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UNDERGRADUATE ACADEMIC ACHIEVEMENT AS AN INDICATOR OF FLEET PERFORMANCE AND RETENTION

by

John D. Gremillion

August 1998

Thesis Co-Advisors: Alice Crawford
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This research analyzes the relationship between academic performance and fleet performance and retention of United States Naval Academy graduates. Linear regression and LOGIT models are developed for USNA classes of 1980 through 1985 to analyze the effect of explanatory variables on the measures of occupational success, fitness reports (FITREPS) and retention in the Navy.

Understanding the relationship between college academic performance and job performance is important because of the organizational and cultural emphasis placed on academic grades. At the Naval Academy, high academic performance affords midshipmen extra privileges and, most importantly, precedence for service selection.

Analysis of academic factors and several other explanatory variables, both academic and military, shows that academics accounts for only a small percent of the variation in fitness report grades. Subjective criteria, such as military performance grades, proved much more predictive than course grades for both performance and retention. This study recommends that the component weighting of order of merit calculation be revisited. That way, midshipmen and Naval Academy focus is realigned to emphasize factors predicting occupational success.

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This research analyzes the relationship between academic performance and fleet performance and retention of United States Naval Academy (USNA) graduates. Linear and LOGIT regression models are developed for USNA classes of 1980 through 1985 are developed to analyze the effect of explanatory variables on the measures of occupational success, fitness reports (FITREPs) and retention in the Navy.

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I. INTRODUCTION

> It is by no means enough that an officer of the Navy should be a capable mariner. He must be that, of course, but also a great deal more. He should be as well a gentleman of liberal education, refined manners, punctilious courtesy, and the nicest sense of personal honor....In one word, every commander should keep constantly before him the great truth, that to be well obeyed, he must be perfectly esteemed (Reef Points, 1998).

A. BACKGROUND

The above quote is taken from a compilation of phrases from John Paul Jones, American patriot and father of the United States Navy. It is interesting to note the wide range of characteristics that he believes are required of a naval officer. Most significantly, he claims that being a good mariner is only a portion of being a good naval officer. That is similar to saying being proficient in math is only a portion of being a good accountant. The point John Paul Jones is making is that naval officers, and their brethren in the other services, are required to be people with broad ranges of abilities other than their primary jobs of driving ships and submarines and flying airplanes.

The Naval Academy has a very different mission when compared to its counterparts, civilian colleges and universities. Unlike the Naval Academy, civilian institutions seek to produce an expert in a specific field. For example, a civilian student majoring in mechanical engineering takes numerous classes in the engineering field and an associated number of core curriculum courses. Upon graduation, a civilian will hopefully find employment in an organization designing, fabricating, or testing some sort of structure or device. As career

progression continues, the engineer works to become more of an expert in that particular field, continually working to stay on the cutting edge of technology, design techniques, and manufacturing processes.

After graduating from the Naval Academy, a mechanical engineer could be an aviator, ship driver, or submarine driver. During a first tour of duty, a junior officer could be responsible for a ship's propulsion plant or weapons systems, a budget up to several hundred thousand dollars, and the work and well-being of a dozen to one hundred personnel. As an officer's career progresses, opportunities become available to work in various jobs besides shipboard billets. When assigned to shore duty, an officer may be assigned to numerous duties including instructor duty, personnel assignments, research stations, intelligence gathering, and staff positions.

Although the primary jobs of naval officers deal with a wide variety of weapons platforms, other necessary personal skills and roles include, but are not limited to, the following: attention to detail, strategic thinking, tactical expert, professional competence, consoler, disciplinarian, teacher, parent, role model, and motivator. All of the aforementioned qualities apply to officers, but surprisingly few are directly related to sailing and flying. These other characteristics temper a manager of things into a leader of people.

Part of the Academy's official mission is to develop midshipmen mentally and physically (Reef Points, 1998). However, the mission also speaks of moral development, and imbuing midshipmen with "the highest ideals of duty, honor, and loyalty" (Reef Points, 1998). Field Marshal Montgomery believed that "the beginning of leadership is a battle for

the hearts and minds of men" (Montgomery, 1961). General Matthew B. Ridgway, former Army Chief of Staff, based his philosophy of leadership upon what he called "the three C's--character, courage, and competence" (Taylor, 1984). A consolidation of the three

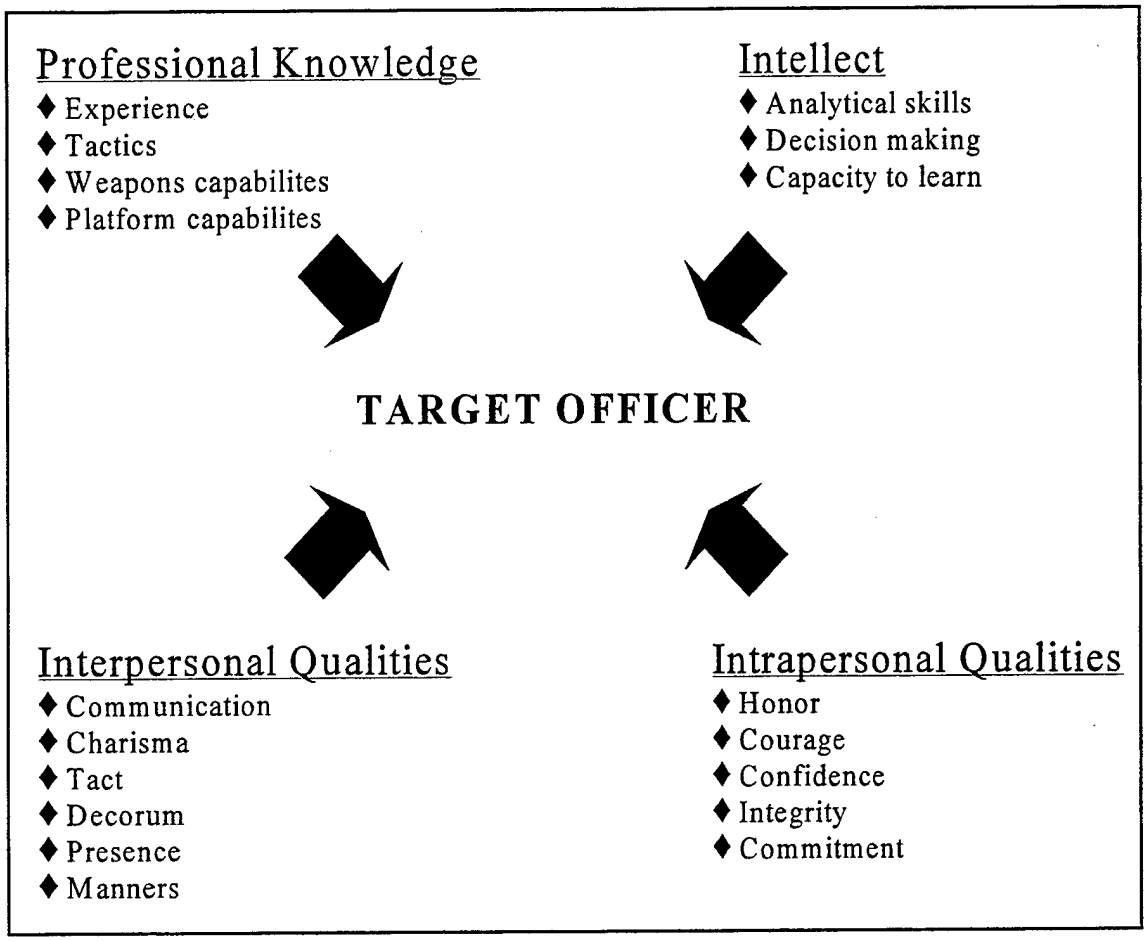


Figure 1. Desired qualities of an officer.

descriptions of leadership is presented in Figure 1. Between John Paul Jones' qualifications, General Ridgway's personal philosophy, and the Naval Academy's mission statement, leadership appears to be a slippery concept that can only be described, not quantified. Herein

lies the problem of creating an academic curriculum to train young adults to become the leaders of tomorrow's Navy and Marine Corps: How does an institution develop a course of study, consisting of graded requirements and merit-based rankings, that will prepare midshipmen for the fleet and give an accurate assessment of leadership potential?

This thesis explores the relationship between academic performance and job performance by studying graduates of the United States Naval Academy (USNA). Although the observation group and hypotheses are oriented to the Naval Academy, the study may more widely applicable. Any organization would benefit from a method that will more accurately predict job performance from empirical data rather than vague, opinion-based criteria.

B. OBJECTIVES

The overall purpose of this research is to assist the Naval Academy in maintaining an organization whose policies are based on empirical research rather than trial-and-error approximations. More precisely, this study analyzes the relevance of academic success at the Naval Academy as a method of ranking for service selection, predicting fleet performance, and predicting officer retention. Based on the results of this analysis, pertinent recommendations can be forwarded to the United States Naval Academy's staff for consideration.

What this thesis does not attempt to do is devalue the atmosphere of academia nor suggest drastic changes to the curriculum. It is obvious that having academically accredited

majors is very important to maintain the Naval Academy's national reputation as an institute of higher learning. Indeed, John Paul Jones himself decreed that a naval officer should be a person of liberal education (Reef Points, 1998).

What is under scrutiny by this thesis is the institutional emphasis placed on academic achievement by the Naval Academy. Scholastic aptitude is more crucial for success at the Academy than physical fitness, conduct, or even military performance. For example, if a midshipman is scholastically strong, then more time and energy can be applied to athletics or military bearing. Conversely, weak academic performers must direct their efforts to studying. Because time is a finite resource, extra time for study comes at the expense of other non-academic activities.

Academic performance can also impose restrictions on a midshipman's most cherished commodity, liberty. During the semester, personnel may not take weekends off if their quality point rating (QPR) drops below a 2.15, are failing a class, or have more than one "D" in their classes (COMDTMIDNINST 5400.6). If any of these conditions exist when end of semester grades are released, the midshipman may not take weekends off for the entire following semester.

Besides time management and extra privileges, strong academic performance may also assist one in obtaining positions, called striper billets, in the midshipman chain of command. The Brigade of Midshipmen is managed by the midshipmen, who in turn are guided by Company Officers and Company Chiefs. It is generally believed within the brigade of midshipmen that striper selection, a prime opportunity for leadership training, is

merely a reward for academic success. Certainly, Company Officers do take into account a midshipman's academics when selecting personnel to assume next semester's billets. If a midshipman is struggling with classes, then the extra time and duties required of a striper are very likely to hinder classroom effectiveness even more.

More important than extra privileges or striper billets, service selection can affect a midshipman's entire naval career; service selection is when midshipmen choose the warfare community in which they wish to serve. Midshipmen choose communities based upon their order of merit, an aggregate multiple of the midshipman's grades in academics, athletics, conduct, and military performance. If the midshipman's order of merit is too low, certain highly competitive billets such as aviation or nuclear power may not be available. Unfortunately, surface warfare ends up being the catch-all for midshipmen who fail to select their first choices. Because academic QPR is so heavily weighted in order of merit computation, grades become the most important factor in deciding the course of a midshipman's career.

C. RESEARCH QUESTIONS

This research examines the following questions associated with academics and performance:

- Do midshipmen who graduate at the top of their class make the best officers, and does this start them on the career fast-track?

- Do midshipmen who struggle academically have the necessary cognitive skills to make good officers?
- Are the best and brightest junior officers leaving the service?
- Do well rounded personnel (i.e., athletes, club members, high academic credentials) make the best leaders?
- Is academic performance an accurate predictor of workplace performance for Naval Academy graduates?

For the purpose of this research, workplace performance is measured by officer fitness reports (FITREPs) and retention in the military.

The research questions are investigated through a review of the literature and multi-variate analysis of data from a group of Naval Academy graduates. The Naval Academy is a very homogenous group because all midshipmen have similar undergraduate experiences. All midshipmen take the same core courses, are subject to the same performance evaluation system, and are all employed by the military upon graduation. Additionally, once commissioned, all naval officers are subject to the same, universal fitness report criteria. These environmental conditions provide a unique opportunity to study undergraduate academic performance as a predictor of job performance.

This study focuses on Naval Academy personnel graduating in the classes of 1980 to 1985. These year groups were chosen in order to capture retention rates for the three major warfare communities and to establish a reliable record of performance evaluations for each individual.

Each service community has different service obligations upon graduation. For example, all surface warfare officers and submariners have a five-year service obligation after graduating. Following the initial five-year obligation, an officer can decide to continue in the Naval or submit a letter of resignation. Unlike their colleagues on ships, the Navy requires aviators to serve seven years after earning their wings at flight school. Due to backlogs in the training pipeline and open time between one school ending and another beginning, aviator trainees can take anywhere from two to four years to earn their wings. In total, an aviator's initial service obligation is usually nine to ten years, as opposed to five years for officers in surface warfare and submarine communities. To examine retention in the three main warfare communities, the study requires an observation group with at least ten years of active duty service.

The other important reason for selecting the classes of 1980 to 1985 is to allow sufficient fleet time for personnel to establish an accurate performance record. FITREPs are written semiannually for Ensigns and Lieutenant Junior Grades, then annually once promoted to Lieutenant. Traditionally, the first FITREP a junior officer receives at a new command is neutral because the Commanding Officer has not had sufficient time to gauge the new officer's performance. Likewise, the last FITREP when detaching a command is called a "goodbye kiss" evaluation. In other words, the command may give the officer a very good report as a farewell pat on the back. However, during the first five years of sea duty, training schools not included, an officer can expect to receive approximately six or seven FITREPs, which should create a reliable representation of performance.

D. ORGANIZATION OF THE STUDY

The study is divided into six chapters and one appendix. Chapter II presents a brief history of the Naval Academy while describing the terminology and events pertinent to this study. Most importantly, this chapter reviews the evolution of the Academy's curriculum and calculation of order of merit. Chapter III reviews literature relevant to the relationship between academic performance and job performance. Chapter IV discusses the data set and the methods used for analysis. Chapter V reviews the findings of the data analysis and determines whether or not the proposed questions are supported. Chapter VI provides a brief research summary, conclusion of findings, recommendations, and recommendations for further research.

II. UNITED STATES NAVAL ACADEMY

Although the title of midshipman is somewhat ambiguous, being neither enlisted nor commissioned, it is part of a colorful distinguished history. After Great Britain's wars with France and Spain in the mid-1600s, the Royal Navy was expanding to protect the empire's flourishing empire. The Navy's High Command began to direct attention to the training of young officers to command the growing fleet. Without a new source of officers, some government officials said they would have to rely on "men who were bred from the swabbers" to command the new vessels (Lovette,1941).

The wooden ships under construction were so large that it was difficult to relay messages from the forward forecastle and the aft quarterdeck. Alert, intelligent men were assigned the midships area in order to relay messages fore and aft. The midships messengers, eventually called midshipmen, were positions of prestige and assured advancement in rate. In 1676, official recognition was given to the title of midshipman (Lovette, 1941).

At that time, there was no formal means of educating the young midshipmen. Any formal instruction they received was by their own efforts through numerous private schools out in town. One such school, circa 1720, placed this advertisement:

> ... in Bond Street, Wapping, near Wapping New Stairs, are taught the Mathematical Sciences, Navigation, Astronomy, Dialling, Gauging, Gunnery, Fortification, the use of the Globes and the projection of a Sphere upon any Circle, by Joshua Kelly, Mariner; with whom Young Gentlemen and others are well boarded and completely and expeditiously qualified (on reasonable terms) for any business relating to the accompts and the Mathematicks

(Lovette, 1941).

To remedy the diverse, unstandardized training of junior officers, the British Naval Academy was established in 1728 (Lovette, 1941). Like numerous aspects of American culture, many of Britain's naval customs and traditions were carried over into the United States Navy.

A. HISTORY OF THE NAVAL ACADEMY

The United States Navy experienced a renaissance after the War of 1812 with a surge in the numbers of both vessels and sailors. Other major undertakings was reorganizing the War Department, reforming the Army's officer training program at the United States Military Academy (USMA or West Point), and pushing for the establishment of a permanent naval school ashore for training new officers.

1. Fighting for a Naval School Ashore.

Beginning in 1814, several Navy Secretaries, with the backing of a few high ranking naval officers, petitioned to establish a shore school for training prospective naval officers (Lovell, 1979). Congress was unenthusiastic, and many naval officers mocked the idea of a naval school on land. One naval officer was quoted to say that "you could no more educate sailors in a shore college than you could teach ducks to swim in a garrett" (Lovette, 1941). The issue of a land-based naval school remained undecided for several years because support had split between the inland states and coastal states. The inland states saw no merit in the idea. On the other hand, the coastal states endorsed the plan because they would directly

benefit from government tax dollars funneled into schools, personnel, and ships residing in their lands and harbors.

After years of political dueling, real progress was made by trickery. George Bancroft had became Secretary of the Navy in March, 1845 (Lovell, 1979). Without Congressional knowledge, he struck a deal with Secretary of War William L. Marcy for Fort Severn at Annapolis, Maryland. The Army post and accompanying lands would be turned over to the Navy to be used as the new naval school. The Examining Board for Midshipmen, an advisory board composed of Naval Officers, debated the issue for twelve days before finally approving the plan.

Two incidents helped qualm Congressional displeasure concerning this slight-of-hand. First, Midshipman Philip Spence, son of the Secretary of War, was hanged for participating in a mutiny (Lovell, 1979). The ensuing investigation received extensive publicity and resulted in support to amend the problems causing the mutiny. Second, the Industrial Revolution tolled the end of sail as a part of a modern navy. In 1837, the United States Navy's first steam warship, the Fulton, was launched. Money was appropriated for three more to follow (Lovell, 1979). Technology created an end to the traditional naval officer and the advent of a new technical officer. Advances such as steam propulsion, turbines, steel-hulled ships, rifled gun barrels, and breech-loaded weapons meant naval officers needed more technical knowledge and new warfare tactics to survive in battle (Lovell, 1979).

2. Naval Academy Established.

On the evening of Friday October 10, 1845, the years of struggle to establish a naval school on shore ended. Commander Franklin Buchanan, as the first Superintendent, addressed forty midshipmen and faculty (Lovette, 1941). The staff's enthusiasm and dedication made up for the poor material condition of the Academy. The buildings inherited from Fort Severn were dilapidated and the grounds were only about ten acres in size.

Superintendent Buchanan's right hand was Lieutenant James H. Ward, who served double duty as the Academy's Executive Officer and instructor in gunnery and steam. Surgeon John A. Lockwood taught chemistry, Chaplain George Jones taught English, Professor Arsene N. Girault taught French, and Professor Henry H. Lockwood taught natural philosophy. Professor William Chauvenet was responsible for both mathematics and navigation, with Passed Midshipman S. Marcy assisting in mathematics (Lovette, 1941).

Between the loyal faculty and willing new midshipmen, the Naval Academy operated as best it could for several years until the outbreak of the Civil War. With troubled consciences and torn loyalties, most southern midshipmen broke ranks and headed home to defend their family and homeland. Due to the proximity to Confederate territory, the Naval Academy was temporarily moved to Fort Adams in Newport, Rhode Island for the remainder of the war (Lovette, 1941).

3. Post-Civil War.

After hostilities ceased, the Academy then came under attack from within. The Board of Visitors of 1864 recommended that the Naval Academy be completely disbanded. Instead

of one naval school, the Board proposed seven separate schools. Fortunately, congress decided to return the Academy to Annapolis in 1864 (Lovette, 1941). Both the Navy and the Naval Academy suffered for many years after the Civil War. The war had seen the introduction of numerous revolutionary advances in maritime technology. However, one major setback was that the new steam plants required coaling stations across the oceans which the United States did not have. As a result, ships still cruised by sail.

During the Spanish-American War, the Navy played a critical role. As a result of the war, the United States became a major world power with possessions across the world. New territories included Hawaii, Guam, Philippines, Puerto Rico, and special privileges in Cuba. President Theodore Roosevelt, a great supporter of the Navy, was determined to make good use of the United States' new found power. He pushed a series of bills through Congress that increased the Navy's annual appropriations by fifty percent (Lovell, 1979).

While the fleet was undergoing a period of expansion, so was the Naval Academy. In 1868, four acres of land and the old Maryland Governor's mansion were bought. Strawberry Hill, now the cemetery, was also acquired. New quarters for staff were built along with a brick chapel (Lovette,1941). The turn of the century saw another building frenzy at the Academy, resulting in a Yard almost identical to today. In 1901, construction began on Bancroft Hall, with new wings added in 1918 and 1941. In 1904, construction on the new chapel commenced and the Superintendent's house was completed. The new administration building, Mahan Hall, Maury Hall, and Sampson Hall were completed in 1907 (Lovette, 1941).

In 1916, courses were shortened and recitations increased to prepare for the United States' entry into World War I. Classes graduated early to meet the increased wartime demands (Lovette, 1941).

4. World War II.

Prior to World War II, President Franklin D. Roosevelt convinced Congress to increase defensive readiness, especially a two-ocean Navy. Congress appropriated money to increase the Navy's budget by twenty percent. Compared to the previous class, the new class of midshipmen entering the Academy in the summer of 1938 had significantly increased in size from 560 to 741 (Lovell, 1979).

When World War II did erupt, just like the previous world war, all of the service academies shortened their academic programs to meet the increased need for officers. The first courses to go were English, history, and the social sciences (Lovette, 1941). By cramming courses together and allowing minimal leave time, 88 percent of the normal course load was given in only three years (Lovette, 1941). By the fall of 1941, the brigade numbered over 3,000 personnel. Because of the accelerated schedule, the class of 1942 graduated in December 19,1941 and the class of 1943 followed shortly thereafter in June of 1942.

5. Post-World War II.

Much like the Civil War, World War II brought about many technological changes that effected the course of the Navy and the Academy. Radar, sonar, proximity fuses, jet turbines, atomic weapons, and the aircraft carrier replacing the battleship as the queen of battle are but a few. Also, old technology such as submarines, rockets, mines, and armor had

been greatly refined since their introduction in World War I. Most all of these changes in technology and tactics found their way into the military training and academic courses of the midshipmen.

B. BALANCING ACADEMICS AND THE MILITARY

In the age of sail, a midshipman's education was mainly limited to shipboard experiences. Some captains took an active interest in training midshipmen. On the other hand, others believed that the best training was "for the midshipmen to do what they are told and that a rope's end or a foot helped to expedite the execution" (Lovette, 1941). Many times, midshipmen spent their brief time ashore in private schools to learn navigation and other topics. In other words, whatever formal education midshipmen acquired was on their own time and at their own expense.

The Naval Academy was based on the educational system at West Point, which was rather revolutionary for that time. West Point's system shifted from the deductive to the experimental, from knowledge for the sake of knowledge to applicable math and sciences. For years, West Point remained one of the few schools in the United States that helped meet the demand for engineers to build roads, railroads, bridges, dams, canal design, and exploration (Lovell,1979).

Initially, the energy behind developing the Academy's academic program came from William Chauvenet. Chauvenet was well versed in teaching maritime subjects. After graduating from Yale, Chauvenet was president of a very successful private school that

honed prospective midshipmen's academic skills to pass their pre-commissioning exams (Lovell, 1979).

The Naval Academy's first curriculum of study was a year of school, then a six-month probationary period at sea. If the young men performed well, as determined by evaluations from the ship's Commanding Officer, they received warrants as midshipmen. After a total of three years at sea, the midshipmen returned to Annapolis for another year of academics. Upon completion of school, the last hurdle was to pass the examinations for Lieutenant (Lovette, 1941).

1. Post Civil War Curriculum.

After the war, Superintendent David D. Porter began to modernize the academic curriculum. Admiral Porter created the Department of Steam Engineering and made other changes that some say evolved the Academy from a "high school to a college" (Lovell, 1979). Also during his tenure, Porter instituted weekly dances for recreation and morale, drill and dress parades, and the first honor system. No different now than one hundred years ago, the Navy resisted Porter's endeavors to change the organization or curriculum of the Naval Academy.

The first Board of Visitors, lead by Admiral Dahlgren, addressed the new changes in the Academy curriculum. The Board recommended that the relative weights be increased in gunnery, seamanship, naval tactics, fencing, drawing, Spanish, and French while decreasing the weight of mathematics. Even bolder, he suggested that astronomy, mechanics, physics, moral science, law, history, and composition be dropped from the curriculum.

Dahlgren claimed these topics could be covered by what he termed "familiar lectures" (Lovette, 1941).

Admiral Christopher Rodgers, nephew of Commodore Oliver Hazard Perry, became Superintendent of the Academy in 1874. A strong advocate of education, Rodgers felt that the midshipmen required a more challenging regime. Differential and integral calculus were added to mathematics, while Spanish was added to language instruction (Lovell, 1979). Rodgers also added elective courses for midshipmen doing exceedingly well in their courses. In 1882, Congress abolished the distinction between cadet midshipmen, the regular student, and cadet engineers, who followed a different course of study. As a result, the Academy abandoned elective courses and the curriculum would remain basically unchanged for the next 75 years (Lovell, 1979).

2. Post-World War II Curriculum

War, as always, proved to be a catalyst for technology. Aircraft had replaced battleships as the critical tool of war and aircraft carriers became the centerpiece of a modern battle group. In fact, Secretary of the Navy Forrestal was an aviator himself. The Naval Academy became the first service academy to create a separate Department of Aeronautics. (Lovell, 1979). Also during this post-war period, the Academy introduced courses in applied psychology in leadership training, although no separate department of leadership or psychology was created.

The military began to show a growing interest in the social sciences and humanities during World War II. Officers were faced with considerable social, political, and economic

problems in Europe and Asia. In general, military officers had little formal training in these areas and were not properly prepared for the challenges. At the Naval Academy, science and engineering dominated 48 percent of instructional time, while only 26 percent for the social sciences and humanities and 26 percent for professional courses (Lovell, 1979).

3. Rickover's Assault: 1950s and Early 1960s.

This interesting period began in 1959 when Vice Admiral Rickover, himself an Academy graduate, delivered a report to the House Appropriations Committee. Initially, the report related his assessment of Soviet scientific and technological education following the launch of Sputnik. One particular part of the report denigrated the Academy for its "mediocre academic program" and demanded change (Lovell, 1979). After this first report, Rickover's attack on the Academy's curriculum became an annual occurrence (Lovell, 1979).

After several years of Rickover's pressuring, prodding by the Board of Visitors, and awakening in the aftermath of Sputnik, the wheels of change finally began to turn. Rear Admiral Charles Melson, after becoming Superintendent in 1958, spearheaded a review and modernization of the Academy's curriculum (Lovell, 1979). The crux of the modernization was a shift from the traditional trade school mentality to a course of study that taught basic principles and developed analytical skills (Lovell, 1979). An example of this shift was replacing courses like Naval Boilers and Naval Machinery with Thermodynamics and Fluid Mechanics. Changes instituted by Admiral Melson and the Board of Visitors were put into effect for the 1959-1960 school year.

In 1962, Secretary of the Navy Fred Korth announced a major policy change

concerning the Academy's faculty. The policy declared that all commissioned officers serving as instructors would be replaced by civilians, except for officers in the Division of Naval Science. If all went as planned, the turnover would be accomplished gradually as new civilian instructors replaced officers at the end of their tour of duty. All of the civilian instructors would be required to have at least a master's, if not a doctoral degree, as compared to military instructors who rarely had more than a bachelor's degree. One final step in the new policy was to appoint a civilian to the position of Academic Dean.(Lovell, 1979).

By 1967, the Naval Academy's formal mission statement had been changed from producing "capable junior officers" to "graduates who are dedicated to a career of naval service and have potential for future development" (Lovell, 1979). Now, in the wake of reform, some believed that the Academy had shifted its focus too far towards academics at the expense of professionalism. Summer cruises, one example of the shift, became neglected by the Academy administration. As a result, summer training time was not spent effectively and midshipmen were not motivated for at sea training.

Admiral James Calvert arrived to relieve Kauffman as Superintendent in 1968. During the turnover briefing, Calvert was informed of a "serious loss of professional emphasis" that had manifested while updating the Academy's curriculum (Lovell, 1979). Calvert attacked this problem by revitalizing the summer cruises. All midshipmen were attached to four ships, two ships on each coast. The particular ships were selected because their captains would ensure that the midshipmen would receive consistent quality

training (Lovell, 1979).

In the spring of 1969, Calvert set into motion a major revision of the curriculum for that fall semester. A sign of his commitment to professionalism, the number of required military courses almost doubled (Lovell, 1979). The core curriculum shrank to a minimum of required mathematics, sciences, social sciences and humanities while the number of electives greatly increased. Midshipman could also choose from among 24 academic majors. Calvert also allowed the instructors of each department to develop specialized and advanced courses within their discipline. Developments in math, science, and engineering were specifically designed to satisfy requirements for accreditation. Majors in aerospace, electrical, mechanical, and systems engineering were all accredited by the Engineers Council for Professional Development (Lovell, 1979).

Also during this period, the Department of Foreign Languages added Chinese to its roster of languages that included French, German, Spanish, Italian, Portuguese, and Russian. The Department of English, History, and Government added courses concerning Asia such as Contemporary Non-Western Civilization, Political and Military Development of Southeast Asia, and Afro-Asian Culture (Lovell, 1979).

Admiral Calvert justified the curriculum changes and new courses with the rationale that Ensigns and Second Lieutenants needed a broad, liberal education rather than one of immediate utility (Lovell, 1979). Ironically, that is exactly what John Paul Jones decreed about two hundred years earlier.

4. Present.

The Academy experiences periods of transition concerning curriculum, regulations, and culture. After approximately twenty years of relatively quiet operation, the Academy is again feeling the winds of change. Recently, an advisory group conducted a thorough examination of USNA's academic regime. Some of their recommendations, such as replacing a celestial navigation course with psychology, sparked a heated protest. One side, call them "traditionalists," balks at the notion of losing the time-honored tradition of sailing by the stars. To make matters worse, its replacement, a study of basic psychology, is viewed as a very non-military, understand-one-another's-feelings type of course. Proponents of the change believe that the Academy must adapt to its changing environmental requirements. The Navy may soon find, much like in the business world, an organization that fails to be innovative, fails to be competitive.

C. HISTORY OF ORDER OF MERIT DETERMINATION

Many midshipmen come to the Academy with general aspirations to become Navy or Marine Corps officers. Some midshipmen, however, have much more specific and ambitious desires. For those aspiring to specialized billets and smaller communities, more importance is placed upon the midshipman's Order of Merit (OMERIT) than is otherwise the case. Order of merit is a system that combines a midshipman's academic, professional, conduct, and physical performance into a composite number. All midshipmen within a year group are then ranked according to their OMERIT multiple. At service selection,

midshipmen may choose which community or billet they wish based on their class ranking. Individuals ranked near the top have many options, while those near the bottom have whatever is left. Throughout the history of the Naval Academy, a continuing debate has been: What should be the relative weights assigned to academic, professional, conduct, and physical components for determining OMERIT?

1. OMERIT System in the 1800s.

In June 1846, the Academy conducted its first set of examinations. Superintendent Buchanan had a book of regulations that stated the regulations concerning examinations. In these regulations was a system of weights and multiples for each subject, and class standing was established for determining seniority in the Navy (Lovette, 1941).

During the mid-1800s, mathematics was more heavily weighted than any other single subject (Lovell, 1979). After a series of disciplinary problems, conduct grades were given equal weight with math to enforce the regulations.

Compiled from data in the 1883-1884 Naval Academy Annual Register, Table 1 represents the OMERIT system used during the 1883 academic year. Math and Science includes all general academic classes involving algebra, geometry, calculus, chemistry, physics, astronomy, and electrical theory. Humanities and Social Sciences include the few required English and history courses. The "other" category consists of International Law and the either French or Spanish language studies. Military and Professional encompasses seamanship, ship-building, ordnance and gunnery, marine engines, and navigation.

The aforementioned trade-school mentality is very much evident from the statistics.

Professional courses, very practical in nature, are 42.6 percent of a midshipman's total

Table 1.

Weighting of Courses for Order of Merit in Late 1800s

Class	Percent Math/Science	Percent Humanities/SS	Percent Military/Prof	Percent Other
4th	4.10	3.15	0	2.63
3rd	14.20	2.11	1.57	2.11
2nd	15.80	1.04	11.57	1.58
1st	7.00	0	9.46	3.68
Percent of OMERIT	41.10	6.30	42.60	10.00

Source: Annual Register of the United States Naval Academy 1883-1884.

multiple. Academic studies account for almost 50 percent, but only 6.3 percent are for the so called "soft subjects." However, even these figures are somewhat conservative. Classes such as chemistry, physics, and electrical theory actually feed back into practical uses for midshipmen learning about steam plants and modern weaponry.

2. Present System for Determining OMERIT.

Over the 150-year history of the Naval Academy, various factions have lobbied to create what they believed to be a better system for producing capable junior officers. Some approached the problem by modifying, and sometimes completely changing, the subjects taught in the classroom.

Others believe that, regardless of exactly what courses are taught, the most capable

young men and women will rise above their peers by measured performance. This battle is not fought over the classroom, but the system to rank the midshipmen. In the early years of the Academy, according to Table 1, midshipmen with the most promise as junior officers performed well in professional courses. Therefore, professional courses received very heavy weighting for class standing.

Before comparing the old OMERIT system with the current method, a few differences must be explained. Table 2, the current OMERIT system, is set up very

Table 2
Weighting of Courses for Order of Merit in1982.

	Percent of OMERIT
Course Work	
Academic	55.39
Professional	14.47
Physical Education	4.51
Conduct	6.75
Military Performance	18.88
Total	100.00

Source: USNAINST 1531.16R, May 1982

differently from Table 1. Because of the numerous majors that midshipmen may elect, the percentages of math, science, humanities, and social science courses can vary dramatically. To include even the most significant combinations would add more complications than value. Another difference is seen in the composition of the professional multiple. In Table 1, the professional multiple consisted only of course grades that were vocational in nature,

relating directly to the Navy. In Table 2, the professional multiple includes not only military course grades, but also semester military performance grades, summer cruise evaluations, and Professional Competency Review (PCR) exam grades (USNAINST 1531.51, 1994).

By contemporary measures, it appears that professional courses are not considered indicative of fleet performance. According to Table 2, the professional component of OMERIT dropped from 42.6 percent (Table 1) to 33.35 percent (by adding professional course multiple and military performance multiple). On the other hand, academics increased from 47.4 percent to over 55 percent. Another significant change, the new system affords over 11 percent of the final multiple to conduct and physical education, whereas the old system did not weight them at all.

D. SUMMARY

The attempt to achieve the proper balance between academics and military has been a long standing struggle. Since the inception of the Naval Academy, both sides have fought with equally persuasive arguments. In order to arrive at the correct answer, one must be sure to ask the correct question. The desired question is based upon the mission of the Naval Academy: What qualities in midshipmen should be reinforced so that the Naval Academy produces the best junior officers, with potential for growth and service outside of the Navy?

III. LITERATURE REVIEW

There has been a long-standing debate concerning the relationship between college grades and occupational success. Employers claim that success in school, indicated by grade point average and class rank, indicates intelligence, motivation, and other abilities applicable to success on the job (Roth, Bevier, Switzer, & Schippman, 1996). This stance represents the adage "success breeds success." On the other hand, some academics counter that there are many instances where skills learned in school are not required on the job (Calhoon and Reddy, 1968; Nelson, 1975; Roth, BeVier, Switzer, & Schippman, 1996). Likewise, some job skills, such as social skills, are not even taught in school, and grading criteria vary from school to school. Both sides have valid arguments, but research has not clarified the exact relationship between grades and performance.

A. STUDIES RELATING ACADEMIC AND JOB PERFORMANCE

Some research has explored the relationship directly between academic performance and occupational performance. The model in Figure 2 represents this approach to

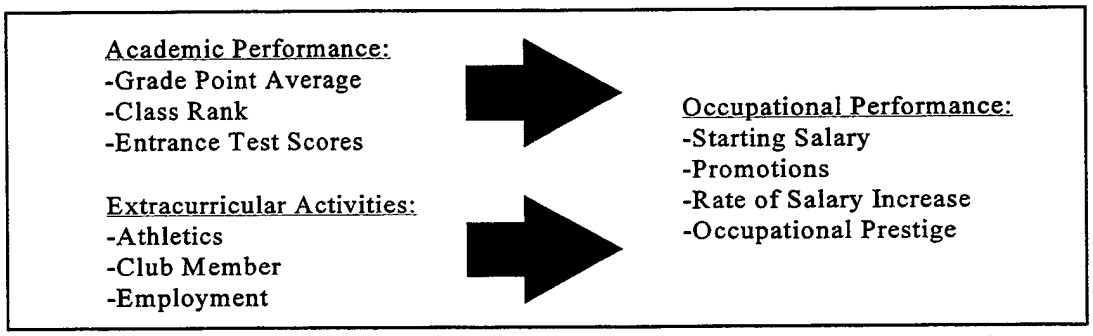


Figure 2. Relationship Between Academic Performance, Non-Academic Activities, and Occupational Performance.

investigating the correlation.

In the long history of interest in this issue, one of the earliest studies was conducted by Jepsen in 1951. The research evaluated 797 male students who graduated from Fresno State College from 1929 to 1941. Approximately 60 percent of the graduates cooperated by answering questions about college grades, year of graduation, college activities, and income. As it turns out, all salaries were within 10 percent of each other, regardless of graduation percentage. Surprisingly, graduates in the bottom twenty percent earned the highest average salaries. Jepsen proposed that the low correlation between academic performance and job performance indicates occupational success is dependent upon qualities or attributes other than academic grades (Jepsen, 1951).

The overall correlation between grades and income was small (Jepsen, 1951). However, some occupations showed stronger correlation than others. Teachers had the highest correlations at 0.32, while professional occupations had the lowest correlations at R^2=-0.15. Extra-curricular activities appeared to be a better job performance predictor over all occupations (R^2=0.27).

In a similar study, Martin and Pacheres (1956) investigated ninety-nine engineers working at Hughes' Aircraft Company research laboratory. The study compared collegiate academic standing with occupational performance, indicated by salary. Theoretical knowledge was highly valued in the laboratory and closely associated with academics, therefore a high correlation was expected. However, this was not the case. Engineers with four years of experience showed a very small positive correlation between college class

standing and salary; for engineers with six to eight years of experience, there was no correlation.

Puzzled by these results, the researchers hypothesized that differences in college quality might account for the surprising results. They proposed that an average student from an excellent school would perform better than an excellent student from an average school. The Hughes engineers graduated from seventy-one different undergraduate programs which were ranked by another group of engineers into three categories: superior, average, and inferior. However, school rating was not significantly related to performance. Their findings of a weak correlation between academic performance and occupational performance agree with the majority of studies in this field since then (Martin & Pacheres, 1962).

Attempting to explain the low correlation between academic performance and occupational performance, Martin and Pacheres suggested that the most creative students were being stifled by the academic system. Traditional learning, they continued, is centered around students reiterating exactly what has been taught. Creative students often invent original, correct methods to solving problems. However, their marks may be lower because the answer was not achieved by the "approved" method.

While some researchers continued to analyze the relationship between academics and job performance, Professor Abraham Korman (1968) studied the relationship while including the element of time. Korman pointed out that research on academic-performance relations are of two sorts: predictive validity and concurrent validity. Predictive validity uses a set of predictive elements, such as college grades, and compares them to performance elements,

such as evaluations, that occur later. Concurrent validity, on the other hand, compares grades and work performance collected during the same period of time. Another distinction indicated is that some studies are psychometric, pertaining to tests, while others are judgmental, such as interviews and impressions. Korman conducted a review of research to assess the soundness of each model in predicting managerial performance.

Korman's analysis showed correlations ranging from R^2=0.1 to 0.3, but the most important points of his research regarded theories for further research. Korman found a very significant problem while conducting an analysis of data collected by Weitz (1966). When predicting correlations between academics and job performance, the explanatory variables appeared to vary over time. Korman's findings showed that experience had a greater effect earlier in an easy task and later in a more difficult task. In that same vein, motivation has a greater effect on performance early in an easy task and later in a difficult task.

Korman's theories were important because they encouraged researchers to take a more detailed view of the academics-job performance relationship. Instead of viewing the relationship as a closed system, people began to look at environmental influences that regulated the correlations. Other researchers, such as Fiedler and Fletcher, expanded on Korman's ideas and included environmental factors into their models. The various research approaches are described in later sections.

1. Occupational Prestige as Job Performance Measure.

Lewis' research in 1975 examined data from 619 people who graduated from the University of Iowa in 1948, 1954, and 1959. All of the subjects graduated with degrees in

general humanities, social science, natural science, or journalism. The Iowa Placement Test, given to all students entering the university, was used as the measure for academic performance. Job performance was determined with Anne Roe's (1956) classification scheme, which divided occupations based on prestige. Using Roe's scheme, the level of each graduate's occupation was determined. These levels were used for the classification scheme in which level I equated to highly trained professional careers, level II represented jobs with moderate skills and training, and level III represented jobs requiring little skill or training.

Analysis of the data showed that 18.8 percent of graduates ranked in the top half of the class held level I jobs, 70.9 percent held level II, and 10.3 percent held level III (Lewis, 1975). By comparison, the bottom half had 9 percent of graduates working in level I, 72 percent in level II, and 19 percent in level III. Lewis concluded that there is a relationship between college admission test scores and occupational success.

Lewis' measurement data, admissions test grades (versus college grades) are different from most studies in this field. Also, using job prestige as the measure of occupational performance, especially using only three levels to categorize jobs, does not seem like an accurate measure. Such broad occupational groupings surely introduced significant quantities of error into the analysis.

2. Accounting for Job Description Variance.

Unlike Lewis, Wise (1975) tried to keep occupational description constant while varying only academic performance. Wise conducted research on a group of individuals working in a large manufacturing corporation. All of the subjects had similar levels of

education, worked in the same environment, performed comparable tasks, were no more than thirty years old, and had approximately the same amount of time with the company. In 1968, the company collected biographical data on 1,300 employees including college attended, academic grades, and non-academic activities. Like most studies in this field, job performance was measured by salary and level attained.

Analysis of the data showed a small but consistent positive relation between academic achievement and rates of salary increase (Wise, 1975). The rate of salary increase went up with prestige of college attended, grades achieved, and rank in graduate class. In fact, the rate of salary increase for a top-ranked graduate of a highly ranked college was twice that of a bottom-ranked graduate of a lower-ranked college (Wise, 1975).

When determining differences in salary, Wise observed that both academic and non-academic characteristics carried the same weight. However, both account for little variation. Wise's data lent some support to the hypothesis that academic performance predicts future academic performance; however, since academic and non-academic variables account for equal variation, the study suggests that a composite of all college activities may better predict performance than grades alone.

The United States Civil Service Commission conducted research into this field with the same approach as Wise. By investigating a group of social insurance claims authorisers (Nelson, 1975), the study avoided the potential error of comparing widely varying occupations. The claims authorisers review paperwork involving complex determinations or unusual circumstances. All subjects were at the same salary level, job position, and task

requirements.

Job performance measurements included a work sample, job information test, and immediate supervisor rankings. Academic performance was measured by undergraduate grade point averages. With sample sizes of 112 to 115 people, correlations between grades and a combination of work sample score and supervisor ranking ranged from 0.00 to 0.14 (Nelson, 1975). None of the three coefficients were statistically significant ($p>0.05$), therefore supporting the theory that grades and occupational performance are not correlated. Nelson reported several limitations of the study such as using self-reported grades and including only journeyman-level workers as subjects. A particular strength of this study, however, was measuring job performance by tests and evaluations rather than salary.

3. Controlling for Occupational Variance in the Military.

Butler (1976) conducted a study in the Office of Institutional Research at the United States Military Academy. Similar to Nelson (1975) and Wise (1975), Butler attempted to minimize occupational variance by studying 103 West Point graduates from the class of 1962 who were commissioned in the infantry branch.

The four indicators of college performance were academic grades, physical education grades, tactics grades, and aptitude for the service ratings (ASR). The ASR is a leadership score given two or three times at the USMA, similar to Naval Academy military performance grades. The ASR consists of 65 percent peer evaluations and 35 percent officer evaluations. Occupational success was measured by six year order of merit list ranking (6yr OMLR), current OMLR, and promotions. OMLR is a ranking based on efficiency reports, like Navy

FITREPS, given twice a year.

Data analysis of 6yr OMLR produced correlations with ASR=0.44, academic grades=0.28, PE grades=0.22, and tactics grades=0.06. For current OMLR, ASR accounted for twice the variability of academics, with 0.39 and 0.20, respectively. Also, ASR had small but better correlations with promotions than academics. Both academics and ASR accounted for very little in predicting retention with R^2 values between zero and 0.10, respectively. Surprisingly, retention is the one category where the tactics grade was a good predictor, accounting for 0.29 of the variability. The reason for the relationship is not clear.

According to the findings of this study, the relation between grades and performance are consistent with other studies with academics accounting for approximately 2 to 3 percent of job performance variance (Butler, 1976).

4. Effect of Working While in School.

In 1989, Bretz conducted a study of 328 recent graduates from three large universities. All of the subjects had earned bachelor's and master's degrees in business. Academic performance was measured by college grade point average, and occupational performance was determined by starting salary, current salary, salary growth, and job satisfaction.

Analysis of the data showed that grades had a slight positive relationship with starting salary, R^2=0.103 for undergraduates and 0.124 for graduates, but only to a 0.10 confidence level (Bretz, 1989). On the other hand, the number of hours a student worked at a job while in school was a much better predictor for starting salary. Correlations for undergraduate and

graduate were R^2=0.214 and 0.256, respectively, with higher levels of confidence ($p<0.01$ and $p<0.05$, respectively). Grades were insignificant in predicting salary growth, but numbers of hours worked had a moderate correlation of R^2=0.275 (Bretz, 1989). Likewise, grades were not significant at predicting current salary.

Bretz's analysis reiterates what other studies have said: grades are only a small part of predicting future success. Other items, that can not be empirically measured, may indicate a much strong predictive element. For example, working to put oneself through college may indicate strong commitment, good work ethic, and persistence despite adversity. All of these characteristics may embody the desired employee more effectively than a grade point average.

5. Academics and Job Performance Meta-Analyses.

Meta-analysis research methods can be very useful for several reasons. For example, sometimes studies can not muster enough subjects to provide enough data for thorough analysis. By combining several studies, the number of observations can be expanded. Also, researchers working several decades ago did not have the technology now available for complex mathematical operations.

a. Academic, Non-Academic, and Job Performance.

Calhoon and Reddy (1968) performed an analysis of fifteen studies that provided mixed results. Four studies showed a positive correlation between academics and occupational performance, four showed slight correlations (R^2 approximately equal to 0.2), and seven showed no correlation at all. Calhoon and Reddy did find, however, some very

interesting data. One of the studies revealed that 26 percent of the people graduating in the bottom third of their class earned salaries in the top third (Calhoon & Reddy, 1968). Conversely, 21 percent of the people graduating in the top third of the class had salaries in the bottom third.

The meta-analysis showed that extra-curricular activities may be as effective as grades at predicting performance. The Haveman and West study (1952) of 9,064 graduates of 1,037 colleges showed no correlation between extra-curricular activities and job performance. On the other hand, the Husband study (1957) of Dartmouth University graduates showed that those students holding one leadership position in a club earned slightly more than those who did not. Students holding two or more offices earned significantly more than those participating in no activities.

Calhoon and Reddy also discovered evidence of poor research techniques that spoiled any chance of realistic observations. One particular study used subjects that all graduated in the top 10 to 15 percent of their class. Of course, that survey showed no correlation between college grades and job performance.

b. Multiple Academic and Job Performance Measures.

Another meta-analysis, conducted by Samson, Graue, Weinstein, and Walberg (1984), utilized thirty-five studies conducted after 1950 that correlated multiple measures of academic success and occupational performance. Rather than concentrating in one occupational field, the accumulated data came from fourteen studies of teaching, three of engineering, seven of business, two of nursing, three of medicine, five of military and civil

service, and one general study (reporting on various occupations). Each study was coded with forty-two variables: three described the type of study, twelve described the subjects, eight described academic performance, six described job performance, and thirteen described research design. Research design variables describe how each study was conducted. For example, occupational performance might be measured two years after college by supervisor ratings in one study, and ten years after college by rate of salary increase in another.

Analysis of the data showed a higher correlation between academic performance and job performance in fields such as nursing, military/civil service, and business (R^2=0.26, 0.23, and 0.19, respectively) with high levels of confidence ($p<0.01$). Medicine and the general population showed a significant ($p<0.01$) but very small correlation (R^2=0.09 and 0.05, respectively).

Length of time between academic measurement and job performance measurement also demonstrated interesting statistics. Academic performance correlated R^2=0.14 with job performance measured one year after college, -0.01 two years later, 0.40 five years later, and 0.10 later than five years. The significance of the relatively high correlation five years after college is unclear although it is statistically significant ($p<0.01$).

Although grades and test scores proved statistically significant, they provided a mean correlation of only 0.155, or 2.4 percent of the variation. Samson et al. (1984) concluded that the paltry variance accounted for voids the usefulness of grades as a predictor of occupational performance.

Cohen (1984) used the same approach as Samson et al. (1984) by using

multiple performance measures for academic and occupational performance. The data were condensed into eleven variables that controlled for factors such as institution setting and selectivity, grade point average calculation and range restriction, and time lapse. Occupational success was determined by several factors including income, supervisor evaluations, peer evaluations, promotions, and graduate education.

In order to simplify the data analysis of studies with multiple measures of occupational success, the job performance data were averaged into a single occupational performance composite (Cohen, 1984). Of the 108 studies, 98 showed a positive correlation between grade point average and job performance composite while 10 were negative. Only 55 studies were statistically significant at a 95 percent confidence level ($p<0.05$). Overall, grades were only slightly correlated with the occupational performance composite ($R^2=0.18$). Supervisor evaluations correlated the highest ($R^2=0.20$) with job performance composite (Cohen, 1984). Academic performance proved somewhat less predictive of other measures of job success. Promotions and receiving a graduate degree correlated $R^2=0.16$, income correlated 0.12, and personal satisfaction with success correlated least at 0.09. Cohen concluded that college grades are predictive, although the relation is minimal and the usefulness is questionable.

c. Factors Moderating Grades-Job Performance Relationship.

Research by Roth, BeVier, Switzer, and Schippmann (1996) examined seventy-one studies of the relationship between academic and occupational performance. Across all studies, there was a correlation of $R^2=0.16$ between grades and job performance.

The most important finding of the meta-analysis, however, is five elements that moderate the grade-performance correlations.

First, education level appears to moderate the relationship. The observed correlation of R^2=0.16 for undergraduate grades is higher than 0.07 for Ph.D. grades (although there were only six studies for Ph.D.). Second, the years between graduation and measurement of job performance shows an average correlation of 0.23 after one year, 0.15 after two to five years, and 0.05 after six or more years. This trend of decreasing correlation between academics and job performance was also observed in research by Samson et al. (1984). The researchers were not sure if the decreasing correlation is a function of a dynamic criterion or an increase in range restriction (Roth et al., 1996). Third, supervisor ratings seemed to be more predictive (R^2=0.16) than expert ratings (R^2=0.11). Fourth, correlations were highest in education (R^2=0.21), less in business and the military (R^2=0.14), and least in medical organizations (R^2=0.11). Finally, there is a large drop in correlations in studies after 1961 (R=0.14) compared to those conducted prior to 1961 (R^2=0.23).

Findings in this meta-analysis suggest that grades do predict job performance, but not as well as other measures. Overall, the meta-analysis showed a correlation of 0.16 between academic and occupational performance (Roth et al., 1996). The researchers concluded that there is a relationship between grade point average and job performance, but the relationship is too small for practical use in predicting job performance.

B. ENVIRONMENTAL INFLUENCES

Fiedler, in concert with other researchers, conducted several studies of the relationship between intelligence and job performance. However, Fiedler approached the problem by investigating non-academic and non-occupational elements, represented in Figure 3, that may moderate the relationship between intelligence and job performance. The studies in this section are included because intelligence and academic performance are

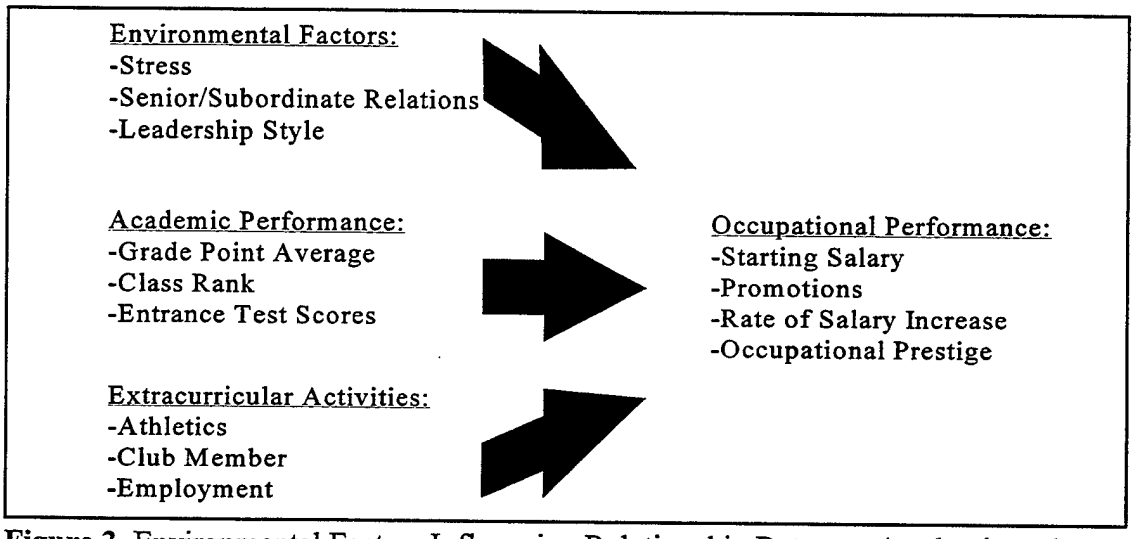


Figure 3. Environmental Factors Influencing Relationship Between Academic and Occupational Performance.

closely associated. Therefore, understanding the relationship between intelligence and job performance may provide some insight into the relationship between academics and job performance.

1. Fiedler and Leister's "Multiple Screen Model."

In their 1977 study, Fiedler and Leister tried to explain the weak correlations between intelligence and job performance. The researchers proposed that previous studies did not take

into account the complex interaction of the leader and the situation, as well as various intervening processes. They developed what was called a "Multiple Screen Model" which assumes a series of "screens" of various permeability. The leader's intellectual processes must pass through these screens while being changed at each stage.

The four screen variables they identified in their research were leader motivation, leader experience, leader-boss relations, and leader-group relations. To test their model, they used 158 army infantry squad leaders. The subjects typically had a rank of staff sergeant (E6), an average 5.7 years of service, and held positions in charge of eight to ten soldiers. Data sets were constructed using the Army General Testing Score (GTS), a motivation questionnaire, months of active service, a boss relation questionnaire, and interviews to assess leader-group relations. Criteria for leader performance were based on ratings of the leader by at least two superiors.

High correlations between intelligence and job performance existed when a highly motivated leader had high levels of experience (R^2=0.42), and low correlations existed with low motivation and low experience (R^2=0.07) (Fielder & Leister, 1977). Another interesting scenario was provided by introducing interpersonal stress with bosses. Low stress with a boss and good group relations produced high (R^2=0.42) correlations. Conversely, high stress with the boss and poor group relations showed very poor performance (R^2=-0.40).

When the leader had a stressful relationship with the boss, any benefit of either leader motivation or intelligence was eliminated. In fact, a stressful situation with the boss was determined to be the most significant factor to moderating leader performance (Fiedler &

Leister, 1977).

2. Cognitive Resource Theory.

In 1995, Fiedler continued his study of the influence of stress, while also incorporating leader experience, on the intelligence-job performance relationship. According to Fiedler's Cognitive Resource Theory (CRT), leaders use their intelligence, rather than experience, when stress with the boss is low (Fiedler, 1995, 1996). Likewise, Fiedler further proposed, leaders use experience instead of intelligence when stress with the boss is high.

Fiedler's theory is an important step towards understanding the relationship between academic performance, which can be considered a measure of intelligence, and occupational performance. However, the Cognitive Resource Theory describes only half of the social dynamic occurring in the workplace. Fiedler did not include the influence of leader-subordinate relations, nor did he account for a person's ability to handle stress.

From the analysis of Fielder's data and theories, a general conclusion is that smarter does not always mean better. Granted, this does not imply that a leader does not need intelligence. Organizations must hire people who meet a standard of intelligence, but must also evaluate the interviewee for experience and ability to work under stress. Once a capable group of personnel are assembled, reducing stress in the working environment can help employees achieve their full effectiveness.

C. IF NOT ACADEMIC GRADES, THEN WHAT?

Most studies of the relationship between academic performance and occupational

performance show, at best, only modest correlations. If academic measures, such as grade point average or class rank, are not practical for predicting job performance, what other factors may be more effective? Some researchers, instead of using academic measures, studied the predictive validity of vocational tests, job-relevant skills, and desired traits (See Figure 4) for predicting job performance.

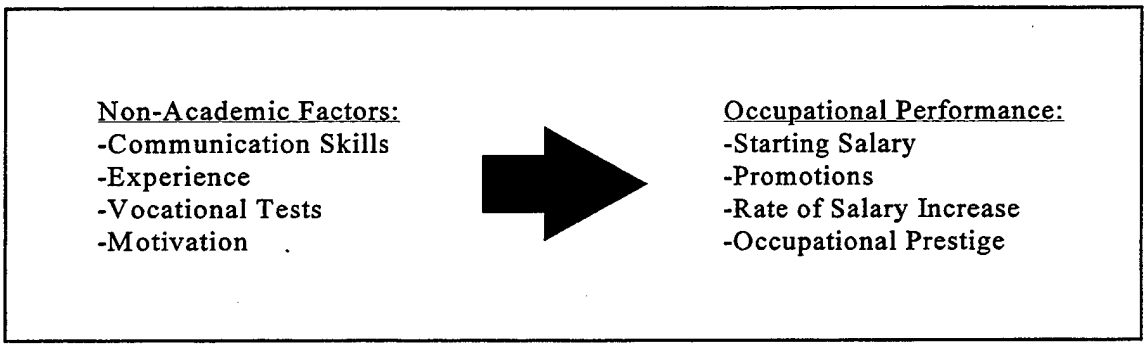


Figure 4. Various Non-Academic Factors Predicting Occupational Performance.

1. Peer Relations, Leadership Style, and Intelligence.

Csoka (1974), in conjunction with the Office of Naval Research, approached the intelligence-performance relationship by observing motivation and situational favorableness. Csoka used three measures to determine situational favorableness: leader-member relations, task structure, and positional authority. Csoka's model, similar to Fiedler and Leister' (1997) Multiple Screen Model, proposes that intelligence does not directly relate to performance but rather is moderated through the leader's motivational style, experience, and leader-member relations.

Csoka's study examined fifty-five sergeants in charge of artillery units, fifty-two

sergeants who supervised mess units, fifty-five Navy petty officers who directed aviation maintenance shops, and fifty-eight unit commanders -- usually with the rank of captain. Intelligence was measured by a version of the Henmon-Nelson Mental Ability Test, and job performance was measured by evaluations from at least two immediate supervisors. Group atmosphere, indicating the leader's perception of group loyalty and the worker's opinion of group atmosphere, was determined by a questionnaire.

Analysis of the data indicates that high leader intelligence was beneficial to performance only when the group atmosphere was favorable and the leader had experience and strong authoritative power (Csoka, 1974). The findings also showed that less intelligent leaders performed better in some situations (low group atmosphere, low experience, weak authoritative power). This relation appears similar to the description of directive and collaborative leadership. For example, an intelligent, experienced leader can hold all the authoritative power and have a task-driven relationship with subordinates. On the other hand, a less intelligent, less experienced leader will tend to use a collaborative leadership style. By acting as a coordinator with less formal boss-worker relationships, the leader can draw upon the experience of the workers for ideas and making decisions.

Unlike many other studies, Csoka addressed the importance of social dynamics that may moderate a leader's performance. Unit cohesion and leadership style are factors that appear to significantly affect performance.

2. Study of Concurrent Academic and Job Performance.

Most studies in this field have focused on the relationship between academic grades

predicting job performance several years after graduation. Fletcher's (1988) study approached the relation from a different aspect with the cooperative education program, where academic performance and job performance exist concurrently. Fletcher directed a study of the cooperative education program at Northeastern University's College of Business and Administration. A group of undergraduate students were placed in companies to work within their field of study as interns. The units of measure were grade point averages for academic performance and supervisor evaluations for work place performance.

Analysis of the supervisor evaluations revealed low correlations, R^2=0.089 to 0.148, between grades and job performance (Fletcher, 1988). This study, although it provides interesting information, contains data that may or may not contaminate the analysis. Student grade point averages followed, as one would expect, a normal distribution. However, supervisor evaluations were skewed very high with an average of 4.375 on a five-point scale.

Although Fletcher's study did find new areas that merit further research, no significant correlation between grades and occupational success was observed. In fact, less than three percent of work performance variability could be explained by student grade point averages.

3. General Knowledge Versus Vocational Knowledge.

While some studies investigated the relationship between academic and job performance (Lewis, 1975; Wise, 1975; Samson et al., 1984), other studies have investigated the influence of environmental factors on the relationship (Fiedler & Leister, 1977; Fiedler 1995, 1996). Taking a new approach, Ree, Earles, and Teachout (1994) conducted a study

comparing the predictive power of general cognitive ability (*g*) and specific abilities or knowledge (*s*) as predictors of job performance.

Subjects of the Ree et al. (1994) study were 1,036 United States Air Force enlisted personnel who had entered the service from 1984 to 1988 and had an average of twenty-eight months of active duty service. All personnel held very technical jobs such as jet engine mechanic, air traffic controller, and avionics technician. Interactions of *g* and *s*, a combination of general ability and job experience, were measured by scores on the Armed Services Vocational Aptitude Battery (ASVAB). Job performance was measured by observer assessment of job task completion.

Using multiple regression analysis and correcting for range restriction, the data revealed that *g* was a fairly good predictor of performance. Correlations ranged from 0.267 to 0.757 depending on job specialty. *S* added approximately 0.02 to the correlation, a statistically significant but practically insignificant amount.

4. Motivation as a Key Performance Factor.

The United States Army commissioned a study by McCloy, Campbell, and Cudeck (1994) to improve the process of assigning personnel to their military occupational specialties (MOS). The researchers proposed a model that defines performance by three variables: declarative knowledge (DK), procedural knowledge and skill (PKS), and motivation (M) (McCloy et al., 1994). In other words, the person must have the necessary knowledge of rules and procedures, master the necessary skills through experience, and desire to complete the task. The method of measurement was a battery of examinations

including vocational tests, personal evaluations, and hands-on performance tests.

Research showed that in five of the eight MOSs, motivation accounted for almost twice as much of the variance as the other indicators. Procedural knowledge was the second best predictor, followed by declarative knowledge. In the other three MOSs, PKS accounted for less variance than the other two variables. This may imply that procedural knowledge is not as important in these jobs.

The results showed fairly accurate models for each MOS, but there were acknowledged problems. The models suggest that a very motivated person with no skills can perform as well as a skilled person with little DK or PKS. The researchers suggest that a multiplicative function is needed, however there is no current procedure to test multiplicative relationships between variables (McCloy et al., 1994). Further research could prove very useful. If a relation between personal attributes and optimal jobs can be found, then job assignments could be made effectively with less job dissatisfaction and better utilization of worker skills.

D. SUMMARY

Calhoon and Reddy (1968) suggested that grades demonstrated an intellectual capacity, need to learn, need for achievement, and a mature sense of responsibility. On the other hand, they also suggested that grades could also indicate introversion, compensation for social or athletic deficiencies, and intenseness (Calhoon & Reddy, 1968). Also, learning in a classroom is not the same as learning from social interactions or awareness of work

environment requirements.

Success may be more dependent on other factors not measured by grade point averages or class rank. Several qualities, such as drive, shrewdness, ruthlessness, showmanship, and chance, are things that can not be measured but are extremely valuable for occupational success (Jepsen, 1951).

Leonard Baird (1985) suggested that occupational performance, whether measured by salary or evaluations, is too complex a phenomena for so few measurements. In fact, a study by Crooks and Campbell (1974) used thirty methods to measure occupational success. Also, there may be too many environmental effects on data to adequately control. For example, a very talented doctor in a small town may earn $70,000 per year while a mediocre broker earned $200,000 per year on Wall Street. Is the broker's occupational performance realistically three times that of the doctor?

Before becoming too engrossed in the intricacies of academic-occupational relationships, a very important question must be answered. What is the Navy's measure of occupational performance? In the military, the measure of job performance is by a person's leadership abilities, which is an intangible concept that is not easily quantified. Instead of measuring efficiency and production, leadership is more dependent on dynamic social interactions between individuals.

Senior leaders of the United States Navy should be careful how future junior officers are evaluated. The Naval Academy does not exist to produce individuals who are simply administrators or researchers. First and foremost, the Academy's mission is to produce

leaders.

This research describes the relationship between academic performance and occupational performance while minimizing potential sources of analysis error observed in other studies. This study addresses potential error at the two points of measurement. First, many studies gather data from several different colleges, across academic disciplines, or use different measures of academic success. These approaches will introduce factors difficult to control such as differences in grading or curriculum differences. Also, occupational performance has many elements to control such as salary differences, based on geographical location and job field, and multiple measures of job performance. This study should control for a significant percentage of the aforementioned errors. All midshipmen take the same core curriculum, are required to participate in extra-curricular activities, and all are subject to the same job performance evaluation system in the fleet.

IV. DATA SET AND METHODOLOGY

A. DATA FIELD DESCRIPTION

The data used in this study were compiled by Professor Bowman of the United States Naval Academy and Professor Mehay of the Naval Postgraduate School. The data set is an integration of three Navy Bureau of Personnel (BUPERS) data sets merged by officer identification code: Navy Officer Promotion History Files 1981-1995, Navy Officer Loss Files 1981-1995, and Navy Officer Performance Fitness Reports 1978-1995.

Initially, the total number of graduates for USNA classes 1980 to 1985 contained in the data set was 6,011 graduates. Because this study focuses only on the major warfare communities, any subject not in the surface, submarine, pilot, or naval flight officer (NFO) community was discarded. For the sake of simplifying the research and because of the similarity between communities, pilots and NFOs are grouped together and referred to jointly as aviators.

After removing all Navy personnel not in the four major unrestricted line communities (URL), Marine Corps selectees, and foreign exchange students, a total of 3,567 remained. The personnel are distributed between the four warfare communities as shown in Figure 5.

B. DETERMINANTS

Originally, the data set contained approximately fifty-two variables for each subject.

Some variables, such as social security number and alpha code, were not necessary and therefore ignored. Variables such as fitness report grades, promotion results, and several types of grade point averages were critical to the data analysis. Before discussing the findings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SWO	1,024	28.7	28.7	28.7
	SUB	1,066	29.9	29.9	58.6
	PLT	916	25.7	25.7	84.3
	NFO	561	15.7	15.7	100.0
	Total	3567	100.0	100.0	
Total		3567	100.0		

Figure 5. Community Entered Upon Graduation.
Source: Bowman-Mehay Data File for Navy Unrestricted Line Officers.

of the data analysis, it is useful to address each variable used in the study to familiarize the reader with them and the descriptive data associated with each.

1. Pre-USNA Variables.

The variables shown in Table 3 describe the subjects' academic performance and extracurricular activities in high school or preparatory school:

Table 3. Pre-USNA Variables.

Variable	Description	Percentages, Means, and Standard Deviations
CLUBP	Was president, leader, or director of a high school club or group.	27.7%
SCOUT	Was member of Boy Scouts or Girl Scouts.	21.9%
SCOUTLDR	Was a senior scout member.	10.9%
EAGLE	Was an Eagle Scout.	13%
MILFAM	Comes from a military family.	21.1%

BOOST	Was a Navy BOOST candidate or graduate.	0.5%
NAPS	Attended the Naval Academy Prep School (NAPS).	12.3%
PREP	Attended a preparatory school other than NAPS.	14%
SATV	Verbal score achieved on the Scholastic Aptitude Test (SAT).	M=580.2, SD=70.1
SATM	Math score achieved on the SAT.	M=674, SD=64.9
COLL	Attended at least six months of college prior to USNA.	7.5%

Source: Bowman-Mehay Data File of Navy Unrestricted Line Officers.

2. USNA Variables.

The factors shown in Table 4 are academic, extracurricular, and professional performance while attending the Naval Academy:

Table 4. USNA Variables.

Variable	Description	Percentages, Means, and Standard Deviations
ACADQPR	Academic QPR.	M=2.80, SD=0.48
BLCHIP1	Recruited athlete.	18.6%
CONDQPR	Conduct QPR.	M=3.75, SD=0.36
COREQPR	Core curriculum QPR.	M=2.84, SD=0.47
GROUP1	Group I majors (Engineering)	43.6%
GROUP2	Group II majors (Math and Science)	27.6%

GROUP3	Group III majors (Humanities and Social Sciences)	28.8%
HUMSQPR	Humanities and social sciences QPR.	M=2.83, SD=0.47
MTSCQPR	Math and sciences QPR.	M=2.87, SD=0.56
NLETTER1	Awarded letter for varsity athletics.	14%
OMERIT	Final order of merit at graduation.	
PCRQPR	Professional Competency Review (PCR) test QPR.	M=2.4, SD=0.61
PEQPR	Physical education QPR.	M=2.55, SD=0.66
PERFQPR	Military performance grade QPR.	M=3.18, SD=0.56
PRDVQPR	Professional development classes QPR.	M=3.06, SD=0.43
STRIPER	Held a striper billet during the academic year.	11.2%

Source: Bowman-Mehay Data File of Navy Unrestricted Line Officers.

3. Fleet Variables.

The following variables describe various aspects of the subjects' fleet performance and retention:

Table 5. Fleet Variables.

Variable	Description	Percentages, Means, and Standard Deviations
ENSCOM	Community as an Ensign.	See Figure 2

GRADED	Earned a Master's Degree.	35.9%
LTJGCOM	Community as a Lieutenant Junior Grade.	See Appendix B
LCCOM	Community as a Lieutenant Commander.	See Appendix B
PRAP1	Percent of Ensign FITREPs recommended for accelerated promotion.	7.9%
PRAP2	Percent of Lieutenant Junior Grade FITREPs recommended for accelerated promotion.	31.8%
PRAP3	Percent of Lieutenant Commander FITREPs recommended for accelerated promotion.	71.4%
PRAPTOT	Percent of all FITREPs recommended for accelerated promotion.	46.3%
PROMOTE	Promoted to Lieutenant Commander.	78.3% of the 1,779 who stayed in the Navy
STAYLCBD	Remained in the Navy until the Lieutenant Commander promotion board.	49.9%

Source: Bowman-Mehay Data File of Navy Unrestricted Line Officers.

C. ASSUMPTIONS

In order to conduct research concerning the relationship between academic performance and fleet performance and retention, several assumptions were made. Some assumptions were based on logical analysis while others were made based on the author's fleet experience. The three main areas of concern are the validity of officer fitness reports,

accuracy of community fitness report distribution, and the utility of retention as a performance measurement.

1. FITREP.

Because officer fitness reports are the primary measure of fleet success, it is critical that they are accurately assessed. Therefore, the preponderance of assumptions concerns the officer FITREPs.

a. Valid Evaluations.

First and foremost, only valid FITREPs are considered for calculating the officer's PRAP for each rank and aggregate PRAPTOT. Valid FITREPs are determined by the following criteria:

- Not received while at a training command.
- Not classified as a "not observed" fitness report (less than ninety days at the command).
- Not the first evaluation received at that command.
- Not the last evaluation received at that command.

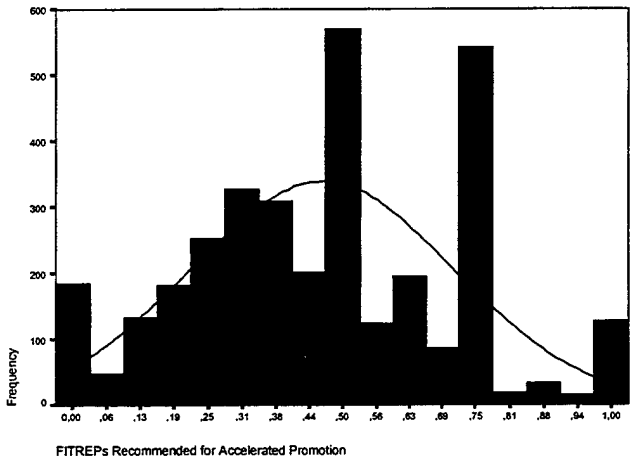
These assumptions are derived from the author's experience with the fitness report system. Evaluations received while stationed at a training command or school are not given the same significance as other evaluations. All students are given the same grades unless they proved to be a disciplinary problem or are performing very poorly on tests. Likewise, "not observed" FITREPs are useless because there are no grades. These FITREPs are written only for continuity purposes.

In general, the first evaluation received at a new command is not truly indicative of an officer's capabilities. It is difficult for a Commanding Officer to rank a new, untried officer higher than a veteran of the wardroom. It is the author's observations the highest rankings are frequently given to those who have been onboard the longest or to the individual who is going up for the next promotion board.

While it may be hard to rank peers against one another, a transfer evaluation totally alleviates that problem. When an officer transfers from the command, that person is basically ranked against themselves. That makes it much easier for a Commanding Officer to inflate the evaluation grades as a pat on the back.

b. PRAP Distribution.

Another item that one must assume is that the officer fitness report system is fair and is an accurate description of an officer's performance. In other words, one must believe that the evaluations are based on work effectiveness and not on certain extracurricular activities extraneous to job performance. According to Figure 6, the



Source: Bowman-Mehay Data File of Navy Unrestricted Line Officers.

Figure 6. Distribution of PRAPTOT.

percentage of FITREPs recommending accelerated promotion is not normally distributed. There are extremely large spikes at the fifty and seventy-five percent intervals. It is unclear whether or not the lack of a normal distribution, resulting in large part from these spikes, indicates a bias in the occupational performance measurement that could adversely effect the research.

c. Weighting of FITREPs.

Each subject in this study has fitness reports grouped according to rank when received; namely Ensign (PRAP1), Lieutenant Junior Grade (PRAP2), and Lieutenant (PRAP3). In order to make occupational performance easier to analyze, FITREPs for all three ranks were aggregated into one performance multiple called PRAPTOT. The basic assumption here is that all officers spend approximately the same amount of time in each rank and receive approximately the same number of evaluations. Almost all officers are Ensigns and Lieutenant Junior Grades for two years. After that, an officer will remain a Lieutenant for four years before being eligible for the Lieutenant Commander promotion board. Therefore, using the time in grade of each rank, PRAP1 and PRAP2 were each weighted twenty-five percent while PRAP3 was weighted fifty percent.

2. Communities.

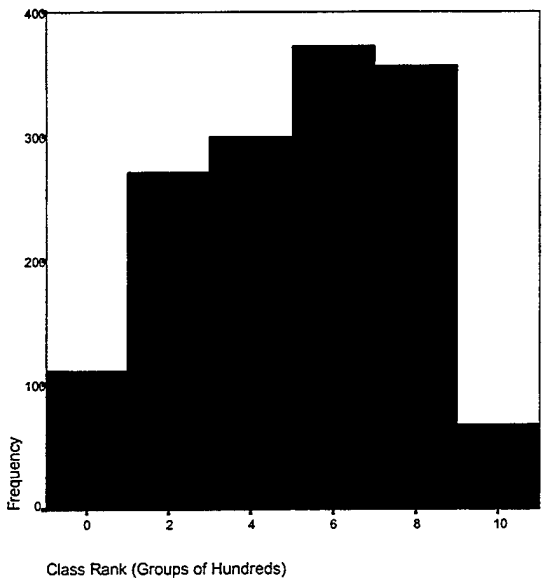
Community distribution is another component that required some significant assumptions be made. Although warfare community is not related to either academic performance or fleet performance, it is always possible that an error in one variable could indicate a flaw in the entire data set.

a. Number of Submariners.

The most perplexing item is the number of submariners identified in the data set. Figure 2 shows that there are as many submariners for year groups 1980 to 1985 as there are surface warfare officers. This statistic seems quite strange because the number of active submarines is much smaller than surface ships. One possible explanation is that all nuclear power selectees, both surface and submarine, are grouped together in the data set. Because of common selection screening criterion and training pipelines, they will both be considered as one group.

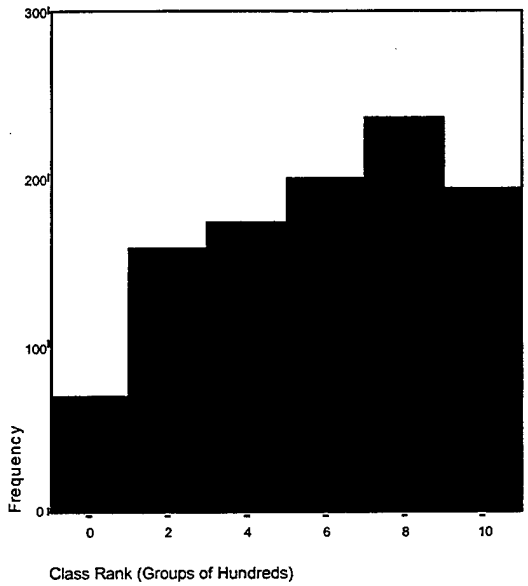
b. Community by Class Rank.

Another ambiguous aspect of the data set is the uneven distribution of the various warfare communities over class rankings. For example, Figures 7, 8, and 9 represent the distribution of service selection billets by midshipmen order of merit in groups of



Source: Bowman-Mehay Data File of Navy Unrestricted Line Officers.

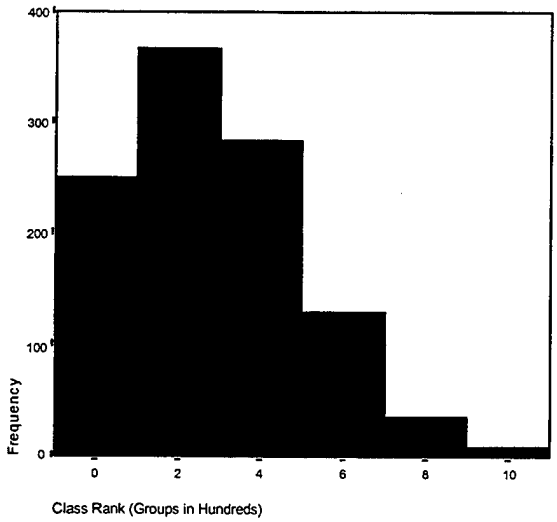
Figure 7. Aviator Class Rank.



Source: Bowman-Mehay Data File of Navy Unrestricted Line Officers.

Figure 8. SWO Class Rank.

hundreds. Figure 7 shows that aviators generally graduate from the middle of the class with an average OMERIT of 460 (SD=264). Surface warfare officers (see Figure 8) graduate



Source: Bowman-Mehay Data File of Navy Unrestricted Line Officers.

Figure 9. Submariner Class Rank.

lower in the class with an average OMERIT of 540 (SD=298). On the other hand, submariners are rigorously screened for acceptance into the nuclear community. Such high academic standards are reflected in Figure 9 where the graduates are almost exclusively from the top of the class (average OMERIT=236, SD=205).

Much like the question of FITREP grade distribution, it is uncertain if high concentrations of academically successful officers in one community can skew the data. The reasoning for caution may not be obvious. Suppose that academic performance is directly related to work performance. A person ranked low in a highly intelligent group would have been ranked near the top of a group with intellects that are more closely distributed around the Naval Academy average. However, that person would still be counted as a low-graded

performer in the first group. Because there is no definite reason to believe otherwise, we must assume that the uneven distribution of high academic performers across communities will not invalidate the research.

3. Retention.

The final assumption is that retention can be used as an additional measure of an individual's performance. Although an indirect measure, retention indicates that the person provides benefit to the Navy. Regardless of how well someone does their job, reflected by high FITREP grades, they are of no value to the Navy if they leave the military service. In that same vein, a person dedicated to naval service is a highly valuable asset. The measure for retention is the variable STAYLCBD, indicating the person elected to stay in at least until the Lieutenant Commander promotion board.

D. HYPOTHESES AND METHODOLOGY FOR TESTING

This research explores the relationship between academic performance and occupational performance. The null hypothesis (H_0) and the alternate hypothesis (H_A) are as follows:

$$H_0\text{: } \beta_{\text{academics}} = 0$$
$$H_A\text{: } \beta_{\text{academics}} \neq 0$$

In order to examine the relationship between academics-fleet performance and academics-retention, a series of steps will be followed. First, linear regression based on the model specifications will be performed to evaluate the statistical properties of the initial specification. This specification includes variables that are statistically held constant as academic performance varies. Th effect of

academics on performance is being assessed, other factors equal.

After analyzing the statistical properties of the initial specification, an analysis of multicolinearity will be conducted. From this analysis, an alternative specification will be developed. Coefficients with p values less than 0.05 are considered statistically significant in the alternative specification.

If the analysis suggests that there is no relationship between academics and job performance, the null hypothesis that $\beta_{academics}$ equals zero will be accepted. This means that there is no relationship between academics and occupational performance. If the regression coefficient for academic performance is statistically significant, the alternate hypothesis, that there is a relationship between academic and occupational performance will be accepted. This research will also explore other hypotheses such as the relationship between academic performance and retention in the Navy.

V. ANALYSIS

The data set used to conduct the research is comprised of over 3,500 Naval Academy graduates from the classes of 1980 to 1985. Each subject has approximately fifty explanatory variables that describe academic performance prior to the Naval Academy, academic performance while at the Naval Academy, and job performance in the fleet. Job performance is measured by percent of fitness reports recommended for accelerated promotion and service retention. First, this study examines the relationship between academics and fleet performance.

A. FLEET PERFORMANCE

1. Proposed Fleet Performance Model.

In the fleet performance model, the variable PRAPTOT is the dependent variable. PRAPTOT is a composite of all valid fitness reports received during each subject's career. The proposed model for expressing the relationship between academics and fleet performance is shown below:

$$\begin{aligned}\text{PRAPTOT} = {} & \alpha_0 + \beta_1\text{ACADQPR} + \beta_2\text{ BLCHIP1} + \beta_3\text{BOOST} + \beta_4\text{CLUBP} + \beta_5\text{COLL} + \beta_6\text{CONDQPR} + \\ & \beta_7\text{COREQPR} + \beta_8\text{ENGQPR} + \beta_9\text{EAGLE} + \beta_{10}\text{FOUND} + \beta_{11}\text{NAPS} + \beta_{12}\text{HUMSQPR} + \\ & \beta_{13}\text{MILFAM} + \beta_{14}\text{MTSCQPR} + \beta_{15}\text{NLETTER1} + \beta_{16}\text{OMERIT} + \beta_{17}\text{PCRQPR} + \beta_{18}\text{PERFQPR} + \\ & \beta_{19}\text{PREP} + \beta_{20}\text{SCOUT} + \beta_{21}\text{SCOUTLDR} + \beta_{22}\text{STRIPER}\end{aligned}$$

2. Method of Analysis.

The first step of the analysis is to develop an initial model, using linear regression,

to provide a reference point for further analysis. Using that reference point, the model is tested for variable significance and multicolinearity. Testing is done by removing one explanatory variable at a time, then checking the remaining variables for significant changes in their coefficients and *t* values. The following rules will be used to gauge significance:

$p<0.05$ significant
$p<0.10$ fairly significant
$p<0.15$ marginally significant

Ultimately, deciding which variables to remove from the model will be based on the multicolinearity analysis, significance of *t* values, and importance of the variable to the study.

3. Analysis of Performance Model.

Table 6 shows the results of the initial estimated fleet performance linear regression model. Upon further inspection of the data, several variables exhibited multicolinearity.

Table 6. Linear Regression Coefficients for Initial Fleet Performance Model.

Variable	Coefficient	*t*	Significance
α	0.064	1.296	0.195
BLCHIP1	0.024	2.177	0.034
BOOST	0.063	1.084	0.278
CLUBP	0.0075	0.809	0.418
COLL	-0.01	-0.660	0.509
CONDQPR	-0.0011	-0.087	0.931
EAGLE	0.011	0.792	0.428
ENGQPR	0.0092	0.768	0.442

FOUND	0.027	1.44	0.15
GROUP2	-0.024	-1.893	0.058
GROUP3	-0.01	-1.079	0.281
HUMSQPR	0.048	4.251	0.000*
MILFAM	0.011	1.05	0.294
MTSCQPR	-0.041	-3.139	0.002
NAPS	-0.0066	-0.509	0.611
NLETTER1	0.015	1.234	0.217
PCRQPR	0.019	2.3	0.021
PERFQPR	0.097	9.368	0.000*
PREP	0.00042	0.035	0.972
SCOUT	-0.034	-2.887	0.004
SCOUTLDR	0.021	1.328	0.184
STRIPER	0.038	2.683	0.007
WALKON	0.025	1.585	0.113
* Significance greater than 0.001			
R^2=0.088 N=3,335			

Source: Bowman-Mehay Data File for Navy Unrestricted Line Officers.

a. Academic Multicolinearity.

The first area of concern is the academic performance variables ENGQPR, HUMSQPR, and MTSCQPR. Depending on a subject's undergraduate major, there could be a substantial difference in the number of courses applied to one of the QPRs. For example, an engineering major could have only five humanity and social science courses, those required in the core curriculum, in the variable HUMSQPR. A humanities major could have

three or four times that number of courses, but each subject's HUMSQPR would have the same importance in the regression. To account for this effect, the subjects' undergraduate majors were added to the regression, summarized in Table 6. Group I engineering majors was chosen as the reference set because its corresponding performance measure, ENGQPR, was not significant.

The initial model showed that the *t* values of GROUP1 and GROUP2 are not significant and did not considerably change the *t* values of ENGQPR, HUMSQPR, and MTSCQPR. This suggests that the effect of different numbers of courses composing ENGQPR, HUMSQPR, and MTSCQPR due to majors curriculum is not important to the analysis. Therefore, GROUP2 will not be kept in the final model since all of its variance appears to be accounted for in MTSCQPR. In addition, GROUP3 will not be included in the final model because it is not significant.

b. ACADQPR Ambiguity.

Because the focus of this research is to determine the relationship between academics and performance, ACADQPR was initially considered as the measure of academic performance. Preliminary analysis, however, showed it to be not significant, suggesting no relationship with fleet performance. However, this turned out to be misleading. By using the separate parts of ACADQPR, Table 6 shows that HUMSQPR and MTSCQPR are both significant. This is sensible because the significance of ACADQPR is basically an average of the significance of ENGQPR, HUMSQPR, and MTSCQPR. The final model will therefore use the individual parts instead of overall academic grades.

c. *Scout Multicolinearity.*

Multicolinearity also existed, as one would expect, between SCOUT, SCOUTLDR, and EAGLE. The correlations proved difficult to account for because each successive variable is not always a part of the previous variable. For example, all eagle scouts and scout leaders are also scouts. However, not all eagle scouts were also scout leaders. Therefore, the simplest way to address this problem is to incorporate only significant variables into the final model. Even though thirteen percent of the subjects were eagle scouts, the variable was not significant and therefore not included.

d. *Athletic Multicolinearity.*

The variables BLCHIP1 and NLETTER1 also presented an interesting case. One would normally think that almost all of the varsity letter winners would be recruited athletes. The opposite is actually true. Of the 435 recruited athletes in this study, 229 earned a varsity letter. Midshipmen who joined the teams without being recruited, called walk-ons, earned 261 varsity letters. To investigate this further, the variable WALKON was created to describe midshipmen who were not recruited athletes yet still lettered. Joining a team and excelling could indicate determination and initiative, useful traits in occupational performance. WALKON proved to not be significant (t=1.585) and was not retained in the final model. NLETTER was also not significant (t=1.234) and not included in the final fleet performance model.

4. Revised Performance Model.

After completing the analysis, the initial model can be refined by removing the relevant variables. ENGQPR was retained in the final model, even though it is not

statistically significant, in order to provide a complete representation of academics. The final linear regression model is shown in Table 7. Several interesting observations can be made of data from scout membership, military performance measures, and academic discipline.

Table 7. Revised Linear Regression Coefficients for Fleet Performance Model.

Variable	Coefficient	*t*	Significance
α	0.064	2.018	0.044
BLCHIP1	0.023	2.117	0.034
ENGQPR	0.015	1.377	0.168
HUMSQPR	0.056	5.176	0.000*
MTSCQPR	-0.043	-3.526	0.000*
PERFQPR	0.099	10.504	0.000*
SCOUT	-0.031	-2.761	0.006
SCOUTLDR	0.026	1.748	0.081
STRIPER0	0.037	2.618	0.009
* Significance greater than 0.001			
R^2=0.083 N=3,335			

Source: Bowman-Mehay Data File for Navy Unrestricted Line Officers.

a. Evaluation of Boy/Girl Scout Membership Data.

The most interesting statistic about scouting is that being a scout leader has a positive coefficient, while being only a scout has a negative coefficient. Across the group of subjects, people who had been a scout leader had a higher percent of FITREPs recommended for accelerated promotion than plain scouts. These data seem to suggest that being a member of an organization does not predict performance. Instead, one must take on

responsibility and assume leadership roles within the group. People who hold positions of responsibility at a young age may be better prepared and can transfer the learned skills to work later in life. Responsibility and "take charge" skill transferal is a reasonable evaluation of the SCOUT-SCOUTLDR interaction and relates directly to the requirements of an officer.

b. Evaluation of Military Performance Measures.

Analysis showed that PERFQPR and STRIPER are the most significant predictors of fleet performance. This means that being a striper provides additional predictive power over and above that provided by PERFQPR. Further analysis shows that, even though both variables are significant, they are also correlated. This is because while overall, midshipmen had an average performance grade of 3.18 (SD=0.56), those who held striper billets had an average performance grade of 3.82 (SD=0.25).

Regardless of the interactions between PERFQPR and STRIPER, the data suggest that people who perform well at the Academy will also perform well in the fleet. This information supports the old adage that past success is the best predictor of future success, or "success breeds success."

c. Evaluation of Academic Discipline Variables.

Keeping true with its long history of emphasizing a technical curriculum, the Naval Academy encourages midshipmen to elect technical majors, especially engineering. In this study, 46.3 percent of the subjects are engineering majors (Group I), 27.6 percent are math-science majors (Group II), and 28.8 percent are humanities-social science majors (Group III). If Group I and II majors are combined as technical majors, an overwhelming 71.2 percent of the subjects are labeled as such.

Realizing the Academy's emphasis on technical majors, the regression analysis provides some very interesting data. HUMSQPR, a subject's grade point average in humanity and social science courses, has a positive relation to performance, while MTSCQPR, the math and science grade point average, has a negative relation. This fact may suggest that humanities and social science courses are particularly important indicators of fleet performance. ENGQPR was not statistically significant to the model, but was included so that all academic facets would be represented.

5. Conclusions of Performance Model.

Even though ENGQPR was not significant (t=1.377) in predicting fleet performance, this research does not imply that engineering courses are not important. The Navy is a job that requires a working knowledge of engineering principals and systems. A sound foundation of engineering knowledge may not be reflected in fitness reports, but will make it easier for a new Ensign to learn the weapon and engineering systems on board the ship, aircraft, or submarine.

The fact that the coefficient of ENGQPR was not significant may simply mean that the foundation knowledge was achieved by all midshipmen. HUMSQPR, however, seems to provide something extra. This research suggests that the most important element in predicting fleet performance may not be an objective criterion like academic grades. Instead, it is close supervision and evaluation, represented by PERFQPR, by Company Officers that is most indicative of Academy and fleet performance. Many of the skills required for academic success, such as critical thinking and problem solving, are likely to be useful at work but do not tell the whole story.

Although very little of the variance (8.3 percent) between academics and performance has been explained by the model depicted in Table 7, this simply indicates that the model can effectively predict mean PRAPTOT for a group of individuals with a given set of characteristics, but not for the individual graduate. Numerous factors effect individual performance that are not included in the model. It does, however, identify systematic relationships between certain independent variables and fleet performance.

B. RETENTION

Retention is the second measure of occupational success examined in this research. The Navy is concerned about retention rates because, unlike most companies, senior personnel always come from within the Navy. For example, if IBM needs another senior executive, they can conduct interviews and hire someone to fill the position. If the Navy needs a senior executive, equivalent to the rank of Captain, that person will have joined the military twenty years earlier and have been "grown" into a Captain. If that person leaves the service after five years, that is one less person that could fill that senior billet in twenty years.

1. Proposed Retention Model.

In the retention model, the variable STAYLCBD is the dependent variable. STAYLCBD has a value of zero or one, indicating that a subject left the Navy or elected to stay in, respectively. The proposed model for expressing the relationship between academics and retention is shown below:

$$LN\left(\frac{STAYLCBD}{1-STAYLCBD}\right) = \alpha_0 + \beta_1 ACADQPR + \beta_2 CONDQPR + \beta_3 COREQPR + \beta_4 GRADED + \beta_5 HUMSQPR + \beta_6 MILFAM + \beta_7 MTSCQPR + \beta_8 NAPS + \beta_9 OMERIT + \beta_{10} PCRQPR + \beta_{11} PERFQPR + \beta_{11} PREP + \beta_{12} STRIPER$$

where $LN\left(\frac{STAYLCBD}{1-STAYLCBD}\right)$ is equal to log of the odds of staying in the Navy until the Lieutenant Commander promotion board.

2. Method of Analysis.

Much like the methodology for the fleet performance model, the first step is to develop an initial model as a reference point. Instead of linear regression, the retention model requires LOGIT analysis because of the zero-one values of STAYLCBD. As before, multicolinearity is examined and taken into account. Explanatory variables will be included or eliminated from the final model based upon the multicolinearity analysis, the importance of the variables, and significance of their Wald values.

3. Analysis of Retention Model.

Table 8 presents the results of the initial LOGIT retention model. Further inspection of the model revealed multicolinearity between several variables yielding some ambiguous coefficient values and statistical tests.

Table 8. LOGIT Coefficients and Significance Tests for Initial Likelihood of Retention Model.

Variable	Coefficient	Wald	Significance
α	-0.6295	2.4014	0.1212
BLCHIP1	-0.0111	0.0136	0.9073

BOOST	0.9398	3.0933	0.0786
CLUBP	-0.0362	0.2202	0.6389
COLL	0.0651	0.2482	0.6183
CONDQPR	0.0427	0.1586	0.6904
EAGLE	0.3156	7.0591	0.0079
ENGQPR	0.0369	0.1395	0.7088
FOUND	0.087	0.307	0.5795
GROUP2	-0.0896	0.7326	0.392
GROUP3	0.0489	0.3705	0.5427
HUMSQPR	-0.0809	0.7393	0.3899
MILFAM	0.3705	18.8112	0.0000**
MTSCQPR	-0.1387	1.6436	0.1998
NAPS	0.2782	6.6375	0.01
NLETTER1	-0.0593	0.3323	0.5643
PCRQPR	0.0896	1.7134	0.1905
PERFQPR	0.1962	5.2869	0.0215
PREP	-0.188	0.0346	0.8525
SCOUT	-0.1217	1.5626	0.2113
SCOUTLDR	0.2776	4.3119	0.0378
STRIPER	0.0051	0.0019	0.9653
Chi-square=62.429, Significance lower than 0.0001			N=3,567
** Significance lower than 0.0001			
Note: Wald statistic is approximately equal to t^2 in large samples.			

Source: Bowman-Mehay Data File for Navy Unrestricted Line Officers.

a. Effect of Undergraduate Major.

The likelihood of retention does not appear to be influenced by the subjects' undergraduate majors. ENGQPR, HUMSQPR, and MTSCQPR each showed negligible Wald values when GROUP2 and GROUP3 were included in the equation. As in the fleet performance model, GROUP2 and GROUP3 will not be included in the final model.

b. Academic Multicolinearity.

Review of retention model data shows that none of the academic variables have significant Wald values. However, substituting ACADQPR for ENGQPR, HUMSQPR, and MTSCQPR provided an interesting result. ACADQPR is marginally significant (Wald=2.7963) when used in the equation instead of its three components. This is opposite of the performance model where ACADQPR was not significant and its components were. As a result, ACADQPR will be included in the final model as the measure of Naval Academy academic performance.

c. Graduate Education.

Graduate education was initially included in the retention model. However, several obstacles were soon discovered. Some graduate degree programs, such as those at the Naval Postgraduate School, have extra service commitments. Officers who elect to take that billet will have to stay in the Navy longer. This may indicate that the officer wanted to remain in the service anyway and a no-cost graduate degree is an extra benefit. The only way this variable could be useful for a retention analysis is to separate it into two different variables where the graduate degree does and does not incur a service commitment. In this data, graduate education was not identified as either a commitment no-commitment billet.

Therefore, analysis of GRADED was not included in this analysis.

Another point against including a graduate education explanatory variable is the focus of this research is examining Academy variables that predict fleet performance and retention. Fleet performance accounts for performance prior to the time most individuals receive graduate training. The effect of graduate training might also be best examined by considering its effect on promotion to Lieutenant Commander rather than the likelihood of remaining in the Navy until the promotion board meets.

d. Scout Multicolinearity.

SCOUT, SCOUTLDR, and EAGLE all showed significant multicolinearity. However, SCOUT was eliminated because it was not significant when either SCOUTLDR or EAGLE were excluded from the calculations. Both SCOUTLDR and EAGLE were retained in the final model because they were marginally significant with Wald values (3.1947 and 5.7295, respectively).

4. Revised Retention Model.

After completing the analysis of multicolinearity and the significance level of the coefficients, the original retention model was revised. No marginal variables became significant as the model was refined. The final LOGIT regression retention model is shown in Table 9.

Table 9. Revised LOGIT Coefficients for Likelihood of Retention Model.

Variable	Coefficient	Wald	Significance
α	-0.5755	6.09	0.0136

ACADQPR	-0.1164	1.8657	0.172
EAGLE	0.2769	6.0118	0.0142
MILFAM	0.367	19.4291	0.0000**
NAPS	0.2386	5.2041	0.0225
PERFQPR	0.2298	10.1951	0.0407
SCOUTLDR	0.2259	3.2366	0.0158
Chi-square=51.3, Significance lower than 0.0001			N=3,567
** Significance lower than 0.0001			
Note: Wald statistic is approximately equal to t^2 in large samples.			

Source: Bowman-Mehay Data File for Navy Unrestricted Line Officers.

a. Evaluation of Military Family Data.

By far, MILFAM is the most significant explanatory variable for predicting officer retention. That fact is surprising considering MILFAM was not even significant in the performance model. The strength of the variable (Wald=19.4291) suggests that coming from a family tradition of military service greatly increases the rate of officer retention. One possible explanation is that the subject became accustomed to the military lifestyle while growing up, therefore making the cultural transition to the Naval Academy and the fleet much smoother.

b. Evaluation of Military Performance Measures.

Military performance grades are an extremely important factor in predicting officer retention, second only to MILFAM in statistical significance. PERFQPR's high Wald value (10.1951) and positive coefficient (0.2298) indicate that higher military performance grades predict higher rates of retention.

c. Evaluation of Accession Program Data.

The positive effects of attending the Naval Academy Preparatory School on retention is somewhat expected. Some of the personnel attending NAPS are prior enlisted sailors, already accustomed to the military lifestyle. Also, NAPS graduates took the longer and more difficult path to the Academy and a commission. The extra work to achieve their goals may indicate they are extremely dedicated to Naval service, thereby contributing to the increased rate of retention for these subjects.

d. Evaluation of Scout Data.

SCOUTLDR was retained in the final model despite its marginally significant (3.2366) Wald value. When SCOUTLDR was removed from the calculations, EAGLE increased from Wald=6.0118 to Wald=13.2731. After further analysis, it was determined that a greater EAGLE significance did not add as much value to the model as the marginally significant SCOUTLDR.

By including SCOUTLDR, the model included thirty-three percent more subjects than with only EAGLE. As a predictive model is more useful when it can be applied to a larger group of people, SCOUTLDR remained in the model in order to give it greater inclusiveness.

e. Evaluation of ACADQPR.

ACADQPR decreased from marginally significant to not significant while refining the model. In the final model, however, ACADQPR is still more significant than are the three academic components. Therefore, overall academic performance was retained as the academic performance measurement. It is interesting to note that ACADQPR has a

negative effect on retention. It is possible that a negative ACADQPR lends support to the view that some of the best and brightest officers are leaving the service. However, one can not make a definitive statement on this issue because of low statistical significance.

5. Conclusions of Retention Model.

This research shows that the major elements in predicting officer retention are not objective grading criteria. Instead, the greatest statistical influence seems to come from being brought up in a military family. The second most significant retention predictor is military performance grades. Close evaluation by Company Officers appears to identify individuals who thrive in a military environment. Both variables share a common theme where the Navy culture is not just learned, but internalized by the individual. When the culture is internalized, Navy regulations and traditions are cherished for their uniqueness and not scorned for their oppressiveness.

VI. CONCLUSIONS AND RECOMMENDATIONS

In June 1972, after turning over to Vice Admiral William Mack his duties as Superintendent of the Naval Academy, Admiral James Calvert addressed assembled guests with the following words:

> ...there are those who point out that we could give a better education here if we would knock off all this military stuff and stop participating in intercollegiate athletics. And that is also true. But what these people fail to understand is that magic non-rational ingredient which is the catalyst for excellence in our profession, and without which, indeed, we have nothing (Lovell, 1979).

The ingredient that Admiral Calvert mentioned "could be sensed in parades, when the band began to play, and felt in the tear-stained exultation which comes from a great football victory (Lovell, 1979)." The point of Admiral Calvert's speech, just like the findings of this research, is that academics are only one part, albeit important, of adequately preparing a person for the many challenges after college.

A. CONCLUSIONS

Many studies of academic performance as a predictor of occupational success use salary and productivity to measure job performance. However, the Navy has no such scale to measure officer performance. Instead, junior officers are subjectively evaluated by senior officers, using their years of experience to assess the junior's potential for future military service. The Naval Academy, on the other hand, attributes 55 percent of its evaluation system, a midshipman's order of merit ranking, to academic grades.

Academic grades are certainly a measure of intelligence, but leadership is so much more than academic intelligence. Some of the attributes of a leader are sound judgement and the ability to analyze complex information, something that classroom grades can not adequately measure (Fiedler & Garcia, 1996). Furthermore, leadership becomes even more intricate when adding interpersonal elements such as working with "difficult" people, learning to be an ambassador, smoothing over disagreements, or motivating groups of people. Leadership is a dynamic and complex a concept. McClelland (1973) believed that the most important factor for occupational success is not how well someone did in college, but whether or not they attended college at all. McClelland believed that dedication to completing school and having the necessary intelligence to pass the curriculum was more important than a difference in grade point averages.

Analysis of the data showed that, overall, academic grades are not statistically significant for predicting either fleet performance or retention in the Navy. Some academic disciplines were statistically significant, such as humanities and math-science grade point averages, but accounted for little variance between academics and fleet performance. The most significant variable, military performance grades, proved almost twice as predictive of fleet performance as humanities grade point averages, the second most predictive variable. For analysis of retention data, coming from a military families proved to be the most predictive variable, followed by being an Eagle Scout, attending NAPS, and military performance grades.

Whether or not undergraduate academic performance indicates future job performance, this study suggests that there are other factors that influence a person's

occupational success. Past leadership challenges, such as captain of a sports team or president of a club, may give students priceless experience that benefits them later in life. The accumulation of social and academic challenges may translate itself to skills required for future performance in the fleet.

B. POLICY RECOMMENDATIONS AND FUTURE RESEARCH

The recommendations set forth here are not meant to radically change either the curriculum or the culture of the Naval Academy. Instead, they are meant to initiate further research of the Academy's role in professional development and assessing midshipmen potential.

1. OMERIT Determination.

a. Policy Recommendation.

The first recommendation is to consider adjusting the criteria for order of merit calculation to better account for military performance grades, the most predictive explanatory variable of fleet performance. Military performance grades accounted for only 18 percent of the order of merit composite compared to over 55 percent for academic grade point average. This, despite the fact, in terms of statistical significance, that military performance grades are almost twice as predictive of fleet performance as humanities grade point average, the next most significant explanatory variable.

b. Future Research on OMERIT.

During the mid-1990s, the Naval Academy changed the procedure for service selection. Instead of relying only on order of merit, warfare communities began to interview

midshipmen as a screening method. Further research should be conducted to analyze the criteria that warfare communities, especially for highly competitive billets like aviation or special operations, are using to accept or reject candidates. Most importantly, research could concentrate on whether the interview process has actually changed the distribution of highly preferred billets in the order of merit standings.

2. Military Performance Evaluations.

a. Policy Recommendation.

Along with increasing order of merit emphasis on military performance grades, further research must be conducted to understand the essence of the military performance grade. For example, what elements are being measured by the military performance grades that link it to fleet performance? Once these elements are understood, they should be standardized so all midshipmen are comparably evaluated. Also, the Academy could develop other methods to subjectively evaluate midshipmen instead of depending solely on military performance grades. Military performance grades are currently the only method to closely supervise and subjectively evaluate a midshipman's potential for future military service.

b. Future Research on Military Performance Grades.

Military performance grades proved to be the most statistically significant predictor of fleet performance in this study. Further investigation should be performed concerning the connection between military performance grades and fleet performance. For example, high military performance grades may indicate that someone thoroughly enjoys the military lifestyle and culture. Therefore, that person will also enjoy and excel in fleet

performance. By understanding the elements of military performance grades, the Academy can modify the grading criteria to improve prediction of fleet performance.

3. Embracing the Navy Culture.

a. Policy Recommendation.

This study found that coming from a military family increases the chances a junior officer will stay in the Navy. These midshipmen, at an early age, apparently came to understand and appreciate the military culture. Likewise, the Academy must explore more ways to expose midshipmen to the Navy culture in a positive manner. If midshipmen embrace the Navy's culture and make it a part of their life, junior officer retention will very likely increase.

b. Further Research on Military Families.

According to the data analysis, coming from a military family had a very large impact on predicting officer retention. Interviewing officers from military families could reveal common themes about what influenced them to join the military and remain in past the obligatory five-year commitment. Important variables to include in the study would be the subject's age when the parent left the military and how long the parent served in the military.

4. Further Research on the New FITREP System.

One of the ambiguous elements of this data set is the FITREP performance measurement "recommended for accelerated promotion," or "rapped." Popular fleet opinion of the evaluation system was that it was conducive to inflated grading. Approximately three years ago, the Navy introduced a new FITREP system with clearly defined rules on ranking.

Instead of an unlimited number of officers being highlighted by being rapped, there are now five categories: early promote, must promote, promoteable, progressing, and significant problems. Only twenty percent of personnel can be rated as early promote and thirty percent as must promote. The remaining fifty percent can be rated in any of the other three categories. Further research could be conducted to see if there is a more significant relationship between academics and the new FITREP system. All that is required for research to proceed is for BUPERS to collect the fitness report data into one data file for analysis.

C. SUMMARY

Based on this study's findings, one can not say that academic excellence ensures outstanding fleet performance. However, this study does not wish to de-emphasize the virtues of higher education as a tool of enlightenment and developing intellect. Analysis shows a statistically significant, but modest, relationship between academic performance and occupational performance and retention in the Navy.

APPENDIX NAVY AND NAVAL ACADEMY TERMINOLOGY

Brigade of Midshipmen - Midshipmen student body is called the Brigade of Midshipmen. Also referred to simply as "the Brigade."

Commandant - The "vice-president" of the Naval Academy. Responsible to the Superintendent for the day-to-day operation of the Academy.

Company Officer - The Brigade of Midshipmen is divided into thirty companies of midshipmen. Each company is headed by a commissioned officer with the rank of Lieutenant or Lieutenant Commander.

Duty Station - The organization where a military person works. Also referred to as one's command, unit, or tour of duty.

Fitness Reports - Periodic evaluations of an officer's job performance. Promotions are based upon fitness report (FITREP) grades.

Liberty - Free time, usually limited to weekends, when midshipmen may leave the Academy for recreation.

Military Performance - A semesterly grade determined by the midshipman's Company Officer. The military performance grade is a subjective measure of aptitude for military service.

Order of Merit - Midshipmen class rank is determined by order of merit. The order of merit multiple is composed of several components including grades in academics, military performance, conduct, and physical education. The percentage of each component has varied throughout the years.

Quality Point Rating - Midshipmen refer to their grade point average as quality point rating, or QPR.

Reef Points - Handbook issued to all midshipmen upon arrival. Contains information, which must be memorized verbatim, on military ranks and insignia, Naval history, Academy slang, mission of the Naval Academy, etc.

Service Selection - Ceremony in January or February where senior midshipmen choose, based on order off merit, the warfare community they wish to join. The number one ranked midshipman may choose any billet. The midshipman ranked last chooses from whatever is left.

Shore Duty - Shore duty is simply not being assigned to a ship or submarine.

Striper - Senior midshipmen designated to hold a position of management within the Brigade. Position is held for one semester, then another midshipmen assumes the job.

Superintendent - The "president" of the Naval Academy. Ultimately responsible for all activities and policies of the Academy.

Warfare Communities - Job specialties within the Navy that have their own culture, traditions, and terminology. The major warfare communities are surface warfare, aviation, and submarine.

Weekend - A form of midshipmen liberty. Regular liberty expires between 11 p.m. and 1 a.m., depending on the midshipman's class. However, a "weekend" allows one to stay on liberty overnight.

Yard - The Naval Academy campus is called "the Yard."

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