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THESIS

**THE EFFECTS OF INDIVIDUAL AUGMENTATION (IA)
ON NAVY JUNIOR OFFICER RETENTION**

by

Michael A. Paisant

March 2008

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ON NAVY JUNIOR OFFICER RETENTION**

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ABSTRACT

In 2000, the Navy started the Individual Augmentation (IA) deployment program. IA deployment provides a tool for military leaders to designate and assign specific individuals, not forces, to fill temporary duty jobs outlined by combatant commanders in support of National Command Authority (NCA) directed operations. IA is one of the Navy's means of contributing to the Global War on Terror (GWOT) and Operation Iraqi Freedom (OIF).

This thesis uses standard statistical modeling techniques to quantify the effects of IA deployments on Navy junior officer retention. Using these models we found that the odds of retention for junior officers who went on IA deployments were statistically significantly higher than for those officers that did not. This is an important result because Navy leaders have said that IA deployments will continue in the future. Officers are the foundation of the Navy command and leadership structure; therefore, it is important to understand the effects these deployments have on their retention.

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EXECUTIVE SUMMARY

Previous research regarding the effects of deployments on U.S. military officer retention contradicted the common assumptions that increased number of deployments results in lower retention among U.S. military officers. This research has shown that there is a positive association between increased number of deployments and military officer retention rates. Findings also showed that military officers with higher numbers of hostile deployments showed higher retention rates than officers with the same amount of non-hostile deployment. Hostile deployments for junior officers lessened the positive association between deployment and retention but did not eliminate it.

Individual Augmentation (IA) deployment is a program started by the Navy in 2000. It is a tool for the Navy to designate and assign specific individuals, not forces, to fill temporary duty jobs outlined by combatant commanders in support of National Command Authority directed operations. IA deployments started in response to the increased demand for Navy personnel to fill jobs related to operational commitments to the Global War on Terror and Operation Iraqi Freedom. IA deployments are assigned to specific individuals in contrast to the typical deployments that are assigned to units or ships. This paper uses data collected from the Defense Manpower Data Center (DMDC) and the Bureau of Navy Personnel (BUPERS) to quantify the effects of IA deployments on Navy junior officer retention. Consistent with the previous research regarding deployment effects on officer retention, we determined that there is a positive association between IA deployments and junior officer retention.

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I. INTRODUCTION

A. PROBLEM STATEMENT

Effective Naval force planning requires an understanding of how various factors such as operational tempo (optempo), force demographics, and external economic conditions affect officer retention. Officers are vital to the Navy's command and leadership structure; therefore it is critical to understand how these factors affect officer retention. Failure to understand these effects could result in a future officer corps incapable of meeting the Navy's leadership needs. Individual Augmentation (IA) deployments, which started in 2000, may also affect officer retention. Because the IA program has been in use for such a short time, the Navy does not have an understanding as to how the program affects retention. In order to effectively plan for future officer needs, it is important for the Navy to gain insight into the effect IA deployments have on officer retention. This thesis quantifies the effects of IA deployments on Navy junior officer retention. This thesis also provides statistical evidence that there is a positive association between IA and junior officer retention. That is, the odds of retention are higher for those officers who deploy on IA than for officers who do not.

B. BACKGROUND

The Navy's "Total Force" policy calls for the "integration of both the Active and Reserve components into a seamless and cohesive force capable of meeting all

requirements in peacetime and in war.”(OPNAVINST 1001.21B)
Recently, with limited resources and increased operational commitments, the Navy’s challenge is to ensure its force is adequately manned, trained, and equipped to respond to the full spectrum of military operations. Under the “Total Force” policy the Navy tries to retain Active and Reserve forces and personnel capable of accomplishing assigned wartime mission tasking and capable of meeting peacetime contingency requirements. (OPNAVINST 1001.21B)

Individual Augmentation is the Navy’s process of identifying and responding to combatant command mission-related temporary duty personnel requirements. More specifically, IA provides a tool for the Navy to designate and assign specific individuals, not forces, to fill temporary duty jobs outlined by combatant commanders in support of National Command Authorities directed operations. (CJCS 1301.01B) OPNAV INSTRUCTION 1001.24, dated 5 July 2000, and Chairman of the Joint Chiefs of Staff Instruction 1301.01B, dated 1 July 2001 outline augmentation policies for the military. Recently, with increased optempo (measure of the pace of operations) and manning requirements experienced by the U.S. military, the IA process goal is to identify and fill the voids in mission-related manning within the military. The IA process is also intended to provide manning to the Navy’s commitments in the Global War on Terror (GWOT) and Operation Iraqi Freedom (OIF).

IA is designed to temporarily alleviate manning shortfalls for combatant commands which lack sufficient personnel to fill jobs specific to their mission tasking. It is not intended to be a long-term solution to fill permanent

manning shortages. (OPNAVINST 1001.24B) IA focuses on billet or job requirements rather than personnel requirements. The process is not intended to allocate more manpower to combatant commands just because they feel undermanned. Combatant commands determine and validate billet requirements to support specific mission tasking by the National Command Authority. Navy component commands are tasked with providing the manpower necessary to fill the billets specified by the combatant commands. In the event that the Navy Component command cannot fill the required billets, IA procedures are initiated by the Office of the Chief of Naval Operations (CNO) for Navy requirements, OPNAV (N31).

The following outlines the procedures under OPNAV INSTRUCTION 1001.24 regarding IAs. The procedures are broken down into five categories with corresponding subcategories. The specific procedures are as follows:

1. Initial Tasking

(a) Combatant commands are tasked directly by the National Command Authority. They determine and validate the force requirement for the mission tasking, and task the Navy component command with identifying and assigning personnel to meet the force requirements. It is the responsibility of the combatant commands to ensure the billet requirements are valid. (CJCS 1301.01B)

(b) If the Navy component command cannot meet the personnel requirements as specified by the combatant command, OPNAV (N31), the Joint Staff (J-1) and the combatant command headquarters are informed. The Navy

component commander sends a request for augmentation. The procedure specifies that Flag officer involvement in this process is vital. Senior officers are required to validate the need for each billet requirement. There should be a specific billet that has been validated to support the use of IA. (OPNAVINST 1001.24B)

2. Validation and Resource Assignment Process

(a) OPNAV (N31) reviews and validates requests for billet augmentations based on information forwarded by the Navy component command. Additionally, the availability of resources is reviewed by both the active components (OPNAV (N12)) and reserve components (OPNAV (N095)) to identify the available personnel the Navy has to allocate to the IA process. This process takes three days. OPNAV (N31) then tasks either the active component or reserve component with the IA assignments.

(b) Without Presidential Reserve Call-Up Authority, OPNAV (N12) satisfies billet requirements with active duty volunteers, reserve volunteers, and if necessary active non-volunteers. Under PRC authority, OPNAV (N095) fills billets with volunteers, non-volunteers, or by reassignment of TAR personnel.

3. Identification of Sources Outside of Navy Assets

Under special circumstances OPNAV (N12) may identify sources available for filling IAs external to the Navy. The sources include other combatant commands, United States Special Operations Command (USSOCOM) personnel, and North Atlantic Treaty Organization (NATO) personnel.

4. Personnel Extension Beyond Expected Rotation Date

The combatant command reserves the right to extend IA deployments past their expected rotation date with concurrence from the Navy component command or Defense Agency. Reservists on IA assignment under PRC may not be extended beyond a total of 270 days (mobilization and redeployment time included). The Chairman, Joint Chiefs of Staff, resolves all objections to IA extensions. (CJCS 1301.01B Encl A)

5. Ongoing Operations

Navy Component Commanders and OPNAV (N31, N12, and N095) are required to follow procedures for IA request, validation and sourcing identical to those discussed above. In the case of recurring requests for IA assignments over 12 months, IA procedures recommend long-term sourcing via the Program Objective Memorandum Process (POM). Simply put, IA procedures recommend that a permanent job position, rather than a temporary billet be created. (OPNAVINST 1001.24B)

IA is not intended to increase peacetime manning, to fill permanent manning shortfalls, or to meet training requirements. The goal of the deployment is to alleviate some of the stress on combat forces by filling the temporary duty support roles with Navy personnel. Cross-checks, such as combatant commanders validating manning requirements and Flag level review at the component command level, are in place to prevent the misuse of the IA program. All IA requests are submitted to the CNO. OPNAV (N3/N5) is the final validation authority. (OPNAVINST 1001.24B)

Both active duty and reserve personnel may serve on IA assignments. In January 2007 at the Surface Navy Association Conference, Rear Admiral Sonny Masso, head of Task Force Individual Augmentation (TFIA), stated that since 2001, 82 percent of personnel serving on IA deployment have been from the reserve component. Both officers and enlisted personnel serve on IAs. The majority of the billets are located in the Middle East with most of those being in Iraq and Afghanistan; however, billets also include service in locations such as US Central Command, US European Command, Guantanamo Bay, and at commands within the Continental United States. Personnel selected for IAs usually undergo training prior to deployment. There are two types of training. Navy Individual Augmentation Combat Training is intended for all personnel assigned to an IA. There is also theatre-specific training based on the missions and locations of the specific IA assignment. (Navy Newsstand 2007)

Force planning requires an awareness of the changing factors affecting Navy personnel. Factors changing in the U.S. Navy include individual and unit deployment patterns, force demographics, and external economic conditions. Recently, the Navy deployment cycle has allowed for more flexibility in increasing deployment lengths; however, there is less uncertainty regarding when and where deployments will occur. According to Chief of Naval Personnel, Vice Admiral John C. Harvey, the Navy is trying to more effectively manage and track the amount of time individuals are deployed. (Navy Newsstand 2006)

Force demographics are also an important factor in force planning. According to the CNO, diversity is a "strategic imperative" for the Navy. (Navy Newsstand 2006) Past research has proven that retention behaviors vary according to gender, race, and marital status among other demographic factors. As demographic patterns change within the Navy, retention behavior will likely change also.

C. OBJECTIVE

Former CNO Admiral Mullen stated that IAs would continue to serve in support of combatant commands. In his March 2007 statement before the Senate Committee on Appropriations Subcommittee on Defense, Admiral Mullen stated that the IA program was "central to the Navy's ability to sustain overall readiness, particularly in support of the Global War on Terror." (Mullen 2007) Admiral Mullen also stated:

I see this as a long-term commitment by the Navy. I'm 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, home one year, deployed one year and now are on their third or fourth deployment. (Navy Newsstand 2007)

Given that IA deployments will continue for the foreseeable future, it is important to assess whether they are having an effect on officer retention. There may be reason to believe that there exists a negative association between IA and officer retention. IA deployment often removes officers from shore billets and deploys them to combat zones. IA deployment is similar to conventional Navy deployment in that it often requires servicemen to be away

from their home ports or duty station for extended periods of time. However, the IA process is different in that it is not part of the detailing process and is not specifically outlined within a serviceman's career path. It is also different in that officers deploy individually, not as part of a unit. An officer on IA assignment, which we will refer to as an "IA", may also deploy to serve with another service. IAs often receive very little notice prior to being assigned; therefore, cannot plan IA assignments in their career path. The IA process will in the future be part of the typical detailing process and therefore will be able to be better incorporated in a service member's career path.

There are advantages to conventional Navy deployment that are also typical to IA deployments. Military pay incentives help entice some serviceman to opt for overseas deployments, often to combat zones. Service members receive tax advantages while in combat zones and also receive Family Separation Allowance (FSA) while deployed away from their families more than 30 days. Military personnel deployed to hostile or combat zones receive Imminent Danger Pay. All result in an increase in pay.

Previous research regarding the effects of perstempo on officer retention showed that increased deployment activity had a positive association with officer retention rates. Additional findings were that officers with higher numbers of hostile deployments had, on average, higher retention rates than officers with the same numbers of non-hostile deployments. Both findings contradicted the common

assumption that increased deployment results in lower retention rates. (Fricker 2002)

This thesis quantifies the effects of Individual Augmentation deployment on Navy junior officer retention. Our goal is to confirm or contradict the common assumption that IA deployment causes lower retention. Additionally, we evaluate demographic, family status, and job-related factors to determine if any such factors can be associated with an officer's retention behavior. We gathered data on officers who deployed on IA assignment and compared it to data on officers who deployed on conventional deployments. A descriptive analysis of IA deployments was conducted and models were fit to assess the impact of IA deployments on retention.

D. ORGANIZATION

This paper is organized as follows. Chapter II describes the data and the data sources. It also explains what information was unavailable but would have been useful for our research. Chapter III describes the methods used to evaluate officer retention decisions. It also explains the statistical test used to quantify the effects of IA on officer retention. Chapter IV provides the results of the statistical tests and Chapter V provides the conclusions and recommendations from the model.

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II. THE DATA

A. DATA SOURCE

We collected IA deployment information from 2001 to 2007 for 15,000 Navy enlisted personnel and officers from the Bureau of Navy Personnel (BUPERS). Among the 15,000 IAS were 4,038 officers. Social Security Numbers (SSN's) were used to uniquely identify each officer. BUPERS provided rank, Navy Officer Designation Codes (DESIG's), Navy Officer Billet Codes (NOBC's) and information on the specific IA assignment such as deployment dates, deployment length, deployment location, allocated training time prior to deployment, and job description codes.

The Defense Manpower Data Center (DMDC) provided data on 98,708 Navy officers within its database from September 1997 to September 2007. This data included demographic information, education history, commissioning source, pay data, family status information, discharge and retention information, and other information specific to each individual's military service. The DMDC data also identified officers by SSN.

The data from the BUPERS was matched with the information from DMDC using SSN to link personnel data to IA deployment data. The final product was a database with information on 98,708 officers of whom 4,038 had been deployed on an IA assignment.

B. RANK, DESIG'S AND NOBC'S

Rank, DESIG's and NOBC's were used to identify each officer and associate each officer to specific warfare or job specialties. These are the typical ways in which the Navy divides its officers. Pay data and time in service are also associated with an officer's rank and job specialty. In general, the longer an officer has been in the Navy the higher his or her pay and rank. The officer ranks in the data were Warrant Officers (WO's) and Commissioned Officers (O-1 through O-6).

In Table 1, the 4,038 IAs are compared to the 94,670 Non-IAs by rank. Personnel who deploy on IA assignments are referred to as IAs. The table divides the officers by rank and by whether or not the officers were deployed on an IA assignment. Of the 4,038 officers who deployed on IA, 86.6% were O-3's, O-4's and O-5's. These same ranks made up 71.1% of the 94,670 Non-IAs.

Rank	IA	
	No	Yes
WO's	3.7%	2.2%
O-1	7.8%	1.3%
O-2	8.6%	5.1%
O-3	37.5%	41.6%
O-4	19.8%	28.7%
O-5	13.8%	16.3%
O-6	8.7%	4.8%

Table 1. Percentage of IAs and Non-IAs by Rank

DESIG's are four-digit numeric codes used to identify an officer's warfare community or primary job. Officers are assigned to specific warfare communities based on selection processes and completed training qualifications. Two

officers in the same warfare community may have slightly different designator codes because the codes also identify whether an officer is active duty or a reservist and whether and officer is an Unrestricted Line Officer (URL), Restricted Line (RL) or Limited Duty Officer (LDO). Officers were divided into five job categories: "Aviation," "Surface Warfare," "Submarine Warfare," "Supply Corps" and "Other." Each job category included the URL's, RL's, LDO's, active duty and reservist within the warfare community. "Other" included all officer jobs not covered by the other categories including Staff Corps, Restricted Line (other than Supply), and undesignated officers.

DESIG's were unavailable for 17,696 officers in the data. For these officers NOBC's were used to classify their job communities. NOBC's are also four-digit codes; however, they identify an officer's specialty by way of job experience rather than warfare community. NOBC's identify officer job requirements and officer occupational experience acquired through job experience or through a combination of education and job experience. It was more difficult to classify officers into the five warfare communities using NOBC's because the job descriptions rarely included any keywords that specified the warfare community the job supported. For the cases where the community an officer belonged to was obvious, we classified the officer into the appropriate warfare community. Officers who lacked DESIG's and whose NOBC's did not lead to an obvious classification were placed into the "Other" category.

Table 2 compares the IAs and Non-IAs by warfare communities. The table displays the percentage of officers

from each warfare community by IA status. Of the 4038 officers who deployed on IAs, nearly half of them were classified as "Other." This seems reasonable since the same holds true for the Non-IA officers.

Warfare Community	IA	
	No	Yes
Surface	17.8%	17.1%
Sub	5.8%	4.5%
Supply	6.9%	10.0%
Aviation	23.6%	22.5%
Other	45.9%	45.9%

Table 2. Percentage of IAs and Non-IAs by Warfare Community

C. DEPLOYMENT LOCATIONS, TRAINING TIME, DEPLOYMENT DATES

BUPERS provided duty locations for the IA assignments. Deployments to Iraq and Afghanistan accounted for 58 percent of IA assignments. Other locations included Africa, United Arab Emirates, Kuwait, South America, Germany, and Saudi Arabia. Figure 1 displays the number IAs assigned to the specific IA duty locations.

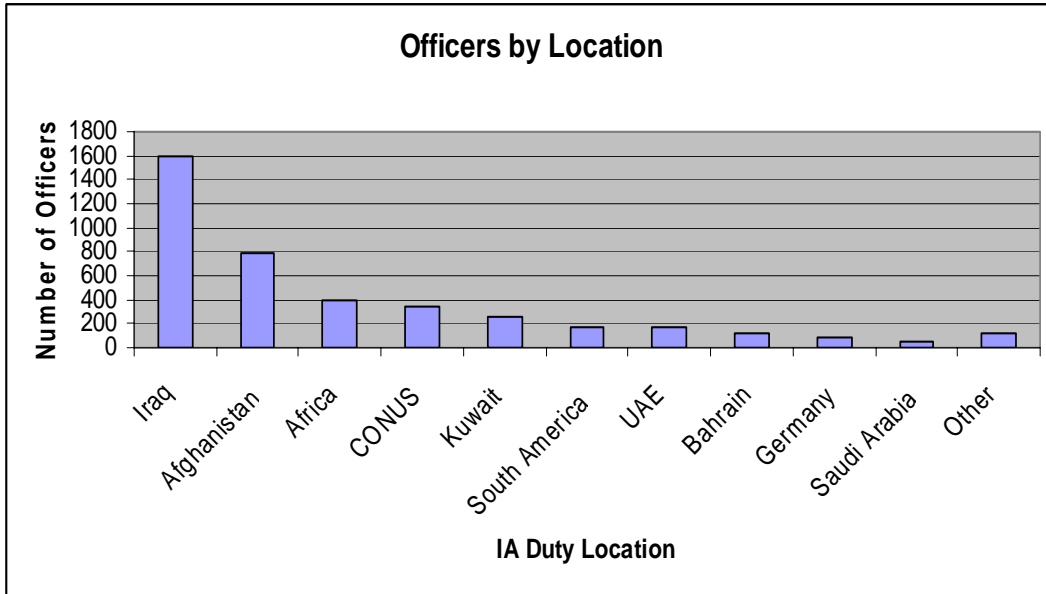


Figure 1. Number of Officers per IA Deployment Locations

Training time was the time allotted for training on IA prior to arriving in theatre. In some cases officer received no training prior to being deployed to the IA duty location. The average training time was 34 days and the maximum time was 300 days. An error in the data claims that one particular officer received -24 days of training prior to going on IA assignment. This is clearly an error and must be noted prior to any analysis results. We left the error in the data.

TAD provided how long an officer was on IA assignment. The mean IA deployment length was 232 days and the median time was 179 days. The longest IA deployment lasted 730 days. Two officers on IA assignment were reported to have spent zero or fewer days on IA assignment.

D. PAY ENTRY BASE DATE, DATE OF ENTRY TO THE OFFICER RANKS AND TIME IN SERVICE

Pay Entry Base Date (PEBD) and Date of Entry to the Officer Ranks (DOLE) are two dates provided in the data. PEBD is the date a service member begins military service. This date is used for accounting purposes and years of total service are calculated with this start date. DOLE is the date an officer was commissioned. In about half of the cases, PEBD and DOLE were identical for officers. However, some officers served in the enlisted ranks prior to being commissioned. In the cases which the PEBD was prior to the DOLE, the PEBD was the date a service member entered the Navy as an enlistee and the DOLE was the date the service member received a commission as an officer.

Time in service is the time an officer has served in the military. Time in service was set to the amount of time between DOLE and the loss date, if the officer was no longer in military service. For officers still in military service in September 2007, time in service was set to the amount of time between DOLE and September 2007. If an officer was prior enlisted, then service time was set to the time between the PEBD and the loss date or September 2007. Some officers in the data have fewer than six months of enlisted service prior to joining the officer ranks. In these cases we assume that the enlisted time was associated with an officer commissioning program. However, if an officer spent more than six months in the enlisted ranks, we presumed the officer was enlisted prior to becoming an officer. Finally, Warrant officers provide another special case. Warrant officers spend many years in the enlisted ranks prior to

becoming officers. In the case of Warrant Officers the PEBD is many years before the DOLE. Therefore the time in service for warrant officers is often much greater than that of commissioned officers.

E. DEMOGRAPHIC DATA

DMDC provided demographic information on all officers. This data included age, gender, ethnic group, education level, commissioning source and family status. Family status was divided into four groups: Joint marriage, Married, Single without family, and Single with family. Joint marriage described officers who had a spouse also in military service. Single without family described unmarried officers with no dependents. Single with family described unmarried officers with dependents.

Table 3 displays the percentages of IAs and Non-IAs by gender. According to the data, males were slightly more likely to be given IA assignments than were females. Table 4 displays the percentage of IAs and Non-IAs by family status. There was very little difference in the percentages between IAs and Non-IAs based on family status.

Gender	IA	
	No	Yes
Male	84.1%	87.1%
Female	15.9%	12.9%

Table 3. Percentages of IAs and Non-IAs by Gender

Family Status	IA	
	No	Yes
Joint	3.1%	3.2%
Married	67.3%	68.7%
Single(w/family)	6.7%	5.5%
Single(w/o family)	22.9%	22.6%

Table 4. Percentage IAs and Non-IAs by Family Status

F. LOSS DATA

DMDC provided loss dates and loss codes for officers who resigned from military service between September 1997 and September 2007. Loss codes provided reasons that the officer left military service. DMDC provided a number of different loss codes; however, the major reasons for leaving military service were end of service obligations, medical reasons, or that the military forced the officer to resign. Loss codes were missing for many officers in the data. Of the 4,038 officer deployed on IAs, 639 are no longer in military service. Of the 94,670 of the officers not deployed on IA, 44,806 are no longer in military service.

G. UNAVAILABLE DATA

Unavailable data that would be useful are the obligation times for officer commitments. For URL officers (officers who have combat specialties) with the exception of naval aviators and naval flight officers, the initial contract obligation after commissioning is five years. For aviators and flight officers, the initial obligation is seven to eight years after completing flight training. After the initial obligation, an officer may choose to sign another obligation contract. These contracts lengths vary in the different officer communities. For RL officers and

Staff officers the initial and subsequent contract lengths vary throughout the communities. Some of this information is available on the Naval Personnel Command website (www.bupers.navy.mil). This data would be useful to determine the times within a career at which an officer had to decide whether he or she would remain in military service.

The date an officer was initially assigned to an IA deployment would also be useful data. This time could be compared to the decision time discussed above. An officer has to give the Navy advanced notice, usually about a year, prior to resigning his or her commission. Anecdotal evidence suggests that often an officer is assigned to an IA only after the Navy receives his or her notice of intent to resign. This is not the cause and effect relationship we care about. Instead we want to determine whether an IA deployment changes the retention habits of officers, not the reverse.

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III. MODELING THE EFFECTS OF IAS ON JUNIOR OFFICER RETENTION

A. INTRODUCTION

This chapter describes the development and use of the model used to quantify the effects of IA deployments on junior officer retention. The first sections in this chapter describe the development of the model and rules used to create a subset of the officer data that could be used to address the problem. The remaining sections of this chapter describe the statistical tools used to quantify the effects of IA on retention.

Fricker (2002) notes that it is difficult to use raw trends in data to determine the effects of deployments on retention. There are many reasons an officer may choose to stay or leave and just observing raw trends may not provide any real answers to deployment effects.

B. THE MODEL

We created a model similar to that of Fricker (2002) for addressing the effects of deployment on junior officers. Modifications were made to the model Fricker used to make our model more specifically relevant strictly to Navy junior officers. In our model, Surface, Submarine, and Supply officers were grouped together separate from Aviators, because aviators are bound to different service contract obligations than other junior officers. The differences in the obligations required us to model the Aviators slightly differently from members of the other officer communities.

1. Surface, Submarine and Supply

The initial service contract for junior officers commissioned in these warfare communities is five years. Officers may choose to resign their commission after five years or choose to sign additional service obligation contracts after the initial five years has ended. For some of the communities, there are specific pay incentives for signing such contracts. Other officers continue service without signing contracts. This allows them an additional 18 to 24 months of service prior to having to make the decision of whether to continue or resign. These officers make the decision around the 6.5 years time-in-service point. Figure 2 is a graphic taken from the Surface Warfare Junior Officer Community Brief from January 2008. It is a timeline of a typical junior officer career path in the Surface Warfare community. The timeline for junior officers in the Submarine and Supply Communities differ only slightly. Figure 3 is a similar table we created for a Submarine junior officer career path.

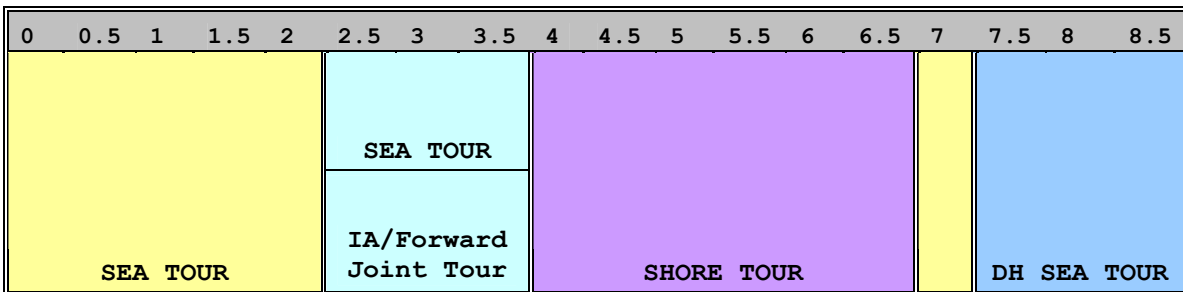


Figure 2. Surface Warfare Officer Career Timeline (PERS-41 2007)

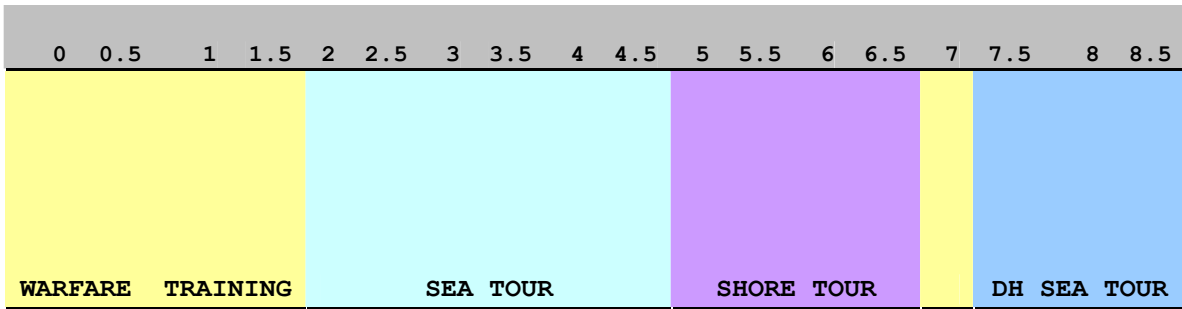


Figure 3. Submarine Officer Career Timeline (Source: author)

To assess the affects of IA deployments on Surface, Submarine and Supply Junior officers we examine officers at the seven-year time-in-service point. We chose seven years to allow sufficient time after the expiration of the initial service contract obligation to as accurately as possible determine whether an officer left military service. We declare that a Surface, Submarine or Supply junior officer still in the Navy after seven years time-in-service has decided to remain in the Navy. Junior officers not present at seven years of service have left the Navy. Junior officers who decide to resign after the initial five-year service contracts were accounted for because they would have resigned prior to seven years. We believed that the seven-year time-in-service provided a good point in the career to prevent inaccurately determining an officer's decision to remain or resign. Figure 4 is a simplified version of the junior officer career timeline and it incorporates the seven-year decision point we used to determine an officer's retention behavior.

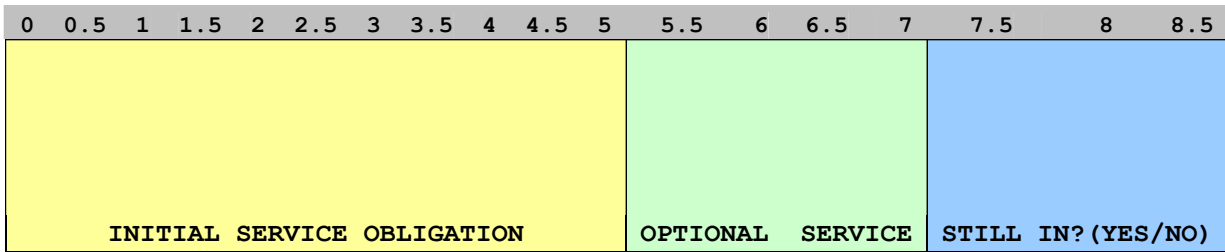


Figure 4. General Timeline used for Surface, Sub and Supply Officers

2. Aviators

We model the retention habits of Naval Aviators similarly to that of the Surface, Submarine and Supply officers; however, we changed the decision point to ten years instead of seven years because of the difference in the service obligation time. The initial service contract for aviators is approximately seven years after being certified. Additionally, it takes on average two years to become qualified as pilot. Ten years is approximately one year after the end of the initial service contract obligation. The career path timeline for aviators is dependent on the specific aviation platform to which an officer is assigned. Helicopter pilots have different training requirements than fixed-wing pilots which results in some differences in the career path timeline. Figure 5 shows the typical career path of a junior officer aviator based on verbal discussions with actual Naval Aviator junior officers. Figure 6 is a simplified version of the career timeline for aviators and incorporates the ten-year decision point, at which we determine an aviator's retention behavior.

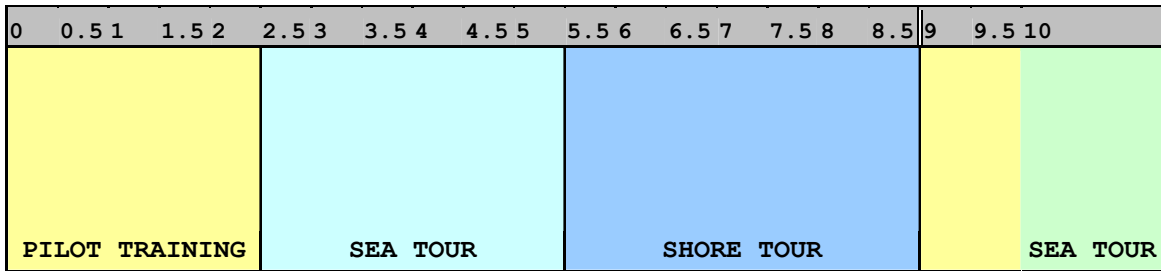


Figure 5. Naval Aviator Career Path Timeline

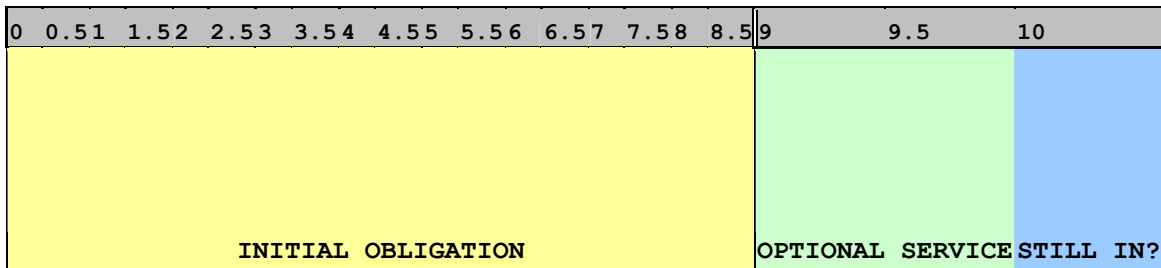


Figure 6. General Timeline used for Naval Aviator

C. MODEL COVARIATES

In addition to IA deployments, we incorporated other factors that affect retention behavior. These factors included gender, race, family status (whether the officer was married or single and whether or not he or she had children), and DESIG.

D. DATA CENSORING

The IA program started in 2000; therefore, the officers we are interested in are those officers who could have gone on IA as junior officers. We removed from the data those officers who would not provide insight into the problem. Because our goal is to quantify the effects of IA on junior officers, we removed all WO's, mid-grade and senior officers from the data. We also removed officers who were not in the Navy when the IA program was active. Officers with prior

enlisted service were removed because their retention time points and decisions were presumed to be different. The subset of officers remaining was the group of junior officers with no other Navy experience other than their time as a JO. Additionally, these junior officers were in the Navy during the time in which the possibility existed for them to be selected for an IA assignment.

E. GENERAL RULES

We started with the initial database of 98,708 officers. Restrictions were applied to the officer data to create a subset that included only the officers who could provide insight to the problem. The final subset included only officers who could have gone on IA as junior officers. The following rules were applied to the original data to create the subset of officers for our problem.

1. WO's were removed from the data.
2. DOLE was used rather than PEBD as the beginning of service date. The time in service was set to time between DOLE and Loss Date. If the officer was not lost then the time in service was set to the time between DOLE and September 2007.
3. Officers with more than six months between PEBD and DOLE were assumed to be prior enlisted and therefore not included in the model. Prior enlisted officers have Navy experience other than their time as a JO which may affect retention decision.
3. Officers with fewer than six months between PEBD and DOLE were assumed to have not been prior enlisted and were included in the model.

4. Only officers who joined the Navy in 1995 or later remained in the data. These officers are junior officers during the time the IA program was in effect.

5. Surface, Submarine, and Supply officers who entered the Navy after 2001 were removed from the data because they have not yet reached the seven-year decision point necessary to determine whether they were retained.

6. Aviators who entered the Navy after 1998 were removed from the data because they have not yet reached the ten-year decision point necessary to determine whether they were retained.

The final subset included 17,887 officers who were junior officers during the time the IA program was in effect. The possibility existed for each of these officers to be assigned to an IA. Of this set of 17,887 officers vulnerable to IA assignment, 911 officers were actually assigned to an IA. Table 5 divides officers by whether they were assigned to an IA assignment and whether they were lost or retained in the Navy. Retained officers were Surface, Sub, and Supply officers still in the data after seven years and Aviators still in the data after ten years. Officers not present in the data after these years were considered a loss.

	Loss	Retained	Total	%Retained
IA	310	601	911	66%
Non-IA	9659	7317	16,976	43%
Total	9969	7918	17,887	44%

Table 5. Retention of IA and non-IA officers

F. ANALYSIS METHODS

1. Chi-squared Test

A Chi-squared test was performed to compare the loss rates of IAs to non-IAs. The Chi-squared test for independence tests for statistically significant differences between the IA and non-IAs with regard to their retention behavior. The test will evaluate whether there exists an association between IA and Navy junior officer retention. Because our data includes all officers who were deployed on IA assignment, we view the data as a random sample from a hypothetical population of Navy officers. Any statistically significant differences we observe would mean that we have observed differences bigger than we would expect in other random samples from our hypothetical population. The hypothesis tested is:

Ho: IA is not associated with retention.

Ha: Not Ho.

The basic form of the Chi-squared statistic is

$$\chi^2 = \sum_{\text{all cells}} \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}} = \frac{\sum_{i=1}^I \sum_{j=1}^J (n_{ij} - \hat{e}_{ij})^2}{\hat{e}_{ij}}$$

where

n_{ij} = number among the n who fall in both category i of the first factor and category j of the second factor

e_{ij} = expected number of people who fall in both category i of the first factor and category j of the second factor

The Chi-squared statistic was used to evaluate the association between IA and junior officer retention.

2. Logistic Regression

As in Fricker's (2002) model for assessing deployment effects on military junior officer retention, logistic regression is the modeling technique that was used to model Navy JO retention. Logistic regression is a standard statistical modeling tool used to estimate the probability of a binary event's occurrence. In our model we use logistic regression to quantify the effects of many factors including gender, race, family status, DESIG's, and IA on junior officer retention. The basic form of the model is

$$\log(p/1-p) = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n$$

where p is the loss probability that a junior officer will leave prior to seven years (ten years for Aviators). $p/(1-p)$ is the odds ratio and β 's represent the change in log odds for a unit change in X . The X 's represent the various factors in our model such as gender, race, family status, DESIG's and IA. Log odds are assumed to be a linear function of the covariates.

The model identifies what factors, including IA, have an effect on junior officer retention. The model also quantifies how changes to the factors will affect officer retention. Chapter IV summarizes the results from our statistical tools.

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IV. THE EFFECTS OF IA ON RETENTION

This chapter quantifies the effects of IA on Navy junior officer retention. We present our findings and discuss the overall trends in the data. The results of our statistical analysis represent the findings from the 17,887 junior officers in our data during the time IA was in use. Our results are discussed in terms of statistical significance.

A. THE SELECTION OF IAS

Prior to discussing the results from our statistical test we compare the populations of IA and non-IA officers by gender, DESIG, race, and family status. We think that there exists some bias in the Navy's selection process for IAs; however, with the current data we are unable to observe some of this potential bias. The Navy also accepts volunteers for IA so any bias we observe might be a result of differing demographics among people who volunteer for IA. It might be the case that the Navy attempts to select officers it thinks will stay in beyond the initial service contract obligation for IA. In the tables below we compare the percentages of IA officers to non-IA officers by gender, race, family status, DESIG, to observe any bias in Navy selection of IAs.

Tables 6,7,8 and 9 show the proportions of IAs and non-IAs by gender, DESIG's, race and family status within the subset of 17,887 junior officers who were in the Navy during the time IA was in use. By category, the proportion of officers assigned to IA is similar to the proportion of those not assigned to IA. We do observe some differences.

Male officers make up 85.8 percent of the IA officers but only 78.6 percent of the non-IA officers. Officers classified as "other" make up 45.2 percent of IAs and 49 percent of non-IAs. There appears to be a difference between those officers selected (or volunteering) for IA when compared by gender and family status. There appears to be no substantial difference between those officers selected (or volunteering) for IA assignment when compared by DESIG and race.

	IA	Non-IA
Male	85.8%	78.6%
Female	14.2%	21.4%

Table 6. IA and non-IA officers by Gender

	IA	Non-IA
Aviation	18.1%	16.2%
Surface	23.1%	22.9%
Supply	7.0%	5.5%
Sub	6.6%	6.4%
Other	45.2%	49.0%

Table 7. IA and non-IA officers by DESIG

	IA	Non-IA
White	74.0%	76.6%
Black	8.5%	6.7%
Hispanic	8.9%	6.9%
Indian	0.9%	1.0%
Asian	5.9%	6.0%
Other	0.9%	0.8%
Unknown	1.0%	1.9%

Table 8. IA and non-IA officers by Race

	IA	Non-IA
Joint Marriage	3.5%	4.5%
Married	63.8%	60.7%
Single w/ dependents	4.7%	7.8%
Single w/o dependents	28.0%	26.9%

Table 9. IA and non-IA officers by Family Status

B. IA EFFECTS ON JUNIOR OFFICER RETENTION

1. Chi-Squared Test Results

As displayed in Table 5 in Chapter III, 66 percent of the IA officers remained in the Navy after their initial service contract obligation. However, only 43 percent of the non-IA officers remained in the Navy after the initial service obligation. The data strongly suggests that IAs are more likely to stay in the Navy beyond their initial obligation than non-IAs. This positive association between IA and retention contradicts the perception that IA leads to lower retention for junior officers. The Chi-squared test rejected the hypothesis that officer losses were independent of IA. The calculated Chi-squared statistic was 182.36 with 1 degree of freedom and a p-value of 0.

2. Logistic Regression without Covariates

The result from our regression model without covariates was consistent with the previous results from the Chi-squared test. At an alpha of .05, IA is a significant factor in evaluating the odds an officer will remain in the Navy. Additionally, the results from the logistic regression showed a positive association between IA deployments and junior officer staying in the Navy. Table 11 displays the

factor, log odds value, standard error, and t statistic from the logistic regression model without covariates.

The positive association between IA and retention contradicts the notion that IA leads to lower retention. From the log odds (β), we quantify using e^β the effect IA deployments has on junior officer retention. If an officer deployed on IA assignment, the odds of retention were 60 ($e^{.469} = 1.60$) percent higher than for an otherwise similar non-IA officer.

Factor	Log odds (β)	Std Error	t value
(Intercept)	0.192	0.035	5.37
IA	0.469	0.036	13.125

Table 10. The effects of IA on Navy junior officer retention excluding model covariates.

This result does not consider the contribution of other factors that may affect officer retention. As stated in Chapter I, previous research has proven that there are many factors that affect an individual's decision to remain in the Navy or separate. The next section shows logistic regression results where covariates, to examine other factors that may affect officer retention, are included.

3. Logistic Regression with Covariates

Adding covariates to the model led to results consistent with the Chi-squared test and the model excluding covariates. IA remained a statistically significant factor associated with increased junior officer retention in the presence of the other factors. As observed in the model excluding covariates, there was a positive association

between IA and junior officer retention. The positive association between IA and retention increased when covariates were included. Based on the log odds value of .944, if an officer deployed on an IA, the odds of retention were 157 percent higher than for a similar non-IA officer.

	Log odds (β)	Std. error	t value
(Intercept)	-0.235	0.146	-1.61
Gender	-0.356	0.042	-8.47
White	0.286	0.119	2.39
Black	0.585	0.132	4.41
Hispanic	0.392	0.132	2.96
Indian	0.441	0.197	2.23
Asian	0.326	0.134	2.43
Other	0.549	0.208	2.64
Married	-0.176	0.077	-2.28
Single w/dep	-1.243	0.096	-12.98
Single w/o dep	-1.154	0.080	-14.39
DesigOther	0.235	0.046	5.14
DesigSub	0.171	0.072	2.36
DesigSupply	0.573	0.077	7.44
DesigSurface	0.231	0.052	4.47
IA	0.944	0.074	12.74

Table 11. IA effects with covariates

According to the statistical test performed, the odds of retention for junior officers who deployed on IA assignment were higher than for officers not deployed on IA. In Chapter V, we discuss our conclusions and identify areas for further research.

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V. CONCLUSION

A. DISCUSSION

With the results from our statistical test we are able to contradict the general assumption as it applies to junior officers that IA leads to lower retention rates. In fact, we see that the odds of retention are higher for officers who go on IA deployments. This is an important conclusion for Navy manpower decision-makers. IA deployments do not appear to result in higher junior officer loss rates. According to our results, decision makers can continue to use IA deployments to fill Combatant Command mission related temporary duty assignments without decreasing the odds of retention for the selected officers.

It is unlikely that the cause and effect relationship is as simple as the IA deployments make officers want to stay in the Navy. We think it is more likely that the officers who volunteer or get selected for IAs are more inclined to stay in the Navy in any case. Unfortunately, we did not have information on when officers made the decision to stay in the Navy or get out. Our results simply show odds of retention are higher for IA officers.

Anecdotal evidence suggests that IA assignments are often given to officers who have informed the Navy of their intention to leave. Because we did not have information describing when officers made the decision to stay or leave, we could not account for this scenario. We think it is unlikely that an officer who has decided to leave the Navy and then is assigned to an IA will change his or her mind

and stay. However, due to pay incentives there may be such cases. Our research has simply quantified the association between IA and junior officer retention. If the Navy wants to know if IA deployments influence officer decisions to stay in the Navy, it should simply ask. Surveying the population of officers who go on IA deployments and simply asking these officers whether the IA assignment affected their decision to stay in or leave the Navy would help answer this question.

B. AREAS FOR FURTHER RESEARCH

The effects of IA deployments on Navy enlisted personnel and mid-grade officers should be quantified. Enlisted personnel make up the majority of Navy personnel and mid-grade officers make up over 28 percent of the officers given IA assignments so it is important to understand how IA affects their retention.

Because the IA deployments started in 2000, we had a limited set of officers to observe. The relationship between IA and retention should be determined again in the future after more officers experience IA deployments. According to Admiral Masso, the Navy is committed to IA deployments. Therefore it is important to continue to monitor the retention rates of personnel who deploy on IA assignments.

From our results, IA appears to have a positive impact on junior officer retention. A survey would be a good method of gathering useful information on the population of IAs. It could pose questions on whether IA deployments affected individual's decisions to stay in the Navy and how

their decisions were affected. This would give the Navy a better understanding of how IA affects its personnel. A survey could better identify possible cause and effect relationships that this thesis could not address.

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