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ASSESSING THE EFFECT OF MOBILIZATION ON ENLISTED RESERVE RETENTION

by

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September 2010

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13. ABSTRACT (maximum 200 words)

Retention of personnel is as important for United States military organizations as it is for any organization to ensure continuity and effectiveness. The demands that the current long-term conflicts place on the military have affected the Navy, both Active and Reserves. Naval personnel are asked to do missions on shore with ground units in an Individual Augmentation (IA) billet. Many of these IA billets have been filled by mobilized reservists, particularly to the operations in Iraq (OIF) and Afghanistan (OEF).

This thesis uses standard statistical modeling techniques to quantify the effects of these mobilizations on enlisted and officer retention, and in particular, mobilizations to certain operations, on retention. The results concluded that the operation that the enlisted reservist was mobilized to was the most important factor in determining retention. The reservist's paygrade and rating were also significant factors in predicting attrition. These results can help the Naval Reserve manage its manpower flows.

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ASSESSING THE EFFECT OF MOBILIZATION ON ENLISTED RESERVE RETENTION

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ABSTRACT

Retention of personnel is as important for United States military organizations as it is for any organization to ensure continuity and effectiveness. The demands that the current long-term conflicts place on the military have affected the Navy, both Active and Reserves. Naval personnel are asked to do missions on shore with ground units in an Individual Augmentation (IA) billet. Many of these IA billets have been filled by mobilized reservists, particularly to the operations in Iraq (OIF) and Afghanistan (OEF).

This thesis uses standard statistical modeling techniques to quantify the effects of these mobilizations on enlisted and officer retention, and in particular, mobilizations to certain operations, on retention. The results concluded that the operation that the enlisted reservist was mobilized to was the most important factor in determining retention. The reservist’s paygrade and rating were also significant factors in predicting attrition. These results can help the Naval Reserve manage its manpower flows.

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LIST OF ACRONYMS AND ABBREVIATIONS

AC	Active Component (of the Navy)
AOR	Area of Responsibility
BM	Boatswain’s Mate
BU	Builder
CB	Construction Battalion
CNO	Chief of Naval Operations
COCOM	Combatant Commander
EO	Equipment Operator
EOS	End of Obligated Service
GWOT	Global War on Terror
HM	Corpsman (Hospitalman)
IA	Individual Augmentation
IRR	Individual Ready Reserve
LRT	Likelihood Ratio Test
MA	Master-at-Arms
NEC	Navy Enlisted Classification
NOBC	Navy Officer Billet Codes
NOSC	Navy Operational Support Center
NRMS	Naval Retention Monitoring System
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
ONE	Operation Noble Eagle
PERS	Personnel
PSRC	Presidential Reserve Call-Up
RC	Reserve Component (of the Navy)
SELRES	Selected Reserve
SK	Storekeeper
SSN	Social Security Number
VTU	Volunteer Training Unit

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EXECUTIVE SUMMARY

Retention of personnel is as important for United States military organizations as it is for any organization to ensure continuity and effectiveness. The demands that the current long-term conflicts place on the military have affected the Navy, both Active and Reserves. To address the need for troops, Naval personnel are asked to do missions, on shore with ground units, in an Individual Augmentation (IA) billet. IA deployments for Navy personnel appear to be staying for the foreseeable future. These IAs have affected Navy Reservists since many of them have been mobilized to fill these billets, particularly to the operations in Iraq (OIF) and Afghanistan (OEF). Previous research has shown that there is a positive association between the number of deployments and military officer retention rates. Other research has shown that there is little evidence that IA deployments were hurting retention rates of officers or enlisted Sailors.

This thesis uses data that was gathered from the Navy Reserve Data Warehouse and the Naval Reserve Headquarters to assess the effects of mobilizations, and in particular, mobilizations to certain operations, on retention. The results show that the operation that the enlisted reservist was mobilized to was the most important factor in determining retention in all models. The reservist’s paygrade and rating were also significant factors in predicting attrition. These results can help the Naval Reserve manage its manpower flows.

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I. INTRODUCTION

A. PROBLEM STATEMENT

Former Chief of Naval Operations (CNO) and current Chairman of the Joint Chiefs of Staff, Admiral Michael Mullen, stated in 2007 his belief that Individual Augmentations (IAs) would continue to be part of the U.S. Navy's role in support of the Global War on Terror (GWOT). In his statement before the Senate Appropriations Subcommittee on Defense, Admiral Mullen stated the Navy "…was anxious to pitch in as much as we possibly can, for the duration of this war. Not only can we do our share, but [we can] take as much stress off those who are deploying back-to-back…"(Navy Newsstand, 2007b). In a statement before the House Armed Services committee in May 2009, the current CNO, Admiral Gary Roughead stated that the Navy was focused on today's fight, saying:

> Our Sailors are fully engaged on the ground, in the air, and at sea in support of operations in Iraq and Afghanistan…. I am thankful for the support of Congress for Navy Individual Augmentees who are providing combat support and combat service support for Army and Marine Corps personnel in Iraq and Afghanistan. (Roughead, 2009)

With these statements by the past and current CNOs, it is obvious that IA deployments will continue into the future. The Navy Reserves is directly affected since many reservists have been mobilized to fill IA billets. Therefore, it is important to assess the impact of these mobilizations on retention.

Many reservists were mobilized to operations that began after the events of September 11, 2001. This thesis looks at the effects of these reservist mobilizations (both IA and other) for the operations in Iraq and Afghanistan, specifically on the enlisted ranks. This thesis also shows statistical evidence that there are lower odds of retention for those enlisted who are mobilized to certain operations for the global war on terror.

B. BACKGROUND

As stated by Paisant (2008), the Navy's force policy integrates both the active and reserve components to meet the requirements in peace and in war. This "Total Force" policy is in place so that the full spectrum of the military, and specifically the Navy, can respond to the demands that the nation puts upon it. Obviously, retention is also important to ensure a healthy force for the future.

To meet the force needs of Combatant Commanders (COCOMs) throughout the world temporarily, Individual Augmentation (IA) was established. Individual Augmentation is a policy where a military member is temporarily assigned to fill in, or augment, another unit that may be outside their normal organization or even their branch of service. The Navy published an instruction that defined the policies and procedures of Individual Augmentation (Office of the Chief of Naval Operations, 2000).

After the events of September 11, 2001, there was a challenge given to the nation's military to address the terrorist threat. Termed the Global War on Terror (GWOT), there were subsequent operations where there was a demand

for troops on the ground. The Reserves were mobilized to fulfill anticipated requirements throughout the military. Operation Noble Eagle (ONE) began a few days after the attacks and was followed by operations in Afghanistan (OEF) and Iraq (OIF).

The Navy increasingly looked to the Reserves to meet the requirements that Combatant Commanders were placing upon it. The majority of Sailors mobilized under IA were sent to Iraq and Afghanistan, but some individuals were also sent to the Horn of Africa or other countries in the Middle East for U.S. Central Command to support GWOT operations, OEF, or OIF. Still others were mobilized to U.S. European Command, Guantanamo Bay, or even commands within the United States.

Both active and reserve personnel may serve as Individual Augmentees. As of January 2007, Rear Admiral Sonny Masso, then the head of Navy Personnel Command, stated that 82 percent of personnel who have served on an IA deployment were from the reserve component (Navy Newsstand, 2007a). Vice Admiral Ferguson III and Vice Admiral Debbink (2008) stated in a message that over 50,000 Reserve Component Sailors had been mobilized to support all of the operations against terrorism. Currently, there are over 10,000 Navy Individual Augmentees and over half of them are reservists (U.S. Fleet Forces Command, 2010).

Although volunteers from either the Active or Reserve Component can satisfy these billet requirements, reservists usually go through a process of mobilization to meet the needs of the COCOMs. The procedures by which reservists are mobilized and activated into the active forces are defined in U.S. law as the Federal Call-Up Authority. These

regulations regarding federal call up of reserve forces to active duty are found in Title 10 of the U.S. Code, Subtitle E, Sections 12301-12304. Section 12301 states that the Congress can call the military reserves to active duty in time of war or national emergency. Section 12302 states that in time of national emergency declared by the President, up to one million members of the Ready Reserve (which is comprised of the Selected Reserve (SELRES), the Individual Ready Reserve (IRR) and the Inactive National Guard) can be called to active duty but not for more than 24 months. Then, Section 12304 states that the President can augment the active forces for operational missions. The President is limited to activating 200,000 members of the Selected Reserve and for only 270 days before 2007 and to 365 days for 2007 and after. This is known as the Presidential Selected Reserve Call-Up (PSRC) authority, but it cannot be used for domestic emergencies (Title 10 of U.S. Code, 2007).

Force planning and ensuring that adequate numbers of personnel are available in the Reserves requires an awareness of the changing factors that affect Naval personnel retention. As stated by Paisant (2008), some of the factors that affect individuals are deployment patterns, external economic conditions and force demographics. As also stated by Paisant and others, research has shown that retention behaviors vary according to gender, race, and other demographic factors.

C. LITERATURE REVIEW

Previous studies have been done on the effects of mobilization on retention. Fricker (2002) showed a positive

relationship between deployment activity and retention rates. Additional findings were that officers with more hostile deployment had higher retention rates, on average, than others with the same amount of non-hostile deployment. These findings contradicted the common belief that increased deployment results in lower retention rates. This study was about deployments prior to the operations in Iraq and Afghanistan and therefore does not address the situation facing the Navy Reserves now.

Kirby and Naftel (1998) focused on enlisted reservists after their service in Operation Desert Storm and Desert Shield in the early 1990s. They noted that while the retention numbers were slightly lower for mobilized reservists than for non-mobilized reservists, the difference was not statistically significant. That paper concluded that there were no adverse affects of mobilization on retention during these operations. While this study was useful at that time, it does not address the current situation. Namely, there are now much longer periods during which a reservist could get mobilized and the reservists mobilized could very well be assigned to a different service and doing a job different from the one for which they have been trained.

Chun (2005) looked at retention of enlisted personnel in the Army Reserve and the National Guard. The study showed a higher retention rate in the Reserves than in the National Guard and that there was no effect on retention associated with the number of deployments. In fact, they found that members with one or two deployments had higher retention rates than those with none (Chun, 2005). This

study does well to address the concerns of the Army, but not how the Navy Reserves might be affected with the additional complicating factor of individual augmentation.

In 2006, the Congressional Budget Office did a study on Recruiting and Retention in the services. In the Navy section, the study shows a continuation rate (the rate of staying in the service) in the Navy of approximately 86% and states an attrition rate in the Navy Reserve of approximately 28%. It also shows that the continuation rate in the Reserves is lower than that of the Active Component. Although the study outlines scenarios in which the Navy and specifically the Navy Reserve can meet their manpower goals, it does not address specific issues, such as mobilizations and Individual Augmentations, that affect retention (Marron, Golding et al., 2006).

It is also possible to compare retention rates between services, but this has limited value. For example, the Air Force Reserve also has sent many individuals on Individual Augmentation for the Global War on Terror. Its retention rate was over 84% for enlisted individuals for the time period 2004-2009 (*U.S. Air Force Reserve Snapshot*, 2010), but differences in types of missions and tasks being done for GWOT, plus differences in the demographics of the forces, make this comparison only anecdotal.

Paisant's (2008) study also concluded that for junior Naval officers there was a positive relationship between an IA deployment and retention. While counterintuitive, the study was not able to take into account if the individual volunteered for the IA assignment, which would have provided much more insight. Still, it was important for manpower

decision makers, showing that IA deployments do not increase junior officer loss rates. Similarly, Fricker and Buttrey's study (2008) showed little evidence that IA deployments were hurting active duty officer and enlisted retention rates. Therefore, decision makers could continue to use IAs as a way to fulfill Combatant Commanders' mission needs without adversely affecting retention in future years.

D. OBJECTIVE

With the emergence of the Naval Retention Monitoring System (NRMS) that has been implemented on the active side and is scheduled for implementation on the reserve side of the Naval Force later this year, the entirety of the Naval Force will be able to monitor several factors that affect retention. The Reserve Component (RC) has been always tasked to assist the Active Component (AC) in fulfilling the requirements that have been put upon the latter. With the wars in Iraq and Afghanistan, the policy of Individual Augmentation was used to ensure combatant commanders had the troops needed to complete missions in their Areas of Responsibility (AOR). As Operation Enduring Freedom (OEF) in Afghanistan and Operation Iraqi Freedom (OIF) began, more troops were needed. To fulfill these demands, the Reserve Component was asked to temporarily fill some of these positions. As IA demands increased, so did the demands on the Navy Reserves and many reservists were mobilized to meet the demands of these IAs. Because the IA program has only been in existence since 2000 and was made much larger after 2001, the Navy does not have a great deal of understanding on how these mobilizations affect Reserve retention.

Data obtained from the Navy Reserves did not have direct information about reservists going to an IA billet, but it did show mobilizations. Many reservists were mobilized for the operations that began after 2001, the majority of those mobilized going to OEF and OIF. The demands of the COCOMs for these operations were mostly ground-unit related, and those mobilized for these operations would most likely be in or in direct support of those ground units.

To provide further insight on retention, a study into the effect of mobilizations and specifically the effect of mobilizations for specific operations such as OIF and OEF proves valuable. Additionally, demographic and rating or job specialty factors can be evaluated to determine if these factors have an effect on retention. Reservists who were retained during the time period of the mobilizations to these operations can then be compared with those who were not retained, giving an analysis of these mobilizations and obtaining a model to assess the impact of these mobilizations on retention.

E. ORGANIZATION

This thesis is organized in the following manner. Chapter II describes the data and the data sources. It also explains shortcomings in the dataset. Chapter III describes the methods used to evaluate retention decisions. It also describes the methods by which retention was tested statistically. Chapter IV provides the results of the statistical tests and Chapter V provides the conclusions and recommendations from the model. Appendix A is a synopsis of officer data that was analyzed, and Appendix B describes the

Individual Ready Reserve (IRR) and the Volunteer Training Unit (VTU), two ways in which a reservist can be lost to the SELRES.

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II. DATA

A. DATA SOURCES

Data was collected from the Navy Reserve Data Warehouse on all Selected Reservists (SELRES) serving between March 2003 and March 2010. This data consisted of a PERS file (for personnel) and a LOSS file (for individuals lost), which was a stream of data on individuals from month to month. The Reserve Data Warehouse PERS file provided rank, Navy Enlisted Classification (NEC) codes, Designator codes, Navy Officer Billet Codes (NOBCs) and the dates of each individual's mobilizations and demobilizations, if any. The Reserve Data warehouse LOSS data file provided information on when the individual was lost from the SELRES and for what reason.

Data was also obtained from the Naval Reserve Headquarters in Norfolk, VA. This additional file (referred to as the Noble Eagle file) contained data on all reservists who had been mobilized for Operation Noble Eagle (ONE) and other operations such as Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and the Global War on Terror (GWOT).

Using Social Security Numbers (SSNs) as a unique identifier, a complete list of 148,354 individuals was compiled from all three sources. There were many data mismatches (as might be expected in this large a data set), such as individuals no longer appearing in the PERS file but not listed in the LOSS file, and individuals listed as mobilized but not appearing in the Noble Eagle file. To

illustrate some of the anomalies in the data, there was a number of mismatches in the gender of various individuals between datasets.

This data was then separated into officer and enlisted ranks for analysis.

B. OFFICER AND ENLISTED DATA

Table 1 shows how the 148,354 individual records we analyzed were broken down into officers and enlisted. The table details total numbers and percents of Naval Reservists mobilized, as well as numbers and percents mobilized specifically for OEF/OIF according to the data from the Naval Reserve Headquarters.

Table 1. Officer and enlisted mobilization data

	Total	1+ Mob.	% Mob.	% not Mob.	# to OEF/OIF	% Mob. OEF/OIF	% of Total Mob. to OEF/OIF
Officer	25,522	8,537	33.4%	66.6%	6593	77.2%	25.8%
Enlisted	122,832	37,050	30.2%	69.8%	29192	78.8%	23.8%

In Table 1, the column labeled “1+ Mob.” is the number of individuals who mobilized at least once in our data. The “% Mob.” column is the percentage of total individuals who mobilized and the “% not Mob.” is the percentage of the total who had not mobilized. The “# to OEF/OIF” column is the number of those who were classified as going to those operations. The “% Mob. OEF/OIF” column shows the percentage of those mobilized who were mobilized to those operations. The column labeled “% of Total Mob. to OIF/OEF” shows the percentage of all individuals that were mobilized to Operations OEF or OIF.

C. ENLISTED PERSONNEL

Mobilization and retention of enlisted personnel was examined first. It was determined which individuals had mobilized, the date of the end of the first mobilization was identified for those who had mobilized, and then it was determined whether the individual faced a decision to stay in or leave by looking at the end of obligated service date (EOS) for him or her.

The individuals were separated into four categories: Retained, Lost, No Decision, and No End of Mobilization. Those who were in the Retained or Lost categories had been mobilized and then subsequently faced a decision to stay in or leave the SELRES. Those labeled as Retained were individuals who extended their EOS date once they had returned from a mobilization. Those labeled as Lost did not extend their EOS after they had returned from a mobilization. Those who were in the No Decision category had been mobilized, but a decision to stay or go after a mobilization was not observed in the data. Those in the No End of Mobilization category never mobilized or had not yet returned from their mobilization. Figure 1 shows the number of enlisted personnel in each of these categories.

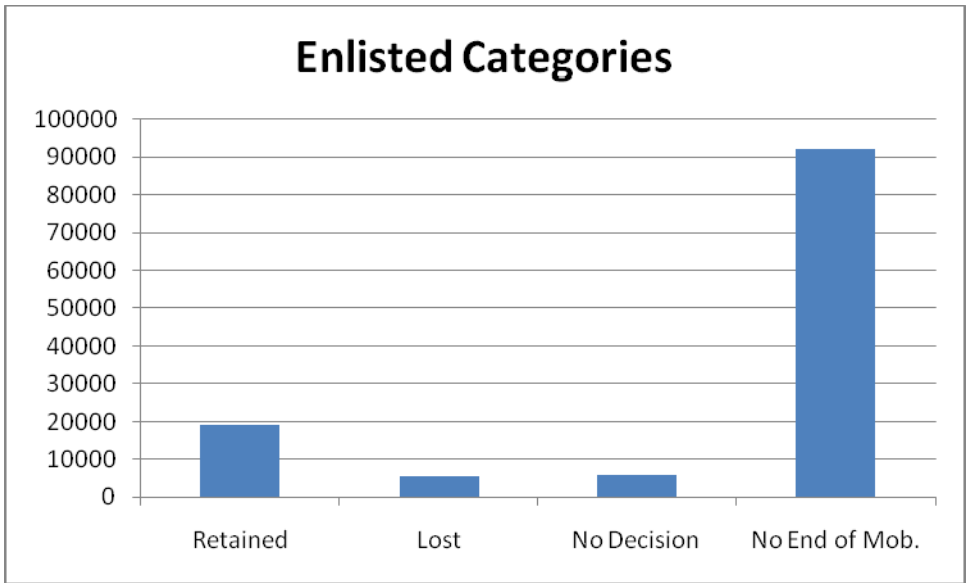

Figure 1. Graph of numbers of enlisted categories

In particular, Figure 1 shows that a large number of enlisted reservists were in the No End of Mobilization category.

The phrase “those enlisted personnel who mobilized and subsequently reached an EOS date or re-enlisted” is an unwieldy one. Since this is the group of primary interest to us, we will refer to those personnel as “the Decision Group” since these individuals mobilized, returned and had to make a decision to stay or leave the Navy Reserves.

D. DEMOGRAPHIC DATA

1. Gender of Individual and Retention

Figures 2 and 3 show the number of enlisted personnel by gender and the retention category by gender.

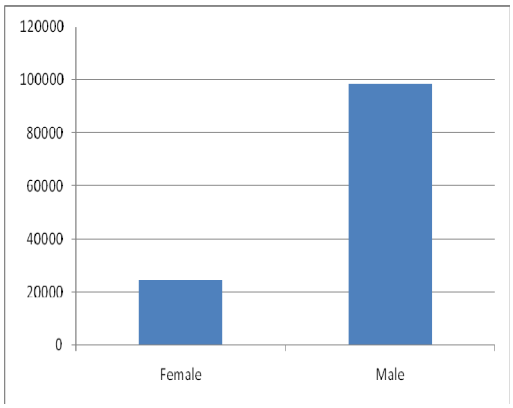

Figure 2. Numbers of enlisted personnel by gender in data

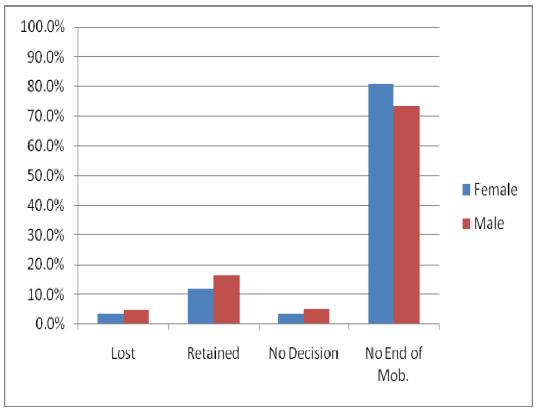

Figure 3. Numbers of enlisted personnel by category and gender

Figure 2 shows that there were approximately three times as many males as females in the database. Figure 3 shows similar trends across the four designated categories for both males and females. Among those reservists who faced a decision (the Decision Group), the rate of females leaving the service was slightly higher than that of males (see Table 2).

Table 2. Percentage of the Decision Group not retained broken down by gender

Gender	Lost	Retained	% Lost
Female	886	2,948	23.1%
Male	4,809	16,244	22.8%
Total	5,695	19,192	22.9%

2. Race of Individual and Retention

Retention status across four racial categories was also compared. The four racial categories were Asian, White, Black (African-American) and the remaining aggregated into Other. Figure 4 shows the total numbers of individuals in the data by racial group. Figure 5 shows that the racial groups had similar behaviors in each designated category.

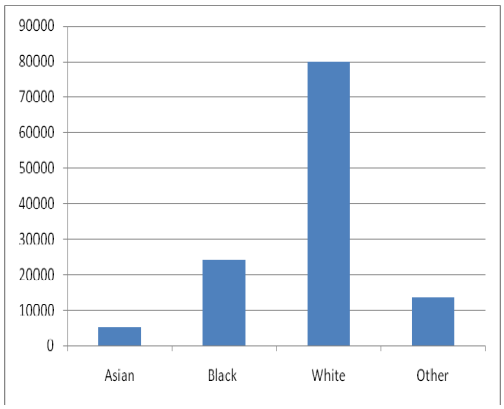

Figure 4. Numbers of individuals by racial category

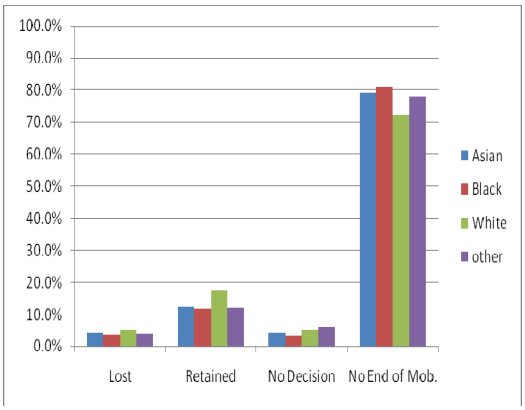

Figure 5. Percentage of individuals by category and racial group

Table 3 gives the attrition percentages of the Decision Group, showing the percentage difference of the Asian group and those aggregated into the 'Other' group slightly higher than the other two categories.

Table 3. Percentage of the Decision Group not retained by race

Race	Lost	Retained	% Lost
Asian	222	646	25.6%
Black	879	2,849	23.6%
White	4,042	14,064	22.3%
Other	552	1,633	25.3%
Total	5,695	19,192	22.9%

3. Rank

Figure shows the distribution of the enlisted individuals by rank.

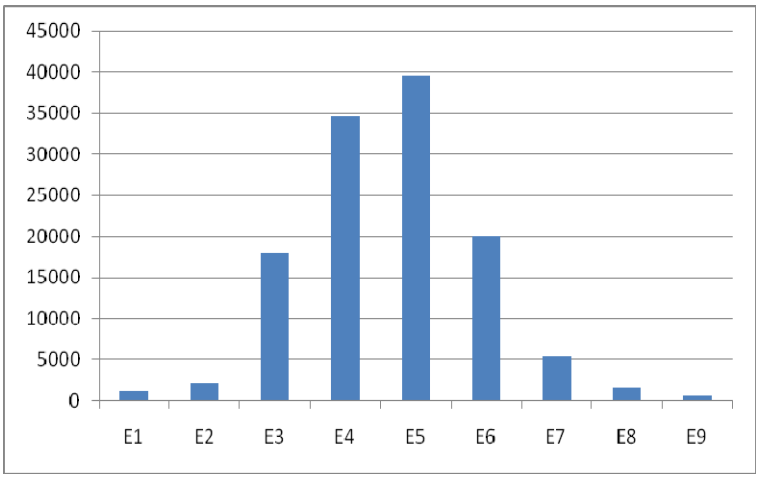

Figure 6. Numbers of individuals in database by rank

Table 4 shows the number of individuals that, according to the data obtained from the Naval Reserve Headquarters, were mobilized. The chart also includes a subset of those individuals who were mobilized to Operations OEF/OIF and the corresponding percentages, which are based upon the total number of individuals of that rank in our dataset.

Table 4. Numbers and percentage of individuals who were mobilized by rank

Rank	Mobilized	% Mob.	Mobilized to OEF/OIF	% Mob. to OEF/OIF
E1	57	5.0%	52	4.5%
E2	204	9.9%	186	9.0%
E3	1,187	6.6%	935	5.2%
E4	7,340	21.2%	6,015	17.4%
E5	15,449	39.0%	12,461	31.5%
E6	9,333	46.4%	7,041	35.0%
E7	2,562	48.0%	1,838	34.5%
E8	694	47.3%	509	34.7%
E9	224	38.5%	155	26.6%
Total	37,050	30.2%	29,192	23.8%

On average, 30% of the reservists in our data have been mobilized. Generally, personnel of higher ranks were mobilized at a higher rate. From the table, one can also observe that they were correspondingly mobilized to OEF and OIF at a higher rate.

Table 5 shows that, when faced with a decision (the Decision Group), personnel at lower ranks were most likely to attrite.

Table 5. Percentage of the Decision Group not retained by rank

Rank	Lost	Retained	% Lost
E1	2	6	25.0%
E2	4	7	36.4%
E3	143	166	46.3%
E4	1,614	2,579	38.5%
E5	2,393	8,040	22.9%
E6	1,141	5,987	16.0%
E7	262	1,759	13.0%
E8	99	486	16.9%
E9	37	162	18.6%
Total	5,695	19,192	22.9%

4. Specific Navy Ratings Within Enlisted Ranks

Some jobs or Navy ratings were mobilized at different rates or in higher numbers than others. Ratings that were mobilized in higher numbers were Boatswain's Mate (BM), Corpsman (HM), Storekeeper (SK), Master-at-Arms (MA), Builder (BU) and Equipment Operator (EO).

Table 6 is a chart of mobilization of these ratings compared with others within the Navy Reserves.

Table 6. Mobilization rate for specific Navy ratings

Rating	Mob.	Non-Mob.	% Mob.
HM	4,133	8,126	33.7%
SK	2,384	4,810	33.1%
MA	2,254	4,453	33.6%
EO	2,215	3,051	42.1%
BU	2,154	3,514	38.0%
BM	2,103	4,133	33.7%
Others	21,807	57,695	27.4%
Total	37,050	85,782	30.2%

Table 7 shows the retention rates for the Decision Group with these ratings, that is, those who had come back from deployment and had to make a decision.

Table 7. Percentage of Losses in the Decision Group by specific rating

Rating	Lost	Retained	% Lost
HM	1,106	2,238	33.1%
SK	462	1,712	21.3%
MA	223	722	23.6%
EO	421	1,245	25.3%
BU	272	974	21.8%
BM	265	1,242	17.6%
Others	2,946	11,059	21.0%
Total	5,695	19,192	22.9%

The average rate of departure from the SELRES among all enlisted rates in the Decision Group is 22.9%, as can be seen from all of the tables; most of the ratings that are shown in Table 7 depart at that rate or lower, except for the Equipment Operators, Corpsmen, and Master-at-Arms. Also, the only other rating shown in Table 7 that is lower than all the other ratings aggregated in the 'Other'

category is that of Boatswain's Mates. Otherwise, all other ratings shown in Table 7 have a percentage lost rate of more than 21%.

E. LOSS DATA

The LOSS data file from the Reserve Data Warehouse contained data from individuals who had been lost from the SELRES. The data included the individual's SSN, Loss code and date of Loss. Losses were broken down into many categories, including DISCHARGED, RETIRED, DIED, TRANSFER TO ACTIVE DUTY, TRANSFER NRPC – FORCED ATTRITION, TRANSFER TO IRR, and TRANSFER TO VTU, and others. The data in the LOSS file did not matchup exactly with the PERS data, with some individuals' data stream no longer existing in the PERS file, but not occurring in the LOSS file.

Table 8 summarizes the number of Losses by operation type for the time period 2003-2010. Along the vertical is the type of Loss, of which were selected those with the highest numbers and aggregating the remaining categories into "OTHER." Included in those rows is the number of enlisted reservists that were retained. Across the top is the operation mobilized to, where OEF/OIF is the aggregated numbers from those operations. The other operations different from these two are combined, and there also is a column of those who were lost but did not incur a mobilization. The total column shows those who were lost to the SELRES for that particular type of Loss. The explanation of the terms IRR and VTU is in Appendix B.

Table 8. Individuals who have been lost by mobilization theater

	Operation			
Loss Type	OEF/OIF	GWOT/ONE /Other Operation	No Mob.	Total
TRANSFER TO IRR	2,562	1,293	17,546	21,401
TRANSFER TO VTU	4,783	1,493	23,238	29,514
DISCHARGED	3,742	1,180	16,328	21,250
OTHER	2,411	1,313	6,277	10,001
Total Losses	13,498	5,279	63,389	82,166
Retained	15,694	2,579	22,393	40,666
Total	29,192	7,858	85,782	122,832

With this data, it is possible to look at the percentage of individuals who were lost or transferred by the theater to which they were mobilized. Table 9 shows that information. Since the populations are not exactly the same, direct comparison is not possible.

Table 9. Percentage of individuals lost by mobilization operation

	Operation			
Loss Type	OEF/ OIF	GWOT/ ONE/Other	No Mobilization	All Enlisted SELRES
Discharged	12.8%	15.0%	19.0%	17.3%
Transfer to IRR	8.8%	16.5%	20.5%	17.4%
Transfer to VTU	16.4%	19.0%	27.1%	24.0%
Lost from SELRES	46.2%	67.2%	73.9%	66.9%

The rows show what type of Loss and the columns aggregate the operations that the reservist could have been mobilized to. This percentage can then be compared to the

column that shows the Loss percentage for that type of Loss over all of the enlisted Reserves. The row labeled “Lost from SELRES” is the percentage of individuals no longer in the SELRES from the total of 122,832 enlisted individuals records that were in the data. This row is then also broken down by operation as shown in the columns.

F. OFFICER RANKS

Because the officer ranks do not have EOS dates included in their data, we were not able to examine them in the same manner as the enlisted ranks and divide them into categories of Retained, Lost, No Decision, and No End of Mobilization. It was possible to look at the raw data and put them into graphs and charts similar to the enlisted ranks. This data is included in Appendix A for comparison, but because of the lack of EOS data the officers could not be modeled.

G. SUMMARY

It can be seen from the charts that from the dataset provided, about 30% of the enlisted were mobilized. Of those that were mobilized about 79% were mobilized to either OEF or OIF. Looking at those that were mobilized and then faced a decision to either stay in the Reserves or get out (the Decision Group), females got out at a slightly higher percentage than males. Also, retention proportions were similar among racial groupings, but the Asian and ‘Other’ groupings had a higher attrition rate than the remaining racial groups.

Breaking down the data into paygrades, ranks of E-5 to E-9 were mobilized at a higher rate than were those of E-1 to E-4. Also those ranks of E-5 to E-9 had higher retention rates than those of the lower ranks of E-1 to E-4. Looking at the specific ratings or job specialties of the enlisted, the ratings of HM, SK, MA, EO, BU, and BM mobilized in higher numbers and percentages than others in the data. Comparing the retention rates of these ratings with the rest of the enlisted Reserves it was found that all of them departed at similar rates except for those of MA, EO and HM, which were higher in the dataset.

Looking at the LOSS dataset and comparing it to our other dataset, it could be seen also seen that most of the losses to the SELRES were from those discharged, or transferred out of the SELRES to either the IRR or the VTU. Comparing the percentages of those lost it can be seen that those who did not mobilize were lost at higher rates than those who did. And those who mobilized to OEF or OIF were generally lower than those who mobilized to other operations.

This dataset was then examined to determine if there was a relationship between the operation mobilized to, demographic factors, and the factors of paygrade and rating on enlisted reservist retention. The method by which this was done is explained in the next chapter.

III. MODELING THE EFFECTS OF PARTICULAR MOBILIZATION OPERATIONS ON RETENTION

A. INTRODUCTION

This chapter describes the model used to assess the effects of mobilization, specifically to the operations ONE, OEF, OIF, and GWOT, on retention in the enlisted Reserve ranks. This chapter describes the rules used to create the subset of data used in the analysis and the statistical models that were used to quantify the effects of mobilization on retention.

Fricker (2002) and Fricker and Buttrey (2008) note that assessing the effects of deployment on retention using simple tabulations can be problematic since other factors can also affect retention. Since mobilization in the Reserves is in many ways similar to active duty deployment, this problem applies to reservists as well. Indeed, there are many reasons why an enlisted reservist may choose to leave or stay in the SELRES, so simply looking at raw attrition statistics does not provide insight to the actual effect or effects of mobilization.

B. THE MODELS

Two models were developed to analyze the data. Only data from enlisted Reserve Sailors who were mobilized and for whom an End of Obligated Service (EOS) date was observed were used in the models, since only for these

personnel could we determine whether they decided to stay or get out. The two statistical modeling methods that were used are as follows:

1. Tree-based Classification Model

A tree-based classification model (classification tree) was developed using PASW® Modeler 13 software (SPSS Inc., 2009). This type of model takes the data and divides it up into homogeneous groups based on a categorical attribute variables and some outcome measure. For this data, attributes we used were gender, age, paygrade, race, rating, and the operation for which the individual was mobilized. The outcome measure was either SELRES attrition or retention. In the tree-based classification model groupings of individuals by their attributes are created that have similar attrition/retention rates (Breiman, 2001). More discussion of how this method works can be found later in this chapter in section F.1.

2. Logistic Regression Model

A logistic regression model (see Section F.2) was also developed using the same attributes of gender, age, paygrade, race, rating, and the operation to which the individual was mobilized. Logistic Regression is a good statistical modeling tool used to estimate the probability of a binary event’s occurrence.

C. MODEL COVARIATES

The operation that the individual was mobilized to was determined in the data. If there was more than one listed,

the one that was listed first was taken to be the primary operation or theater that they were mobilized to.

Demographic data was also used in the model, such as the individuals' gender (i.e., male or female). Race data was also used in the model. With race data, the individuals were aggregated into four categories: White, Black, Asian and other.

Rank of the individual was also used. If there was a disagreement of rank between databases, the individual's rank that was listed in the PERS data file was used.

The data contained Navy rating or job specialty combined with rank, such as SK1 (Storekeeper, First Class Petty Officer). Since rank was already part of the data, each individual was aggregated into the enlisted reservists' rating. Ratings were then further aggregated into the major ratings that were mobilized in higher numbers in the dataset. These were discussed in Chapter II and were comprised of BM, BU, EO, HM, MA, and SK.

D. DATA CENSORING

The mobilizations for GWOT operations started in 2001. As stated earlier, Operation Noble Eagle was begun in 2001 and operations in Afghanistan started later that year. Operations in Iraq started in 2003. Since our dataset began in 2003, all operations were underway at that point in time. We also were only interested in enlisted Reserve personnel who mobilized, returned from mobilization and then had to make a decision. So those who had not been mobilized at all, and those who had not yet reached a decision point, were removed from the data. This included personnel that

are still mobilized as well as those for whom the decision to stay or leave the SELRES is still in the future.

E. GENERAL RULES

We started with the initial database of monthly records of individuals in the SELRES, called the PERS data. The data was then aggregated by SSN to produce one record for each individual, a total of 148,354 individual records. The enlisted and officers were then separated, yielding 122,832 enlisted records and 25,522 officer records. These records were then merged by SSN to the LOSS file data and to the Operation Noble Eagle data, which provided information on mobilization. The final subset for the model only included enlisted reservists who had mobilized and had faced a decision after mobilization to stay in or leave the SELRES. In our dataset this totaled 24,887 enlisted individuals. In addition to the rules stated earlier, here are some additional criteria for the data.

1. The BU and EO ratings were combined into one category of Construction Battalion (CB) or Navy SeaBee category.

2. When an individual's gender did not agree between databases, the PERS database gender was used.

F. ANALYSIS METHODS

1. Tree-based Classification Model

In this model, the homogeneity of a set of response values is measured by, for example, the binomial deviance. The model starts with all the data in one large group (the

"root node"). Then, every possible splitting of the root node into two or more groups according to the values of one of the attribute variables is evaluated to determine the change in deviance associated with that splitting. (For example, a split might separate men from women, or age at EOS $\leq$ 24 from age at EOS $\geq$ 25. In either case, the deviances of the two subsets are computed and added.) The split producing the largest decrease in deviance between the root and the two "child nodes" is selected. Then the process continues recursively with the separate splitting of the two child nodes until some stopping criteria are reached. See Breiman (2001) for additional information about tree-based modeling methods.

Several tree-based classification methods were tried to determine what model (i.e., which set of attributes) determined the best predictor of individual behavior. We were looking for models that were both simple and accurate. The PASW® Modeler software reports the variables it deems most important and then subdivides the data based upon those attributes to determine the category that individual would most likely fall into (in this case, if they would stay or leave the SELRES).

Every tree model includes a number of settings, among them a variable selection algorithm under which certain potential predictors may be omitted from the model. These settings will also include stopping rules (more precisely, pruning rules) that determine when the iterative process

should stop. It is therefore not surprising when a tree model selects variables different from those in another statistical model, like logistic regression.

2. Logistic Regression

As in Fricker's (2002) model for assessing deployment effects on military junior officer retention, logistic regression was used to model retention for Navy Reserve enlisted personnel. Logistic regression is a statistical modeling methodology used to estimate the probability of a binary event's occurrence. The method can be used to model the effects of many factors on retention including gender, race, rating, and to what operation or theater the individual was mobilized. The basic form of the model is

$$\log(p/1-p)=\beta_0+\beta_1 x_1+\ldots+\beta_n x_n$$

where p is the probability that an enlisted reservist will leave and not reenlist in the Navy Reserves. $p/(1-p)$ is the odds ratio; the β's represent the change in log odds for a unit change in the associated X. The X's represent the various attributes in our model, such as gender, race, rating, and mobilization to a specific theater or operation. Log odds are assumed to be a linear function of the independent variables. See Devore (2009) for additional information about logistic regression modeling.

The model identifies the effects that attributes, including mobilization to what theater or operation, have on the retention of an individual. The model also quantifies how changes to the factors will affect Navy Reserve enlisted retention. Chapter IV summarizes the results from our statistical methods outlined in this chapter.

IV. THE EFFECTS OF PARTICULAR MOBILIZATION OPERATIONS ON RETENTION

This chapter quantifies the effects of mobilization of Navy Reserve Enlisted personnel to particular operations on retention, adjusting for the demographic factors of race, gender, paygrade, and rating. Findings are presented and the overall trends are discussed. The results of our statistical analysis are based on the 24,887 individuals contained in our data for the period 2003-2009. Here, and with other statistical tests, we employ the entire set of population data, but we treat it as a sample for the purposes of assessing statistical significance. (We might envision a "super-population" that could generate data sets distributed like the one we have, one of which we have actually acquired.)

A. UNIVARIATE ANALYSES

In this section, we look at certain predictors one at a time and assess whether they appear to be related to the retention decision made by the individual. In later sections we examine multiple variables simultaneously, but the univariate analyses can reveal important predictors and act as a screening mechanism.

Table 10 compares the observed number of the Decision Group undergoing attrition to the number predicted under the hypothesis that operation is independent of outcome. There were 2,913 individuals that were part of the Decision Group but were not listed in the data on mobilization from the Naval Reserve Headquarters. These individuals were placed

into the Other/Unknown/Missing category. Since the overall attrition rate is 22.9%, the expected attrition rate is, in each case, 22.9% of the number of the Decision Group. The chi-squared test (Devore, 2009) evaluates the probability of seeing divergences between observed and expected attrition of the magnitude in the table, if the hypothesis were true, by comparing the statistic Σ_i $(Obs_i - Exp_i)^2 / Exp_i$ to the critical value of the χ^2 distribution with, in this case, 4 degrees of freedom. In Table 10, we see that the numbers of attritions from GWOT (with only 17 individuals, compared to an expected value of 151) and OIF are much smaller than expected, and those from ONE much higher than expected. The p-value, essentially zero, leads to the rejection of the hypothesis of independence.

Table 10. Observed vs. Expected numbers of reservists attrited from the Decision Group by operation

		GWOT	OEF	OIF	ONE	Other/ Unknown/ Missing	Overall	Chi^2 test
	Total # mob.	659	6,311	12,122	2,701	3,094	24,887	< .0001
Expected	attrition	151	1,444	2,774	618	709	5,695	
Observed	attrition	17	1,959	1,721	1,169	829	5,695	

Similarly, Table 11 compares observed and expected attrition by paygrade, under the hypothesis that paygrade is independent of attrition. (We combine E1 and E2 to make sample sizes sufficiently large.) Since the attrition rate is 22.9%, that percentage is applied to each paygrade. This is then compared to the actual retention numbers observed among the Decision Group.

Table 11. Observed vs. Expected numbers of reservists undergoing attrition by rank (among the Decision Group)

Rank	(at 22.9%) Expected Attrition	Observed Attrition	Chi^2 test
E1/E2	5	6	< 0.0001
E3	71	143	
E4	959	1,614	
E5	2,387	2,393	
E6	1,631	1,141	
E7	462	262	
E8	134	99	
E9	46	37	
Total	5,695	5,695	

As can be seen by Table 11, Decision Group attrition rates differ by rank. The p-value shows that the probability of seeing such big differences if the hypothesis were true is essentially zero.

B. TREE RESULTS

Figure 7 shows the diagram of how the tree algorithm divided up the data for the enlisted reservists. Each box in the diagram gives the number of individuals (n) and the attrition rate from the SELRES in percent. At the top is the root box containing all of the enlisted reservists who were mobilized and were faced with a decision. As can be seen, the most significant attribute that determined retention was the theater to which the individual was mobilized. The next most important attribute was that of paygrade; the figure shows how for OEF and ONE the data was divided into paygrade groups. The third most important attribute was rating for E-4s in OEF.

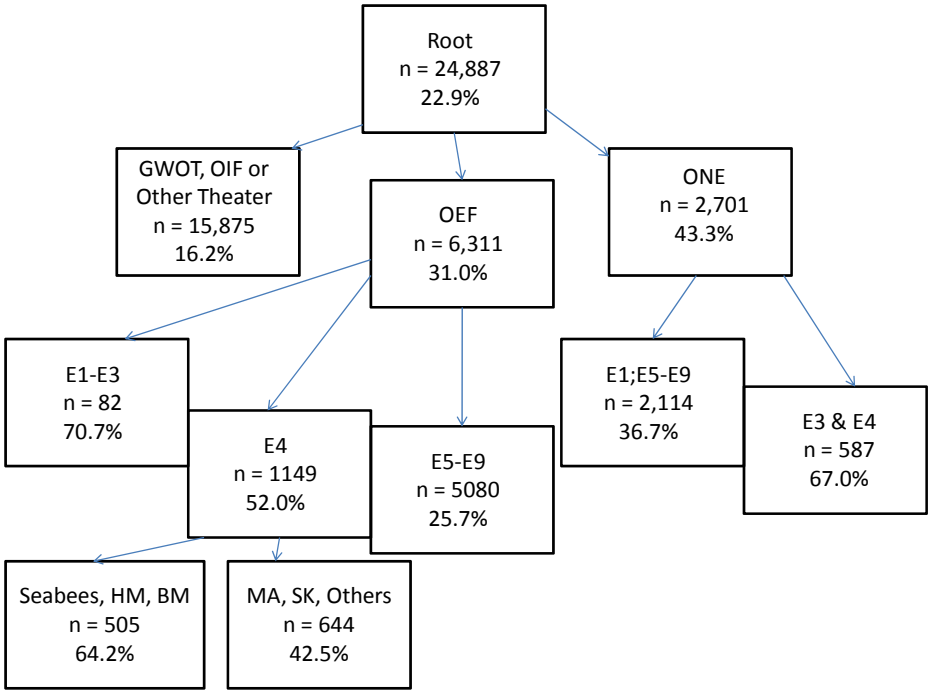

Figure 7. Tree diagram of enlisted retention results from the Decision Group

This model was created in PASW Modeler 13® software and used the C 5.0 modeling tool with the default settings. As can be seen from the diagram, the Operations of ONE and OEF were the only ones that were set apart and all others were grouped together. The algorithm showed that these two operations differed significantly from the others in terms of retention rates. For OEF and ONE, paygrade is the next most important factor, with generally higher paygrades with lower attrition rates and subsequently higher retention. The final layer in the tree diagram dealt with rating for E-4s in OEF. Ratings were grouped based upon the numbers of individuals that were mobilized. The Seabee rates of Equipment Operator (EO) and Builder (BU) were grouped together and the rates of Corpsman (HM), Master-at-Arms

(MA), Storekeeper (SK), and Boatswain's Mate (BM) were broken out from all others. That is, the algorithm broke down two operations, OEF and ONE, and one paygrade, E-4, into individuals who had significantly different attrition rates. Those who were MAs or SKs or others had a different attrition rate than the Seabee rates, the HMs or BMs.

C. LOGISTIC REGRESSION RESULTS

In the logistic regression model, all included factors were statistically significant. We show our results in Tables 12 and 13, one showing each combination of levels and the other showing each level individually. This analysis was done using S-plus® software (Insightful Corp., 2005).

As seen in Table 12, the contribution of each factor is significant. The LRT column refers to the likelihood ratio test, which is the difference between the deviance for the model with the factor and the deviance of the base model. The p-values in the next column show that these terms are each significant at a 5% significance level since the p-value is less than .05 for each term. Therefore, each group of factors, operation, paygrade, rating, gender and race are significant for the whole model.

Table 12. Aggregated Factors and Contribution of Significance to the Model

Term	Df	Deviance	LRT	P-value
Base model		24052.0		
Race	3	24062.8	10.8	0.01
Gender	1	24061.6	9.6	< 0.01
Rating	5	24210.6	158.6	< 0.01
Paygrade	8	24931.9	879.9	< 0.01
Operation	5	25646.0	1594.0	< 0.01

Table 13 shows how each individual level's contribution to retention compares with the baseline level. The baseline terms, whose coefficients are zero, are not listed for each subcategory. The baseline factors are as follows: the baseline gender is female, baseline rating is Boatswains Mate (BM), baseline race is Asian, and baseline theater is none (missing/unknown). Each level's coefficient in the table then shows the estimate of the effect of that level on the log odds of retention. For example, the 0.487 with the rating of MA says that the model predicts an increase in the log-odds of retention for a Master-at-Arms of 0.487, compared to an otherwise similar Boatswain's Mate.

Table 13. Individual Factor Contributions to the Logistic Regression

Coefficients	β Value	Std. Error	z value
(Intercept)	- 1.463	0.854	-1.71
Gender (Male)	0.139	0.045	3.08
Rate SeaBee	0.563	0.085	6.63
Rate HM	0.698	0.081	8.59
Rate MA	0.487	0.107	4.53
Rate SK	0.275	0.090	3.05
Rate Other	0.221	0.074	2.98
Race Black	-0.106	0.093	-1.14
Race Other	0.003	0.099	0.03
Race White	0.044	0.086	0.51
Operation GWOT	-2.581	0.250	-10.34
Operation OEF	0.210	0.052	4.07
Operation OIF	-0.800	0.051	-15.76
Operation ONE	0.838	0.059	14.09
Operation Other	0.097	0.176	0.55
PAYGRADE E2	0.817	1.062	0.77
PAYGRADE E3	1.078	0.852	1.27
PAYGRADE E4	0.701	0.844	0.83
PAYGRADE E5	0.018	0.844	0.02
PAYGRADE E6	-0.500	0.844	-0.59
PAYGRADE E7	-0.780	0.846	-0.92
PAYGRADE E8	-0.492	0.851	-0.58
PAYGRADE E9	-0.373	0.864	-0.43

What is interesting in the results is that the marginal rate for men staying in is lower than that for women. Overall, women appear to get out at a higher rate than men, as shown in Chapter II. But, there may be a number of other factors that contribute to this. For example, a higher percentage of women are in the lower paygrades such as E-3 and E-4 than in paygrades E-7 and above; these lower paygrades have higher attrition rates.

We also looked at interaction terms for the logistic regression model, for instance how retention was different for women in OEF versus OIF or how White E-4 Boatswain's Mates behaved differently than White E-4 Corpsmen. While we found that many of these terms were statistically significant, we decided not to include them in our model for the sake of simplicity.

The confusion matrix, in other statistical parlance a table that combines specificity and sensitivity, is shown for the logistic regression in Table 14. It shows how the model would have predicted the individuals' staying or leaving based upon the model we developed. Rows show how the model would have predicted the individual, and the columns show the actual results. The model used 0.5 as the break point; that is, individuals with predictions of attrition greater than 0.5 appear in the top row of the table and those with predictions smaller than 0.5 appear in the bottom one. This model is about 78.8% accurate; that is, it has an error rate of 21.2%.

Table 14. Confusion Matrix of Retention, Predicted vs. Actual(from the Decision Group)

Decision	Actual Attrited	Actual Retain
Predict Attrited	900	486
Predict Retain	4,795	18,706

D. SUMMARY

The operation to which an individual was mobilized is the most important factor in all models. It was selected as the first split (that is, at the root) in the classification tree model, and also produced the largest decrease in deviance in the logistic regression. We conclude that attrition rates within the Decision Group vary by operation.

Not surprisingly, there are other statistically significant factors that can help predict attrition. Paygrade was significant in the logistic regression model and was the second splitter on both sides of the tree model. Senior personnel have, on average, lower attrition rates.

A Sailor’s rating was significant in the logistic regression model, although it was used only to separate a portion of the E-4s that went to OEF in the tree model. That is, these three factors kept about the same hierarchy of significance in the two models; first, operation mobilized to, then paygrade, then rating.

It is interesting to note that Race and Gender were retained as predictors in the logistic regression, but not in the tree models. Table 10 shows that the LRT, while statistically significant for those two predictors, is much smaller than for the other three, from which we conclude that the other variables are more important in predicting attritions. Furthermore, the tree model selects only the single best predictor at each node, whereas the logistic regression model considers predictors globally. So while Race and Gender are significant, the tree model did not select these predictors in its model.

In conclusion, while all five factors may be helpful in the models, operation, paygrade, and rating are particularly valuable in predicting attrition from the Decision Group.

V. DISCUSSION AND CONCLUSIONS

A. DISCUSSION

With the results of the statistical tests and the tree model, we were able to confirm our initial hypothesis that retention rates differed by mobilization. However, the models also show a correlation with the operation to which the individual was mobilized, the paygrade of the individual, and the rating of the individual, as well as gender and race. In Table 15 is the summary of the results found, showing attrition percentage by the operation to which reservists were mobilized.

Table 15. Results showing differences in percent attrition by operation

	Operation Mobilized to					
	GWOT	OEF	OIF	ONE	Other	Overall
Attrition	2.6%	31.0%	14.2%	43.3%	28.7%	22.4%

Table 15 shows that, overall, those who had mobilized once left the Reserves at a rate of 22.4%. But that is not the rate across all of the operations, and as can be seen there is quite a difference between operations to which the reservists were mobilized. Our initial expectation was that attrition rates would be higher for both operations OEF and OIF, but it turns out that attrition was higher only for OEF. This observation can be used by manpower decision-makers to further understand how their mobilization decisions may affect retention. It is important to stress these results only show that there are differential

retention rates by mobilization operation. This does not mean that the mobilization operation caused an increase or decrease in retention. Indeed, an individual's decision to reenlist or leave the SELRES is surely based on many factors, only one of which may be being mobilized to a particular operation. It also is likely that there are a number of other factors, perhaps economic or family-related, that influence a member's retention. The results simply show that retention in the SELRES was lower for individuals mobilized to specific operations and in some cases for specific paygrades and ratings.

It appears that mobilization procedures have improved over time (Ferguson & Debbink, 2008). For example, the average amount of time between notification and mobilization has increased, and progress has been made in matching individuals' skills to jobs. There are also many rules and policies regarding mobilization that have changed over the years we studied, and which have had the effect of increasing the time that individuals have between mobilizations (unless they specifically volunteer for mobilization). These policies would presumably have had an effect on the retention rates over the time period of our data and are hard to quantify.

B. AREAS FOR FURTHER RESEARCH

Paisant's study on Individual Augmentation showed that there was not the effect of reducing retention based upon doing an IA. While we were not able to look at Individual Augmentation specifically, we have been able to look at a similar situation and conclude that there have been

different retention rates based upon where the individual was mobilized. We are not able to observe any improvement or worsening of retention over time.

Knowledge of effects of mobilizations on Naval Reserve officers would be of great value to a study on retention. Officers are critical to the overall health of any force, and this definitely includes the Navy Reserves. There were over 25,000 officers in the data but we were unable to use them, since time of obligated service data was not available. Data must exist on this but we did not have access to it.

The Navy Reserve Data Warehouse provided loss information, but did not provide specific information on discharges from the Navy Reserves. Information on the type of discharge, whether administrative, disciplinary, medical, or otherwise, would be of further help in determining how or why individuals left the service. If this information were available, it would be of value to use in a follow-on retention study.

The data upon which this study is based also did not have information on multiple deployments for those individuals who experienced more than one. Rather, it only had the latest mobilization, and thus it could not be determined whether previous deployments or the number of deployments were associated with increased loss. Having this information would have helped us better model and understand the effects of mobilization on retention.

Determining specifically where and to what type of command an individual was mobilized would also be of value in a future study on retention. Anecdotal evidence suggests

that individuals who were mobilized to ground units and in jobs where they did not have a matching skill set had lower satisfaction and thus potentially could have had lower retention. Although Reserve Headquarters provided data for where the individuals were mobilized, it was difficult to determine where, exactly, each individual ended up. A follow-on study focused on determining where and to what type of command an individual was mobilized would be of great use.

An important area for further research would be to attempt to determine volunteerism for mobilizations. It seems intuitive that those volunteering for mobilization would likely have higher retention rates. As indicated by the Reserve Headquarters, this data was inconsistent, sometimes valid and sometimes not over different time periods and different sources. Voluntary assignments not considered mobilizations are available for reservists. Data collected on individuals who took those types of assignments would be a great comparison to a mobilization study.

Retention is affected by many factors, often differing by individual, but also analyzable and quantifiable in the aggregate. A solid understanding of these factors and their impact is essential to maintaining a fighting force that is robust enough to defend the nation. As these factors continue to change over time, collecting and analyzing the right data is important. The problem of retention will remain a significant one, ensuring that there is a healthy Reserve force for the future.

APPENDIX A.

A. OFFICER DATA

Since generally officers do not have an EOS date, we were not able to use the officer data in the generation of our model. We provide the information here so that it can be used for comparison purposes to the Navy Reserve enlisted or some other database.

Navy Reserve officers have varying obligations of service time based upon several factors. Some examples of the variable length of officers' obligation time would be if they came into the Reserves from the Active Component, took a bonus and incurred an obligation, or joined the Reserves directly and have a contractual obligation. Since data of this type was not provided to us, it was decided not to use the officers in the model. The model that was used also differed from Fricker and Paisant since it did not use a specific timeline, which was based upon training or obligation, for each type of individual. The model was simply looking for an indication that the individual was mobilized and if after the mobilization he or she faced a decision to stay in or leave the SELRES.

Because the officer ranks do not have EOS dates included in their data, we were not able to examine them in the same manner as the enlisted ranks and divide them into categories of Retained, Lost, No Decision, and No End of Mobilization. It was possible, however, to examine the individuals and determine the same basic demographic data and if they were mobilized and where they were mobilized.

1. Sex of Officer and Mobilization

Table 16 shows where the officers were and the percentage of them that went to OEF and OIF, the total, and the associated percentage.

Table 16. Numbers and percentage of officers mobilized to OEF/OIF.

	total	OEF	OIF	OEF/OIF	%
Male	4,480	618	587	1,205	26.9%
female	21,042	2,005	3,383	5,388	25.6%
total	25,522	2,623	3,970	6,593	25.8%

2. Race and Mobilization of Officers

We did the same analysis that was performed on the enlisted ranks for the officers. We also used the same categories as the enlisted ranks. As the results show in Table 17, those shown as Asian in the database were mobilized at a higher rate than many of the additional categories of race.

Table 17. Race and officer data

	total	OEF	OIF	OIF/OEF	% going OIF/OEF
Asian	685	75	127	202	29.5%
Black	1,272	147	196	343	27.0%
White	20,127	1,979	3,059	5,038	25.0%
other	3,438	422	588	1,010	29.4%
total	25,522	2,623	3,970	6,593	25.8%

3. Rank and Mobilization of Officers

Of the 25,522 individuals who were labeled as officers, 7,750 individuals appeared to be mislabeled, but we were able to determine how they should be combined with the other data. In this way, we were able to look at these individuals in the same manner as those of the enlisted ranks.

Table 18. Officer rank and mobilization

Rank	MOB'd	Non-MOB'd	% MOB'd	MOB'd to OEF/OIF
O1	17	464	3.5%	16
O2	26	559	4.4%	23
O3	321	3,416	8.6%	246
O4	668	4,333	13.4%	447
O5	608	4,116	12.9%	292
O6	318	2,691	10.6%	137
O7	3	37	7.5%	2
O8	1	59	1.7%	1
O9	0	1	0.0%	0
W2	1	13	7.1%	1
W3	6	28	17.6%	2
W4	12	74	14.0%	3
Total	8,537	16,985	33.4%	6593

The officer mobilization rate is higher than that of the enlisted ranks, but of those mobilized, the officers were mobilized to OEF or OIF at a lower rate than that of the enlisted ranks.

B. LOSS DATA

Using the LOSS data file, it was possible to also look at the officers and how they were retained in the same manner as it was for the enlisted reservists. The data contained in the LOSS file was the same as it was for the enlisted and a similar chart was generated for the officers from 2003-2010 as was created for the enlisted reservists. See Appendix B for an explanation of IRR and VTU terms.

Table 19. Officer Losses by theater

	Theater Type			
Loss Type	OEF/OIF	Other	none	total
TRANSFER TO IRR	711	210	4,246	5,167
TRANSFER TO VTU	1,132	620	4,315	6,067
OTHER	778	307	2,556	3,641
Total Loss	2,621	1,137	11,117	14,875
Retained	3,972	807	5,868	10,647
Total	6,593	1,944	16,985	25,522

Again, the data was assembled into a table of percentages comparing individuals who were lost or transferred by which theater they were mobilized to. As with the enlisted data, since the populations are not exactly the same, direct comparison is not possible.

Table 20. Percentage of officers lost by mobilization theater

	Theater Mobilization			
	OEF/	GWOT/	No	All
	OIF	ONE/Other	Mobilization	SELRES
Transfer to IRR	10.8%	10.8%	25.0%	20.2%
Transfer to VTU	17.2%	31.9%	25.4%	23.8%
Lost from SELRES	39.8%	58.5%	65.5%	58.3%

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APPENDIX B. THE INDIVIDUAL READY RESERVE

(Quoted from Navy Personnel Command, 2010)

The Navy Individual Ready Reserve (IRR) is a force that consists of personnel who must fulfill their Military Service Obligation under Title 10, United States Code, sec. 651. It also may include members fulfilling a service obligation incurred via contract, and those who voluntarily remain in the IRR after their obligation is complete. The IRR is composed of the Active Status Pool and the Volunteer Training Unit (VTU). Reservists in this category are subject to involuntary recall to Active Duty per Title 10, United States Code, 12301(a) and 12302.

The Active Status Pool is a pool consisting of individuals who have had training and have previously served in the active force or in the Selected Reserves (SELRES) and are serving in a non-pay, and non-drill status.

The VTU consists of personnel, organized into units, who are eligible and willing to return to a pay status or personnel not eligible for further pay assignments but who voluntarily drill for retirement points. Navy Operational Support Centers (NOSCs), under the cognizance of the Commander of the Reserve Forces, are responsible for the continual screening and management of their attached VTUs.

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LIST OF REFERENCES

Breiman, L. (2001). Statistical modeling: The two cultures. *Statistical Science 16*(3): 199-231.

Chun, Clayton K. S. (2005). *Who stays and who goes: Army Enlisted Reserve and National Guard retention*. Carlisle, PA: Strategic Studies Institute.

Devore, J. L. (2009). *Probability and statistics for engineering and the sciences*. United States of America: Thompson Brooks/Cole.

Ferguson, M. E. & Debbink, D. J. (2008, August). *Naval Message released by N1 and N095 VADM M. E. Ferguson and VADM D. J. Debbink on 251346Z AUG 08*. Retrieved September 11, 2010, from www.ecrc.navy.mil/1/idc_predeploy/nav23508.txt

Fricker, R. D. (2002). *The effects of Perstempo on officer retention in the U.S. Military*. Santa Monica, CA: RAND.

Fricker, R. D. & Buttrey, S. E. (2008). *Assessing the effects of Individual Augmentation (IA) on Active Component Navy enlisted and officer retention*. Naval Postgraduate School, Monterey, CA.

Insightful Corp. (2005), *S-Plus for Windows Users Guide*, Seattle: Insightful Corporation

Kirby, S. N. and Naftel, S. (1998). *The effects of mobilization on retention of enlisted reservists after Operation Desert Shield/Storm*. Washington, D.C.: RAND.

Marron, Golding, et al. (2006, October). *Recruiting, retention, and future levels of military personnel.* Congressional Budget Office.

Navy Newsstand. (2007a, January 1). *Masso dispels IA myths at Surface Navy Association Conference*, story number NNS070111-07. Retrieved September 12, 2010, from www.news.navy.mil/search/display.asp?story_id=27281

Navy Newsstand. (2007b, January 23). *CNO to Sailors: IA's critical to War on Terror*, story number NNS070123-10, release date 1/23/2007. Retrieved September 8, 2010, from www.news.navy.mil/search/display.asp?story_id=27425

Navy Personnel Command. (2010). *A guide to the Individual Ready Reserve*. Retrieved September 21, 2010, from http://www.persnet.navy.mil/CareerInfo/ReservePersonnelManagement/IRR/IRRGuide.htm

Office of the Chief of Naval Operations. (2000, July). *OPNAV INSTRUCTION 1001.24: Individual Augmentation policy and procedures, N512H.*

Paisant, M. A. (2008). *The effects of Individual Augmentation (IA) on Navy junior officer retention*. Master's Thesis. Naval Postgraduate School, Monterey, CA.

Roughead, G. (2009, May 14). Statement of Admiral Gary Roughead, Chief of Naval Operations, before the House Armed Services Committee, on FY10 Department of the Navy Posture. Retrieved August 25, 2010, from http://www.navy.mil/navydata/people/cno/Roughead/Testimony/Roughead_Testimony051409.pdf

SPSS Inc. (2009) *PASW MODELER Web Mining 13 users guide*. Chicago: NetGenesis Corp.

Title 10 of U.S. Code, Subtitle E, Sections 12300-12304, enacted Jan. 3, 2007

U.S. Air Force Reserve snapshot. (2010, September). Retrieved September 10, 2010, from www.afrc.af.mil/shared/media/document/AFD-060712-018.pdf

U.S. Fleet Forces Command. (2010). *U.S. Navy Individual Augmentees*. Retrieved September 11, 2010, from www.facebook.com/navyIA

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