for their 'expertise' in the means of warfare. "[23] Hence in order for the Navy to have a more professional officer corps the Naval Academy needed to "provide graduates who are dedicated to a career of naval service…", as its mission now clearly states.

Much like measuring leadership potential, determining who will become a career naval officer has proven to be a difficult undertaking. The revised mission based on the ideal of career naval service is an appropriate statement of intent but has become consistently harder to achieve based on current retention concerns. Much of the recent literature on retention attributes the United States' current economic prosperity as a leading cause of the shortage of mid-grade officers.

Although it may be a current factor, at the beginning of the last decade a growing economy was not widely considered to be the cause of military retention deficits. Accordingly, the absence of a well-defined cause of poor retention spurred a litany of "what's wrong with the academies" literature. Retention problems have increased criticisms from "concerned citizens" such as author and academic Williamson Murray:

> In the first half of the 1990s the services were losing nearly 50 percent of academy graduates at the end of their obligatory time in uniform. The claims of the academy public affairs offices that such early leavers will pay the nation back in other ways sound hollow, especially given the

[23] Janowitz, M. p. 6.

mission of the academies to prepare young people for long-term service in the military.[24]

Despite many criticisms the Naval Academy admissions staff believes its procedures are based on sound principles and are effective in selecting tomorrow's naval leadership.

Regardless of the fact that many Naval Academy graduates leave the naval service after their initial obligation almost an equal number of them choose to stay. A few recent studies suggest redefining the focus of retention research. Instead of focusing on why officers leave, perhaps more emphasis should be placed on the similar characteristics that may exist among career officers. For example, Michael found that "USNA graduates from career military families remain in the service at a higher rate"[25] than other graduates. In an unrelated study, Price and Kim concluded from a study of Air Force medical personnel that several demographic variables such as age, gender, education, and occupation were significant in predicting intent to stay in the Air Force. A compelling finding of their study was that women and older personnel tend to have higher career retention rates than men and younger personnel.[26] The approach of both of these retention studies was to determine whether similar characteristics among career military personnel should be considered in recruiting efforts. Resoundingly, naval

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[24] Murray, Williamson (1999). Thinking about the service academies, The World and I, Vol. 14, No. 3, p. 291.

[25] Michael, J. p. 76.

[26] Price, J.L., and Kim, S. (1993). The relationship between demographic variables and intent to stay in the military: Medical personnel in a u.s. air force hospital. Armed Forces and Society, Vol. 20 No. 1, 125-144.

officers leaving the service have reported via exit surveys and resignation letters that the retention problem extends beyond a robust labor market or additional bonuses.[27]

The studies mentioned above represent only a sample of the research possible in determining common characteristics among career naval officers. Thus, studying demographics may not prove to be the answer to quantifying career potential but based on previous research maybe more thought should be given to their effects.

B. SELF-SELECTION

1. The Typical Applicant

For many years the service academies were symbols of status for upper middle class, Christian, white males. This is not to suggest that the academies did not appeal to others but that those of the previously mentioned group were generally the only ones who applied and were admitted. Hence the notion of a "typical" applicant applies. However, as political pressures brought about significant social changes, the idea of the typical applicant includes personality traits as opposed to religious, racial or gender-based characteristics.

A 1982 personality profile study conducted by Richard Hughes suggests the following about those who are attracted to the military academies:

> Cadets were achievement-oriented, assertive, outgoing, adventurous, persistent, expressive, systematic, serious-minded, practical and socially proper. They also preferred structure to ambiguity...enjoying a structured

[27] For further insight into the non-monetary factors that impact officer retention, based on the responses to exit surveys, see Kennedy, Silas R., "Retaining the JOs: Looking Up or Going Down?" Proceedings, June 1997.

> environment and being systematic by nature, cadets attend an institution high in consistency, rules, orderliness, and planfulness.[28]

Hughes' study compared cadets with other students entering college and included both males and females. The findings of his study suggest, "The personality profile for entering [candidates] seem conceptually congruent with unique aspects of the institutions."[29]

Another difference observed among Naval Academy midshipmen and other college students is conservatism. Currently, midshipmen are twice as likely as other students to consider themselves to be "conservative."[30] Despite the fact that the military has often been a testing ground for social experimentation (for example in terms of race, gender, and sexual orientation) members are almost always more conservative than their civilian counterparts. This trait is evidence to support a theory of self-selection of applicants who choose to attend the Naval Academy.

A study of the personal and interpersonal values of Coast Guard Academy (CGA) Cadets conducted by Stevens, Rosa, and Gardener further validated the theory of the "typical" applicant's self selection. The personal and interpersonal values tested in their study are fairly consistent with those in Hughes' study. The results of the CGA study suggested "at entrance cadets who would persist…have values much like officers…[and]

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[28] Hughes, R.L. (1982). Who Goes to a Service Academy? (Paper Presented at Annual Meeting of American Psychological Association). Washington, D.C.

[29] *Ibid.*

[30] Ricks, T.E. (1997). "The Widening Gap between the Military and Society." The Atlantic Monthly, 66-78.

cadets who graduated...have a pattern of vocational interests at entrance that was different from those of cadets who were separated."[31]

Many social scientists agree that diversity is a necessary dynamic of all organizations. For example, R. Roosevelt Thomas, Executive Director of the American Institute for Managing Diversity, believes, "affirming diversity is no longer a question of common decency, it is a question of organizational survival."[32] However, when it comes to the service academies, research by Hughes and others has shown that applicants tend to be more alike than different.

2. Minorities and Women

Despite the fact that the service academies once accepted few minorities and no women, recent research has suggested that both groups self-select the academies for the same reasons as the previous "typical" applicant. Instituting the gender and race integration policies was forced but the decision proved to be the right one. Various researchers using a wide array of resources have concluded that minorities and women who attend service academies have more in common with the typical applicant than differences.

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[31] Stevens, G., Rosa, F., and Gardener, S. (1994). Military academies as instruments of value change. Armed Forces and Society, Vol. 20, No. 3, 473-484.

[32] Thomas, R.R. (1990). From affirmative action to affirming diversity. Harvard Business Review, 39-49.

Although not published until 1982, the data for Hughes' study on personalities were collected at the Air Force Academy immediately after integration of women into the academies in 1976. His research suggested that:

> The personality profile for entering female cadets provides a clear answer to the question "What kind of female would want to attend a (largely male) military academy?" The answer is just the kind of person who has always wanted to attend the Academy, and just the type who characterologically seems best suited to the unique challenges and demands of the profession...While similar on most personality dimensions the global effect is that entering academy females are relatively non-traditional and entering males are relatively traditional.[33]

Taking in to account personality only, women appear to be just as motivated to meet the challenge of a service academy as their male counterparts.

The CGA study conducted by Stevens *et al.* confirms Hughes' findings. These researchers suggest that military academies may not be a change agent that creates a new set of values for individuals, but rather the academies reinforce behavior by further clarifying and solidifying those values new cadets and midshipmen bring with them.[34] "People may act to select and even create environments that are favorable to the maintenance of those values and attitudes which they find most congenial."[35] The preceding statement appears to be additional evidence of self-selection.

Minorities who attend service academies much like the "typical" applicant tend to be conservative and have the same values. Research conducted by Harvard professor,

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[33] Hughes, R.L. p. 3.

[34] Stevens *et.al.*

[35] Hollander, E.P. (1994). The principles and methods of social psychology. In Military Academies as Instruments of Value Change, Armed Forces and Society Vol. 20, No. 3 p. 480.

Christopher Jencks, suggests that minorities generally score 70 to 80 percent below the average white students on standardized tests for college admission.[36] He also found that currently many universities have racially sensitive admissions systems that favor minorities.[37] The two previous findings coupled together create seemingly endless possibilities for minorities considered to be qualified college applicants. Given that the Naval Academy is among the most selective undergraduate schools in the country and that minorities who choose to go to there must be able to compete with his or her peers, it appears that the concept of self-selection holds true for minorities at service academies as well.

The studies conducted by both Hughes and Stevens *et al.* suggest that those who self-select and are successful at service academies have values that are congruent with those favored by the military. This thesis proposes that the enculturated military values of prior enlisted midshipmen, more so than those of the typical applicant, are what the military wants in an officer.

C. CHARACTERISTICS OF ENLISTED MILITARY PERSONNEL

1. Who Chooses Enlisted Military Service

Why are men and women drawn to military service? This particular question has been the focus of a tremendous amount of research. For example, Linda Gorman and

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[36] Jencks, C. (2000). Secrets of the SAT: Interviews with Test Prep Experts, Admissions Officials, SAT Critics and Educators. In Frontline Web Page, [On-line]. Available Internet: http//www.pbs.org/wgbh/pages/fronline/shows/sats/interviews/jencks.html.

[37] *Ibid.*

George Thomas found that the enlisted ranks of all branches of the military seem to be havens for minorities and whites of lower socio-economic classes.[38] From a different study analysts found that the "armed forces attract white men of somewhat lower educational quality" than most 18-22 year-olds.[39]

The two previously mentioned studies suggest that individuals join the military because of a shortage of other options. However, despite the high propensity for minorities to join the military, Gorman and Thomas found that race alone does not explain the phenomenon. "When statistical controls for levels of general intellectual achievement are used in the estimating equations, [minorities] who are not poor are *less* interested in joining the military than equivalent whites."[40] Their study attributes the disproportionate numbers to the fact that intellectual achievement is not uniformly distributed among minorities in the population.[41] Based on this argument, self-selection due to patriotism may have less significance on enlistment among minorities.

Despite all the *other* reasons for joining the military, many social scientists still believe enlistees have a sense of patriotism and service to one's country. John Faris conducted a study in which he interviewed military personnel and concluded that, "The

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[38] Gorman, L. and Thomas, G.W. (1993). General Intellectual Achievement, Enlistment Intentions and Racial Representativeness in the U.S. Military. Armed Forces and Society, Vol. 19, No.4, p.611.

[39] Fredland, J.E. and Little, R. (1978). Educational Levels, Aspirations and Expectations of Military and Civilian Males, Ages 18-22. In The Effect of Military Family Background on Midshipmen Performance at the United States Naval Academy and USNA Graduate Performance in the Fleet. Master's Thesis, Naval Postgraduate School, Monterey, CA.

[40] Gorman, L. and Thomas, G.W. p. 611.

[41] *Ibid.*

dominance of the economic marketplace model in managing the all-volunteer force contrasts with strong evidence of the continuing importance of non-economic considerations—patriotism and a conviction that by serving in the military one is serving the country—as reasons for joining the armed forces."[42] Faris is not alone in his belief. James Burk reported from his 1982 research that patriotic motivations "...can be regarded as the most important single reason explaining why youths enlist."[43]

The research of Charles Moskos indirectly challenges the arguments that patriotism is the most compelling reason one joins the military. Moskos' hypothesis is that the military is becoming more of an occupation and less of a "calling".[44] Assuming his hypothesis is true, the military has become more of a job than a place to express one's patriotism. In his view, the military is in essence becoming a "way out" for the intellectually disadvantaged and economically depressed.

Finally, the last of the popular theories of why one joins the military is an apparent intergenerational linkage or interpersonal influence of others, usually family members, who are serving or have served. There is an overwhelming amount of empirical data to support this assertion. The results of recent research conducted by Michael on U.S. Naval Academy graduates suggest that more than 62% had some

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[42] Faris, J.H. (1995). The looking-glass army: Patriotism in the post-cold war era. Armed Forces and Society, Vol. 21, No. 3, 411-434.

[43] *Ibid.*

[44] Moskos, C.C. (1977). From institution to occupation: Trends in the military organization. Armed Forces and Society, Vol. 4, No. 1, 51-54 .

military experience in their families.[45] Faris also reported from his interviews with military personnel that most respondents said someone else who had served influenced them.[46] These results support evidence of intergenerational linkage and interpersonal influence among those who choose to serve.

It has become clear that there are many dynamics operating when one decides to join the military. In that sense all of the previously mentioned studies have some merit. However, this study is concerned less with why one joins and more with the person he or she becomes after joining the military.

2. Military Values and The Cultural Divide

Military values are not unique to military personnel. Rather they are values that exist in society at large that are emphasized and expected of military personnel. These values include but are not limited to honor, courage, commitment, practical mindedness, uniqueness, decisiveness, orderliness, and selflessness.[47]

Recently, many Americans have become alarmed at a perceived widening gap between military and civilian culture. Disagreements surrounding this rift are from four different perspectives. The arguments are as follows:

- The military has become too extremist and ultra-conservative.
- Society has become too liberal and tolerant.

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[45] Michael. J. p. 56.

[46] Faris, J. H. p. 416.

[47] Etnyre, R.P. (1997). Naval Leadership and Sociey. Master's Thesis, Naval Postgraduate School, Monterey, CA.

- There is no real rift between the military and society.
- There has always been a rift between the military and society and it should be there.

Many believe this "gap" is a recent occurrence. However, according to Samuel P. Huntington, the notion that the military has a distinct set of values has long been accepted.[48] Current researchers are more concerned with how one obtains "military" values. The two most popular theories are socialization and self-selection.

> The socialization theory supports an idea that the military teaches certain types of attitudes and orientations both formally and informally. The alternative theory for promotion of military values focuses on self-selection, the tendency for certain types of people to enter the military and others to avoid it.[49]

The so-called "gap" that exists between the military and civilian society does not lend itself to measurement and for the most part is quite subtle. In his article " The Widening Gap Between the Military and Society" Thomas Ricks provides some anecdotal evidence that the gap is growing at an alarming rate. Ricks spent three months observing the training and indoctrination of a Marine Corps Boot Camp Platoon, followed by interviews with some members after returning to their homes for the first time. Ricks explains that the Marines expressed a quiet disdain for society including some of their former friends.

The overall theme of Ricks' interviews with prior recruits seemed to be that Marines are above the "slack" lifestyle many Americans lead.[50] Unfortunately, Ricks

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[48] Michael, J. p. 24.

[49] *Ibid.*

[50] Ricks, T. E. p. 69.

could not control for the over-emphasis that the Marine Corps places on institutional values during recruit training. As a result, he may have heard comments that were more strongly worded and atypical of the average fleet Marine. However, the fact that Ricks gained consensus from recently retired senior military officers lends credibility to his arguments.[51] Ricks' findings suggest that the Marine Corps is successful in socializing Marines to fully embrace its institutional values. Nevertheless, his evidence does not completely rule out self-selection.

It is unclear how much a difference in values contributes to the civil-military gap. However, it is obvious to those who are familiar with military values that traditionally, they manifest themselves as a strict set of standards and beliefs meant to instill discipline and maximize mission accomplishment. The question of how these standards and beliefs came to be viewed as negative in civilian society is still unanswered.

Those familiar with the military will agree that a culture gap does exist between the services and civilian society. Although they are sometimes perceived negatively in society, perhaps the cultural and value differences are a positive attribute for prior enlisted Naval Academy midshipmen. The theory is that their self-selection or socialized military values will translate to a greater desire to become career naval officers. The underlying premise is that this group of midshipmen may feel more comfortable with the Naval Academy, the military, and their requirements.

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[51] *Ibid.*

D. SUMMARY

This thesis examines the effects of prior military service on Naval Academy performance and fleet retention. There is much evidence to support the notion that the military and society are different in terms of values and culture. Also prevalent is the finding that on average the young men and women who enlist in the military services may be less intellectually capable than their counterparts who attend college immediately after high school.

It is a secondary hypothesis of this thesis that military values, whether resulting from self-selection or socialization, manifest themselves in prior enlisted midshipmen as a strong desire to achieve. Given that the Naval Academy is a highly selective undergraduate institution there is one inherent flaw in this theory. As previously mentioned and supported by research, enlisted candidates are less capable of good academic performance and hence may have a greater propensity for academic attrition. The validity of the hypothesis thus rests on the notion that military values such as commitment, goal orientation, and good work ethic may be able to counter balance a perceived intellectual deficiency.

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II. SELECTION AND EVALUATION AT USNA

USNA's Admissions Board uses a whole-man multiple system to screen and select those candidates who will most likely persevere for four years of academic study and military training. Instantaneous feedback on the board's success is provided by the Academy's evaluation process, which consists of relative measures of academic and military rankings based on performance . This chapter provides a discussion of the Naval Academy's methods of selection and evaluation. Its purpose is to explain how midshipmen are appointed and appraised at the Naval Academy.

A. ADMISSIONS PROCESS

1. Nominations

To be considered for an appointment to one of the service academies the applicant must have a nomination from an authorized nominating source. Title 10 U.S. Code, establishes by law the guidelines by which one may be nominated. Applicants who meet the eligibility requirement may apply for and receive nominations in both of two categories: (1) congressional; and (2) military service connected.

Under the congressional category, representatives of U.S. sovereignties (e.g., Puerto Rico, Guam, and Samoa), congressmen, and senators are entitled to nominate 10 candidates. "The nominees may be submitted without ranking or with a principal

candidate and nine ranked or unranked alternates."[52] If a candidate is a principal nominee his appointment is assured provided he or she is academically, medically, and physically qualified.[53]

Members of Congress are strongly urged to nominate as many candidates as possible in order to increase the likelihood that the academies can appoint a "quality" candidate. Although the service academies do provide congressional staffs with "recommended" selection criteria, they are under no obligation to use it. Because the final selection process resides with the institutions, appointments remain fairly consistent in quality.

A key advantage to using the congressional nomination process is the assurance that the entire geographical United States is represented in the entering class. However, despite the wide representation there still exists potential for bias. There is no historical evidence to suggest that any significant number of congressional principal nominees are offered appointments every year, but the dynamic does make it possible.

Another interesting dynamic operating in the nomination process is the widening gap in civil-military relations. If civilian leaders are in fact out of touch with the needs, mission, and culture of the military as some commentators suggest, then how do they "knowledgeably" nominate tomorrow's military leaders?[54] This issue would be a major

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[52] Title 10 U.S. Code, Section 6954. This section of the U.S. Code specifically outlines the nomination procedures for the Naval Academy.

[53] Reardon M. p.27.

[54] *Ibid.*

concern if each institution were not the final appointing authority, because it would increase the chance of bias. However it is the academies' responsibility to ensure the system works and is applied fairly.

2. Candidate Multiple Computation

The second step in the admissions process is the candidate multiple computation. The candidate or whole-man multiple consists of the following seven variables:

- SAT (or ACT) math score,
- SAT (or ACT) verbal score,
- Class standing in high school,
- Combined athletic and non-athletic high school extra-curricular activities,
- High school teacher recommendations,
- Technical interest score from the Strong-Campbell Interest Inventory (SCII),
- Military career interest score from SCII.

The candidate multiple has been in use since 1975 and has undergone several refinements initiated both by changes in policy and the previously mentioned research conducted by NPRDC.[55]

The variables in the candidate multiple are weighted according to their ability to predict USNA-specific performance values such as order of merit, academic quality point rating, and attrition. Each year NPRDC reevaluates the effectiveness of the predictors, which cause the weights to shift from year to year. However, academic

[55] Alf, E.F. *et.al.* p.3

variables are consistently weighted heaviest (usually 60%-70% of total).[56] The candidate multiple variable weights for the USNA Class of 2003 are shown in Table 3.1 below.

Table 3.1 USNA Candidate Multiple Variable Weights for Class of 2003

VARIABLES	*WEIGHTS(%)*
SAT(or ACT) Math	34
SAT(or ACT) Verbal	11
High School Class Rank	19
Teacher Recommendations	8
Extra-Curricular Activities	10
SCII Technical Interest Score	9
SCII Military Career Interest Score	9

Source: Review of USNA Admissions Multiple[57]

The version of the candidate multiple above derives 64% of the total score from academic aptitude performance tests. As mentioned earlier, extensive research conducted by the College Entrance Examination Board (CEEB) reveal that these measures only effectively predict *freshmen* (plebe year) grades. Given the results of CEEB's study the current selection composite will always have limited success in determining academic suitability beyond the first year. The admissions staff is aware of this limitation. However, it is accepted by Admissions and the Academy's leadership that looking

[56] Goss, W.B., Watson, A.W., Culler, K., and Zettler, G. (1999). Review of USNA Admissions Multiple. Unpublished Study.

[57] Goss *et.al.* The data for this study were collected through interviews of several USNA Admissions Office representatives and Board members.

beyond the scope of the Candidate Multiple is impractical because 17-18 year-old candidates are inherently unpredictable.[58]

All the components of the candidate multiple are scaled to yield scores in a range of 200 and 800 points. With the exception of secondary school recommendations, all scores are empirically derived. Despite the mechanistic approach to computing candidate multiple scores some nominees receive additional points based on recommendations of the Admissions Board. There is no set guide for awarding additional points, but it isn't haphazard either. For example, a member of the Board may recommend additional points based on some extraordinary characteristics of a candidate's background. (e.g., blue chip athlete, personal essay, and family's military history)[59] The premise is that a member may recognize an attribute either positive or negative that may be missed by the multiple score.[60]

B. USNA SOURCES OF ENLISTED CANDIDATES

1. Naval Academy Preparatory School (NAPS)

NAPS is located in Newport, Rhode Island on the Naval Education and Training Base. The mission of the school is "to prepare selected candidates for admission who are judged to need additional academic preparation so that they will be able to perform successfully as midshipmen at the U.S. Naval Academy, the Merchant Marine

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[58] Reardon, M. p.23.

[59] Goss *et.al.*

[60] Reardon. M. p. 26.

Academy, or as cadets at the U.S. Coast Guard Academy."[61] Each year approximately 200 students enter the Naval Academy via NAPS.

Prior to attending NAPS selectees must enlist in the Navy Reserve and attend basic training. Upon completion they are sent to Newport to begin instruction. The course of instruction is 10 months long, beginning in August of each year. The program emphasizes intensive preparation in English, math, chemistry, physics, and information technology. Also included in the curriculum are courses on character development to ensure individuals are familiar with the academies' concepts of "ethical behavior."

Upon completion of the program and without further application, students then report to their respective academies and are integrated into the entering class of midshipmen and cadets. At that time they are considered matriculated students.

Candidates cannot apply for admission to NAPS directly. Selection for this program requires the normal application process to the Naval Academy. A candidate who is deemed to have potential but is not academically competitive may be selected for the NAPS program. Special consideration for the program is given to less academically prepared minorities, blue-chip athletes, and enlisted candidates.

2. Broadened Opportunity for Officer Selection and Training (BOOST)

The Navy's BOOST program was founded in 1969. It was designed to increase the participation of minorities in NROTC and the Naval Academy. However, BOOST actually has dual missions, "which are to provide upward mobility for all enlisted

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[61] "General Information" (1999). Naval Academy Preparatory School Web Page [On-Line]. Available: www.naps.edu/geninfo.html.

personnel, regardless of race, who are interested in gaining a commission and affirmative action."[62]

BOOST is very much like NAPS. It is located in Newport, Rhode Island, the course of instruction is 10 months long, and emphasis is placed on the same academic curriculum as NAPS. Also like NAPS, those not accepted to the program from the active duty Navy or Marine Corps must enlist in the Navy before attending.

The differences between BOOST and NAPS are few but significant. BOOST is primarily a feeder program for NROTC. Graduates of BOOST are guaranteed an NROTC scholarship without the requirement of submitting an application, similar to the NAPS-USNA relationship. Marine Non-Commissioned Officers who successfully complete BOOST are also eligible to apply for the Marine Corps' Enlisted Commissioning Program (MECEP) in lieu of accepting an NROTC scholarship. Those interested in attending the Naval Academy must adhere to the normal application process of obtaining nominations and competing for an appointment.

3. Fleet Seats (Active and Reserve)

According to Title 10 of the U.S. Code regular and reserve enlisted members of the Navy and Marine Corps can compete for a combined 170 appointments to the Naval Academy. The Secretary of the Navy (SECNAV) grants these nominations. To compete for a SECNAV nomination candidates must possess at least a combined SAT (or ACT

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[62] Jackson, J.T. and Maddox, M.R. (1990). The Role of the Broadened Opportunity for Officer Selection and Training Program in Supporting the Navy's Minority Accession Policies. Master's Thesis, Naval Postgraduate School, Monterey, CA.

equivalent) score of 1050. This score is well below the competitive average of entrants to the Naval Academy. However, enlisted applicants who meet the minimum requirement will be considered for NAPS instead of direct USNA admission.

Though the 170 nominations are set aside for enlisted applicants, an enlisted applicant may pursue any source of nomination and is encouraged to do so. Upon receiving a nomination the application process is the same for those entering from the fleet Navy and Marine Corps. If appointed, the applicant will be discharged from active duty and assigned to the Naval Academy.

C. USNA PERFORMANCE MEASURES

1. Striper Selection

The term striper refers to the midshipmen who hold Brigade billets of Company Commander or higher. The stripes indicate rank and are worn on the midshipman uniform only when one holds a leadership billet requiring that rank. Generally, stripers are first class midshipmen.

Those chosen for striper positions have exhibited the highest moral standards and exhibited exceptional leadership potential.[63] Midshipmen selected for striper positions are generally considered the "top" midshipmen at the Naval Academy judged on the " whole-man" concept.

With the exception of Midshipman Company Commanders, stripers are chosen by a board, which reviews their academic, military, and conduct performance. Upon

[63] Reardon, M. p. 93.

selection stripers hold the position for one semester then the selection board repeats the process for the next semester to reward as many solid performers as possible per year. Midshipmen Company Commanders are selected by the Company Officer using the same approach as the striper board.

2. Order of Merit

Class standing for a particular year group at the Naval Academy is based on the Overall Order of Merit (OOM). OOM for a class is computed by weighing performance in five areas: academic and professional courses; physical education; athletics; military skills; and conduct.[64] Each of the areas is assigned a coefficient to give it a weight based on its level of importance to the Naval Academy. The multiple also takes into account varying degrees of participation in academics and sports. For example, a midshipman taking more than the 16 semester hours will have a higher academic coefficient to account for the effort in completing additional courses. The coefficient is then multiplied by the midshipmen's academic GPA resulting in the number of points he or she earns for academics in any given semester. One's cumulative point total for all five areas is called the Aggregate Multiple (AGGMULT).

OOM is an important measure for graduating midshipmen. The top ten percent of the OOM are awarded their degrees "With Distinction." Those below the top ten percent

[64] USNA Instruction 1531.51A Class Standings and Merit Lists.

who have accumulated more than 75% of the maximum AGGMULT are awarded their degrees "With Merit."[65]

Additionally, there are two other measurements of class standing. One is determined based on academic standing and the other on military and professional standing. The Academic Order of Merit (AOOM) much like the OOM is a measure of class standing except it is based on one's Academic Quality Point Rating (AQPR).[66] Once the AQPR is determined for a class year of midshipmen they are ranked accordingly.

Military Order of Merit (MOOM) is computed in the same manner as the other two. However, MOOM is not only based on military performance. It also includes one's physical education and athletic performance, conduct, and professional course grades. The total grade is the Military Quality Point Rating (MPQR). When a class is ranked according to its MQPR grades the result is the MOOM. MOOM is slightly more useful as a performance metric because its components yield an implied measure of leadership potential with respect to one's peers. Hence, MOOM is important during the selection process for stripers.

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[65] *Ibid.*

[66] AQPR is computed like a GPA. The difference is that it takes into account one's level of academic participation like the example from the OOM explanation. It includes both grades from academic and professional courses.

D. SUMMARY

The selection of midshipmen at the Naval Academy is inherently complex. Inevitably, based on a historical attrition rate of 24%, some candidates who are appointed to the Academy never should have been. Likewise, it is fair to assume that some of those who aren't accepted could have been great military leaders in the Navy and Marine Corps. Many will agree that the system of admissions at USNA is not perfect. Some critics have even said it is "broken."[67] However, in the absence of a more effective system, a 76% graduation rate still far exceeds the national average of 50% for undergraduate institutions and thus "validates" the process.[68]

As for evaluating midshipmen, the system has an obvious bias towards academics. It is an academic institution but, says former Secretary of the Navy, Vietnam veteran, Naval Academy graduate and author James Webb, "[...the Naval Academy] should never aim to be specifically a top-notch academic institution if it is at the expense of leadership development."[69] While James Webb's argument is valid, if the Academy de-emphasized academics the quality of leaders graduating from the Academy might decrease. The premise for this argument is that universities that participate in the NROTC programs do not lower academic emphasis and expectations for their

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[67] Murray, W. p. 300.

[68] According to the U.S. Department of Education, Center for Educational Statistics, only 50% of those who enter higher education actually earn a bachelor's degree. In Seidman, A. (1999) "Journal of College Student Retention: Research, Theory, and Practice." Journal of College Student Retention Web Page. [On-line]. Available Internet: http//www.collegways.com/JournalCSR.html.

[69] Webb, James (2000). What it Means to be a Marine Officer. Speech given at a gathering of USNA's Semper Fi Society.

midshipman. Therefore, civilian schools would produce leaders who are intellectually better prepared than the Navy's "Flagship School." If that dynamic were to occur the Naval Academy could no longer justify its existence unless the leaders it produced are superior to those from other commissioning sources. Hence, with its emphasis on academics, USNA's evaluation system seems to be warranted.

IV. DATA AND ANALYSIS

A. DATA FILES

1. Sources

The data used for this research were obtained from the Naval Academy's Office of Institutional Research (USNA-IR), Defense Manpower Data Center (DMDC), and files assembled by Professor William R. Bowman. The data set provided by Institutional Research contains information on the Naval Academy classes of 1990 to 1999, including high school athletics and academics, standardized test scores, demographics, and Naval Academy academic and performance information. The prior enlisted midshipmen in the Institutional Research files were identified by social security number at DMDC to match their Enlisted Master Files. The resulting DMDC data file contains Armed Services Vocational Aptitude and Battery (ASVAB) scores, occupation specialty, service, component, and other service-related information for the prior enlisted midshipmen. Finally, the data compiled by Bowman consist of post-commissioning promotion and retention data for Naval Academy classes of 1980 to 1985. These data do not coincide with 1990 to 1999 data files because officers typically must have at least ten years of commissioned service before they are considered for promotion to O-4. The purpose of this part of the analysis is to measure career intentions in terms of retention rate to Lieutenant Commander of prior enlisted versus traditional USNA graduates.

2. Variable Definitions

a. USNA Performance and Admissions Variables

The data used to examine midshipman performance at the Naval Academy for the classes 1990 to 1999 were compiled by USNA-IR. This data set contained 12,822 observations. The performance data contain variables that delineate midshipmen success relative to their peers. Table 4.1 summarizes the statistical performance data pertinent to this study.

Table 4.1 USNA Performance Variables for Classes of 1990 to 1999.

Variable	Range	Percentage/Mean	Description
STRIPER	0,1	12%	selected as a striper
OOM	1-class size	490.27	overall class standing
AOOM	1-class size	489.03	academic ranking
MOOM	1-class size	490.08	military/professional ranking
CUM_AQPR	0-4	2.67	academic quality point rating
CUM_MQPR	0-4	3.0	military quality point rating
GRADUATE	0,1	76%	average graduation rate

The table shows that 12% of the classes was selected for striper positions. Additionally, it reveals that on average 76% of the midshipmen appointed to the Academy actually graduate. The mean values for the other variables represent the average scores at graduation for the classes of 1990 to 1999.

The admissions data were also compiled by USNA-IR. Demographic data are self-reported via a candidate questionnaire. The remainder is the variables that make up the Candidate Multiple. The Admissions Office requires this information of all candidates

in order to assess their capabilities relative to other applicants. These data contain 12, 498 observations. Table 4.2 summarizes the admissions variables.

Table 4.2 Admissions Variables for Classes of 1990 to 1999

Variable	Range	Representation/Mean	Description
FLTEXP	0,1	7%	prior enlisted fleet Navy/Marines
MILEXP	0,1	21%	prior military (fleet, NAPS, etc.)
TISSTD	0-772	493	technical interest score
CISSTD	0-847	501	career interest score
SATVHI	200-800	571	SAT verbal score
SATMHI	200-800	660	SAT math score
COMPECA	0-800	549	competitive ECAs
ATHECA	0-800	436	athletic ECAs
NOATHECA	0-800	430	non-athletic ECAs
RECOMMS	0-999	865	high school recommendations score
OFFSTDRN	0-800	581	high school rank score

From 1990 to 1999, 7% of the classes' midshipmen had fleet prior enlisted experience. In all 21% of these midshipmen had some military experience, which includes NAPS and BOOST preparatory schools. The mean values of the other variables represented in this table are average scores of candidate multiple components at entry to the Naval Academy from 1990 to 1999.

b. Enlisted Master File Variables

The data compiled by DMDC consisted of information found in the Enlisted Master File of prior enlisted Naval Academy midshipmen. Normally these data are used by the Department of Defense to conduct studies of career progression and retention. However, the original purpose of much of these data is initial enlistment

screening. For example, ASVAB scores are used by military recruiters to categorize levels of mental ability among those who seek to enlist. The scores on specific subtests of the ASVAB allow recruiters to pre-qualify enlistment candidates for the military occupational specialty that "best fits" their level of ability. The specific DMDC information was extracted from an extensive tracking system containing hundreds of variables. This data set contained 880 observations. Table 4.3 gives a brief description of the prior service variables used in this study.

Table 4.3 Enlisted Master File Variables

Variable	Range	Mean	Description
YOS	0-6	2.72	years of active or reserve enlisted service
AFQT	0-99	84.54	Armed Forces Qualification Test score[70]
EL	0-255	182.8	electronics composite score[71]
GTSCORE	0-196	124.5	composite score of verbal/math aptitude
MARINES	0,1	.13	prior enlisted marines
TECH_MOS	0,1	.50	technical rating or MOS (mechanical or computer related fields requiring solid math/science education)
PAYGRADE	1-5	3.8	paygrade corresponding to rank of member at discharge
PROMRATE	0-4	1.534	promotion rate (paygrade divided by years of service)
NAPS	0,1	.50	prior enlisted midshipmen who attended NAPS
BOOST	0,1	.15	prior enlisted midshipmen who attended BOOST

[70] The AFQT score measures the trainability of potential recruits. It is used by the services to categorize potential recruits by mental ability from one to five, best to worst respectively.

[71] The EL composite score essentially measures a potential enlistee's technical aptitude. The Navy EL score is derived by summing the Coding Speed, Arithmetic Reasoning, Mechanical Comprehension, and Auto and Shop Information subtests of the ASVAB. The Marine Corps EL score contains the Arithmetic Reasoning, Mathematics Knowledge, Electronics Information, and General Science subtests. Both versions of the score are used to predict technical aptitude.

Of the 880 observations in this table 50% of them had a technical MOS, 13% were Marines, 50% attended NAPS, and 15% attended BOOST. PROMRATE gives the average number of promotions per year and paygrade corresponds to the members rank at discharge from the active service. YOS is the average amount of time a prior enlisted midshipman spent on active duty. The mean scores of the variables shown here are average ASVAB composite scores used in the analysis.

The ASVAB contains ten composite scores. The subtests that yield EL and GT scores most closely resemble commonly used intelligence tests that measure academic aptitude. Hence, they may predict academic performance of prior enlisted midshipmen at the Naval Academy. The years of service (YOS) variable is used for two reasons. First it takes in to account the amount of time one has had direct exposure to military values. In addition YOS may account for the effect of age and maturity. Overall, the YOS variable measures the military experience of the individual.

c. Promotion and Retention Data

Data compiled by Bowman consisted of Navy Bureau of Personnel Officer Master Files, Fitness Report Files, and Loss Files. This data set contains information on post commissioning promotion boards, fitness report and career progression data for the entire population of Navy Unrestricted Line (URL) officers who entered between 1980 and 1985. This thesis will only analyze the Lieutenant Commander (O-4) promotion boards for Naval Academy graduates between fiscal years 1990 to 1995 (USNA classes of 1980 to 1985). Retention to the O-4 promotion board corresponds with approximately

ten years of commissioned service and is assumed to be the decision point for most officers considering a military career. As discussed in Chapter I, those with prior enlisted experience have more than the standard ten years of military service by the time they reach the O-4 board, which may increase their propensity to remain on active duty for 20 years. Because there are many factors that may affect an officer's decision to leave the military, the significance of explanatory variables such as standardized test scores and Academy academic record is expected to be small. Hence the statistical analysis of retention below uses information on prior enlisted status not the individual academic record.[72]

B. SYNOPSIS OF USNA PERFORMANCE BY MILITARY EXPERIENCE

1. Prior Enlisted Experience in the Brigade of Midshipmen.

The candidate questionnaire allows candidates to self-report prior enlisted experience in three ways: 1.) active duty enlisted experience, 2.) reserve enlisted experience, or 3.) no military experience. Because the categories are so broad enlisted military experience may include those who go to NAPS and BOOST directly from high school, a process which routes them through basic training at one of two Navy Recruit Training Commands. Technically, those who attend NAPS and BOOST are justified in considering themselves to be prior enlisted. However, for the purpose of this thesis military experience includes active duty or reserve Sailors and Marines who served in a

[72] For a detailed statistical analysis of retention and selection at the O-4 level which includes predictors from high school and the Naval Academy the reader is referred to Reardon (1997).

fleet unit prior to attending the Naval Academy directly or via a military preparatory program. The binary variable **fltexp** designates those with "true" military experience as 1 while all others are coded 0. Those who have some military experience by way of basic training and the military environments of NAPS and BOOST are designated by the variable **milnoflt**. Midshipmen with no military experience prior to attending the Naval Academy are designated by the variable **nomilexp.** Figure 4.1 delineates the overall military experience for the brigade of midshipmen for classes of 1990 to 1999.

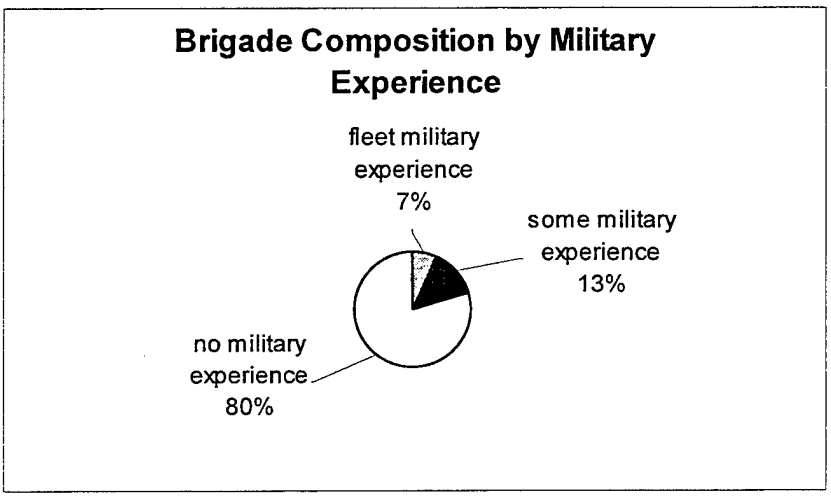

FIGURE 1. MILITARY EXPERIENCE IN THE BRIGADE 1990-1999.

2. Striper Statistics

Striper selection is based on the whole-person concept in order to reward those who perform well in all areas. Figure 2 shows the overall striper selection rates for class years 1990 to 1999 by prior military experience.

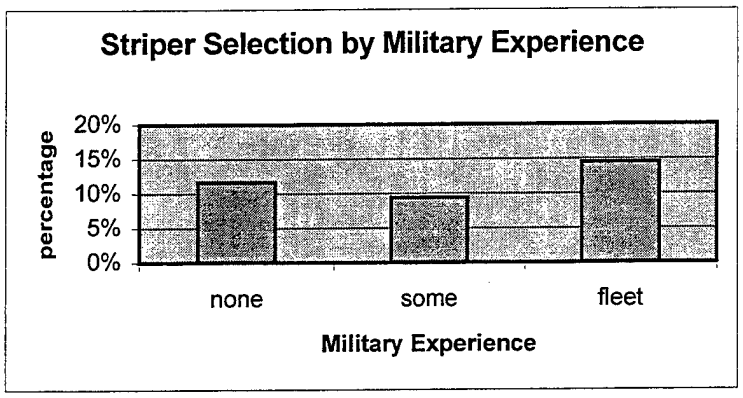

FIGURE 2. STRIPER SELECTION BY MILITARY EXPERIENCE 1990-1999.

Figure 2 suggests that fleet military experience is a factor in predicting striper selection rates. A two-tailed t-test of significance finds that the difference in means between midshipmen with fleet enlisted experience and those with limited and no enlisted experience is statistically significant at the 0.05 level. However, due to small numbers of prior enlisted midshipmen, more analysis is needed to isolate the effects of fleet prior enlisted service on striper selection. The means between traditional midshipmen and those with limited enlisted experience are also significantly different but the result is not important to the focus of this thesis.

3. Graduation Statistics

The ultimate indicator of performance at the Naval Academy manifests itself on graduation day. Regardless of any other measures of performance all midshipmen who graduate will be commissioned officers in the Navy and Marine Corps. Figure 3 depicts the overall graduation rate in terms of military experience.

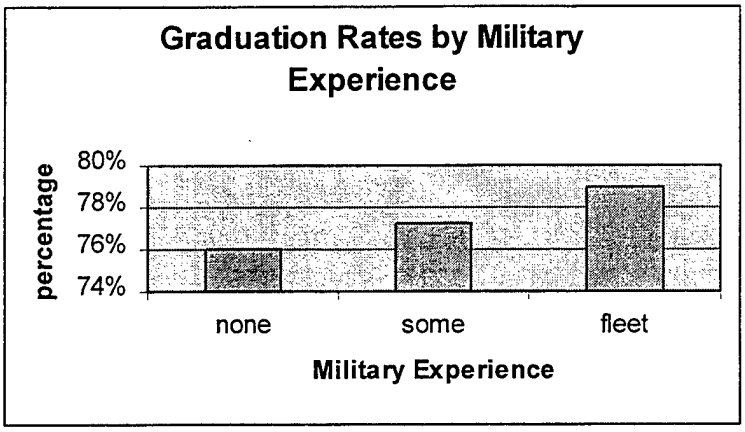

FIGURE 3. GRADUATION RATES BY MILITARY EXPERIENCE 1990-1999.

Figure 3 implies that military experience positively influences graduation rates. A t-test reveals that the differences in means are not significant at the .05 level between any of the classifications of prior enlisted service. However, the difference in means between midshipmen with fleet enlisted experience and those with no enlisted experience is significant at slightly lower than that .10 level.

4. Academic Performance Statistics

Literature reviewed earlier suggested that on average those who enlist in the military are less intellectually capable than their peers who choose to go to college after high school. To test the validity of this hypothesis midshipmen with enlisted experience were compared to those with no military experience in terms of variables that measure intellect. The author decided that in this comparison the group designated "some" should include those who attended NAPS and BOOST because they were deemed unqualified candidates prior to attending these programs. Based on SAT scores, whole-man multiple

scores at entry, overall order of merit, and AQPR at graduation the comparison confirms the findings of the literature reviewed in Chapter 2 as Table 4.4 describes below.

Table 4.4 Performance Comparisons by Military Experience 1990-1999

Variable	None	Some	Fleet
SAT combined	1253	1112	1189
Order of merit[73]	459	668	514
Whole-man multiple	64625	59765	60838
AQPR	2.70	2.37	2.62

A two-tailed t-test of significance finds that all of the differences in means across the specified groups listed in the table are significant to the .05 level or higher. Table 4.4 confirms that on average midshipmen with prior enlisted experience (i.e. some and fleet) enter the academy with significantly lower SAT and whole-man multiple scores and graduate with lower academic grades and class standing. This seems to be in conflict with the preliminary analysis of striper selection and graduation, which suggests that midshipmen with prior enlisted experience are selected for striper positions more often and graduate at higher rates than those with no military experience. This conflict in performance measures necessitates that a more detailed statistical analysis be conducted in order to isolate the effect of prior military experience from other factors on Naval Academy performance.

[73] Order of merit denotes class standing or rank. A higher number indicates a lower rank.

C. PERFORMANCE MODEL DEVELOPMENT

The candidate multiple, discussed in detail earlier, is used to predict the overall success of candidates that apply to the Naval Academy. Table 3.1 from Chapter 3 lists the multiple's components and their weights. The Candidate Multiple is a relative measure hence it predicts the probability of success of one candidate relative to the next. Given that the candidate multiple predicts success the following baseline model was developed to predict the probability of success:

$$Success = \beta_1 * satvhi + \beta_2 * satmhi + \beta_3 * recomms + \beta_4 * compeca + \beta_5 * noatheca + \beta_6 * atheca + \beta_7 * offstdrn + \beta_8 * cisstd + \beta_9 * tisstd + \varepsilon$$

Where:

Success = performance measures:
- striper selection
- OOM
- AOOM
- MOOM
- graduation

The explanatory variables are defined in table 4.2 above. Striper selection and graduation are dichotomous dependent variables where the outcome is coded as 1 and 0. Therefore, the equation above will be specified as a binary logistic (*logit)* model and estimated by maximum likelihood techniques for these two dependent variables. On the other hand, OOM, AOOM, and MOOM are continuous dependent variables so the ordinary least squares (OLS) method will provide efficient and consistent estimations.

The statistical model specified above could accommodate a large number of variables that might influence midshipmen performance at the Naval Academy.

However, the variables in the model represent only those used by Admissions to predict success. Because it is a hypothesis of this thesis that prior military experience will have a positive effect on midshipman performance, the author chose to limit the additional variables to **fltexp** and **milnoflt** which represent prior enlisted midshipmen with fleet experience and without. The full results of the multivariate models are presented in Appendices A-G.

1. Striper Selection

As explained in Chapter 3, being selected for a striper billet is usually indicative of solid overall performance in all areas of the midshipman evaluation system. The means of selecting stripers are based on empirical data and an interview of the prospective candidates, which makes the process somewhat subjective. However, this combination of methods allows the selection board to ensure it chooses the "best" midshipman for each billet. The process ensures that all of the midshipman's prior performance and exhibited leadership ability is scrutinized. Ultimately, the distinction of becoming a striper is highly prized as on average only 12% of the first class are selected each year.

Assuming that becoming a striper is a measure of success this thesis hypothesizes that the information available to the Admissions Board at the time of a candidate's appointment is relevant in predicting the probability of attaining **striper**. The following model is proposed to determine how well the candidate multiple and prior enlisted variables predict who will become a striper:

$$\textbf{Striper} = \beta_1 * \text{satvhi} + \beta_2 * \text{satmhi} + \beta_3 * \text{recomms} + \beta_4 * \text{compeca} + \beta_5 * \text{noatheca} + \beta_6 * \text{atheca} + \beta_7 * \text{offstdrn} + \beta_8 * \text{cisstd} + \beta_9 * \text{tisstd} + \beta_{10} * \textbf{fltexp} + \beta_{11} * \textbf{milnoflt} + \varepsilon$$

Table 4.5 contains the results of the logit regression.

Table 4.5 Logit Model of Striper with Prior Enlisted Variables

Variable	Coefficient	Significance	Marginal Effects
Satvhi	0.0021	0.0000	0.0002
Satmhi	0.0022	0.0001	0.0002
Recomms	0.0016	0.0000	0.0002
Compeca	0.0043	0.0000	0.0005
Noatheca	-0.0014	0.0000	-0.0001
Atheca	0.0005	0.0683	0.0001
Offstdrn	0.0022	0.0000	0.0002
Cisstd	0.0006	0.0644	0.0001
Tisstd	-0.0009	0.0083	-0.00009
Fltexp	0.5467	0.0000	0.05808
Milnoflt	-0.1908	0.1094	-0.0203
Constant	-9.3401	0.0000	-0.9718
-2 Log Likelihood	8765.224		
Chi-square	295.232		
Sample size	12,278		

Overall the model predicted about 2/3 of the striper selections correctly (see Appendix A). Additionally, all variables were significant at the 0.05 level or better with the exception of career interest score, athletic ECAs, and midshipmen with limited enlisted experience. **Milnoflt**, which depicts midshipmen with limited enlisted experience, is almost significant at 0.10 level and has a negative association with striper

selection. This result suggests that on average these midshipmen are less likely to become stripers.

Interpretations of the marginal effects are as follows. A 100 point increase above the mean in any of the significant variables of the candidate multiple raises the likelihood of becoming a striper by less than 2.4%. In comparison prior enlisted fleet experience increases the probability of becoming a striper by 6.9%. Based on the mean probabilities calculated in the marginal effects a notional midshipman with fleet prior enlisted service has a 18.58% chance of becoming a striper while one without prior fleet experience has a 11.68% chance.

2. Order of Merit

Order of merit accounts for overall performance at the Naval Academy. However, approximately two-thirds of this measure of class standing is comprised of academic performance. The formula also takes into account physical fitness, conduct, military performance, the level of participation in athletics, and additional academic course load. In effect, academics and participation significantly impact OOM. Because it is used as the official class rank at the Academy, a high order of merit, which is reflected by a low number, is considered success relative to one's peers. Ordinary least squares is used in this analysis because OOM is a continuous variable. The specified model is presented below.

$$\mathbf{OOM} = \beta_1 * \text{satvhi} + \beta_2 * \text{satmhi} + \beta_3 * \text{recomms} + \beta_4 * \text{compeca} + \beta_5 * \text{noatheca} + \beta_6 * \text{atheca} + \beta_7 * \text{offstdrn} + \beta_8 * \text{cisstd} + \beta_9 * \text{tisstd} + \beta_{10} * \mathbf{fltexp} + \beta_{11} * \mathbf{milnoflt} + \varepsilon$$

The OLS results are presented in Table 4.6.

Table 4.6 OLS Model for Order of Merit Classes 1990-1999

Variable	**Coefficient**	**t-value**
Satvhi	-0.350	-7.705
Satmhi	-1.053	-20.212
Recomms	-0.244	-8.256
Compeca	-0.169	-3.834
Noatheca	0.069	2.735
Atheca	-0.014	-.556
Offstdrn	-.0771	-26.343
Cisstd	-0.017	-.537
Tisstd	-.0500	1.597
Fltexp	-66.91	-6.030
Milnoflt	59.968	5.358
Constant	2093.80	39.203
R^2	0.187	
F statistic	244.976	
Sample size	11,753	

The R^2 statistic for the order of merit OLS model is 0.187. The significance of the variables in an OLS model is given by the t-value. Variables significant to the 0.05 level or higher have t-values greater than 1.96. Using this criterion only the Strong Campbell Interest Inventory and athletic ECA scores are not statistically significant in Table 4.6. Of the significant variables, non-athletic extracurricular activities and limited enlisted

experience are the only ones that did not have a positive association with order of merit. In addition to being negatively associated with OOM those with limited military experience are generally ranked 59 places or 13% lower than the average midshipman. Note that because a low OOM is "better" the negative coefficient indicates a positive association between the explanatory variable and OOM.

The best predictors of a higher order of merit are high school class rank, math SAT scores and prior enlisted fleet experience. The average unadjusted OOM for prior enlisted midshipmen is lower than that of traditional midshipmen (see Table 4.4). However, in Table 4.6 when all other variables are held constant, the regression results suggest that those with fleet prior enlisted service are ranked 67 places or 14.6% higher than those with no fleet enlisted experience.

3. Academic Order of Merit

Academic order of merit is a relative class standing based solely on academics. It is not used to determine award recipients or selections to any special programs but it is a measure of success in academics relative to one's peers. AOOM will be analyzed using the following model:

$$\mathbf{AOOM} = \beta_1 * \text{satvhi} + \beta_2 * \text{satmhi} + \beta_3 * \text{recomms} + \beta_4 * \text{compeca} + \beta_5 * \text{noatheca} + \beta_6 * \text{atheca} + \beta_7 * \text{offstdrn} + \beta_8 * \text{cisstd} + \beta_9 * \text{tisstd} + \beta_{10} * \mathbf{fltexp} + \beta_{11} * \mathbf{milnoflt} + \varepsilon$$

The results of this OLS regression analysis for graduating classes of 1990-1999 are shown below in table 4.7.

Table 4.7 OLS Model for Academic Order of Merit Classes1990-1999

Variable	Coefficient	t-value
Satvhi	-0.231	-4.688
Satmhi	-0.790	-13.999
Recomms	-0.129	-4.045
Compeca	-0.0845	-1.774
Noatheca	0.0205	0.751
Atheca	0.0214	-0.800
Offstdrn	-0.577	-18.198
Cisstd	-0.024	-0.744
Tisstd	0.0395	1.164
Fltexp	-52.083	-4.989
Milnoflt	47.44	3.912
Constant	1607.810	27.776
R^2	0.097	
F statistic	112.627	
Sample size	11,554	

Regression results show that SAT scores, secondary school recommendations, high school class rank, fleet enlisted experience and limited enlisted experience are the only variables statistically significant at the 0.05 level or higher. With the exception of **milnoflt**, all of the significant variables have a positive association with a higher AOOM, which is denoted by a lower number. Those represented by the **milnoflt** variable are ranked 47 places or 10 lower than the average midshipman. Additionally, competitive ECAs are significant at the 0.10 level and have a positive association with AOOM. Like the OOM analysis, holding all other predictors constant, the regression results suggest that fleet experience predicts a 52 point or 11% higher AOOM when evaluated at the mean.

4. Military/Professional Order of Merit

Unlike AOOM, military order of merit (MOOM) is used for special recognition. It is used in the process of striper selection. MOOM is comprised of grades in military and professional courses, physical fitness, conduct and athletic performance and participation, which combine to provide a glimpse of a midshipman's character, commitment, and professionalism in relation to other midshipmen. Based on its components, a high ranking in military order of merit roughly translates to greater leadership potential, which is deemed to be an indicator of "success" by both the midshipman and the Academy.

The OLS model for the analysis of MOOM is specified as follows:

$$\textbf{MOOM} = \beta_1 * \text{satvhi} + \beta_2 * \text{satmhi} + \beta_3 * \text{recomms} + \beta_4 * \text{compeca} + \beta_5 * \text{noatheca} + \beta_6 * \text{atheca} + \beta_7 * \text{offstdrn} + \beta_8 * \text{cisstd} + \beta_9 * \text{tisstd} + \beta_{10} * \textbf{fltexp} + \beta_{11} * \textbf{milnoflt} + \varepsilon$$

Table 4.8 contains the results of the regression analysis.

Table 4.8 OLS Model for Military/Professional Order of Merit Classes 1990-1999

Variable	Coefficient	T-value
Satvhi	-0.178	-3.572
Satmhi	-.0567	-9.977
Recomms	-.0210	-6.525
Compeca	-0.337	-7.019
Noatheca	0.0695	2.526
Atheca	-0.0165	-0.614
Offstdrn	-0.429	-13.409
Cisstd	-0.0072	-0.225
Tisstd	-0.075	-2.204
Fltexp	-76.359	-6.307

Milnoflt	41.289	3.377
Constant	1600.217	27.422
R^2	0.061	
F statistic	67.923	
Sample size	11,554	

Neither extracurricular activities nor the career interest score had a significant positive effect on MOOM. Limited enlisted experience was significant but it had a negative association with MOOM. However, math SAT scores and high school class rank are again good non-military predictors in this model. The results of this regression suggest that a midshipman with fleet experience would rank 76 places or 17% higher in MOOM when all other variables are held constant.

5. Graduation Statistics

The ultimate measure of success for a candidate applying for admission to the Naval Academy is graduation. At that point none of the other performance measures at the Naval Academy matter anymore. However, being able to persevere and make it to graduation is not easy.

There are several factors over four years that may affect a midshipman's chances of graduating. Poor academics, poor physical fitness, conduct, and honor violations are but a few of the many reasons why midshipmen don't graduate. In addition, voluntary resignation can also account for a relatively large percentage of attrition at the Naval Academy.[74]

[74] Michael, J.C. p. 60.

To minimize attrition the admissions staff relies on the Candidate Multiple to predict the likelihood of graduation. If the results of Figure 3 above hold true, the fleet experience variable may also be able to predict the probability of graduation. Because the graduation outcome is binary, a logit model is specified. The following model is specified for the analysis:

$$\textbf{GRADUATION} = \beta_1 * \text{satvhi} + \beta_2 * \text{satmhi} + \beta_3 * \text{recomms} + \beta_4 * \text{compeca} + \beta_5 * \text{noatheca} + \beta_6 * \text{atheca} + \beta_7 * \text{offstdrn} + \beta_8 * \text{cisstd} + \beta_9 * \text{tisstd} + \beta_{10} * \textbf{fltexp} + \beta_{11} * \textbf{milnoflt} + \varepsilon$$

The results of the regression are presented in Table 4.9 below.

Table 4.9 Logit Model of Graduation with Fltexp

Variable	Coefficient	Significance	Marginal Effects
Satvhi	-0.00004	0.9181	---
Satmhi	0.0037	0.0000	0.0006
Recomms	0.0010	0.0000	0.0002
Compeca	0.0018	0.0000	0.0003
Noatheca	-0.0008	0.0001	-0.0001
Atheca	0.0002	0.3108	---
Offstdrn	0.0012	0.0000	0.0002
Cisstd	0.00009	0.6964	---
Tisstd	0.0005	0.0653	0.00008
Fltexp	0.2441	0.0073	0.0389
Milnoflt	-.1026	0.2545	-0.033
Constant	-3.847	0.0000	-0.6448
-2 Log Likelihood	12854.451		
Chi-square	204.318		
Sample size	12,278		

This analysis shows that high school rank, math SAT score, secondary school recommendations, competitive ECAs, and fleet experience are all significant and positively correlated with an increase in the probability of graduation. The best predictor is math SAT: A 100 point increase above the mean score corresponds to a 5.6% increase in the probability of graduation. Additionally, fleet experience, and a 100 point increase above the mean in competitive ECAs are the next best predictors with increases of graduation probability corresponding to 3.5% and 3.0%, respectively. Non-athletic ECAs are significant but they have a negative association with graduation. In this model fleet experience is not the best explanatory variable but it does appear to indicate that on average, holding all other variables constant, a midshipman with fleet experience has a higher probability of graduation from the Naval Academy.

D. ANALYSIS OF ENLISTED MASTER FILE DATA

The data found in an enlisted person's service record provides information on mental and physical ability, demographic characteristics, and career progression. It is a secondary hypothesis of this thesis that some characteristics of one's enlisted service may manifest themselves as motivation, work ethic, and dedication. Specifically, analyzing enlisted master file data of USNA midshipmen with fleet experience may provide insight to the Admissions Board for predicting the probability of success of future candidates with prior enlisted fleet experience. To accurately isolate the effect of any indicators of success in enlisted service records only those midshipmen with fleet experience will be used in the analysis. Additionally, because the results of AOOM and MOOM are

"consistent" with those of OOM only graduation and order of merit will be used as measures of success.

1. Graduation Model

Analyzing enlisted master file data is complicated because many of the variables are correlated with each other. For example, an enlistment candidate must have high ASVAB scores to qualify for a technical military occupational specialty, hence any ASVAB composite or raw score will be collinear with the TECH_MOS variable. Additionally, years of service is expected to be collinear with paygrade because of minimum time-in-grade requirements for promotions. However, despite the inherent problems with analyzing the enlisted master file data the following model is proposed to determine whether enlisted service record data may be able to provide additional indicators of success for Naval Academy candidates with fleet experience. Success graduation is coded as 1 and non-graduates as 0. The explanatory variables in the graduation model are as follows:

$$\textbf{GRADUATION} = \beta_1 * \text{satvhi} + \beta_2 * \text{satmhi} + \beta_3 * \text{recomms} + \beta_4 * \text{compeca} + \beta_5 * \text{noatheca} + \beta_6 * \text{atheca} + \beta_7 * \text{offstdrn} + \beta_8 * \text{cisstd} + \beta_9 * \text{tisstd} + \beta_{10} * \textbf{yos} + \beta_{11} * \textbf{tech_mos} + \beta_{12} * \textbf{paygrade} + \beta_{13} * \textbf{promrate} + \beta_{14} * \textbf{marines} + \beta_{15} * \textbf{naps} + \beta_{16} * \textbf{boost} + \varepsilon$$

The variables in bold indicate those that are not usually a part of the candidate multiple. Years of service and pay grade are used in this model to account for age and experience of the enlisted candidate. Promotion rate provides insight on an individual's performance

in the enlisted ranks. For example, in Navy non-nuclear rates only stellar performers could be promoted to E-5 in 4 years (the first term of service). The reference midshipman with fleet experience in this model served in the Navy. Thus, the **marines** variable is included to distinguish between services. The technical MOS variable is included in the model because at entrance those who are assigned to technical fields have generally performed better than their peers on the ASVAB test. Finally, the NAPS and BOOST variables account for the effect of a preparatory school on midshipmen with fleet experience. The results of the graduation model are provided in Table 4.10.

Table 4.10 Logit Model of Graduation with Enlisted Master File Variables

Variable	Coefficient	Significance	Marginal Effects
Satvhi	-0.0026	0.0581	---
Satmhi	0.0030	0.0488	0.0005
Recomms	0.0022	0.0192	0.0004
Compeca	-0.0014	0.2671	---
Noatheca	-0.0020	0.0310	---
Atheca	0.0020	0.0425	0.0003
Offstdrn	0.0018	0.1088	---
Cisstd	-0.0012	0.2714	---
Tisstd	-0.0010	0.3424	---
Marines	-0.2011	0.4782	---
Promrate	0.9186	0.0317	0.15973
Yos	0.3729	0.1556	---
Paygrade	-0.2654	0.2006	---
Naps	0.2375	0.6027	---
Boost	0.5722	0.0900	0.09950
Tech_mos	0.3509	0.1472	---
constant	-1.9984	0.3424	---
-2 Log Likelihood	816.594		
Chi- square	38.360		

Sample size	819		

The results of the graduation model for midshipmen with fleet experience are interpreted as follows. There are three variables from the candidate multiple that are statistically significant in this model and are positively associated with graduation. The model predicts that a notional candidate with scores 100 points above the mean in SAT math, Commanding Officer recommendations, and athletic ECAs increases his or her probability of graduation by 4.8%, 3.5%, and 3.2%, respectively. Non-athletic ECAs are significant to the 0.05 level; however, they are negatively related to graduation. Additionally, verbal SAT scores are significant to the .10 level but they are negatively associated with graduation. As for the predictors from the enlisted master file, promotion rate was the only one that was significant at 0.05 level. In this model increasing the rate of promotion by one standard deviation (from 1.5337 to 2.1537) increases the probability of graduation by 8.06%. A promotion rate of 2.1537, for example, would correspond to an enlisted Naval Academy candidate being promoted to E-5 within 2.34 years from the first day of basic training. It is virtually impossible to achieve this type of promotion rate without a meritorious promotion. As a result, stellar performance in the fleet characterized by high rates of promotion indicates a significant increase in the probability of graduation from the Naval Academy.

Additionally, the analysis of enlisted master file data found the BOOST variable to be significant at the 0.10 level. According to the results in Table 4.10 an enlisted Naval Academy candidate having attended the BOOST prep school increases his

probability of graduation by 8.85%. Among the other significant variables BOOST is not as strong a predictor as the others in this model but clearly having attended BOOST has an impact on the likelihood of success for midshipmen with fleet experience.

When this model is tested without the Enlisted Master File variables the indicators that were significant in the equation remain significant. Additionally none of the predictors changed in significance. In fact, the coefficients barely changed. Hence, adding the DMDC predictors to the model has a negligible effect on the CM. The results of this model can be seen in Appendix H.

2. Order of Merit Model

The model for predicting order of merit for Naval Academy candidates using enlisted master file data is slightly different from the graduation model. An additional variable, GTSCORE, was added to the model to account for the general intelligence of candidates as measured by the ASVAB test. The order of merit model and its results are specified below.

$$\mathbf{OOM} = \beta_1{*}\text{satvhi} + \beta_2{*}\text{satmhi} + \beta_3{*}\text{recomms} + \beta_4{*}\text{compeca} + \beta_5{*}\text{noatheca} + \beta_6{*}\text{atheca} + \beta_7{*}\text{offstdrn} + \beta_8{*}\text{cisstd} + \beta_9{*}\text{tisstd} + \beta_{10}{*}\mathbf{yos} + \beta_{11}{*}\mathbf{tech_mos} + \beta_{12}{*}\mathbf{paygrade} + \beta_{13}{*}\mathbf{promrate} + \beta_{14}{*}\mathbf{marines} + \beta_{15}{*}\mathbf{naps} + \beta_{16}{*}\mathbf{boost} + \beta_{16}{*}\mathbf{gtscore} + \varepsilon$$

Table 4.11 OLS Order of Merit Model with Enlisted Master File Variables

Variable	Coefficient	T-value
Satvhi	-0.156	-0.928
Satmhi	-0.560	-3.007
Recomms	-0.266	-2.161

Compeca	0.230	1.484
Noatheca	0.112	1.000
Atheca	-0.175	-1.538
Offstdrn	-0.641	-4.725
Cisstd	-0.077	-0.615
Tisstd	0.110	0.886
Marines	-4.497	-0.119
Promrate	-6.979	-0.187
Yos	25.951	0.932
Paygrade	-10.064	-0.442
Naps	-32.465	-0.585
Boost	89.334	2.228
Tech_mos	-36.884	-1.224
gtscore	-0.594	-3.044
constant	1449.167	5.655
R^2	0.114	
F statistic	6.049	
Sample size	816	

The results of the analysis show that candidate multiple variables, math SAT score, Commanding Officer recommendations score, and high school class rank score are significant and positively associated with order of merit. Specifically, as these scores increase one's order of merit ranking improves. Of the enlisted master file variables only the GT score is significant. An increase in this score above the mean corresponds to the probability of a better order of merit. The BOOST variable is also significant but has an unexpected negative association with order of merit.

When this model is tested without the Enlisted Master File variables the indicators that were significant in the equation remain significant. Likewise none of the predictors

that were not significant gained significance. Hence, adding the DMDC predictors to the model has a negligible effect on the CM. The results of this model can be seen in Appendix I.

The results of the analyses of enlisted master file data suggest that rate of promotion, BOOST, and GT score may be helpful in predicting the probability of success for Naval Academy candidates with fleet experience. The author does not suggest that indicators from one's enlisted service record are better than those of the candidate multiple but that they do provide further insight into the capabilities of prior enlisted midshipmen entering the Naval Academy.

E. FLEET RETENTION OF PRIOR ENLISTED OFFICERS FROM USNA

As mentioned in the introduction of this chapter, the data file used for the descriptive analysis of fleet retention was compiled by Bowman and contains career progression data of USNA graduating classes from 1980 to 1985. The graph below summarizes enlisted military experience for USNA classes 1980 to 1985 whereas earlier analysis in this thesis was on 1990-1999 data.

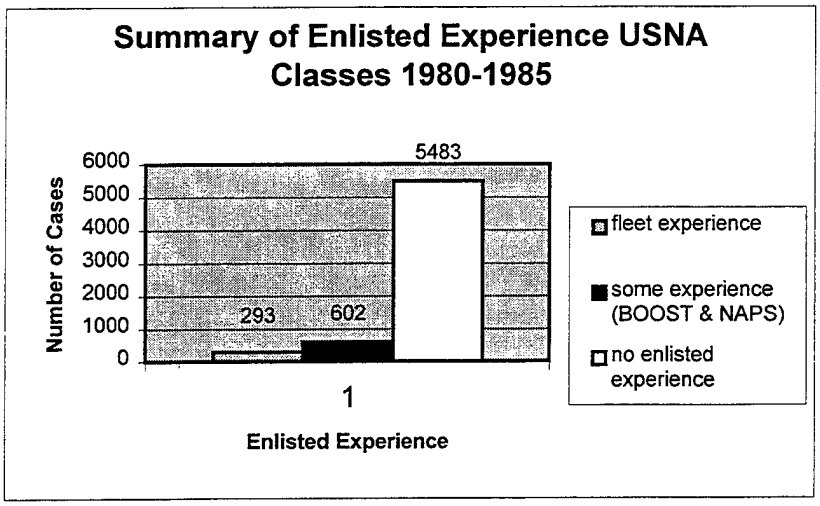

FIGURE 4. ENLISTED EXPERIENCE IN USNA CLASSES 1980 TO 1985.

Among officers commissioned from the Naval Academy between 1980 and 1985, 4.6% had fleet enlisted experience, 9.4% had some enlisted experience, and 86% had no enlisted military experience.

The Naval Academy's mission clearly states that it prepares midshipmen for career military service. However, despite the mission statement approximately half of all Naval Academy graduates leave the naval service after their initial obligation. Although it is much more expensive than other commissioning sources, the Academy has been able to remain viable because it has the highest rate of retention when compared to other officer accession sources.

Officer retention crises of late have sparked criticisms of the service academies in general because it seems as if the services are not getting enough return on the substantial investment required to educate an officer at an academy. The return on the investment manifests itself in the form of military career retention.

On average officers who remain on active duty until the O-4 promotion board have decided to make a career of military service. Thus, retention to the O-4 promotion board is generally a good indicator of desire for a military career. The methodology for this brief analysis is simply determining what percentage of USNA graduates, between 1980 and 1985, with and without military experience, left the naval service before being screened for promotion to O-4. The results of the retention analysis are displayed in the following table.

Table 4.12 USNA Graduate Retention to O-4 by Military Experience Classes 1980 -1985

Group	Number Commissioned	Number Screened	Retention Percentage
Fleet experience			
Fleet enlisted experience	293	168	57.3%
No fleet enlisted experience	6085	3110	51.1%
Total	6378	3278	51.4%
All inclusive enlisted experience			
Any enlisted experience	895	505	56.4%
No enlisted experience	5483	2773	50.5%
Total	6378	3278	51.4%

Interpretation of the results in Table 4.12 is as follows. USNA graduates with fleet enlisted experience remain on active duty to the O-4 selection board at a higher rate than those without fleet experience. Additionally, when graduates with prior enlisted experience of any form are grouped they too have higher rates of retention than the average graduates without prior enlisted service. The propensity for USNA graduates with prior enlisted service to stay in for at least one screening by the O-4 board may be

explained by their additional years of service. A two-tailed t-test found that differences between USNA graduates with prior enlisted service and those without are statistically significant. The results substantiate the hypothesis that in terms of officer retention to the O-4 board USNA candidates with prior enlisted experience are a better investment than candidates with no prior enlisted experience. However, because prior enlisted officers qualify for retirement earlier than those without prior enlisted service they may not actually serve longer as officers.

F. SUMMARY

The number of Naval Academy midshipmen who possess any prior enlisted experience is relatively small (20% of the Brigade). However, the type of enlisted experience seems to be an important factor in performance and graduation rates.

On average for the classes of 1990 to 1999, midshipmen with prior enlisted experience enter the Naval Academy with lower academic credentials than midshipmen entering directly from high school. Additionally, entering the Academy after spending years away from an academic setting can be at a disadvantage. However, midshipmen with fleet prior enlisted experience maintained higher rates of graduation and striper selection. Multivariate analyses confirmed that the fleet experience variable was consistently significant and positively associated with higher levels of success.

A perceived intellectual disadvantage, lower standardized test scores, and time away from school, all appear to indicate that midshipmen with fleet enlisted experience would not perform as well as midshipmen with no fleet experience. However, not only

do midshipmen with fleet experience perform as well and sometimes better than their peers at USNA, but they also remain in the military at higher rates. Perhaps the enculturation of military values or some other aspect of enlisted experience may explain their relatively greater commitment and success.

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V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

This study examined the effects of prior enlisted military experience on the performance of midshipman at the United States Naval Academy and their subsequent fleet retention. Various predictors from enlisted service records were examined for their ability to predict the success of prior enlisted midshipmen at the Naval Academy. The findings suggest that midshipmen with prior enlisted experience graduate at higher rates and remain in the military longer than midshipmen with no prior enlisted service.

Chapter I provided an introduction to the study and gave reasons why it should be conducted. Furthermore, the chapter described the Naval Academy's whole-man multiple system, and why it might fall short in predicting the suitability of prior enlisted candidates to attend the Naval Academy.

The first section of Chapter II explored previous research on identifying the academic and leadership potential of service academy applicants. Much of the emphasis in this section was placed on the Navy Personnel Research and Development Center's refinement of the Naval Academy's whole-man multiple system. The next section discussed previous research on self-selection to explore the many factors that may influence a person's decision to apply to a service academy. The final section illustrates the many differences that exist between individuals who have been enculturated with military values and those who have not. This section provided the reader with evidence that individuals with military service may be more achievement-oriented and on average

are likely to finish what they start. This section provided rationale for the hypothesis that prior enlisted candidates would be more likely to be successful at the Naval Academy than those with no military experience.

Chapter III provides a detailed discussion of the Naval Academy's methods of selection and evaluation. The purpose of this chapter was to ensure the reader has a firm grasp of how the Naval Academy's Admissions Board uses the candidate multiple to select candidates. Furthermore, Chapter III illustrates performance measures and their ability to provide an accurate portrayal of a midshipman's performance.

Chapter IV described the data for this study. It then statistically examined the relationship between prior enlisted experience and midshipman performance. For every performance outcome chosen, the fleet enlisted experience variable was significant and positively associated with likelihood of success, despite prior enlistees having lower entrance scores and a perceived intellectual disadvantage. Chapter IV also provided evidence that variables from enlisted service could be used to predict a prior enlisted applicant's success at the Naval Academy. The chapter concludes with the results of a descriptive analysis of fleet retention showing that USNA graduates with prior enlisted experience are more likely to stay to O-4 selection boards.

The whole-man multiple has been used for many years as the basis for selecting midshipmen. After years of refinements it does a relatively good job of predicting the success of applicants. However, the candidate multiple is not perfect. For example, the high weight given to academics for selection usually puts prior enlisted applicants at a disadvantage because their grades, secondary school rank, and test scores are generally

lower than the average candidate. This study found that despite all their perceived shortcomings prior enlisted midshipmen in the classes from 1990 to 1999 consistently performed better than their peers at the Naval Academy when all other variables are held constant.

B. CONCLUSIONS

1. USNA Performance and Graduation

Performance at USNA is evaluated in this thesis by a number of different measures. These performance measures continuously monitor, among other things, academic achievement, military skills, self-discipline, and dedication, which are key ingredients for success at USNA. Prior to admission, USNA's Candidate Multiple provides a whole-person measure of potential to succeed. Thus, the individual variables of the Candidate Multiple essentially predict a midshipman's relative performance and likelihood of graduation. Specifically, high school class rank, SAT math scores, and recommendations consistently affect the various orders of merit and the likelihood of graduation. The Candidate Multiple does a good job predicting the success of USNA applicants.

On the other hand, the results of this study suggested that in addition to the variables in the Candidate Multiple, prior enlisted experience also has a positive effect on performance and graduation. In fact, among the performance indicators analyzed, in most instances the prior enlisted explanatory variable predicted higher rates of success than any of the components of the Candidate Multiple. These results illustrate that despite lower

than average whole-man multiple scores, midshipmen with fleet prior enlisted service perform better and graduate at higher rates than those with no prior enlisted experience when all other variables are held constant.

2. Enlisted Service Record Predictors

According to this study's findings midshipmen with prior enlisted experience perform well relative to their peers at the Naval Academy. Additionally, the thesis evaluated information from the service records of former enlisted midshipmen to determine if there are any variables that might be helpful in predicting the success of enlisted applicants. The research found that the ASVAB GT composite score positively predicts order of merit among prior enlisted midshipmen. Surprisingly, in the same analysis the BOOST variable negatively affected performance.

The GT score, which is comprised of math, science, and verbal subtest scores, represents the general trainability of enlistment candidates when joining the military; therefore its positive association with order of merit should be expected. Consequently, the GT composite score could be used with relative confidence to predict the overall performance of prior enlisted midshipmen. Although the research suggests that prior enlisted midshipmen who attended BOOST do not perform well relative to other prior enlisted midshipmen in terms of academics, graduation statistics "paints a different picture."

When variables from enlisted service records were evaluated relative to the candidate multiple variables in a graduation model only two were significant and

positively related. The more significant of the two variables, rate of promotion, illustrated that exceptional fleet performance, characterized by high promotion rates, is a good indicator of likelihood of graduation. In fact, rate of promotion predicted probability of graduation better than any of the candidate multiple variables. The other variable, BOOST, had a coefficient of 0.5722 and was significant to the 0.10 level, inferring that one can be 90% confident that prior enlisted midshipmen who attended the preparatory school have a probability of graduation 8.85% higher than the average prior enlisted midshipman. However, note that there may be some unobserved characteristics, such as innate ability of prior enlistees, that are correlated both with high promotion rates and graduation probabilities and that explain this result. No analysis of this selection or ability bias is attempted in this thesis.

In all, eight variables from enlisted service records were evaluated. Most of these variables are not good predictors of success at the Academy. However, the fact that three of them namely, GT score, BOOST, and rate of promotion are significant predictors supports the hypothesis that the selection of prior enlisted applicants can be improved in both quality and quantity.

3. Fleet Retention

In recent years retention of junior officers has become a major problem. Several studies have been conducted to determine what can be done to remedy the problem. However, none of the solutions has been overwhelmingly successful. Recent research conducted by both Reardon and Michael suggested that instead of approaching the

retention problem from the standpoint of encouraging current officers to stay, more focus should be given to commissioning new officers who possess the characteristics of officers who typically stay in the military. Following their logic, a descriptive analysis of USNA graduate retention in terms of enlisted military experience was conducted. The results show that USNA graduates with prior enlisted experience appear to exhibit a greater desire for career military service than those with no prior enlisted experience. Based on the research undertaken here, the common characteristic of prior enlisted experience is indeed an indicator of officers who are more likely to make the military a career.

C. RECOMMENDATIONS

1. United States Naval Academy

This research has shown that midshipmen with fleet prior enlisted experience have higher graduation rates and remain in the service at higher rates. Therefore, it is warranted to recommend that USNA's Admissions Board give more consideration to enlisted military experience when calculating the Candidate Multiple. Additionally, this research has shown that the selection of qualified prior enlisted applicants could be more accurate if the Board evaluated the candidate's enlisted service record as a predictor performance. These two recommendations support the Naval Academy's goal to select the most qualified applicants with the greatest potential to graduate and pursue a career in the naval service.

An additional benefit of increasing the number of prior enlisted midshipmen is its affect on diversity at the Naval Academy. For the classes of 1990 to 1999, prior enlisted

midshipmen as a group had a representation of 42% minorities and 20% women. Given that the Naval Academy as a whole during the same period had 19% minorities and 12% women, the enlisted ranks of the fleet Navy and Marine Corps seem to be good resources from which diversity may be increased.

2. United States Navy and Marine Corps

The Navy and Marine Corps should endeavor to expand efforts to educate enlisted personnel about the Naval Academy as a means of attaining a college education, upward mobility, and quality of life enhancement. Perhaps a program run by Navy career counselors and Marine Corps career planners should be created to identify potential Naval Academy candidates after two years of enlisted service and encouraging them to apply. The two years of service ensures they have been fully indoctrinated as fleet Sailors and Marines prior to applying to the Academy. The results of this research suggest that officers with prior enlisted service performed well at the Naval Academy and are more likely to become career officers.

D. SUGGESTIONS FOR FUTURE RESEARCH

This thesis primarily focused on the performance of midshipmen with prior enlisted military experience at the Naval Academy. In the future a study of prior enlisted midshipmen might include more explanatory variables and performance measures to further substantiate, contradict, or provide alternate explanations of the results obtained in this research. Further study of information from enlisted service records such as special duty assignments, decorations and awards, and military evaluation scores may provide

additional insight on the character, capability, and career officer potential of prior enlisted applicants. Based on additional study of enlisted service records, perhaps a refinement would be made to the Candidate Multiple for prior enlisted midshipmen to give less weight to academic predictors and more to prior military performance.

Finally, a study should be conducted including other commissioning sources (i.e. ROTC, OCS, etc.) relative to USNA.

APPENDIX A. GRADUATION LOGIT MODEL RESULTS AND MARGINAL EFFECTS

```
      Total number of cases:       12822 (Unweighted)
      Number of selected cases:    12822
      Number of unselected cases: 0

      Number of selected cases:                    12822
      Number rejected because of missing data:  544
      Number of cases included in the analysis: 12278

Dependent Variable..   STRIPER

Beginning Block Number  0.  Initial Log Likelihood Function

-2 Log Likelihood   9060.4558

* Constant is included in the model.


Estimation terminated at iteration number 4 because
Log Likelihood decreased by less than .01 percent.

 -2 Log Likelihood     8765.224
 Goodness of Fit      12249.106
 Cox & Snell - R^2         .024
 Nagelkerke - R^2          .046

                     Chi-Square    df Significance

 Model                  295.232    11        .0000
 Block                  295.232    11        .0000
 Step                   295.232    11        .0000

Classification Table for STRIPER
The Cut Value is .14
                 Predicted
                 0       1      Percent Correct
                    ⇔
Observed      ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
         0    ⇔  7707 ⇔  3085 ⇔   71.41%
              ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
         1    ⇔   794 ⇔   692 ⇔   46.57%
              ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
                         Overall  68.41%


---------------------- Variables in the Equation -----------------------
```

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
SATVHI	.0021	.0005	19.0819	1	.0000	.0434	1.0021
SATMHI	.0022	.0005	15.7496	1	.0001	.0390	1.0022
OFFSTDRN	.0022	.0003	53.0285	1	.0000	.0750	1.0022
RECOMMS	.0016	.0003	21.9494	1	.0000	.0469	1.0016
COMPECA	.0043	.0005	91.0227	1	.0000	.0991	1.0043
ATHECA	.0005	.0003	3.3228	1	.0683	.0121	1.0005
NOATHECA	-.0014	.0003	28.2484	1	.0000	-.0538	.9986
TISSTD	-.0009	.0003	6.9760	1	.0083	-.0234	.9991
CISSTD	.0006	.0003	3.4207	1	.0644	.0125	1.0006
MILNOFLT	-.1908	.1192	2.5635	1	.1094	-.0079	.8263
FLEETEXP	.5467	.1105	24.4827	1	.0000	.0498	1.7275
Constant	-9.1472	.5871	242.7408	1	.0000		

Marginal Effects

VARIABLES	x bar	LOGIT	X*LOGIT	MARGINAL LOGIT*P(1-P)
(Constant)	1	-9.1472	-9.1472	-0.9718
satvhi	571.1183	0.0021	1.1993	0.0002
satmhi	660.0260	0.0022	1.4521	0.0002
recomms	864.7320	0.0016	1.3836	0.0002
compeca	549.4418	0.0043	2.3626	0.0005
noatheca	430.3361	-0.0014	-0.6025	-0.0001
atheca	435.7478	0.0005	0.2179	0.0001
offstdrn	581.5000	0.0022	1.2793	0.0002
cisstd	500.7354	0.0006	0.3004	0.0001
tisstd	492.6603	-0.0009	-0.4433943	-9.56206E-05
fltexp	0.07	0.5467	0.038269	0.058084175
milnoflt	0.13	-0.1908	-0.024804	-0.020271558
			-1.9844081	=SUM *LOGIT
Probability of Striper =		0.1208497=(1/(1+EXP(P)))		

APPENDIX B. ORDER OF MERIT LINEAR MODEL RESULTS

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.432[a]	.187	.186	297.77

a. Predictors: (Constant), FLEETEXP, TISSTD, MILNOFLT, RECOMMS, CISSTD, COMPECA, SATVHI, OFFSTDRN, SATMHI, ATHECA, NOATHECA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.4E+08	11	2.2E+07	244.976	.000[a]
	Residual	1.0E+09	11742	88668.503		
	Total	1.3E+09	11753			

a. Predictors: (Constant), FLEETEXP, TISSTD, MILNOFLT, RECOMMS, CISSTD, COMPECA, SATVHI, OFFSTDRN, SATMHI, ATHECA, NOATHECA

b. Dependent Variable: OOM

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2093.804	53.410		39.203	.000
	SATVHI	-.350	.045	-.077	-7.705	.000
	SATMHI	-1.053	.052	-.203	-20.212	.000
	RECOMMS	-.244	.030	-.071	-8.256	.000
	COMPECA	-.169	.044	-.035	-3.834	.000
	TISSTD	5.003E-02	.031	.014	1.597	.110
	CISSTD	-1.68E-02	.029	-.005	-.573	.566
	ATHECA	-1.37E-02	.025	-.010	-.556	.578
	NOATHECA	6.883E-02	.025	.051	2.735	.006
	OFFSTDRN	-.771	.029	-.256	-26.343	.000
	MILNOFLT	59.968	11.193	.063	5.358	.000
	FLEETEXP	-66.909	11.096	-.053	-6.030	.000

a. Dependent Variable: OOM

APPENDIX C. ACADEMIC ORDER OF MERIT LINEAR MODEL RESULTS

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.311[a]	.097	.096	320.13

a. Predictors: (Constant), FLEETEXP, TISSTD, MILNOFLT, RECOMMS, CISSTD, COMPECA, SATVHI, OFFSTDRN, SATMHI, ATHECA, NOATHECA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.3E+08	11	1.2E+07	112.627	.000[a]
	Residual	1.2E+09	11543	102485.2		
	Total	1.3E+09	11554			

a. Predictors: (Constant), FLEETEXP, TISSTD, MILNOFLT, RECOMMS, CISSTD, COMPECA, SATVHI, OFFSTDRN, SATMHI, ATHECA, NOATHECA

b. Dependent Variable: AOOM

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1607.810	57.885		27.776	.000
	SATVHI	-.231	.049	-.050	-4.688	.000
	SATMHI	-.790	.056	-.150	-13.999	.000
	RECOMMS	-.129	.032	-.037	-4.045	.000
	COMPECA	-8.45E-02	.048	-.017	-1.774	.076
	TISSTD	3.954E-02	.034	.011	1.164	.244
	CISSTD	-2.37E-02	.032	-.007	-.744	.457
	ATHECA	2.137E-02	.027	.015	.800	.424
	NOATHECA	2.052E-02	.027	.015	.751	.452
	OFFSTDRN	-.577	.032	-.188	-18.198	.000
	MILNOFLT	47.436	12.127	.049	3.912	.000
	FLEETEXP	-52.083	12.010	-.041	-4.336	.000

a. Dependent Variable: AOOM

APPENDIX D. MILITARY/PROFESSIONAL ORDER OF MERIT LINEAR MODEL RESULTS

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.247[a]	.061	.060	322.72

a. Predictors: (Constant), FLEETEXP, TISSTD, MILNOFLT, RECOMMS, CISSTD, COMPECA, SATVHI, OFFSTDRN, SATMHI, ATHECA, NOATHECA

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.8E+07	11	7074066	67.923	.000[a]
	Residual	1.2E+09	11543	104148.6		
	Total	1.3E+09	11554			

a. Predictors: (Constant), FLEETEXP, TISSTD, MILNOFLT, RECOMMS, CISSTD, COMPECA, SATVHI, OFFSTDRN, SATMHI, ATHECA, NOATHECA

b. Dependent Variable: MOOM

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1600.127	58.352		27.422	.000
	SATVHI	-.178	.050	-.039	-3.572	.000
	SATMHI	-.567	.057	-.109	-9.977	.000
	RECOMMS	-.210	.032	-.061	-6.525	.000
	COMPECA	-.337	.048	-.070	-7.019	.000
	TISSTD	-7.55E-02	.034	-.022	-2.204	.028
	CISSTD	-7.22E-03	.032	-.002	-.225	.822
	ATHECA	-1.65E-02	.027	-.012	-.614	.540
	NOATHECA	6.955E-02	.028	.051	2.526	.012
	OFFSTDRN	-.429	.032	-.141	-13.409	.000
	MILNOFLT	41.289	12.225	.043	3.377	.001
	FLEETEXP	-76.359	12.108	-.060	-6.307	.000

a. Dependent Variable: MOOM

APPENDIX E. GRADUATION LOGIT MODEL RESULTS AND MARGINAL EFFECTS

Regression Results

```
Total number of cases:       12822 (Unweighted)
Number of selected cases:    12822
Number of unselected cases: 0

Number of selected cases:                        12822
Number rejected because of missing data:         544
Number of cases included in the analysis:        12278
```

```
Dependent Variable..   GRADUATE

Beginning Block Number  0.  Initial Log Likelihood Function

-2 Log Likelihood   13058.769

* Constant is included in the model.

Estimation terminated at iteration number 3 because
Log Likelihood decreased by less than .01 percent.

 -2 Log Likelihood    12854.451
 Goodness of Fit      12298.121
 Cox & Snell - R^2         .017
 Nagelkerke - R^2          .025

                     Chi-Square    df Significance

 Model                  204.318    11        .0000
 Block                  204.318    11        .0000
 Step                   204.318    11        .0000

Classification Table for GRADUATE
The Cut Value is .50
                 Predicted
                 0       1      Percent Correct
Observed      ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
   0          ⇔      5 ⇔  2744 ⇔     .18%
              ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
   1          ⇔      5 ⇔  9524 ⇔   99.95%
              ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
                         Overall  77.61%
```

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
SATVHI	3.69E-05	.0004	.0106	1	.9181	.0000	1.0000
SATMHI	.0037	.0004	82.8136	1	.0000	.0787	1.0037
OFFSTDRN	.0012	.0002	27.7655	1	.0000	.0444	1.0012
RECOMMS	.0010	.0002	19.0681	1	.0000	.0362	1.0010
COMPECA	.0018	.0004	26.3347	1	.0000	.0432	1.0018
ATHECA	.0002	.0002	1.0271	1	.3108	.0000	1.0002
NOATHECA	-.0007	.0002	14.1509	1	.0002	-.0305	.9993
TISSTD	.0005	.0002	3.3986	1	.0653	.0103	1.0005
CISSTD	9.09E-05	.0002	.1523	1	.6964	.0000	1.0001
MILNOFLT	.1026	.0901	1.2985	1	.2545	.0000	1.1081
FLEETEXP	.2441	.0909	7.2088	1	.0073	.0200	1.2765
Constant	-3.8470	.4202	83.8109	1	.0000		

Marginal Effects

VARIABLES	x bar	LOGIT	X*LOGIT	MARGINAL LOGIT*P(1-P)
(Constant)	1	-3.756	-3.756	-0.6448
satvhi	571.1183	-0.00001	-0.0057	0.0000
satmhi	660.0260	0.0037	2.4421	0.0006
recomms	864.7320	0.001	0.8647	0.0002
compeca	549.4418	0.0019	1.0439	0.0003
noatheca	430.3361	-0.0008	-0.3443	-0.0001
atheca	435.7478	0.0001	0.0436	0.0000
offstdrn	581.5000	0.0012	0.6978	0.0002
cisstd	500.7354	0.000082	0.0411	0.0000
tisstd	492.6603	0.0005	0.2463302	8.58359E-05
fltexp	0.07	0.231	0.01617	0.039656195
milnoflt	0.13	-0.1908	-0.024804	-0.032754987
			1.2649188=SUMX*LOGIT	
Probability of Graduation=		0.7798717=(1/(1+EXP(P)))		

APPENDIX F. GRADUATION LOGIT MODEL WITH SERVICE RECORD VARIABLES REGRESSION RESULTS AND MARGINAL EFFECTS

Regression Results

```
      Total number of cases:      12822 (Unweighted)
      Number of selected cases:   12822
      Number of unselected cases: 0

      Number of selected cases:                    12822
      Number rejected because of missing data:  12003
      Number of cases included in the analysis: 819
Dependent Variable..   GRADUATE

Beginning Block Number  0.  Initial Log Likelihood Function

-2 Log Likelihood   854.95334

* Constant is included in the model.
Beginning Block Number  1.  Method: Enter
Estimation terminated at iteration number 4 because
Log Likelihood decreased by less than .01 percent.

 -2 Log Likelihood      816.594
 Goodness of Fit        838.615
 Cox & Snell - R^2         .046
 Nagelkerke - R^2          .071

                     Chi-Square    df Significance

 Model                  38.360    16        .0013
 Block                  38.360    16        .0013
 Step                   38.360    16        .0013

Classification Table for GRADUATE
The Cut Value is .50
                 Predicted
                  0       1     Percent Correct

Observed      ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
        0     ⇔    2  ⇔  175  ⇔    1.13%
              ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
        1     ⇔    3  ⇔  639  ⇔   99.53%
              ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
                         Overall  78.27%


---------------------- Variables in the Equation -----------------------

Variable            B       S.E.      Wald     df       Sig        R     Exp(B)
```

OFFSTDRN	.0018	.0011	2.5717	1	.1088	.0259	1.0018
SATVHI	-.0026	.0014	3.5919	1	.0581	-.0432	.9974
SATMHI	.0030	.0015	3.8810	1	.0488	.0469	1.0030
RECOMMS	.0022	.0010	5.4845	1	.0192	.0638	1.0023
COMPECA	-.0014	.0012	1.2316	1	.2671	.0000	.9986
TISSTD	-.0010	.0010	.9015	1	.3424	.0000	.9990
CISSTD	-.0012	.0010	1.2095	1	.2714	.0000	.9988
ATHECA	.0020	.0010	4.1152	1	.0425	.0497	1.0020
NOATHECA	-.0020	.0009	4.6547	1	.0310	-.0557	.9980
MARINES	-.2011	.2836	.5029	1	.4782	.0000	.8178
PROMRATE	.9186	.4277	4.6131	1	.0317	.0553	2.5058
YOS	.3729	.2626	2.0169	1	.1556	.0044	1.4519
PAYGRADE	-.2654	.2074	1.6378	1	.2006	.0000	.7669
NAPS	.2375	.4563	.2709	1	.6027	.0000	1.2681
BOOST	.5722	.3375	2.8740	1	.0900	.0320	1.7722
TECH_MOS	.3509	.2421	2.1008	1	.1472	.0109	1.4204
Constant	-1.9984	2.1049	.9013	1	.3424		

Marginal Effects

VARIABLES	x bar	LOGIT	X*LOGIT	MARGINAL LOGIT*P(1-P)
(Constant)	1	-1.9984	-1.9984	-0.3475
satvhi	549.1534	-0.0026	-1.4278	-0.0005
satmhi	640.7614	0.003	1.9223	0.0005
recomms	877.4364	0.0022	1.9304	0.0004
compeca	511.5682	-0.0014	-0.7162	-0.0002
noatheca	288.2045	-0.002	-0.5764	-0.0003
atheca	269.7330	0.002	0.5395	0.0003
offstdrn	501.3900	0.0018	0.9025	0.0003
cisstd	510.9114	-0.0012	-0.6131	-0.0002
tisstd	489.3557	-0.001	-0.4893557	-0.000173885
marines	0.13	-0.2011	-0.026143	-0.03496826
promrate	1.5337	0.9186	1.4088568	0.1597307
yos	2.72	0.3729	1.014288	0.064841692
paygrade	3.8	-0.2654	-1.00852	-0.046149061
NAPS	0.5	0.2375	0.11875	0.041297672
BOOST	0.15	0.5722	0.08583	0.099496959
tech_mos	0.5	0.3509	0.17545	0.061016223
			1.2418714 =SUM X*LOGIT	
Probability of Graduation =	0.7758896=(1/(1+EXP(P)))			

APPENDIX G. OOM LINEAR MODEL WITH SERVICE RECORD VARIABLES

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9456243	17	556249.6	6.049	.000[a]
	Residual	7.3E+07	799	91949.739		
	Total	8.3E+07	816			

a. Predictors: (Constant), GTSCORE, Competitive Eca, MARINES, OFFSTDRNK, CIS STD, Recommendations, SATV HI, PAYGRADE, TIS STD, SATM HI, rate of promotion, All who went to naps, those who attended boost, TECH_MOS, YOS, Athletic Eca, Non Athletic Eca

b. Dependent Variable: OOM

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1449.167	256.271		5.655	.000
	SATV HI	-.156	.168	-.035	-.928	.354
	SATM HI	-.560	.186	-.115	-3.007	.003
	Recommendations	-.266	.123	-.075	-2.161	.031
	Competitive Eca	.230	.155	.057	1.484	.138
	TIS STD	.110	.124	.032	.886	.376
	CIS STD	-7.67E-02	.125	-.021	-.615	.539
	Athletic Eca	-.175	.114	-.144	-1.538	.124
	Non Athletic Eca	.112	.111	.096	1.000	.317
	OFFSTDRNK	-.641	.136	-.168	-4.725	.000
	YOS	25.951	27.835	.070	.932	.351
	PAYGRADE	-10.064	22.745	-.028	-.442	.658
	All who went to naps	-32.465	55.528	-.051	-.585	.559
	those who attended boost	89.334	40.093	.101	2.228	.026
	MARINES	-4.497	37.757	-.005	-.119	.905
	TECH_MOS	-36.884	30.133	-.058	-1.224	.221
	rate of promotion	-6.979	37.293	-.014	-.187	.852
	GTSCORE	-.594	.195	-.104	-3.044	.002

a. Dependent Variable: OOM

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APPENDIX H. GRADUATION MODEL OF MIDSHIPMEN WITH FLEET EXPERIENCE WITHOUT ENLISTED MASTER FILE VARIABLES

```
Total number of cases:       880 (Unweighted)
Number of selected cases:    880
Number of unselected cases: 0

Number of selected cases:                          880
Number rejected because of missing data:  8
Number of cases included in the analysis: 872

Dependent Variable..   GRADUATE

Beginning Block Number  0.  Initial Log Likelihood Function

-2 Log Likelihood   898.66696

Beginning Block Number  1.  Method: Enter

Estimation terminated at iteration number 3 because
Log Likelihood decreased by less than .01 percent.

 -2 Log Likelihood      875.670
 Goodness of Fit        884.133
 Cox & Snell - R^2         .026
 Nagelkerke - R^2          .040
                     Chi-Square    df Significance

 Model                   22.997     9        .0062
 Block                   22.997     9        .0062
 Step                    22.997     9        .0062

Classification Table for GRADUATE
The Cut Value is .50
                 Predicted
                                 Percent Correct
                  0  ⇔    1
Observed      ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
   0          ⇔    0  ⇔  184  ⇔     .00%
              ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
   1          ⇔    1  ⇔  687  ⇔   99.85%
              ⇧⇩⇩⇩⇩⇩⇩⇩⇧⇩⇩⇩⇩⇩⇩⇩⇧
                         Overall  78.78%
```

---------- Variables in the Equation ----------

Variable	B	S.E.	Wald	df	Sig	R	Exp(B)
SATVHI	-.0029	.0013	4.7536	1	.0292	-.0554	.9971
SATMHI	.0030	.0014	4.5275	1	.0334	.0530	1.0030
RECOMMS	.0021	.0009	5.4202	1	.0199	.0617	1.0021
COMPECA	-.0016	.0011	1.9555	1	.1620	.0000	.9984
NOATHECA	-.0018	.0008	5.5058	1	.0190	-.0625	.9982
ATHECA	.0020	.0009	5.5905	1	.0181	.0632	1.0020
OFFSTDRN	.0014	.0011	1.7001	1	.1923	.0000	1.0014
CISSTD	-.0010	.0010	1.0246	1	.3114	.0000	.9990
TISSTD	-.0006	.0010	.3770	1	.5392	.0000	.9994
Constant	.0839	1.7178	.0024	1	.9610		

APPENDIX I. OOM MODEL OF MIDSHIPMEN WITH FLEET EXPERIENCE WITHOUT ENLISTED MASTER FILE VARIABLES

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6849977	9	761108.6	8.015	.000[a]
	Residual	8.2E+07	861	94956.671		
	Total	8.9E+07	870			

a. Predictors: (Constant), OFFSTDRN, COMPECA, RECOMMS, CISSTD, SATVHI, TISSTD, ATHECA, SATMHI, NOATHECA

b. Dependent Variable: OOM

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1758.457	216.866		8.108	.000
	SATVHI	-.274	.162	-.061	-1.692	.091
	SATMHI	-.754	.174	-.154	-4.320	.000
	RECOMMS	-.340	.115	-.097	-2.947	.003
	COMPECA	.111	.142	.028	.778	.437
	NOATHECA	.116	.096	.101	1.209	.227
	ATHECA	-.113	.101	-.093	-1.118	.264
	CISSTD	-6.15E-02	.122	-.017	-.502	.615
	TISSTD	3.088E-02	.121	.009	.255	.799
	OFFSTDRN	-.710	.130	-.187	-5.467	.000

a. Dependent Variable: OOM

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