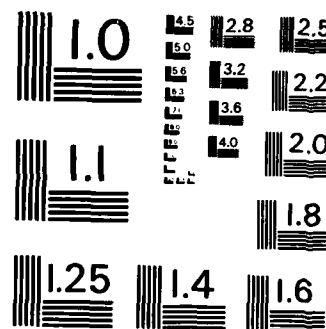END

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THESIS

DEVELOPMENT OF A NEW SCREENING TABLE
FOR
SEA/AIR MARINERS

by

Dwight F. Scott

June 1985

Thesis Advisor: R. A. Zimmerman

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Development of a New Screening Table
For
Sea/Air Mariners

by

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Commander, United States Navy
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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

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June 1985

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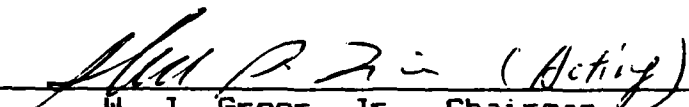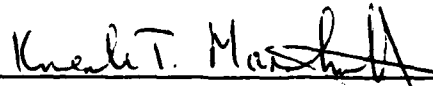

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ABSTRACT

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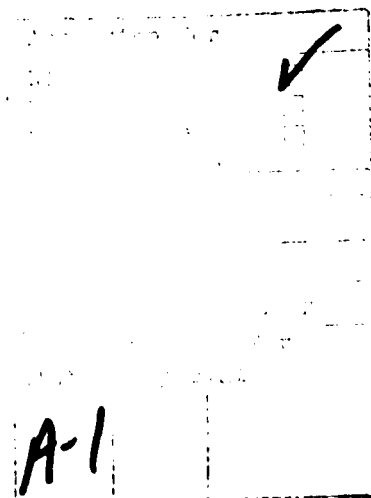
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I. INTRODUCTION

In 1978-79, a flag study group chaired by Mary Snavely Dickson, the Deputy Assistant Secretary of the Navy for Manpower, attempted to identify current manning needs and predict furture manning requirements. The outcome, the Navy Manpower Mobilization System (NAMMOS), was implemented in 1979. NAMMOS is currently a macro-oriented, computer-based system for estimating mobilization requirements by time intervals. This is usually stated in terms of the number of personnel required per month for mobilization. [Ref. 1]

NAMMOS has indicated a shortage of E1-E4 rated personnel in the Naval Selected Reserves (SELRES). The majority of personnel entering the SELRES have had three to four years of active duty or prior serivce (PS) and generally are E-4s, soon to be eligible for E-5. A new program initiated in fiscal year 1984, the Sea/Air Mariner (SAM) program, enlists 10,000 non-prior-service (NPS) personnel annually, with a maximum of 12 months active duty for training before joining a SELRES unit. The SAM program is targeted to the E1-E4 shortages identified by previous NAMMOS results.

SAMs entering the SELRES are sent to full-time training to qualify them for their assigned rating. This training ranges from a minimum of four months for low-aptitude skills to more than ten months for higher-aptitude skills. The cost

of training NPS personnel varies by skill, but simple cost estimates that include recruiting cost, training cost, and military pay during training range from $12,000 to more than $35,000. [Ref. 2] The return from this training investment comes as individuals serve their term of service and are available for mobilization. For the SELRES, almost all NPS enlistees enlist for six years. Of course, selected reservists work only part-time and are usually required to work on the reserve job 38 days per year (14 days of annual training and 24 days of drill). A typical NPS reservist who enlists for six years and serves a complete term would serve for 228 days. However, the return from training for a reservist can not be measured strictly by days served, since the reservist is liable for full-time duty at any time during the six year period.

There are several measures to use to judge whether or not a SELRES is successful. Some of the more commonly accepted measures of determining success are:

1. attrition

2. performance on the job (skills test and evaluation by seniors)

3. legal infractions or lack thereof

4. trainability

5. team participation and interaction.

This thesis focuses on the first of these factors, attrition, and in particular, attrition from the SAM program.

The term attrition is not clearly defined. Webster's definition of attrition is, "a wearing down or reduction, chiefly as a result of resignation, retirement or death," [Ref. 3] but the interpretations of that definition vary from service to service. The definition offered by DOD Directive #1315.7 refers to attrition as "separation prior to completion of the contractual active duty obligation." All the military services currently lose approximately 30 percent of each entering cohort before the completion of contractual obligations. The largest loss rate occurs during the first six months, when over 10 percent of the entering cohort is discharged. Since this time frame coincides with the approximate time SAMs spend on active duty, SAM success will be determined by six month attrition rates. [Ref. 4]

A current topic in any government agency is the budget deficit. There is enormous pressure from Congress, the public, and the Executive Branch to reduce cost. Obviously, one means of meeting manpower requirements at a reduced cost is to reduce replacement costs resulting from premature attrition of first term personnel.

Beyond the direct budget costs associated with high attrition, indirect, but real, cost in the form of an additional "failure experience for young people in the form of negative attitudes held by prior service personnel must not be overlooked. Negative and credible information about military service experiences among large numbers of prior

service personnel can only make recruiting and advertising efforts much more difficult.

The inception of the All Volunteer Force (AVF) in 1973 provided Navy manpower planners with the challenge of attracting, recruiting and retaining high quality personnel in the absence of conscription. Navy manpower planners must also cope with a decreasing supply of 18-21 year olds. In fact, this cohort is predicted to shrink by approximately 15 percent by 1988 when compared to the 1979 cohort, and by approximately 25 percent by 1994. [Ref. 5]

In fiscal year 1983, the ability of Navy recruiters to meet their recruiting goals was enhanced by the unfavorable economic conditions at the time. The trends referred to above, however, indicate that such ease in manning the force will not prevail throughout this decade. As of March 1985, Navy recruiting as a whole is 15 percent short of its goal [Ref. 6], this deficiency may continue so long as the economy stays healthy and there is no major international discord. The Navy SELRES may be forced to recruit "less qualified" personnel just to meet manning requirements.

The foregoing discussion suggests that more accurate and cost effective screening will be necessary to meet manning requirements. Presently, the SAM program applicants are screened using the same screening table as active duty applicants. This table has remained unchanged since 1977. [Ref. 7] Lockman and Lurie of the Center of Naval Analysis (CNA), have laid the foundation for this thesis in a series

of studies concerning first term attrition. [Ref. 7,8] The objective of this thesis is to develop a more accurate and cost effective screening table for the SAM program.

This thesis will provide the reader with a background to better understand the problem of attrition, especically reserve attrition. This is accomplished through a presentation of Naval Reserve history, followed by a discussion of current literature on the subject. The analysis section includes a discussion of the data base, variables, and methodology used to develop the new SAM screening table. The empirical results section presents findings as they relate to screening of recruits. The conclusion summarizes the findings and presents recommendations for personnel in the manpower field.

active Navy under a four year USN contract and then chose
not to reenlist in the regular Navy but did decide to join
the SELRES.

As mentioned earlier, the SELRES is the center of the
Naval Reserve. Most are presently NAVETs. The bulk of this
community, approximately 80,000, serve in the Surface
Reserve Force. Surface reservists train at 235 reserve cen-
ters located in every state and in Puerto Rico. The centers
are administered by 16 readiness commands. Also included in
the surface reserves are 17 reserve naval mobile construc-
tion battalions, the SeaBees. More than 23,000 selected
reservists are members of the Naval Air Reserve Force. They
are assigned to more than 50 reserve squadrons with more
than 400 aircraft of 18 different types which are located at
23 sites in the United States.

The various SELRES units have differing structures and
differing mobilization missions. There are three types of
units:

1. Commissioned Units - complete operational entities
   such as ships, squadrons, and construction battalions

2. Reinforcing Units - those ready to augment active
   Navy ships and squadrons, and afloat staffs

3. Sustaining Units - those ready to augment active
   Navy bases, stations, and other support organizations.

Types of commissioned units today include nine modern
frigates, 18 minesweepers, four special boat units, 12
cargo-handling battalions, two carrier air wings, two patrol
wings, a helicopter wing, and a fleet logistic support wing.

keep current the naval experience of the individuals without undue interference with their normal civilian lives.

These two classes are directed into three main programs of junior enlisted personnel for the Selected Reserve. One is the Active Mariner (AM) program. Recruits enlisting under this program spend three years as part of the active-duty force. Following this period, they are obligated to spend an additional two years as members of the SELRES. Over the period from fiscal year 1979 to fiscal year 1982, approximately 6,000 AMs reached SELRES drilling units each year. A second source of junior enlisted personnel for SELRES is the Ready Mariner (RM) program. Ready Mariner recruits undergo an initial six to twelve month period of active duty for training. They are then obligated to drill with the SELRES for the remainder of a six year term. Before FY 1984, this program was relatively small, with annual accessions of approximately 2,000. In FY 1984, the Ready Mariner program was expanded and modified. It is now called the Sea/Air Mariner (SAM) program and is scheduled to have 10,000 accessions per year. The SAM program retains many of the features of the old RM program (recruits receive training but do not serve with the active-duty fleet before joining the SELRES drilling units).

Navy veterans (NAVETs) are the final source of junior enlisted personnel for the SELRES. NAVETs in paygrades E-4 and below are generally individuals who enlisted in the

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The remainder of the Ready Reserve includes about 74,000 individuals who are on full-time active duty. Almost 14,000 of these are career active-duty reservists responsible for the training and administration of reservists; they are called TARs. The balance of the ready reservist on active duty are active mariners and Officer Candidate School students and graduates.

There are another 62,000 individual ready reservists, almost 55,000 of whom do not drill at all. Additionally, the remaining 7,000 drill without pay and are assigned to voluntary training units (VTUs). VTUs train at every surface and air reserve training site. Finally, there are about 9,000 Naval Reserve Officer Training Corps cadets who are also members of the ready reserve. The Retired Reserve accounts for another 133,000 members, and there are about 13,000 members in the Standby Reserve. Retired reservists and standby reservists are liable for active duty in time of war or national emergency declared by Congress or when otherwise authorized by law, but only after the Ready Reserve has been called.

Broadly speaking, the Naval Reserve effort in times of peace is concerned with two classes of citizens. The first class consists of those who have little or no active duty experience. This class is recruited principally from high school age and up. A second class consists of those who have had naval experience and training but have left the service. The aim in the case of this class is to conserve and

addition, the Naval Reserve's organization has been improved. In 1983, in recognition of the emerging role of the Naval Reserve, the Chief of Naval Reserve staff in New Orleans, Louisiana, was reorganized and elevated into a force command (Commander, Naval Reserve Force) with two subordinate commands (Commander, Naval Surface Reserve Force and Commander, Naval Air Reserve Force).

Organization, administration, training and supply of the Naval Reserve are under the direction of the Chief of Naval Operations, aided by an Assistant Chief of Naval Operations for the Naval Reserve. The Bureaus and offices of the Department of the Navy hold the same relationship and responsibility to the Reserve as they do to the regular Navy. The next section discusses the composition of the reserves.

2. Force Composition

There are almost 400,000 men and women serving in the Naval Reserve today. The bulk of these, almost 250,000, are members of the Ready Reserve. The Selected Reserve, which is the Navy's source of immediate mobilization manpower, is the core of the Ready Reserve. There are approximately 105,000 selected reservists. They drill one weekend a month and perform two weeks of annual active duty in a paid status. These are the "active" reservists who are not on active duty. [Ref. 20]

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During this period, Project Readiness was implemented to improve the capabilities of the Naval Reserve to meet the challenges of its new position of importance. This program structured the augmentation personnel of the Naval Reserve into units that were tied directly to their gaining command of the active force unit to which they would mobilize. Training was focused on specific requirements of each mobilization billet, and emphasis was placed on having the Selected Reserve unit train with its gaining command during annual active-duty training. The weekend away training (WET) program has expanded this concept to include increasing amounts of inactive duty (weekend) training with the gaining command or at a centralized training site. [Ref. 19]

The Naval Reserve has progressed from a structure in which a large portion of its personnel, those who would augment the active force, were organized in manpower pools called naval air reserve divisions or surface reserve divisions, to a structure of reinforcing and sustaining units that linked directly to their gaining commands. Previously, there were pools of qualified personnel who did not have adequate training opportunities to maintain the skills gained on active duty because they did not know what specific training was required of them and the Naval Reserve did not have the capability to train them. Currently, there are precise mobilization billets with appropriate qualification requirements for all augmentation personnel. In

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such conflict, thus reducing the need for reinforcements. Those that adhered to a short war philosophy, concluded that the reserve forces had to be capable of rapid response. Based on this conclusion, legislation was passed, in 1976, to provide the Secretary of Defense with the authority to call up to 50,000 Selected Reservists (raised to 100,000 in 1980) to active duty for up to 90 days without a declaration of war or national emergency. Originally, the proponents of the short war philosophy thought that it would require less reserve personnel, but the need for a rapid response had actually increased the need for a viable reserve force.

The third event that affected the reserve organization involved the collision of the aforementioned short war philosophy with the realities of international politics. Soviet and Soviet-proxy military involvement in the Third World, effectively precluded the ability of the U.S. to adhere to an exclusively European scenario. At the same time, adherence to the short war scenario decreased. While the short-war scenario was accepted as one possible outcome of U.S. Soviet hostilities in Europe, equally plausible scenarios involving protracted conflicts could be constructed. Therefore, it was not prudent for the U.S. to plan for only one contingency, especially one which called for the smallest force structure and minimum funds. Scenarios involving protracted conflicts suggested the need for a larger Reserve force and more emphasis on mobilization. [Ref. 18]

certainly resulted in the tacit acceptance of active force strengths lower than would have been considered prudent had a draft been available to fill the ranks. The reserve components remained the sole available source of trained units and individuals for augmentation of the active forces upon mobilization until such time as conscription could be reinstated. Deprived of draft-pressured voluntary enlistments, the Selected Reserve declined 19% in six years. The net effect of the end of the draft has been to increase the responsibilities of the reserve forces, as well as the end strengths needed to fill these requirements, while simultaneously drastically decreasing their ability to fill their ranks. [Ref. 17]

The second event was related to our lack of success in the Vietnam War. Subdued by the Vietnam War, U.S. defense planning once again focused on familiar terrain, a war in Europe. Planning for global contingencies was sharply curtailed. Force structuring was to center about how best to fight the Soviet Union and its Warsaw Pact allies in Europe, on the land flanks of Europe, and in waters and airspace adjacent to Europe. This redefinition of U.S. strategy, by geographically constricting the potential area of U.S. military responsibility, decreased the mobilization requirements of the Armed Forces, including the requirements for Reserves. Along with this redefinition was the belief that nuclear weapons would be employed in the early stages of

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concerning rank and ratings, with equal opportunities for advancement and assignment to duties based on the experience and qualifications of the individual. The principal differ- ence between the reservist and regular during declared war is that, as a rule, the latter planned to make the Navy a career when he entered the service, whereas only a small percentage of the former planned to remain in the Navy beyond the period of hostilities. After each period of conflict, the armed forces are drastically reduced and the reserves are the first to be returned to civilian life.

The mid-to-late 1970s were a time of turmoil for the Naval Reserve. A Select Reserve force (a cadre who regularly attend drills and fill immediate mobilization requirements when needed), which had numbered near 129,000 in 1973, was proposed for gradually lower levels. This culminated in the President's budget submission for fiscal year 1980 which called for an average strength of only 48,700. Congressional action repeatedly authorized and funded higher levels than requested, but the Selected Reserve strength did drop to a post-World War II low of 81,000 in 1978. [Ref. 16]

There were three major events during the 1970s which were the source of turmoil for the Naval Reserves. Their cumulative result has been to increase the dependence of the Armed Forces on Reserves should any military action beyond a minor show of force be required.

The first of these was the end of the draft in 1973, which had been approved as law in 1971. This change almost

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enthusiasts from Yale University, who had bought their own planes, volunteered their services to the Navy before the United States entered the war. This first Yale unit pioneered the modern Naval Air Reserve. [Ref. 14]

In World War II, almost 80% of the Navy's uniformed force were reservists, but most of them had not participated in the Naval Reserve before going on active duty. After World War II, there were more than 130,000 people in the organized Naval Reserve. Also, there were hundreds of training centers for reserves located throughout the United States where classroom training was emphasized, and some ships and aircraft were assigned to reserve forces. During the Korean War, more than 130,000 reservists served on active duty, and approximately 75% of the combat sorties were flown by reserve aviators. During the Vietnam War, two SeaBee battalions were mobilized from the reserve forces and served in Vietnam. [Ref. 15]

These wars demonstrated that a small, efficient regular Navy can quickly absorb a large number of recruits from civilian life. In other words, professional sailors need only be a small part of the sea forces of a country in modern warfare if intensive training and indoctrination of the Naval Reserve is maintained. It would, in fact, be inaccurate and misleading to speak of the United States Navy of World War II as composed of regular and of reserve personnel. During the war all were in a temporary status

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organizations resumed functioning as militia units and the Navy Department extended the assignment of ships to them for training purposes. Sixteen states still have naval militias and in a number of states individuals have a dual status as both naval militiamen and members of the Naval Reserve.

In February 1914, "An Act to Promote the Efficiency of the Naval Militia and for other Purposes," commonly known as the Naval Militia Act, became law. All states having such naval militia units in were required to organize them in accordance with the aforementioned Act. On March 3, 1915, another act was passed which created the federal Naval Reserve and set standards for the naval militia which were consistent with those set for the Reserve activities. This reserve was composed of men honorably discharged from the regular Navy. Retainer pay (which is called retirement pay today) was provided and the men were required to keep a uniform on hand. This act laid the foundation for the Naval Reserve as it exists today, although many changes have been made in the details of its organization, training and admin- istration since then. In August 1916, with World War I already under way, Congress passed an act establishing a new Naval Reserve force and federalizing the naval militia. [Ref. 13]

During World War I, about 30,000 reserve officers and 300,000 enlisted reservists served on active duty. Among them were 12,000 female reservists who worked as yeomanettes in Navy and Marine Corps offices. A group of flying

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to them by the various bureaus of the Navy Department. Adminstration of this effort was handled by the Office of the Naval Militia. Some equipment was also loaned by the War Department. The states themselves purchased certain items of clothing and equipment, but in the early years the members of these organizations often defrayed, out of their own pockets, much of the cost of keeping the naval militia units alive. Annual practice cruises were made by some of the organizations and drills were conducted in the National Guard armories.

When the Spanish-American War broke out in 1898, no statutory provision had been made for incorporating the personnel of the naval militia into the federal naval establishment in case of emergencies. The governors of the various states having naval militia units solved the problem by granting leaves of absence to the naval militia personnel which permitted them to join the regular Navy. Some of the units were kept intact and manned ships as a unit, while others were scattered throughout the fleet. The Naval Militia personnel so fully demonstrated their value and efficiency as part of the sea forces of the nation that the Navy Department after the war strongly recommended the establishment of a national naval reserve. Bills were introduced in Congress to bring this about but it took fifteen years for Congress to legislate the establishment of a federal naval reserve. In the interim, the state naval

alone, the maintenance of a Navy of this size continuously, in times of peace, would impose an intolerable burden on the country.

Navies have traditionally been national rather than locally-based organizations. The Anglo-American tradition of armies as an outgrowth of locally-based and recruited militia results in a comparatively greater understanding of and affinity for reserves in the ground forces. Navies, requiring extremely large capital investment in ships and shore facilities, and acting on behalf of the central government at sea rather than on behalf of local interest, do not have a tradition of orginating locally. This explains the late development of the Naval Reserve and its limited size compared to reserve ground forces. [Ref. 11]

Until shortly before World War I, the only Naval Reserve forces of the United States were the naval militia units of a few states. The first such unit was organized in Massachusetts on March 18, 1890, as part of the already existing land militia. [Ref. 12] Other sea coast and lake states followed this example, but the movement was sponsored largely by amateur sailors and navy enthusiasts in civilian life rather than by the federal or state governments.

In 1892, there was included in the annual naval appropriation act of Congress an item of $25,000 for "Arming and Equipping Naval Militia". This was the first federal appropriation for this purpose. Ships wer? loaned to naval militia organizations and material and equipment were issued

assigned missions. The need for a military agency to interface between the Secretary of the Navy and the bureaus became obvious. Thus, a series of proposals were made for the establishment of a general staff. Finally in 1909, a General Board of the Navy was established. Its members served as advisors to the Secretary, with the President of the General Board serving essentially as Naval Chief of Staff. Congressional hearings resulted in passage of a law in 1915 which created the Office of the Chief of Naval Operations which was charged with 1) the operation of the fleet, 2) the preparation and readiness of Naval forces for use in the defense of the United States and its allies, and 3) fulfilling a peacetime role. [Ref. 10]

B. NAVAL RESERVES

1. History

Naval Reserve is the term broadly applied to all of the naval forces of a country which are organized and given professional naval training in times of peace, but which are not continuously employed in the Navy during such periods. The purpose of maintaining a reserve force is to provide, at the least expense to the country, the large numbers of trained personnel needed by the Navy to mobilize for war. During periods of mobilization, reserves are used to bring the complements of stations and ships in commission up to combat strength and to man other ships and stations that must be added immediately. From the point of view of cost

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II. BACKGROUND

A. REGULAR NAVY

The Naval Reserve are under the authority of the regular Navy. Thus, in order to give proper perspective to a discussion of the Reserves, it is necessary to briefly discuss the development and organization of the active Navy.

The original Department of the Navy was established in 1778. It was similar to the Revolutionary Navy in that it was in the hands of civilian appointees. Naval officers were appointed to provide professional assistance to the civilian appointees. This assistance took the form of advice relating to the construction, repair, and equipping of ships and the managing of shipyards. By 1842, the Navy Department had shifted from being primarily a manpower intensive service, like the Army, to a material intensive service, deeply involved in complex and expanding technical problems. Also, five individual bureaus under the Secretary of the Navy had been created. The weakness of this bureau system was recognized during the Civil War, and led to the creation of additional bureaus. [Ref. 9]

During the closing years of the 19th century, it became increasingly difficult for the Secretary to personnally coordinate the activities of the Department of the Navy, due to the growth, increased complexity, and scope of the

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Reinforcing and sustaining units are composed of experienced professionals in more than 30 fields including medicine, submarine forces, unified/joint shore commands, intelligence, military sealift, air systems, Merchant Marine, law, and oceanography. This is designed to fill the trained manpower needs of Navy units that are manned at less than wartime requirements.

The men and women who make up the reinforcing and sustaining units know where they are needed if mobilized. Usually, they train with their gaining command on weekends and on annual active duty training. Commissioned units would mobilize with their own equipment, as a unit, to expand the force structure of the Navy. These reserve ships, squadrons, and SeaBee and cargo battalions would be employed where needed. [Ref. 21]

3. Present Missions

Naval reservists man and operate all of the Navy's U.S. based logistic airlift squadrons. All of the Navy's light attack helicopter squadrons and combat search and rescue capability are in the Naval Reserve. In addition, the Naval Reserve contains all of the Navy's inshore underwater warfare units. Other examples of the missions being presently carried out by the Naval Reserve are:

```
99 percent of Naval Control of Shipping Organization
86 percent of Navy cargo-handling battalions
86 percent of Naval ocean minesweepers
85 percent of Military Sealift Command military personnel
68 percent of mobile construction battalions
66 percent of special boat forces
34 percent of Naval Intelligence personnel
```

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30 percent of Naval medical support personnel
        14 percent of Navy tactical carrier air wings [Ref. 22]

As can be seen from the above list, the Naval Reserve contri-

butes significantly to the national defense.

    4. New Missions

        Historically, the Naval Reserve was issued equipment

which ·was outdated and no longer used by the Navy. This

policy often created a reserve force that was incompatible

with the Navy's current missions. Modern aircraft carriers,

for example, were not equipped to support the reserve A-7B

aircraft and World War II-vintage destroyers were simply not

sophisticated . enough   to play an important   role in

antisubmarine warfare. [Ref. 23]

        This problem was first addressed in 1982 when Secretary

of the Navy John Lehman announced a drive to update Naval

Reserve equipment. He termed it "horizontal intergration";

that is, the assignment of the same types of equipment to

the active and reserve forces. This is aptly demonstrated by

recent delivery to the Reserves of the new A/F-18 aircraft,

Knox-class frigates, Oliver Hazard Perry-class frigates and

up-to-date support ships. These have given the Naval Reserve

increased capabilities.

        The Naval Reserve is unique among the services in the

employment of its forces during peacetime. Certainly, the

Navy recognizes the talent and capabilities within its

reserve ranks. But with its forward deployed strategy, the

Navy faces a greater challenge in optimizing Reserve forces.

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A list of possible new missions for the Naval Reserve was part of the "Report to Congress on the Navy's Total Force" released in February 1984. This list includes:

1. Establishing a new land-based aerial tanking mission for the Naval Air Reserve

2. Establishing a new reserve squadron augment unit for the Navy's carrier onboard delivery (COD) squadrons

3. Modernizing and assigning Naval Air Reserve carrier air wings to the 15th and 16th aircraft carrier battle groups

4. Consolidating P-3C squadron augment units into master augment units and making the P-3C aircraft and weapon system trainers available for reserve use

5. Transferring Navy repair ships to the Naval Reserve Force to support its ships

6. Creating unique roles for reserve responsibility in maritime coastal defense and Caribbean sea lines of communications protection [Ref. 24]

In the future, the Navy will undoubtedly assign even more responsibility to its reserve forces. The Reserves' major challenge is to ensure that it recruits, trains, and retains the numbers and types of selected reservists necessary to meet the requirements of the expanding Naval Reserve.

5. Sea/Air Mariner (SAM) Program

As the Naval Reserves' missions increase, so will its manpower requirements. The Navy determines how many people it needs in the SELRES through the Navy's Manpower Mobilization System (NAMMOS). While projecting its total manpower requirements for mobilization, the Navy also determines the number of reservists needed. The NAMMOS requirement

projected to fiscal year 1989 is for more than 132,000 indi-
viduals in the SELRES, about 30,000 more than the fiscal
year 1984 number. [Ref. 25]

With increasing requirements, a new program to increase
accessions into the Naval Reserve must be initiated. Since
most vacant reserve billets consisted of pay grades E-2
through E-4, the Navy implemented a new program to recruit
non-prion-service (NPS) men and women. This new initiative,
the SAM program, was implemented in fisal year 1984. A
primary requirement of the SAM program was to insure quality
as well as quantity to fill specific junior enlisted vacan-
cies in designated units, particularly ships, aircraft
squadrons, SeaBee battalions, and medical units.

The Naval Reserve's goal is to recruit 10,000 SAMs per
year. Men and women between the ages of 17 and 33 are eli-
gible to join. If a high school junior signs up for the SAM
program, he or she can attend recruit training between the
junior and senior years of school. After high school, SAM's
may attend a Navy "A" school or receive apprenticeship
training (ATP) and then return to their hometown reserve
unit for additional on-the-job training. Some may even be
selected for advanced training at Navy "C" schools. A
requirement that is often overlooked states that the reserve
applicant can not reside more than 100 miles from the
reserve drilling site. This has the effect of reducing the
pool of eligible enlistees drastically, because of the
reasons previously mentioned, Naval Reserve units are

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capital intensive which limits the number of Naval Reserve units in a geographic area. (Recent Army studies indicate that reservists more than 35 miles from the drilling site are less likely to fulfill their service obligation.) [Ref. 26]

All personnel enlisting in the SAM program must enlist for a period of six years in the Naval Reserves. Enlistees are required to complete a period of Initial Active Duty for Training (IADT) of not less than 12 weeks in length to include recruit training and either "A" school, or apprenticeship technical training. The amount of time spent on active duty depends upon the "A" school or apprenticeship program attended, but the maximum is 18 months.

There are two pecuniary incentive programs to encourage enlistees to fill those areas where shortages exist. The first incentive is a bonus plan, in which the enlistee receives $1,000 at the completion of IADT, $500 upon completion of the fourth year of reserve service, and the last $500 upon completion of the sixth year, for a total of $2,000. The second incentive is designated an educational assistance plan for those enlistees who desire to continue their education beyond the high school level. They are eligible for a maximum of $4,000, with a maximum of $1,000 for any 12 month period. It must be emphasized that these incentive programs are only for ratings which are most

difficult to fill, i.e. those with the highest qualification standards. [Ref. 27]

SAM applicants are screened by their AFQT scores, education level, and age using the same SCREEN table used for regular Navy recruits. [Ref. 28] The SAM applicant, being a moonlighter, may possess diferent attributes and attitudes from one who enlists into the regular Navy. Additionally, the reserve environment is quite unique. Both of these factors would seem to indicate that there should be different screening standards for entry into the SAM program as opposed to those for the regular Navy.

About one in five of the new SAM recruits is scheduled to become a member of the reserve's medical force, which is the fastest growing program in the Naval Reserve. From fewer than 8,000 officers and enlisted personnel in 1983, the authorized medical force strength will grow to almost 20,000 by the end of 1987. One major effort underway in the reserve medical force is the creation of augmenting units to staff the new fleet hospital program. These hospitals will be established over the next four to five years and will provide emergency medical care in case of national emergency.

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III. LITERATURE REVIEW

Unlike the active Navy, there is a meager amount of literature concerning the United States Selected Reserve manpower, and in particular, the Naval SELRES. Because of the larger size of the Army Reserve and the National Guard, most of the manpower reports in the reserve area have been sponsored by these organizations. The Navy, with its increased emphasis on the total force concept, is giving more attention to Naval Reserve research. Not all that has been written on the subject of reserve forces will be covered in this review. Rather, a synopsis of the subjects will be presented to set the stage for this thesis.

A. TOTAL FORCE CONCEPT

A paper written at the Air Command and Staff College, Washington, D.C., by Arthur Moxon stressed the effects of active Navy policies on the SELRES forces in consonance with the total force concept (integration of active and reserve capabilities to maximize military effectiveness). [Ref. 29] This total force concept is closely related to the all-volunteer force concept, in the sense that the total force policy assigned increased roles and responsibility to the reserves and the termination of the draft ended the major incentive for reserve enlistments. Moxon's major points were:

1. The SELRES currently depends primarily on prior service individuals to meet annual accession requirements.

2. The Defense Manpower Commission assumes that non-prior-service recruits will come from the same pool that provides manpower for the active forces, thus making it more difficult for active Navy recruiters to meet their recruiting goals.

3. More than 12 percent of all individuals undergoing military training and education are members of reserve components. Both changes in active force training policy and reserve NPS accession requirements affect the training pipeline. This was brought to the forefront with the implementation of the SAM program and the added 5,000 "A" School participants annually.

4. Reserves should seek a higher quality recruit than the active forces because reserve personnel train only part-time and must retain skills over longer periods with less practice and supervision. [Ref. 30]

There have been proposals for an increased substitution of capital equipment for manpower which are based upon the rapid increases in the relative price of military labor since 1971, but the nature of reserve duty limits the savings from this substitution. Essentially, the reserves employ a part-time labor force in contrast to the full-time labor force in the active component, and capital goods are more difficult to employ on a part-time basis. Thus, reserve units become more expensive as capital equipment is substituted for manpower. Of course, reserve units have to be competent in using the same equipment they will be required to use when mobilized. This is consistent with the total force concept and is a primary reason for the increasing cost of equipping the reserves.

Except for the highly praised Air Reserve components, "...the Naval Reserve continues to be criticized, sometimes unfairly, as the least effective and most misused of the reserve components". [Ref.31] Moxon feels that the primary cause for the state of reserve readiness is the persistent unwillingness of the active Navy to give more than nominal support to reserve forces and acknowledge the utility of reserves in performing naval missions in both peace and war. This situation has been remedied, to some extent, by the emphasis on the total force concept. He notes however, the total force concept must be given adequate financial backing if it is to be fully implemented.

B. COST OF RESERVE PROGRAMS

Deborah Clay-Mendez of the Center for Naval Analysis (CNA), was one of the first to specifically compare the cost of two NPS reserve enlistment programs, the SAM and Active Mariner (AM) programs, to the enlistment of PS (NAVETs) into the Naval Reserves. SAM costing data was estimated by using Ready Mariner (RM) historical data. [Ref. 32]

The cost comparisons included recruiting and training cost of SAMs and AMs and the man-years of service they provide to the SELRES. Because of the recruiting and training costs involved, the junior enlisted man-years provided to the SELRES via the mandatory drilling programs (SAMs and AMs) are actually more expensive than the SELRES man-years provided by the more senior NAVETs. Training and

recruiting costs for Navets are assumed to be sunk cost and are not considered.

Clay-Mendez concluded that, in the short-run, SELRES can meet part of the increased requirements for junior enlisted personnel at less cost through the use of higher NAVET bonuses. The bulk of junior enlisted personnel are provided by the mandatory drilling programs but the SELRES man-years provided by these programs are relatively expensive.

What has not been addressed in these economic studies is the problem of increasing the number of NAVETs in the SELRES. As a result, the E1-E4 billets will be filled by more senior personnel. With senior personnel being placed in E1-E4 billets, attrition is likely to increase. Of course, a much simpler answer is to simply reduce the number of NPS mandatory drillers needed in the SELRES. Presently, the SAM program recruiting goals, based on mobilization require- ments, are 10,000 per year. In a reevaluation of these mobilization requirements, Dr. Jean Fletcher of CNA con- cluded that only 6,700 SAMs are needed per year. Also, if normal discharges were prohibited in times of mobilization, the SAM requirements drop to only 3,200 per year. [Ref.33] This would drastically reduce reserve manpower costs because SAMs are the most expensive, per man-year, of SELRES personnel.

C. FACTORS AFFECTING RESERVE PARTICIPATION

William McNaught, in a 1981 Rand report [Ref. 34],
discussed the reserve participation decision in terms of how
it differs from a civilian job decision and how it relates
to the decision to join the active forces.

The reserve participation decision is a decision to take
a second job, or moonlight. If workers were free to set
their own hours, they would set their length of work accor-
ding to their marginal valuation of time. There is a rivalry
between the desire for material goods and services available
through wages and the dislike of work and the desire to
enjoy additional free time. Because fixed working hours are
the rule in most parts of the economy, many workers must
work more hours or fewer hours than they prefer. The secon-
dary job market offers those who desire additional income
through increased working hours an opportunity to obtain a
more flexible work schedule, one which increases individual
satisfaction. [Ref. 35]

The term moonlighting is usually associated with
civilian employment but in this case the term can also refer
to service in the reserves. It is important that one be
aware of the differences between moonlighting in a civilian
job and moonlighting in the reserves. The following is a
list of the most relevant differences:

1. SELRES are obligated for up to six years

2. SELRES must accept military discipline

3. SELRES can be called to full-time military duty during mobilization or civil emergency

4. Drill schedules are inflexible

5. Large travel costs to attend drills can easily offset any gains associated with reserve service

6. SELRES attend 16 hours/month while civilian moon-lighters average 13 hours/week in a second job.

McNaught's report included a model to predict reserve participation which was based upon the characteristics of a moonlighter (younger, more educated, with larger families, smaller primary incomes, greater housing expenses, fewer primary work hours, than those who do not moonlight) His reserve participation (R) model is stated below:

$$R = f(W,C,S,H,U,P,I,T,X)$$

where,
R = Reserve participation (number of reserve enlistments)
W = reserve wage rate
C = primary civilian wage rate
S = secondary wage rate
H = primary hours worked
U = unemployment rate
P = population of eligible enlistees
I = the amount of information available about reserve enlistment opportunities
T = travel cost for the selres to attend drills
X = includes: special enlistment options, seasonal and regional dummies, etc. [Ref. 36]

The regression variables' coefficients that were obtained using the above model of NPS Reserves participation for the Army Reserve, Air National Guard and Marine Corps Reserve showed little similarity between services. For some variables, the sign of the coefficient was not the same for each service. The elasticities with the strongest influence

on NPS Reserve participation in all three services, were secondary wages and primary working hours, with the latter dominant. Elasticities for the other variables show that reserve enlistments increase with increases in military pay and unemployment, and decrease with increases in pay received on the primary job, and hours worked on the primary job.

McNaught's model is not very different from active force models. He states that the NPS enlistment decision in the Naval Reserves has many of the same characteristics of a decision to enlist in the active military. (Approximately 5-15 percent of the reserve personnel joined the active forces between FY78-83.) [Ref. 37] In fact, many NPS reserve enlistees are disguised active duty enlistees who use reserve entrance procedures to sample military life or to circumvent active force enlistment screens. Thus, for NPS personnel, the decision to enter the reserves may be very similar to the decision to enter the active duty.

Lawrence Curran and Aline Quester, CNA, used information from a survey of enlisted reservists and from personnel files to determine what factors influence continued participation in the SELRES. They found that reservists who were more dissatisfied with their experience on active duty than they were with their general reserve experience, were more likely to leave the reserves. This lends some comfirmation to the hypothesis of similarity between active and reserve enlistment decisions. It also supports the idea that

reservists could be screened (to reduce attrition) as if they were enlisting for active duty. [Ref. 38]

Aline Quester has also looked into the propensity of active forces personnel to join the SELRES after their normal tour of active duty has been terminated. She found that the probability of a NAVET joining the SELRES is positively related to reserve pay, the unemployment rate, and the Navy rating in which he served. The average affiliation rate (the rate at which NAVETs join the SELRES after completing their active duty commitment) was 13 percent but the rate varied widely across ratings. All rates were low enough to suggest that there is a substantial pool of NAVETs in the civilian population. As might be expected AMs behave as do NAVETs; generally there is only one year of active duty separating the two groups. This result is consistent with other findings. [Ref. 39]

David Grissmer of the Rand Corporation has written several papers on reserve attrition [Ref. 40, 41] which discuss variables for predicting success of reserve enlistees. Success was defined as completing one's contractual obligation. Among all the variables tested, education level and mental aptitude were the strongest predictors of attrition. This may be due to the fact that individuals with more education and higher mental aptitude tend to make more informed and thoughtful enlistment decisions. In addition, it may be that these people are more able to meet the

TABLE 3

SAM DATA DEMOGRAPHIC PROFILE

Number in Each Category (Row Percent)

Variable	Variable Category	Leavers	Stayers	Total
Education	HSG	690(8.6)	8033(91.4)	8723
Level	NHSG	83(8.2)	1017(91.8)	1100
				9823
Mental	I	26(7.8)	330(92.2)	356
Category	II	207(6.6)	3156(93.4)	3363
	IIIA	162(7.8)	2082(92.2)	2244
	IIIB	243(8.9)	2704(91.1)	2947
	IV	156(14.0)	1110(86.0)	1266
				10176
AGE	17	28(3.8)	701(96.2)	729
	18	165(7.6)	2180(92.4)	2345
	19	200(8.5)	2350(91.5)	2550
	20	132(9.0)	1460(91.0)	1592
	21+	269(9.9)	2691(90.1)	2960
				10176

An examination of the data in Table 1 reveals some disparities between the two data files. To enable the SAM program to meet its recruiting goals, a higher percentage of mental category IIIBs and IVs, females and older recruits, were enlisted. These categories are historically noted to produce higher attrition rates, but this is not reflected in the SAM data. As to education level, the active Navy cohort has more HSGs than the SAM cohort, but this did not appear to decrease the attrition rate as might be expected.

Furthermore, there were numerous start-up problems for the SAM program which were primarily caused by a sense of urgency (which hastened the SAM program's implementation) and the lack of funding available to meet first year costs. These problems resulted in poor recruiter preparedness, a shortage of training vacancies, and a lack of quality data. Therefore, SAM attrition behavior may be different from that of active Navy personnel, at least for the first six month of duty.

Initial analysis of SAM data indicated that the variables of education level, age, and mental category where significant. Table 2 gives the chi-square tests for independence for each of the predictors with attrition. Race, sex, and marital status were not found to be significant.

The demographic profile of the SAM data file is shown in Table 3. Education level, with only 9823 complete

TABLE 1

DEMOGRAPHIC COMPARISONS OF FY84 NAVAL RECRUITS
in Percents

Variable	Active Force	SAMs
Age		
17	5.4	7.1
18	32.2	23.3
19	22.8	24.6
20	12.8	15.7
21+	26.8	29.3
Mental Category		
I	4.1	3.5
II	40.0	33.0
IIIA	22.8	22.0
IIIB	25.2	28.9
IV	7.9	12.6
Education Level		
HSG	91.5	88.9
NHSG	8.5	11.1
Marital Status		
Single	93.3	94.9
Married	6.7	5.1
Race		
Other	4.9	2.0
Black	14.2	19.0
White	80.8	79.0
Sex		
Female	10.7	12.3
Male	89.3	87.7
Six Month Attrition	15.6	7.9

TABLE 2

BIVARIATE RELATIONSHIPS

VARIABLE	CHI-SQUARE	p
Education Level	35.18	.0001
Mental Category	50.62	.0001
Age	25.15	.0001
Sex	5.43	.2511
Race	1.13	.5690
Marital Status	0.03	.8630

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V. EMPIRICAL RESULTS

A. DATA BASE SELECTION

Initial examination resulted in the conclusion that the first year's SAM data were not worthy of being the foundation for a new SAM screening table. The absence of RM attrition data left but one source to analyze for the predicted attrition rates needed to develop a new SAM screening table, that is the active Navy cohort file.

The active Navy file has the advantage of being consistent, having a large sample size and closely representative of the same decision of one joining the SAM program. [Ref. 50] Also, the six month attrition time frame is a good estimate of the average time a SAM has on active duty prior to joining the SELRES unit. A prerequisite to developing a screening table is the selection of the best data base to use as its foundation.

The resultant demographic and actual attrition rate comparisons of the SAM and active Navy data files are displayed sequentially in Table 1. As previously stated, RM attrition could not be computed and there is no comparative RM cohort for fiscal year 1984; therefore, RM data is not presented. For information purposes, an estimated six month attrition rate for RMs was computed to be 21 percent from a previous CNA study. [Ref. 54]

C. METHODOLOGY

The objective of this effort is to use the stated variables to predict six month attrition rates of non-prior-service recruits, using the three defined data files. The distribution of variables and their relationship to attrition was determined by using Statistical Analysis System (SAS) computer language generated data with chi square tests for significance. Predicted attrition rates were obtained by using a categorical logit procedure (Functions of Categorical Responses, FUNCAT). The FUNCAT procedure of SAS deletes any observation that has a missing value on one or more variables. [Ref.53] All individuals in the data file were categorized by education level, age, and mental category.

SAM cohort data file as accurate and reliable as the active Navy file.

The next step was to match the 11,480 SAM SSNs with the Reserve master gain/loss file. This resulted in locating only 9,790 of the 11,480, with only 78 losses from the 11,480 SAMs, which is less that 1 percent attrition for a program which is over 17 months old. It is obvious that this was erroneous. And so, a month by month match with the current Reserve file was done to obtain attrition data, which resulted in 10,248 matches, of which 10,176 were supposedly from fiscal year 1984. These matches were merged with the Military Entrance Processing Station (MEPS) file to provide demographic data.

B. VARIABLES

Of the variables available to predict attrition within the first six months, education level, age, and mental category were selected because of their demonstrated signi-ficance in other noted studies. An examination of attrition across three countries (United Kingdom, Canada, and the United States) and eight service components, revealed con-sistent attrition predictability by the variables age, edu-cation, and mental category. This relationship remained strong despite policy differences, cultural and social dif-ferences, and large differences of scale. [Ref. 52] Initial analysis also included the variables sex, race and marital status.

2. Ready Mariner

The Ready Mariner data file is composed of a fiscal year 1978 to fiscal year 1983 cohort of non-prior-service accessions. This cohort file is also a longitudinal register of all accessions for a given year, combined with the Reserve current file for the corresponding cohort. The resultant file provides data on 110 variables in a standard DMDC cohort format. There were only 8,241 RMs that could be found of the approximately 10,000 RMs that comprise this cohort. Also, the data available from this DMDC file could not provide any basis for a reasonable computation of RM attrition, since, Naval Reserve records provide information for the variable Total Active Federal Military Service (TAFMS in months) for only 50 percent of the personnel records. [Ref. 51] Therefore, it is very difficult to determine how long one has been in the Reserves, especially with similar inconsistencies in other loss related data variables.

3. Sea/Air Mariner

The SAM data file was initiated by a list of social security numbers (SSNs) of "known SAMs" from the inception of the SAM program until February 1985. This list of SSNs was provided by the Naval Reserve Recruiting Command. These SSNs had to be provided because DMDC was never notified of the new SAM program and SAMs were being counted as active Navy personnel accessions. There were many irregularities in the coding of SAMs from the present DMDC data file to develop a

IV. <u>ANALYSIS</u>

A. DATA FILE

The data used for this thesis were prepared by the Defense Manpower Data Center (DMDC) at Monterey, California. The three individual data files were developed from active Navy, Ready Mariner and SAM personnel data files.

1. <u>Active Navy</u>

The active Navy data file is composed of a fiscal year 1978 to fiscal year 1984 cohort of non-prior-service accessions. This cohort file is a longitudinal register of all accessions for a given year, combined with a portion of the active current file for the corresponding cohort. The resultant file depicts each individual in relation to 174 variables in a revised DMDC cohort format. This cohort file was used because it is current, contains data on a large number of individuals (approximately one-half million) and is readily available. It should be noted that the data from any given year may be confounded by political, social, and economic factors which are difficult to measure. This suggests that multiple-year cohorts are advantageous to aid in dampening out these year-to-year fluctuations. However, the cohort for fiscal year 1984 was the primary active Navy data file used for comparison, because the SAM data was restricted to that single year.

Of the aforementioned items to increase SELRES reten-
tion, a more efficient screening system appears worthy of
immediate study and is likely to be cost effective. Since
personnel applying for entrance into the SAM program are
screened for elibility as one of the first requirements, it
is reasonable to try to eliminate individuals with a low
probability of completing training, before a lot of money
has been invested in them.

Screening in itself is not automatically inexpensive.
Screening procedures which include easily available demogra-
phic data and AFQT information are relatively inexpensive
and have proven reliability. Additional data has proven
valuable in screening but it has been either inconsistent
for the whole population of eligible applicants or very
expensive to obtain, or both. (It is vital to be assured
that the screening procedure in use is saving more than it
cost to develop and to administer.)

availability upon recruit entry. Also, the bivariate rela-
tionship between the variables of age and education level to
attrition has been shown to be consistent. Attrition rates
predicted by sex, race, and marital status have not pre-
sented a consistent trend across various cohorts. Thus, the
relationships between demographic characteristics and attri-
tion need to be reevaluated frequently.

The major influence of the demographic structure is the
fertility rate, which determines the growth rate of the
native population. It is predicted that this rate will
remain at its current low level or decline further, and that
higher wages and lower employment will ensue as employers
compete for shrinking cohorts of younger workers. As this
competition intensifies and labor markets tighten, women and
older workers will be drawn into, or retained at work in
greater numbers. This tightening of the labor market, in
conjunction with the pressures of population growth and
political instability abroad, will increase the flow of
immigrants. The effects of these events will be sweeping,
but they will be distributed unevenly across the country as
the population shifts out of larger cities and to the South
and West, and as the immigrants settle disproportionately in
particular areas. [Ref. 50] It is possible that changes in
the demographic makeup of the population may affect the
relationships between demographic characteristics and
attrition.

This thesis will concentrate in the last area, screening.

Screening has always been a major component of personnel selection. In the military, the emphasis has been on applicants who are most likely to attrite. There are two major dimensions entered into the prediction regression equations: demographic/biographic factors and aptitude (as measured by the score on the Armed Forces Qualification Test, AFQT).

Aptitude measurement has been a traditional area of concern and application within the military manpower arena since World War I. [Ref. 49] This emphasis is particularly applicable with a relatively large or unlimited manpower pool. The trend towards using aptitude/intelligence tests for attrition prediction derived from their earlier use as a personnel screening and classification device of new recuits. It is thus a natural outgrowth of what was available to researchers within the operational systems without the requirement for additional tests, surveys, or interviews that intrude upon the operating forces. The underlying assumption in this approach is that those with a higher probability of attrition could be screened out since the major determinant of attrition is seen to be within the individual.

Demographic data has also been used since World War I in predicting attrition rates for population subgroups. The primary reason demographic data is used is because of its

1. physiological
2. safety
3. social
4. esteem
5. self-actualization.

As the needs at the top of the above list are met, people move down the list to fulfill other needs. In other words, if wages are sufficient to satisfy lower level needs, then people will be motivated to fulfill higher level needs, which may not be related to additional income, or if so, not as strong a relationship as did the lower needs.

Some of the other relevant influences on reserve retention are the employer, military peers, friends, and family, with the employer having the greatest impact on the level of reserve participation. These are areas in which the Naval Reserve could try to exert more influence to increase favorable attitudes toward reserve participation. Merritt, in a joint paper with Milton Boykin and Richard Smith, presented a checklist of items the individual reserve unit can do to increase retention. [Ref. 46]

D. SCREENING

A briefing by a CNA research team gives a strategy to improve SELRES retention. [Ref. 47] The strategy includes:

1. Revise Recruiter incentives

2. Target retention management

   a. early attention to problem areas

   b. use affiliation bonuses for NAVETs

   c. more efficient screening [Ref. 48]

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Hardy Merritt, while at the National Defense University, emphasized leadership style as the strongest factor influencing attrition from the Naval Reserves. If this is the case, then leadership style will play a more important role as the number of NPS personnel increases in the SELRES through the SAM program. Merritt suggested that the situational approach to leadership should be stressed in favor of the predominant authoritarian approach. One must consider, when evaluating leadership styles, the differences and similarities between NAVETs and SAMs, and how such differences should influence leadership style. [Ref. 44] Parting from the general concensus, Merritt believes that retirement benefits are substantially more important to retention in the SELRES than current pay levels. Using his model, Merritt determined the retention effects of stopping retirement benefits altogether (with bonuses offered as substitutes), and reducing retirement annuities by 21-30%. The latter alternative would result in a decrease in retention of 4,400 SELRES, while the former would result in the loss of 17,800 SELRES.

The Naval Reservist does not rely on his reserve pay as the primary source of income. Therefore, pay levels above a designated minimal baseline may not significantly contribute to retention. Abraham Maslow developed a framework that demonstrates the strength of certain needs. According to Maslow, [Ref. 45] there seems to be a hierarchy into which human needs are arranged. This are listed on the next page.

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cognitive and psychological demands of training. Also, indi-
viduals with high school diplomas have demonstrated their
ability to "complete" education. Other predictors included:
1) gender (females had higher attrition rates than males),
2) age (older enlistees had higher attrition rates than
younger ones), and 3) race (blacks had lower attrition rates
than whites).

Bonuses, when used to increase retention rates, were only
slighty successful, but lengthened the average term of
commitment considerably. These longer terms of commitment
result in increased man-years of service.[Ref. 42]

A 1980 report from the Office of the Assistant Secretary
of Defense for Manpower, Reserve Affairs and Logistics,
stated that promotion opportunities have greater retention
impact than reserve pay. Thus, grade distribution and promo-
tion policies should be considered as important variables
in solving reserve shortages in the 4-10 year length-of-
service range, whereas retirement benefits have more influ-
ence in subsequent years. [Ref. 43] Also, the Naval Reserve
has historically selected personel with specific skills.
This results in an age distribution which is higher than
that observed for NPS regular enlistees. The overall
demographic trends (especially the decrease in the available
population pool) will ultimately have their greatest impact
on those components which draw most heavily from the the 17-
19 year old males. This is the primary market for the SAM
program.

observations, is the variable with the most missing data. Because of this lack of education data on 353 SAM personnel, only the 9823 observations were used by the logit procedure to obtain the SAM predicted attrition rates. There is very little difference between the attrition rates of HSGs and NHSGs, which is not consistent with the active Navy cohort behavior. In contrast, the difference between these categories in the active Navy cohort is greater than 5 percent.

Both SAM and active Navy files were used to obtain initial predicted attrition rates. The resultant logit models with their respective coefficients are illustrated in Table 4 thru Table 7. Comparison of these tables reveals that the signs of the coefficients are the same although magnitudes differ. Some of the coefficients in the SAM model are not significantly different from zero. This could be the result of the relatively small SAM cohort or that these variables truly do not discriminate between attritters and non-attritters. Additionally, other variables or groupings of variables perhaps could be used to enhance the prediction accuracy of this model. These "other" variables may or may not be demographic. From the comparison of the regression models in Table 4 thru Table 7, it is therefore unclear whether relationships developed from active Navy data would also hold for SAM personnel.

Regression analysis of the actual versus the predicted attrition rates revealed an R-squared of .283 for SAMs,

TABLE 4

CHI-SQUARE ANALYSIS OF MAIN EFFECTS FOR THE SAM MODEL

Variable	Degrees of Freedom	Chi-SQ.	p
Intercept	1	989	.0001
Education Level	1	6	.0130
Mental Category	4	42	.0001
Age	4	18	.0011
Residual	39	49	.1261

TABLE 5

LOGISTIC REGRESSION COEFFICIENTS FOR THE SAM MODEL

Variable	Variable Category	Coefficient	Chi-SQ.	p
Intercept		-2.33	989	.0001
Education Level	HSG	-0.16	6	.0130
Mental Category				
	I	0.07	.16	.6901
	II	-0.32	16	.0001
	IIIA	-0.15	3	.0662
	IV	0.41	22	.0001
Age				
	17	-0.47	7	.0051
	18	-0.01	.03	.8579
	19	0.04	.35	.5533
	20	0.13	2	.1376

TABLE 6

CHI-SQUARE ANALYSIS OF MAIN EFFECTS FOR THE ACTIVE NAVY MODEL

Variable	Degrees of Freedom	Chi-SQ.	p
Intercept	1	57405	.0001
Education Level	1	2741	.0001
Mental Category	4	2188	.0001
Age	4	1038	.0001
Residual	40	253	.0001

TABLE 7

LOGISTIC REGRESSION COEFFICIENTS FOR THE ACTIVE NAVY MODEL

Variable	Variable Category	Coefficient	Chi-SQ.	p
Intercept		−1.82	57405	.0001
Education Level	HSG	−0.29	2741	.0001
Mental Category				
	I	−0.44	360	.0001
	II	−0.17	321	.0001
	IIIA	−0.02	4	.0469
	IV	0.42	1380	.0001
Age				
	17	−0.15	148	.0001
	18	−0.16	374	.0001
	19	0.01	1	.2707
	20	0.07	38	.0001

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R-squared of .794 for active Navy personnel, and a R-squared of .156 for active Navy model in predicting SAM attrition. This reveals while that the active Navy regression model is a good predictor of attrition for active Navy personnel, the active Navy model does not appear to serve as a good predictor of SAM attrition.

Further comparative analysis of the predictive value of the SAM and active Navy models is presented in Table 8. Both the active Navy and SAM models were applied to the SAM data to yield predicted attrition rates for each model. These predicted attrition rates were then crosstabulated with actual SAM attrition rates. These tables substantiate the greater effectiveness of the SAM model in predicting SAM attrition. Four different cut scores were used to demonstrate the consistency of the predictability of the SAM model. With the aforementioned information, it was determined that even though the SAM data file has numerous discrepancies, it is a better predictor of SAM attrition than is the active Navy data file. *

* NOTE: The use of data from one population (active Navy) to predict attrition from another population (SAM) would be expected to result in poorer predictability than that which resulted from the SAM data itself. Even so, the active Navy data clearly predicts SAM attrition very poorly.

TABLE 8

CROSSTABULATION OF PREDICTED vs ACTUAL
ATTRITION FOR VARIOUS CUT SCORES

CUT SCORE OF .075

SAM ACTUAL

		Leavers	Stayers	Total
ACTIVE				
	Leavers	760	8936	9696
PREDICTED				
	Stayers	34	446	480
	Total	794	9382	10176

SAM ACTUAL

		Leavers	Stayers	Total
SAM				
	Leavers	465	4808	5273
PREDICTED				
	Stayers	329	4574	4905
	Total	794	9382	10176

CUT SCORE OF .100

SAM ACTUAL

		Leavers	Stayers	Total
ACTIVE				
	Leavers	631	6477	7108
PREDICTED				
	Stayers	163	2905	3068
	Total	794	9382	10176

SAM ACTUAL

		Leavers	Stayers	Total
SAM				
	Leavers	180	1374	1554
PREDICTED				
	Stayers	614	8008	8622
	Total	794	9382	10176

TABLE 8 (continued)

CROSSTABULATION OF PREDICTED vs ACTUAL
ATTRITION FOR VARIOUS CUT SCORES

CUT SCORE OF .125

SAM ACTUAL

		Leavers	Stayers	Total
ACTIVE	Leavers	427	4243	4670
PREDICTED	Stayers	367	5139	5506
	Total	794	9382	10176

SAM ACTUAL

		Leavers	Stayers	Total
SAM	Leavers	50	335	385
PREDICTED	Stayers	744	9047	9791
	Total	794	9382	10176

CUT SCORE OF .150

SAM ACTUAL

		Leavers	Stayers	Total
ACTIVE	Leavers	268	2301	2569
PREDICTED	Stayers	526	7081	7607
	Total	794	9382	10176

SAM ACTUAL

		Leavers	Stayers	Total
SAM	Leavers	2	12	14
PREDICTED	Stayers	792	9370	10162
	Total	794	9382	10176

B. SAM SCREENING TABLE

A review of the previous SAM logit model in Table 4 reveals that it can be, and should be, refined before developing a screening table. The coefficients for mental category I, and ages 18 and older, are not significantly different from zero. This prompted the combining of mental categories I and II, and age categories 18-21+.

The new SAM logit model with the above groupings of variables is presented in Table 9 and Table 10. When compared to the previous SAM model in Table 4, all probabilites were reduced, except for a slight increase for education level. Regression analysis of the actual versus predicted attrition rates for the new SAM logit model revealed a R-squared of .483, which is .200 greater than the R-squared for the previous corresponding model. All of the comparisons and analyses indicate that the new SAM model in Table 9 and Table 10, would improve attrition predictability. Therefore, this new model is used as the basis for the SAM screening table.

The resultant SAM screening table, based upon the predicted attrition rates of the fiscal year 1984 SAM cohort, is displayed in Table 11. These predicted attrition rates or screen scores, were produced using the categorical logit procedure. The results follow a fairly traditional pattern with attrition rates increasing with age, and mental category, and NHSG showing higher attrition than HSG. There are only minor exceptions between education levels. An advantage

TABLE 9

CHI-SQUARE ANALYSIS OF THE SAM SCREEN MODEL MAIN EFFECTS

Variable	Degrees of Freedom	Chi-SQ.	p
Intercept	1	639	.0001
Education Level	1	2	.0937
Mental Category	3	42	.0001
Age	1	10	.0013
Residual	10	12	.2977

TABLE 10

LOGISTIC REGRESSION COEFFICIENTS FOR THE SAM SCREEN MODEL

Variable	Variable Category	Coefficient	Chi-SQ.	p
Intercept		-2.61	639	.0001
Education Level				
	HSG	-0.11	3	.0937
Mental Category				
	I & II	-0.28	20	.0001
	IIIA	-0.14	4	.0500
	IV	0.43	34	.0001
Age				
	17	-0.33	10	.0013

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TABLE 11

SAM SCREEN TABLE

Variable		Screen Scores	
Age	Mental Category	HSG	NHSG
	I & II	.035	.043
17	IIIA	.040	.049
	IIIB	.045	.055
	IV	.068	.083
18	I & II	.065	.080
and	IIIA	.074	.091
OVER	IIIB	.084	.102
	IV	.124	.149

NOTE: The above screen scores equate to predicted six month attrition rates for each category.

of the screening table in Table 11 is that it is based upon a cohort that is more representative of SAMs than a previous screening table based on active Navy personnel, which should result in a more accurate prediction of SAM recruit attrition behavior.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The objective of this thesis was to develop an improved screening table for the Sea/Air Mariner program. In order to develop this table, fiscal year 1984 data from the SAM program was used.

Non-prior-service men and women entering the military in Fiscal Year 1984 were followed during their initial tour of duty. Data on individuals available at service entry for such variables as education level, age, mental category, sex, race and marital status were related to attrition occurring during the first six months of service. Statistical analyses were performed to develop attrition probabilities for recruits based upon these entry variables. The resultant significant variables of education level, age, and mental category formed the basis for the SAM screening table. These are the traditional attrition predictor variables.

The unreliability of the Naval Reserve data files necessitated a comparison of logistic regression models derived from active Navy and SAM data files. This comparison was made to determine which model would best predict six month attrition for SAM recruits. The two models were compared in terms of coefficients of determination and the

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crosstabulations of predicted and actual attrition for both the SAM and active Navy models. The SAM model was consistently superior in its ability to predict SAM six month attrition. In spite of the considerable amount of missing data in the SAM data file, the model derived from this file outperformed the model which was based on the active Navy file. A combining of categories of the SAM logit model produced a more efficient model which was the basis for the SAM screening table.

The SAM screening table represents an improvement over current screening procedures. This improvement is the result of using the Fiscal Year 1984 SAM data file as the basis for the new SAM screening table. This data file overcomes some shortcomings of the screening table that is presently used, because: 1) it is more current, reflecting the present internal and external factors which affect military attrition, 2) the SAM data file predicts SAM attrition better than active Navy data files.

The SAM screening table, with a floating cutoff score to meet supply and demand fluctuations, would be of benefit to recruiters. Presently, recruiters have their general instructions but receive a deluge of messages monthly which alter the assigned recruiting goals. Instead of referring to the messages, the recruiter would refer to the screening table and apply the current cutoff score, which has been promulgated by manpower specialists.

B. RECOMMENDATIONS

Despite the findings of this study, there remain many opportunities to refine the screening process within the bounds of using the data presently available at recruit entry.

This study found serious deficiencies with the SAM data file. The necessity that manpower data be accurate and reliable must be continually emphasized. Data should be screened for accuracy prior to being sent to the Defense Manpower Data Center (DMDC) and procedures established to monitor progress for alleviating discrepancies as noted by DMDC file managers.

Individual screening tables should be developed for groups of ratings (or smaller divisions) since attrition factors may differ from rating to rating. (One concern in developing multiple tables is the increased confusion for recruiters, who are already heavily burdened with administrative standards.)

The relatively large residual value of the SAM regression model suggests that further research into other variables for inclusion could be profitable.

There needs to be a recognition of and criteria for functional attrition. This is attrition which is desirable to reduce those in the military who truly do not belong. There is a direct relationship between the level of functional attrition and the accuracy of the screening device used. Since there will never be a 100 percent efficient

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screening device, there will always be a need for a certain level of functional attrition.

In conclusion, this thesis has provided an improved method for screening for Naval Reserve attrition. It is clear that continued efforts to develop selection standard models are essential, for it is through these efforts that the cost of recruiting and training Naval personnel can be reduced. The resultant experienced Naval force will increase the Navy's ability to meet the challenges of the future. Sadly, future efforts will be hindered by poor data unless increased quality control procedures are implemented.

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