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AN ANALYSIS OF INSTITUTIONAL AND NON-INSTITUTIONAL FACTORS AFFECTING NAVAL AVIATOR RETENTION

by

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March 1998

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The objective of this thesis is to quantitatively examine the effect of several institutional and non-institutional factors that have traditionally impacted Naval aviator retention. It uses a unique database that includes summarized continuation rate information for pilots from each sub-community by year group and commissioning source. The effects of varying unemployment rates, air transportation industry hiring rates, aviation continuation pay (ACP) opportunities and changing minimum service requirement (MSR) policies are measured statistically to determine their relative significance in impacting aviator continuation rates. The study analyzed the continuation rate behavior between 1990 and 1996 for aviators in year groups 1984 through 1989. Results from the statistical analysis indicate that institutional factors such as changing MSR policies and ACP availability have a greater impact than non-institutional factors such as unemployment rates and air transportation industry hiring rates. Specifically, recent changes in MSR policies have been successful in increasing continuation rates while ACP has not been successful in increasing retention.

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AN ANALYSIS OF INSTITUTIONAL AND NON-INSTITUTIONAL FACTORS AFFECTING NAVAL AVIATOR RETENTION

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The objective of this thesis is to quantitatively examine the effect of several institutional and non-institutional factors that have traditionally impacted Naval aviator retention. It uses a unique database that includes summarized continuation rate information for pilots from each sub-community by year group and commissioning source. The effects of varying unemployment rates, air transportation industry hiring rates, aviation continuation pay (ACP) opportunities and changing minimum service requirement (MSR) policies are measured statistically to determine their relative significance in impacting aviator continuation rates. The study analyzed the continuation rate behavior between 1990 and 1996 for aviators in year groups 1984 through 1989. Results from the statistical analysis indicate that institutional factors such as changing MSR policies and ACP availability have a greater impact than non-institutional factors such as unemployment rates and air transportation industry hiring rates. Specifically, recent changes in MSR policies have been successful in increasing continuation rates while ACP has not been successful in increasing retention.

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I. INTRODUCTION

In 1990, the marginal cost of training one pilot through the CAT II stage of his career ranges from a low of $394,000 for P-3 pilots to a high of $1,348,278 for F-14 pilots (Morrissey, 1990).[1] This is a significant monetary investment in human capital that the Navy makes to ensure its pilots are as qualified as possible to perform their required duties. To protect this investment, the Navy strives to retain aviators beyond the completion of the minimum service requirement (MSR) incurred from flight training. MSR policies have traditionally been structured to ensure that the investment outlays for training aviators have been recovered by expiration of MSR. All officers incur an initial MSR upon their commissioning into the service. This obligated service commitment is generally four years from the date of commissioning. For some more technically specialized communities such as aviation and nuclear power, an additional commitment is incurred to compensate for the increased costs and extended time required for the specialized training.

The obligated service incurred from flight training increased from five years from the completion of flight training or "winging" to six years in 1987, then to seven years for helicopter and propeller pilots and eight years for jet pilots in July 1988. Currently there is

[1] According to a March 1990 Economic Analysis Report titled *The Cost of Pilot Training* by Bill Morrissey and Steve Cylke, these figures include the cost of Undergraduate Flight Training, CAT I training which is usually a pilot's first advanced training in a specific fleet aircraft and CAT II training which is refresher training for a pilot who has previous fleet experience (one tour or more) in that aircraft.

a proposed increase to a maximum of nine years for the sub-community of jet pilots. These changes in obligated service commitments have resulted in aviators' careers being lengthened to almost eleven years (when the approximately two years to complete flight training is factored in) before they are even eligible to voluntarily leave the service. This length of service in itself is a significant factor in predicting the accession behavior of individuals as the increases in obligated service tend to weigh heavily in the minds of young officers making the decision to enter the aviation career "pipeline" versus a shorter pipeline such as that of the surface warfare community. Once they have entered the aviation community pipeline, retention of these individuals becomes a primary concern of the Navy.

The retention of Naval aviators has been studied for many years, probably since the advent of Naval aviation, but is still considered to be a "hot topic" among Navy policy makers. There are an inordinate number of factors that contribute to an aviator's decision to remain in the service or to leave and seek employment in the civilian sector. Many of these factors are difficult to quantify as they deal with "gut feelings" and human behavioral factors. This thesis will quantitatively examine several institutional and non-institutional factors that may have contributed to recent changes in aviator retention in the United States Navy. The primary research question it will seek to answer is, "What have been the separate impacts of various institutional and non-institutional factors on the retention of naval aviators between 1990 and 1997?" Subsidiary questions include:

1) Can we build a simulation model that can be used to predict future behavior by reproducing similar scenarios based on past events and behaviors?

2) What caused an unexpected "spike" in the pilot cumulative retention rate (CCR) for FY96?

3) What caused the upward trend in pilot CCR for years of service 3 through 12 from FY95 through FY97 while the rates for other officer communities remained basically constant?

4) Which institutional factors have significantly contributed to recent changes in aviator retention? For example, have recent changes in MSR policies contributed to an increase in aviator continuation rates?

5) Which non-institutional factors (such as changes in civilian employment opportunities) have significantly contributed to recent changes in aviator retention?

The answers to these questions will provide valuable insights into the retention behavior of individuals and will allow policy makers and officer community planners to structure future decisions based on quantifiable results.

The plan of this thesis is as follows: Chapters II and III provide background information and a comprehensive review of literature pertinent to this study. Chapter IV discusses the data and methodology used in this study. Chapter V analyzes the data and presents results of a statistical model constructed to predict future behavior. The final chapter will provide conclusions and recommendations drawn from the study.

Scope of Thesis

This thesis will focus only on the "pilot" community of aviators. Past studies have shown that the retention behavior of naval flight officers (NFOs) differs significantly from that of pilots due to factors such as available job opportunities in the airline industry and the relative effects of incentive programs such as aviation continuation pay (ACP) and variable separation incentive (VSI). The thesis will analyze pilot retention/continuation behavior between 1990 and 1997 and examine the effects of several different institutional and non-institutional factors on that behavior. It will focus on the career period at which the initial MSR is fulfilled because that is considered the most critical point at which retention can still be controlled to a certain extent by policies and programs. After this point, retirement benefits become the primary incentive motivating retention.

Data for this thesis will be cultivated from the Officer Master File through the Officer Personnel Information System (PC-OPIS). OPIS provides historical aggregate officer retention/continuation behavior. The data from this source originate in Bureau of Personnel (BUPERS) Officer Personnel Records, which are then screened and summarized by Naval Personnel Research and Development Center's (NPRDC) "FAIM-O" system, converted into OPIS III input files, and finally converted into PC-OPIS input files. These files are accessible through the *Highlander* data query software. Cohort data constructed from this database will be used to examine the effects of several different variables on retention rates. These variables will include institutional factors such as commissioning source, aviation qualification designator (AQD), and MSR policies while the non-institutional factors will include various economic factors such as monetary bonuses (like ACP), national unemployment rates, and civilian job opportunities. These factors were chosen because airline hiring rates, airline pay and total unemployment have been proven to be the primary factors affecting retention behavior of Naval aviators (Cymrot, 1989). Once all of the significant factors have been analyzed, a simple Excel simulation model will be constructed in an attempt to reproduce certain scenarios and predict future behavior.

II. BACKGROUND

Currently, analysts use historical retention behavior to predict future behavior. There are several different methods one can use to measure this historical retention behavior but the most appropriate aggregate retention method is generally considered to be the one that most accurately predicts observed future behavior. Historical continuation rates provide insight into the behavior of officers at different points in their careers while cumulative rates summarize the past experience of a group of officers, which is often a critical determinant of future behavior (Mackin, 1996). Three alternative retention measures are most commonly used by personnel analysts and planners. These alternatives include MSR survival rates, spot continuation rates, and cumulative continuation rates (CCRs).

The first type of retention measure studied is the analysis of *MSR survival rates*. This measure takes an inventory of officers in a specific year group two years after the completion of their MSR divided by the inventory one year before the completion of MSR. This is done because this period typically encompasses the time when the largest number of voluntary losses occur. This rate is useful in that time-series variation in the MSR survival rates gives analysts some indication of the availability of officers for future years. These rates are most susceptible to policy changes that are intended to induce short-term changes in retention behavior. Examples of these policy changes include aviation continuation pays (ACP) and variable separation incentives (VSI) that target specific subgroups with monetary incentives in order to either increase or decrease retention.

Previous studies have been conducted to determine the actual effects of these policy changes.

Spot continuation rates are simply the number of officers in a year group who were on active duty on the last day of the fiscal year divided by the number of officers in the same year group on active duty on the first day of that fiscal year. This definition makes the assumption that the retention rate will include net lateral transfers because if it excludes these lateral transfers, the rate would be the proportion of officers who were on active duty on the first day of the fiscal year who were still on active duty on the last day of the fiscal year (Mackin, 1996). Tables 2.1a through 2.1f summarize the spot continuation rates computed for each separate pilot community from 1992 through 1997. For example, Table 2.1a shows the beginning and ending inventories for all 131X (pilot) designated officers (net of lateral transfers) for year groups 1960 through 1991 as of the final day of that fiscal year, September 30, 1992. Because these inventories are 'net of lateral transfers', the ending inventories of one year do not always match the beginning inventories of the next year. Dividing the ending inventory by the beginning inventory, the spot continuation rate is derived and shown in column 3 of the table. For example, for year group 1991, dividing 79 by 80 yields 98.75%. The continuation rates (CR's) for years six through eleven and three through twelve are computed as the sum of the end inventories in those specific years divided by the sum of the beginning inventories for those same year groups. These CR's are also displayed in Tables 2.1a through 2.1f.

Table 2.1a.

FY 1992 Pilot Continuation Rates

YEAR GROUP	BEGIN FY INVENTORY	END INVENTORY	CONTINUATION RATE
91	80	79	98.75%
90	120	119	99.17%
89	725	711	98.07%
88	804	783	97.39%
87	1009	961	95.24%
86	1173	1071	91.30%
85	881	712	80.82%
84	449	334	74.39%
83	407	322	79.12%
82	380	357	93.95%
81	403	322	79.90%
80	215	203	94.42%
79	236	227	96.19%
78	232	220	94.83%
77	245	230	93.88%
76	221	199	90.05%
75	254	246	96.85%
74	308	305	99.03%
73	260	236	90.77%
72	231	161	69.70%
71	130	101	77.69%
70	142	111	78.17%
69	169	137	81.07%
68	122	102	83.61%
67	140	99	70.71%
66	91	59	64.84%
65	46	27	58.70%
64	33	27	81.82%
63	25	20	80.00%
62	14	5	35.71%
61	7	1	14.29%
60	0	0	0.00%
TOTALS	9552	8487	

3 YRS - 12 YRS CR	89.60
(YG 80 - 89) CCR	27.87

6 YRS - 11 YRS CR	84.40
(YG 81 - 86) CCR	32.52

Source: PERS 233

Table 2.1b.

FY 1993 Pilot Continuation Rates

YEAR GROUP	BEGIN FY INVENTORY	END INVENTORY	CONTINUATION RATE
92	111	108	97.30%
91	109	106	97.25%
90	452	448	99.12%
89	900	876	97.33%
88	815	771	94.60%
87	982	926	94.30%
86	1086	942	86.74%
85	723	574	79.39%
84	345	295	85.51%
83	321	296	92.21%
82	358	297	82.96%
81	321	288	89.72%
80	215	202	93.95%
79	227	221	97.36%
78	218	213	97.71%
77	235	228	97.02%
76	205	203	99.02%
75	264	257	97.35%
74	305	267	87.54%
73	232	165	71.12%
72	159	123	77.36%
71	103	92	89.32%
70	112	100	89.29%
69	136	111	81.62%
68	102	83	81.37%
67	100	74	74.00%
66	59	39	66.10%
65	27	20	74.07%
64	27	18	66.67%
63	20	6	30.00%
62	5	1	20.00%
61	1	0	0.00%
TOTALS	9275	8350	

3 YRS - 12 YRS CR	90.60
(YG 81 - 90) CCR	34.63

6 YRS - 11 YRS CR	87.20
(YG 82 - 87) CCR	42.32

Source: PERS 233

Table 2.1c.

FY 1994 Pilot Continuation Rates

YEAR GROUP	BEGIN FY INVENTORY	END INVENTORY	CONTINUATION RATE
93	25	25	100.00%
92	138	133	96.38%
91	269	259	96.28%
90	782	743	95.01%
89	919	828	90.10%
88	796	730	91.71%
87	935	832	88.98%
86	945	746	78.94%
85	586	487	83.11%
84	297	262	88.22%
83	294	250	85.03%
82	300	274	91.33%
81	291	282	96.91%
80	202	196	97.03%
79	221	212	95.93%
78	212	163	76.89%
77	228	176	77.19%
76	203	141	69.46%
75	260	197	75.77%
74	267	182	68.16%
73	163	127	77.91%
72	123	91	73.98%
71	92	70	76.09%
70	101	79	78.22%
69	112	70	62.50%
68	83	49	59.04%
67	74	41	55.41%
66	39	16	41.03%
65	20	17	85.00%
64	18	8	44.44%
63	6	1	16.67%
62	1	0	0.00%
TOTALS	9002	7687	

3 YRS - 12 YRS CR	88.30
(YG 82 - 91) CCR	30.09

6 YRS - 11 YRS CR	85.80
(YG 83 - 88) CCR	40.07

Source: PERS 233

Table 2.1d.

FY 1995 Pilot Continuation Rates

YEAR GROUP	BEGIN FY INVENTORY	END INVENTORY	CONTINUATION RATE
94	10	9	90.00%
93	27	26	96.30%
92	245	242	98.78%
91	426	411	96.48%
90	835	816	97.72%
89	839	780	92.97%
88	733	660	90.04%
87	849	664	78.21%
86	752	553	73.54%
85	487	414	85.01%
84	262	224	85.50%
83	246	210	85.37%
82	275	268	97.45%
81	282	279	98.94%
80	195	189	96.92%
79	213	187	87.79%
78	164	157	95.73%
77	176	165	93.75%
76	141	124	87.94%
75	197	131	66.50%
74	182	123	67.58%
73	130	105	80.77%
72	91	81	89.01%
71	70	46	65.71%
70	79	47	59.49%
69	70	43	61.43%
68	49	25	51.02%
67	41	27	65.85%
66	16	6	37.50%
65	17	3	17.65%
64	8	2	25.00%
63	1	1	100.00%
TOTALS	8108	7018	

3 YRS - 12 YRS CR	87.60
(YG 83 - 92) CCR	27.66

6 YRS - 11 YRS CR	84.00
(YG 84 - 89) CCR	34.88

Source: PERS 233

Table 2.1e.

FY 1996 Pilot Continuation Rates

YEAR GROUP	BEGIN FY INVENTORY	END INVENTORY	CONTINUATION RATE
95	7	7	100.00%
94	10	10	100.00%
93	78	77	98.72%
92	533	528	99.06%
91	589	579	98.30%
90	848	824	97.17%
89	780	725	92.95%
88	665	565	84.96%
87	668	555	83.08%
86	551	479	86.93%
85	408	332	81.37%
84	222	167	75.23%
83	209	204	97.61%
82	267	261	97.75%
81	276	265	96.01%
80	189	148	78.31%
79	189	162	85.71%
78	156	154	98.72%
77	165	157	95.15%
76	124	101	81.45%
75	132	112	84.85%
74	126	117	92.86%
73	119	107	89.92%
72	88	66	75.00%
71	55	48	87.27%
70	56	44	78.57%
69	48	33	68.75%
68	28	19	67.86%
67	30	24	80.00%
66	7	3	42.86%
65	3	0	0.00%
64	2	0	0.00%
TOTALS	7628	6873	

3 YRS - 12 YRS CR	90.40
(YG 84 - 93) CCR	32.43

6 YRS - 11 YRS CR	88.70
(YG 85 - 90) CCR	44.90

Source: PERS 233

Table 2.1f.

FY 1997 Pilot Continuation Rates

YEAR GROUP	BEGIN FY INVENTORY	END INVENTORY	CONTINUATION RATE
96	0	0	0.00%
95	12	12	100.00%
94	68	68	100.00%
93	423	417	98.58%
92	657	650	98.93%
91	582	566	97.25%
90	827	794	96.01%
89	729	634	86.97%
88	563	421	74.78%
87	554	456	82.31%
86	476	383	80.46%
85	336	309	91.96%
84	165	164	99.39%
83	204	195	95.59%
82	261	256	98.08%
81	264	243	92.05%
80	149	134	89.93%
79	162	160	98.77%
78	153	148	96.73%
77	157	126	80.25%
76	101	88	87.13%
75	112	99	88.39%
74	121	114	94.21%
73	107	90	84.11%
72	66	57	86.36%
71	48	42	87.50%
70	44	39	88.64%
69	34	23	67.65%
68	19	15	78.95%
67	24	1	4.17%
66	3	1	33.33%
65	0	0	0.00%
TOTALS	7421	6705	

3 YRS - 12 YRS CR	90.00
(YG 85 - 94) CCR	35.88

6 YRS - 11 YRS CR	87.20
(YG 86 - 91) CCR	40.08

Source: PERS 233

The third alternative retention measure that is most commonly used is the *cumulative continuation rate* or *CCR*. It is also shown in Tables 2.1a through 2.1f. CCRs are the product of spot continuation rates for a specific length of service (LOS). These LOS's typically encompass LOS six through eleven or three through twelve because those specific time periods incorporate the effects of recent events and policies affecting retention across a fairly wide band of LOSs and are easy to compute from current continuation data (Mackin, 1996).

Figure 2.1a presents a graphic illustration of the CCRs for the pilot community from fiscal years 1990 (FY90) through 1997 (FY97). This can be compared to Figures 2.1b and 2.1c that present the CCR's for the same time period for the unrestricted line (URL) and the entire officer community. The graphical pattern of CCRs revealed a "spike" or abnormal increase of more than 10 percentage points in FY96. This increase was common throughout the ALNAV and URL communities, but was especially pronounced in the pilot communities. Because pilots comprise approximately 60 percent of the URL and approximately 25 percent of ALNAV, these results may be biased towards artificially high CCRs. Without pilots included, there would most likely be less of a "spike" in the URL and ALNAV graphs. For pilots, the CCR for years of service (YOS) six through eleven increased from 34.9 percent in FY95 to 44.9 percent in FY96 and then back down to 40.1 percent in FY97. The CCR for YOS three through twelve basically stayed the same for the ALNAV and URL communities from FY96 to FY97 but appears to have continued to rise in the pilot community.

Figure 2.1a.

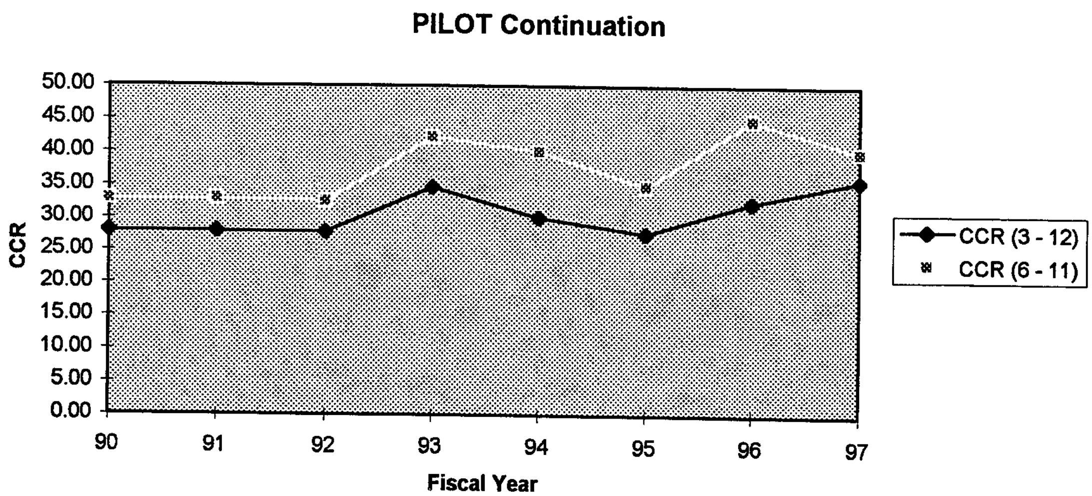


Figure 2.1b.

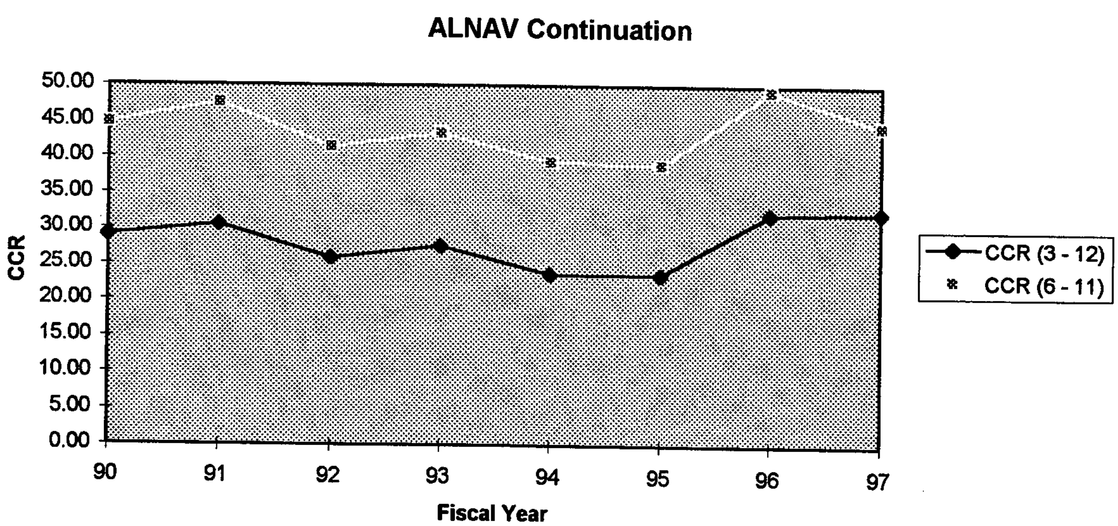
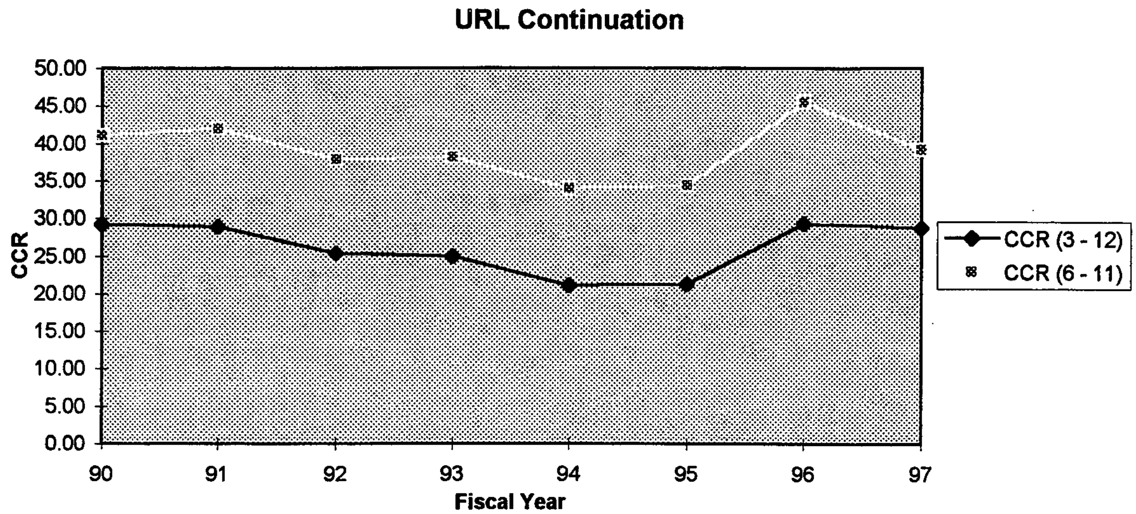


Figure 2.1c.



One simple explanation for this trend would attribute it to recent changes in MSR policies that have increased the obligated service commitment for aviators. Unfortunately, this simple explanation may not be sufficient to explain the recent fluctuations in retention behavior. In order to clarify this problem, cumulative continuation rates must be decomposed to differentiate between those individuals eligible to leave the Navy and those still under some form of commitment and thus not eligible to leave. Naval Personnel Research and Development Center (NPRDC) analysts developed an algorithm to predict an end-of-obligated-service (EAOS) date for officers that would have been useful in determining the eligibility of individuals to leave the service. Unfortunately, the results of implementing this algorithm were less than satisfactory for econometric estimation purposes (Mackin, 1996). The most straightforward way to actually determine the eligibility of individuals to voluntarily leave is also time consuming and inefficient. Each individual officer record must be examined on a case-by-case basis to determine whether or not that individual is still under his initial MSR obligation or under some form of additional obligated service commitment that may have been incurred because of the receipt of ACP (the 'bonus'), Test Pilot School, Naval Postgraduate School, War College or any other activity that may incur additional obligated service. This process would resolve the differences in individuals eligible to leave the service from those not yet eligible to leave the service and would provide a much more concise analysis of retention rates. Once these two categories of individuals have been identified, an analysis of various institutional and non-institutional factors can be conducted to explain and predict voluntary retention decisions.

Tables 2.2a through 2.2j provide the retention statistics as of November 20, 1997 for year groups 1987 through 1990 computed on a case-by-case basis and broken down into the original inventory of pilots and then further into the specific status of the cohort members of each aviation community. Each table provides the number of officers who have resigned their commission as well as those who have once failed to select (FOS) for Lieutenant Commander which traditionally indicates that they will most likely not select the next time around and thus should be considered with those leaving the service, although involuntarily. It also delineates how many individuals are at a decision point, how many have received the 'bonus", and how many have incurred an additional commitment from Test Pilot School (TPS), Naval Postgraduate School (NPS), or any of the war colleges. Finally it provides the number of individuals who are still under their initial MSR obligation. The total number of individuals at their decision point, receiving the bonus or under a commitment incurred from TPS, NPS or war college is then divided by the total number of individuals in the year group excluding those individuals still under their MSR commitment and thus not eligible to leave the service. For example, looking at Table 2.2a for year group 1987, the total eligible to leave the service or under a voluntary commitment, 47, is divided by 81 (85 originally in the cohort minus 4 still under initial MSR) resulting in a 58 percent retention rate. Although there is no "perfect" measure of officer retention, this tedious process produces a retention statistic that includes only those individuals eligible to make the stay or leave decision which clearly links the statistic to the underlying behavior of the individual examined by separating those choosing to leave from those choosing to stay.

Table 2.2a.

Retention Statistics for VFA Pilots Year Groups 87-90

As of 20 November 1997

VFA	YG-87	YG-88	YG-89	YG-90
TOTAL	85	78	97	85
RESIGNATIONS	34	38	19	4
1 X FOS's	1	4	0	0
DECISION POINT	1	7	17	1
BONUS RECIPIENTS	46	26	10	1
TPS/NPS/WAR COLL	0	3	20	4
TOTAL	47	36	47	6
MSR	4	4	31	75
TOTAL	4	4	31	75
Total YG - MSR	81	74	66	10
RETENTION %	58%	49%	71%	60%

Table 2.2b.

Retention Statistics for VS Pilots Year Groups 87-90

As of 20 November 1997

VS - PILOT	YG-87	YG-88	YG-89	YG-90
TOTAL	39	27	43	20
RESIGNATIONS	27	21	13	1
1 X FOS's	0	5	0	0
DECISION POINT	0	0	3	0
BONUS RECIPIENTS	10	3	1	0
TPS/NPS/WAR COLL	1	2	2	0
TOTAL	11	5	6	0
MSR	1	1	24	19
TOTAL	1	1	24	19
Total YG - MSR	38	26	19	1
RETENTION %	29%	19%	32%	0%

Table 2.2c.

Retention Statistics for VP Pilots Year Groups 87-90

As of 20 November 1997

VP - PILOT	YG-87	YG-88	YG-89	YG-90
TOTAL	102	122	168	212
RESIGNATIONS	74	93	86	23
1 X FOS's	8	11	0	0
DECISION POINT	24	28	63	23
BONUS RECIPIENTS	0	0	0	0
TPS/NPS/WAR COLL	1	0	3	1
TOTAL	25	28	66	24
MSR	3	1	16	165
TOTAL	3	1	16	165
Total YG - MSR	99	121	152	47
RETENTION %	25%	23%	43%	51%

Table 2.2d.

Retention Statistics for HSL Pilots Year Groups 87-90

As of 20 November 1997

HSL	YG-87	YG-88	YG-89	YG-90
TOTAL	109	139	106	130
RESIGNATIONS	57	71	24	2
1 X FOS's	13	31	0	0
DECISION POINT	47	58	64	10
BONUS RECIPIENTS	0	0	0	0
TPS/NPS/WAR COLL	4	4	5	9
TOTAL	51	62	69	19
MSR	1	6	13	109
TOTAL	1	6	13	109
Total YG - MSR	108	133	93	21
RETENTION %	47%	47%	74%	90%

Table 2.2e.

Retention Statistics for HS Pilots Year Groups 87-90

As of 20 November 1997

HS	**YG-87**	**YG-88**	**YG-89**	**YG-90**
TOTAL	50	30	51	57
RESIGNATIONS	15	14	4	2
1 X FOS's	6	8	0	0
DECISION POINT	22	6	31	2
BONUS RECIPIENTS	11	8	6	2
TPS/NPS/WAR COLL	2	0	5	0
TOTAL	35	14	42	4
MSR	0	2	5	51
TOTAL	0	2	5	51
Total YG - MSR	50	28	46	6
RETENTION %	70%	50%	91%	67%

Table 2.2f.

Retention Statistics for HM Pilots Year Groups 87-90

As of 20 November 1997

HM	**YG-87**	**YG-88**	**YG-89**	**YG-90**
TOTAL	8	20	11	22
RESIGNATIONS	2	6	3	2
1 X FOS's	0	1	0	0
DECISION POINT	2	10	7	1
BONUS RECIPIENTS	4	2	0	0
TPS/NPS/WAR COLL	0	0	0	2
TOTAL	6	12	7	3
MSR	0	2	1	17
TOTAL	0	2	1	17
Total YG - MSR	8	18	10	5
RETENTION %	75%	67%	70%	60%

Table 2.2g.

Retention Statistics for HC Pilots Year Groups 87-90

As of 20 November 1997

HC	YG-87	YG-88	YG-89	YG-90
TOTAL	65	80	86	80
RESIGNATIONS	33	44	23	3
1 X FOS's	12	17	0	0
DECISION POINT	25	31	45	5
BONUS RECIPIENTS	0	0	0	0
TPS/NPS/WAR COLL	6	1	2	3
TOTAL	31	32	47	8
MSR	1	4	16	69
TOTAL	1	4	16	69
Total YG - MSR	64	76	70	11
RETENTION %	48%	42%	67%	73%

Table 2.2h.

Retention Statistics for VF Pilots Year Groups 87-90

As of 20 November 1997

VF - PILOT	YG-87	YG-88	YG-89	YG-90
TOTAL	62	40	63	40
RESIGNATIONS	33	21	18	2
1 X FOS's	3	12	0	0
DECISION POINT	3	3	14	0
BONUS RECIPIENTS	25	13	6	1
TPS/NPS/WAR COLL	0	0	2	1
TOTAL	28	16	22	2
MSR	1	3	23	36
TOTAL	1	3	23	36
Total YG - MSR	61	37	40	4
RETENTION %	46%	43%	55%	50%

Table 2.2i.

Retention Statistics for VAQ Pilots Year Groups 87-90

As of 20 November 1997

VAQ - PILOT	YG-87	YG-88	YG-89	YG-90
TOTAL	44	31	34	27
RESIGNATIONS	16	16	3	1
1 X FOS's	5	8	0	0
DECISION POINT	12	6	11	1
BONUS RECIPIENTS	14	7	5	0
TPS/NPS/WAR COLL	0	0	1	0
TOTAL	26	13	17	1
MSR	2	2	14	25
TOTAL	2	2	14	25
Total YG - MSR	42	29	20	2
RETENTION %	62%	45%	85%	50%

Table 2.2j.

Retention Statistics for VAW Pilots Year Groups 87-90

As of 20 November 1997

VAW - PILOT	YG-87	YG-88	YG-89	YG-90
TOTAL	30	30	33	88
RESIGNATIONS	14	21	14	8
1 X FOS's	2	6	0	0
DECISION POINT	6	3	13	7
BONUS RECIPIENTS	7	5	3	0
TPS/NPS/WAR COLL	0	0	0	1
TOTAL	13	8	16	8
MSR	3	1	3	72
TOTAL	3	1	3	72
Total YG - MSR	27	29	30	16
RETENTION %	48%	28%	53%	50%

III. LITERATURE REVIEW

Since the advent of Naval aviation, retention has been studied, analyzed and examined in almost every possible way. A comprehensive review of pertinent literature has revealed that several issues are recurrent throughout aviation history and that decision makers and policy analysts have wrestled with these specific issues repeatedly. A majority of the studies attempt to quantify various aspects of an aviator's career in the hope that they can pinpoint primary causes of increases and decreases in retention rates and target specific policies to address such problems.

A 1965 study titled *Pilot Shortages Ahead? An Examination of the Compensation of Career Military Pilots as Contrasted to Commercial Aviation Airline Pilots* (Howard, 1965) is as relevant to today's aviators as it was more than thirty years ago. This study compared the compensation of military pilots to their contemporaries employed by civilian air carriers. It examines pilot manpower requirements in commercial aviation as well as estimates of future trends of such requirements in the industry. The study discusses "vast sums of money spent recruiting, selecting and training men possessing the required qualifications" as well as the importance of retaining these individuals on a career basis. One of the primary factors considered then (and today) is money and the "utility" of pay to a particular individual. The author theorized that this utility should be comparable to what a military aviator might receive in the civilian industry. The civilian industry most logically and practically comparable to a military aviation career is that of a commercial pilot for one of the nation's (or world's) many airlines. The author draws many parallels between the two careers and makes the assumption that the inconveniences and interruptions to a military aviator's home and family life are not worth examining because it is believed that a "typical" airline pilot spends as much time "on the road" away from home and works just as "odd" working hours as a "typical" military pilot does. This assumption may be excessively simplified in that the two careers are not as similar as the author assumes, and if he had not made this assumption his results may have been different.

Another similarity of this study to today's retention problem is that civilian airlines at that time were in a similar bind in that there was a shortage of trained pilots due to the aging of their inventory and reduced inflows of trained military pilots. This is also occurring today as mandatory retirement ages are currently forcing the retirement of "Vietnam Era" military pilots who left the military service after the war to pursue commercial aviation careers. This reduction in inventory coupled with recent downsizing policies that have reduced the number of pilots being trained by the military have led to a limited current supply of trained aviators similar to that experienced around the time of this study. The decrease in supply is worsened by the growth in the airline industry as a whole. This shortage of trained pilots is not solely due to aviator retention issues as the author points out that only a small percentage of the military trained pilots separating from the services in the "under 35" age group apply for or are apparently interested in pursuing a career as a professional pilot in any segment of the aviation industry. Nonetheless, the author concludes that based solely on comparative compensation, the military pilot completing his first tour of obligated duty would be considerably better off if he followed the career of a commercial pilot. With the resources the military has today compared to the resources of the airline industry for compensating its pilots, it is clear to see that this problem is still evident today and probably will be in the future. It is the goal of policy and decision makers to find other means of reducing the civilian-military compensation differential in order to reduce military aviator loss.

A recent *Navy Times* article echoes the issues brought out more than thirty years ago. In "Can the Navy Stop the Flow of Departing Officers?" (15 December 1997), the head of Naval Aviation, RADM McGinn, states that "improving aviator's professional and personal quality of life is the absolutely top, number one, naval aviation issue." He recognizes that the airlines are looking for pilots and the quality of professional life for a naval aviator is diminished by reduced flight hours, shore duty jobs that still keep aviators away from families, spare parts shortages and a flight pay structure that can leave squadron commanders earning less than their junior officers. These issues combined with the "Post-Tailhook culture shock", post-drawdown turbulence and resource-requirements imbalances, have fueled discontent and led aviators to state that "ready rooms and flight lines just aren't as much fun as they used to be." To counter these problems, RADM McGinn has cited the increase in ACP (as of October 1,1997) up to a maximum allowable annual disbursement of $25,000 (from $12,000), an increase in aviation career incentive pay (ACIP) (as of January 1, 1999) to a maximum monthly disbursement of $840 (from $650), and efforts to reduce time away from home between deployments. Whether or not these changes will have a significant impact on aviator retention remains to be seen. The important issue is that retention is a viable concern for policy makers and ongoing study of factors affecting it is a necessity.

One study that attempted to examine causes and predict retention rates was *Naval Aviator Retention: Predicting Retention and Identifying Related Variables* (Cook, 1979). Although this study is almost twenty years old, it takes a unique approach to analyzing the subject. This study used the Navy's Human Resource Management (HRM) and Navy Aviation Career (NAC) surveys to attempt to predict naval aviator retention six to eighteen months in the future. Through these surveys the author hoped to examine specific variables that discriminate "careerists" from "resignees" in order to gain a better understanding of retention behavior and allow the Navy to develop effective action plans aimed at solving aviator retention problems. Results from this study correctly classified 90% of the naval aviator sample into the two groups - careerist or resignee. It proved that attitude measures concerning command climate and general satisfaction were found to be highly correlated with personnel retention and that with the addition of several new items, the HRM survey could effectively predict the retention behavior of aviators.

A problem with this approach was that it used "stated career intentions" as the dependent variable which may tend to bias the results more towards the "politically correct" responses of what their superiors "want to hear." This problem could have been eliminated entirely with a totally anonymous survey but, unfortunately, the surveys contained social security numbers that were used to track the individuals longitudinally throughout their careers. Although the results were not supposed to be seen by the immediate chain of command, there was probably still a slight bias in respondents' candidness. The study also discarded "undecided" individuals who may have provided insight and variation into the overall results of the study. One interesting fact that was presented was that at the time of the survey, 55% of the United States Naval Academy (USNA) graduates were careerists while only 22% were resignees. Of aviators from the Aviation Officer Candidate (AOC) program, the results were almost identical in that 55% were careerists and 25% were resignees. This contradicted a previous study conducted by Rickus, Booth and Ambler (1968) that had indicated that of USNA graduates, 70% were careerists and of AOCs, 41% were careerists. This pattern also will be explored in this thesis as commissioning source will be evaluated as to the effect it has on retention.

Another study that is as relevant today as it was almost twenty years ago is *A General Retention Model Applied to the Naval Aviator* (O'Donnell, 1980). This study presents both a general retention model and a specific model applicable to the naval aviator that are based on various factors affecting job satisfaction. These factors are derived from work attitudes and perceptions of an individual about an organization that can influence the individual's decision to stay or leave. These factors in themselves may be shaped by many other factors which may in turn influence turnover and retention. The results of the model led the author to recommend actions that would satisfy the sociologist Herzberg's "hygiene factors" or Maslow's "lower order needs" first before moving on to more advanced needs. This approach can be restated in current terms by saying that it is first and foremost important to satisfy "quality of life" issues when dealing with job satisfaction before moving on to higher level needs and non-hygiene factors. This appears to be essentially RADM McGinn's approach to attacking the naval aviator retention problem.

As previously discussed, many studies have attempted to quantify variables that have a significant impact on aviator retention. One such study is *A Statistical Analysis of the Effects of Flight Time on Naval Aviator Retention* (Lawry, 1993). This study quantified the relationship between flight time and retention while controlling for the effects of civilian airline pay and hiring levels as well as the effects of marital status, children and race. Although Lawry's a priori hypothesis was that aviators often leave due to a lack of flight time, he found just the opposite: that retention was inversely related to flight time in the jet and propeller aircraft communities. The effect of flight time for helicopter pilots was not found to be statistically significant.

Lawry discounted the use of aviator survey data, probably because it is sometimes difficult to quantify. He also discussed annualized cost of leaving (ACOL) models that base the stay or leave decision on perceived future costs and benefits of each alternative. They factor in monetary components incorporating total expected pay and benefits for both military and civilian employment and account for a "utility" function that measures personal taste or distaste for military life. The specific model Lawry used included variables such as flight time, average annual starting salary for major airlines (lagged one year), number of pilots hired by the airlines (lagged one year), marital status, whether or not the individual has children, and race.

On a broader scale, some studies attempted to determine the effect of a wider range of variables on retention. *The Impact of the Military Drawdown on USN Aviator Retention Rates* (Turner, 1995) uses a unique database that takes grouped data defined by year of commission, fiscal year, and aviator type and quantifies the relationships between various downsizing policies and cohort continuation rates while controlling for the effects of time-since-minimum service requirement (MSR) and civilian employment opportunities. Turner's research examines downsizing policies such as VSI/SSB and involuntary reduction in active duty (IRAD) programs that are intended to reduce retention rates below what they normally would have been. These programs tend to distort the underlying trend in "voluntary" retention that is of primary concern to decision makers.

Turner's study reveals that downsizing policies have had only a minor effect on the underlying, baseline continuation rates. He did find that there was a statistically significant positive relationship between an increase in the amount of ACP bonuses and the continuation rate but the downsizing policies such as VSI/SSB and IRAD did not appear to be statistically significant suggesting that the policies were not as effective as policy makers had hoped. This type of analysis can be very useful to decision makers as they can now quantify effects of various policies and target specific aspects of the policies to increase or decrease desired retention rates. It also substantiated the recurring theory that increases in monetary compensation do have a significant positive impact on aviator retention rates.

Because monetary compensation policies and programs have proven to be successful in increasing retention, analysts have spent a great deal of time studying these programs. One of the most significant of these programs is ACP. In *Implementation of the ACP Program* (Cymrot, 1989), the policy's history is traced to its beginnings. In January 1989, ACP replaced the Aviation Officer Continuation Pay (AOCP) program as the Navy's major compensation tool for retaining mid-grade aviators. ACIP is another tool that is used that affects not just mid-grade, but all aviators. The ACP program was created in response to a critical shortage of Lieutenant Commanders to fill "Category II" billets as department heads or officers-in-charge in aviation squadrons. The program was developed in response to unusually high loss rates between the time aviators complete their active duty service obligation (MSR) and the time they serve in a specific CAT II aviator billet. The previous program, AOCP, had provided desired results by reducing shortages in the past but program and budgetary limitations prevented the program from eliminating the shortages in the current environment. To compensate for that inadequacy, in-depth analysis was conducted to shape the size of the bonus as a function of the size of the specific sub-community shortage. An implementation plan (as well as alternative plans) was also devised to ensure the program was compatible with budgetary limitations. This policy was successful to a certain extent, but appears to have rested on its laurels for too long and has not changed with time or changes in related policies.

In 1997, a study was conducted to evaluate the status of the ACP program. *ACP: Should the Maximum Award Be Increased?* (Moore, 1997) evaluated the ACP program and to no one's surprise found the program to be outdated. The maximum bonus award was not yielding desired increases in continuation rates in some aviation sub-communities and planners were anticipating future shortfalls as the smaller "drawdown era" year groups approached their MSRs. The actual value of the monetary reward for the ACP program was found to be underestimated by 38 percent due to a combination of price inflation and increases in service obligations for YG 87 and later.

Moore also analyzed the inadequacies of the ACIP program. For example, the program was not structured to follow current career paths so that the higher amounts of ACIP were paid solely to aviators at the end of their obligated service. Paying ACIP to aviators not even eligible to leave the service did not meet the original purpose of the program. Realizing this, the author concluded that the policy must change. Because she could not resolve whether it was the additional obligated service or the devaluation of ACP that matters to aviators, she chose to focus her study on what could be quantified. The study calculates required bonus amounts to meet department head requirements over the next few years and constructs an ACIP program that is compatible with current career paths and resources available. This study is an excellent case of quantifying what needed to be quantified but may have been more effective if it had resolved what was causing aviators to leave the service.

The Navy is not the only service to actively study retention. All services are equally concerned about protecting significant investments in human capital. The Marine Corps has experienced many of the same problems in aviator retention that have been discussed in this literature review. *Aviator Retention in the Marine Corps* (Kostiuk, 1989) provides an analysis of factors affecting retention of Marine aviators from 1977 through 1988. These factors included military pay, civilian earnings, unemployment rates and civilian hiring trends. The study examines estimates of the impact of these factors and how they are used to predict the effect of changing policies on Marine aviator retention. It also calculates the potential effects of changes in ACIP and ACP programs. The analysis was conducted by creating a statistical model using retention rates for years 1977 through 1988 broken out by military occupation specialty (MOS), years of commissioned service (YCS) and fiscal year as well as data on civilian employment opportunities, airline salaries and annual hiring rates. The study found that airline hiring, unemployment rates and the difference between military and civilian pay have a significant impact on retention. This study is similar to the approach taken in this thesis.

All of these previous studies have provided insight into the variables that impact aviator retention. Another important issue is how retention statistics are measured. A report called *Effectiveness of Alternative Officer Retention Measures Final Report* (Mackin, 1996) studied various retention measures. It explored the most appropriate aggregate retention measures and the most effective way to provide and deliver retention information to BUPERS analysts and decision makers. The study compares alternative retention measures and evaluates their ability to predict officer retention patterns. The alternative measures it uses are spot continuation rates, MSR survival rates, and cumulative continuation rates. Each of these measures are calculated differently and are used in different situations so it is difficult to say which method is the 'best." Nonetheless, analysts must be able to choose which method to use depending on their specific problem. The method must be able to address the problem of eligibility to leave the service. Currently there is no end-of-obligated-service (EAOS) date for officers and although NPRDC developed an algorithm to predict this date, results of the calculations were less than satisfactory for econometric estimation purposes largely due to data entry problems. The only way to accurately determine whether an individual is under obligation is to evaluate service records on a case by case basis, which is an extremely timely process. Recommendations were made to include a data field in the officer master record (OMR) that indicates specific EAOS as well as the necessary processing logic for assignment officers to update the data as additional service is incurred. These recommendations would greatly simplify the study of retention as analysts would have access to valuable information that is currently relatively inaccessible.

Finally, the study of *Naval Aviator Cohort Survival Rates: Progress and Next Steps* (Hogan, 1995) discusses progress made in separating the influence of policies affecting observed retention from the voluntary decisions of aviators. These decisions form the underlying voluntary survival rates that are of utmost concern to analysts. After resolving this difference, the author suggests directions for improvement in the future. Hogan examines MSR survival rates and cumulative continuation rates to create a simple spreadsheet model for aviation officer community managers to estimate future continuation rates as a function of military and civilian pay growth, ACP and VSI/SSB policies, MSR and years of service, and a catch-all category for miscellaneous factors titled "other." This model is a valuable tool that planners should take advantage of in predicting retention behavior. This thesis will attempt to build on that model and analyze various institutional and non-institutional factors that may affect aviator retention.

IV. DATA AND METHODOLOGY

This study uses a unique, pooled database created from various sources. The primary source was the 1997 Officer Personnel Information System (OPIS) which is an information summary system (ISS) for the Navy officer community managers and analysts. OPIS contains valuable historical information on officers including inventories, losses, promotions and retention arrayed by a variety of dimensions including designator, grade, commissioning source and gender. This information was created in a summarized form from Bureau of Navy Personnel Officer records through the Naval Personnel and Research and Development Center's 'FAIM-O" system. The data is accessed by *Highlander* ™ data query software. Other sources of data for this study are the Bureau of Labor Statistics and the Bureau of Naval Personnel Aviation Community Manager's office.

In accessing the 1997 version of OPIS (OPIS97), the database of "All Navy Less Warrants" was used because it included all commissioned U.S. Navy officers (less Warrant Officers) through 1996. This data contained both the USN and USNR pilots (designated 131X) in every specific aviation sub-community. Within this subsystem, the 'Retention" module was then used to extract continuation rate information for all pilots by year group, commissioning source, and aviation qualification designation (AQD).

To determine the specific year group of pilots and group them by cohorts, the data had to be manually manipulated by converting the "Years of Service" (YOS) dimension into a commissioning year cohort. Currently the YOS dimension allows the user to select any one combination of YOS from zero to 31 (where 31 denotes those with 30 or more) years of service. The *Highlander 1.1*™ software unfortunately does not allow the user to simply query the system by cohort at this time.[2] This study analyzes the pilot cohorts from YG84 through YG89 and their continuation rate behavior between 1990 and 1996.

The "Source" dimension provides information regarding officer commissioning source. This study focused on only three sources, which contain the majority of commissioning sources for all pilots. The three groups studied were U.S. Naval Academy, a combination of NROTC scholarship and college programs, and a combination of Aviation Officer Candidate School (AOCS) and the Aviation Reserve Officer Candidate (AVROC) programs. These three groups were separated to obtain variation in continuation results by commissioning source. Although each commissioning source is subject to a different initial MSR, after flight training, all pilots are grouped together and subject to the same MSR obligations.

The "Designator" dimension allows the user to access information regarding the different aviation sub-communities. Table 4.1 presents a list of the communities studied and the platforms used in each.

[2] Future releases of the software will allow the user to create "macros" or formulas which will enable the user to refine his query to attain desired output.

Table 4.1

Community Variables

Variable	Sub-Community
VF	VF - F14
VAL	VFA - F/A18, A7
VAM	VA - A6
VAQ	VAQ - EA6
VS	VS - S3
VQJ	VQ - ES3
FSJ	FLEET SUPPORT - JET
JO	JET - OTHER
TOTJ	TOTAL - JET
VAW	VAW - E2
VP	VP - P3
VQP	VQ - EP3
FSP	FLEET SUPPORT - PROP
PO	PROP - OTHER
TOTP	TOTAL - PROP
HS2	HSL - SH2
HS6	HSL - SH60B
HS	HS - H3/H60
FSH	FLEET SUPPORT HELICOPTER
HCV	HC - CH46

HMV	HM - MH53
HO	HELICOPTER - OTHER
TOTH	TOTAL HELICOPTER
UNK	UNKNOWN AQD
ALL	ALL PILOTS

Continuation rates for each sub-community, by commissioning source and year group, were obtained for 1990 through 1996 and input into an EXCEL spreadsheet database. These continuation rates were computed as (1 -"strength loss rate") for each given inventory at the beginning of a fiscal year. For example, suppose there were initially one hundred pilots in a specific community and there were 20 strength losses during the year. The continuation rate for that cell would be 80 percent (1 - 20/100). These "strength losses" include reduction in active duty (RAD), resignations, retirements, reversion to enlisted status, death, discharge, and miscellaneous categories. The continuation rates used are summarized in the Appendix to this study and reflect similar results to Tables 2.1a through 2.1f when examining the *ALL* AQD which represents the entire pilot community.

The EXCEL spreadsheet into which the continuation rate data is input also contains unemployment data, airline industry hiring data, a variable specifying the active duty service obligation (ADSO) of each cohort, and a variable specifying whether or not the specific sub-community or cohort was offered aviation continuation pay (ACP).

Unemployment data was provided for the past ten years by the Bureau of Labor Statistics. This information is obtained from the Current Population Survey. The data are seasonally adjusted and encompass the entire civilian labor force (16 years old and older). Monthly unemployment rates were summed and averaged to derive an annual unemployment rate. This annual unemployment rate was then matched to the years studied in this analysis (1990 through 1996) and input into the newly created database. Table 4.2 presents a summary of the unemployment data used in this study.

Table 4.2

U.S. Unemployment Rate Data

Year	Annual Unemployment Rates
1990	5.62
1991	6.85
1992	7.49
1993	6.91
1994	6.09
1995	5.60
1996	5.41

Total "Air Transportation Industry" employee data for the past ten years were also obtained from the Bureau of Labor Statistics. This information was used because it most closely approximates a similar civilian occupation for military pilots. That is not to say that all aviators who leave the service look only to the commercial airline industry for employment, but it should be considered a viable option due to its similarity to military aviation careers. The statistical data were summarized by month, in thousands of employees in the entire industry. This provided a means to monitor growth in the industry by observing increasing or decreasing total numbers of employees. Although only monthly totals were provided, annual increases or decreases in the totals were derived by subtracting the total number of employees in January of one year from the total number of employees in January of the next year. In 1991, the total is negative which indicates a downsizing in the industry for that year. Table 4.3 summarizes the air transportation industry annual growth totals.

Table 4.3

Air Transportation Industry Growth (in Thousands)

Year	Total
1989	55
1990	46
1991	-38
1992	21
1993	28
1994	54
1995	43
1996	70

The remaining data were obtained from the Bureau of Naval Personnel Aviation Officer Community Manager and from historical ACP qualification messages. A dummy variable representing the active duty service obligation (ADSO) policy was created for each cohort based on the ADSO policy associated with that particular year group and sub-community. In 1984 through 1986, the ADSO for all pilots was five years from the date of "winging" or completion of flight training. In 1987, the ADSO increased to six years for all pilots and in 1988, it increased to seven years for helicopter and propeller community pilots and eight years for jet pilots. These increases in ADSO lengthen pilots' careers in order to protect the Navy's investment in human capital made from flight training, but they also cause continuation rates to sometimes misrepresent actual continuation behavior. If a pilot is still serving under his ADSO, he is not eligible to leave the service and therefore, voluntary continuation cannot be assumed. This database associates ADSOs with their respective year groups and communities in an attempt to measure the impact these policy changes have on continuation behavior. It also includes a variable to indicate whether or not an individual is eligible to make the stay or leave decision by controlling for the fact that he is still under an MSR/ADSO policy or not.

The next variables considered are dummy variables representing ACP eligibility. ACP policies are targeted to specific sub-communities and year groups to ensure there are enough officers to adequately fill department head billets. Acceptance of ACP obligates these officers through their fourteenth year of service in return for monetary compensation. Although traditionally not all pilots in each targeted sub-community receive ACP, they are all technically eligible to request it. In some cases a review board is held to determine the "most qualified" individuals within that sub-community so that budgetary limitations will be satisfied. In other cases, individuals simply do not accept the ACP offered because the compensation benefits do not outweigh the psychological or economic costs associated with being obligated for an extended time period. This database classified those particular sub-communities and year groups as "eligible" or "not eligible" for ACP in order to determine whether or not the specific ACP policies implemented between 1990 and 1996 have a significant effect on continuation rates.

Dummy variables were also created for each general sub-community (jet, propeller and helicopter) to control for the differences in continuation behavior between the different aircraft type pilots. Ideally, a study should consider the continuation behavior at the specific sub-community level but due to limitations of this model and problems associated with multicollinearity, this was not possible.

Methodology

The relationship between various institutional and non-institutional factors on aviator cohort continuation rates is specified by the following multivariate linear regression model:

$$CR = B0 + B1\mathit{UNEMP} + B2\mathit{HIRES(t\text{-}1)} + B3\mathit{BONUS} + B4\mathit{JET} + B5\mathit{PROP} + B6\mathit{HELO} + B7\mathit{ADSO5} + B8\mathit{ADSO6} + B9\mathit{ADSO7} + B10\mathit{ADSO8} + B11\mathit{MSR} + U$$

where CR is the continuation rate for cells representing a specific AQD, year group and commissioning source. B0 is the intercept term and B1 - 11 represent the coefficients of the variables in the equation to be estimated. The equation is estimated using ordinary least squares. The independent variables are defined as follows:

1. *UNEMP* is the annual unemployment rate associated with the fiscal year being studied.
2. *HIRES(t-1)* is the growth in the air transportation industry, lagged by one year. It is lagged because that is the time frame during which aviators are making their stay or leave decision regarding their careers.
3. *BONUS* is a dummy variable representing the specific policies implemented between 1991 and 1996. It denotes whether or not a cohort with a given AQD was offered aviation continuation pay (1=yes, 0=no) in a given fiscal year.
4. *JET, PROP* and *HELO* are dummy variables representing the three general aircraft type pilots (1=yes, 0=no). Because every individual must be included in one of these three categories, one must be omitted from the model to determine the relative effectiveness controlling for aircraft type has on continuation rate behavior. The *PROP* category was arbitrarily omitted from this model and referenced as the "base case" for aircraft type.
5. *ADSO5* through *ADSO8* are dummy variables representing the active duty service obligation policy (five through eight years from date of winging) associated with each particular cohort studied (1=yes, 0=no). For example, an

ADSO5 variable coded "1" indicates that that particular cohort has a five-year obligation from the date of winging. Because every individual must be subject to one of these ADSOs in the model, one ADSO variable is omitted to determine the relative effects of the different policies. During each model run, the ADSO5 variable was omitted and the remaining ADSOs referenced from that variable. For models involving jet pilots, the ADSO7 variable was also omitted because jet pilots were never subject to a seven-year obligated service commitment. Likewise, the ADSO8 variable was omitted from the models involving helicopter and propeller pilots because they were never subject to an eight-year obligation.

6. *MSR* is a dummy variable created to indicate whether or not an individual is eligible to leave the service or not (1=yes, 0=no) in a given fiscal year. For example, if *MSR*=1, that particular individual is eligible to leave the service.

7. The error term is represented by *U*.

Table 4.4 provides a sample of the arithmetic means of each variable. It also provides the number of observations (N) of each variable and the standard deviations associated with the means.

Table 4.4

Sample Variable Means

Variable	N	Means	Standard Deviation
CR	3150	90.9712142	16.5730410
UNEMP	3150	6.2814286	0.7443230
HIRES	3150	29.9009524	30.0892876
BONUS91	3150	0.0800000	0.2713363
BONUS92	3150	0.12000000	0.3250131
BONUS93	3150	0.0933333	0.2909452
BONUS94	3150	0.044444	0.2061131
BONUS95	3150	0.0288889	0.1675208
BONUS96	3150	0.0777778	0.2678641
ADSO5	3066	0.5136986	0.4998938
ADSO6	3066	0.1712329	0.3767738
ADSO7	3066	0.1780822	0.3826443
ADSO8	3066	0.1369863	0.3438890
JET	3150	0.3600000	0.4800762
PROP	3150	0.1600000	0.3666643
HELO	3150	0.2800000	0.4490702
MSR	3150	0.6666667	0.4714794

The expected or hypothesized relationship between the independent variables and the continuation rate is as follows:

1. *UNEMP* is hypothesized to have a positive effect on continuation rates. As total civilian unemployment rates increase, continuation rates should increase as more pilots stay in the military due to the lack of available civilian job opportunities. This non-institutional factor is included because it is theoretically relevant to the entire pilot community.

2. *HIRES* is a non-institutional factor hypothesized to have an inverse relationship with continuation rates. As the growth rate of the air transportation industry increases, the Navy pilot community should decrease as officers leave the service to seek civilian employment.

3. The *BONUS* policies are institutional factors hypothesized to have a positive impact on continuation rates. As monetary compensation is offered to pilots to remain in the service, the gap between civilian and military earnings will become smaller causing military pilots to be more satisfied with their current status.

4. The general aircraft type variables represent institutional factors that are hypothesized to affect continuation rates due to different opportunities for employment in the civilian sector.

5. All of the *ADSO* variables are institutional factors hypothesized to have a positive impact on continuation rates because the policies enacted will increase the amount of time obligated from flight training. If the individual is not eligible to leave the service, continuation rates should increase.

6. The *MSR* variable is hypothesized to have a significantly negative effect on continuation rate behavior. If more officers are eligible to leave the service, continuation rates should decrease significantly.

Because the *MSR* and *ADSO* variables are similar in measuring service obligations, the model must be executed twice; once with the *MSR* variable included and the *ADSO* variables omitted and once with the *MSR* variable omitted and the *ADSO* variables included. This eliminates the problem of bias in the estimators because they are both theoretically measuring different aspects of the same factor - - being under a service obligation.

The model is also executed with the effect of eligibility to leave the service accounted for. This allows us to examine the true effects of these variables on the continuation rates of only those individuals eligible to leave the service.

V. STATISTICAL RESULTS

Results of estimating OLS models are presented in Tables 5.1 through 5.3. These tables include the parameter estimate, standard error, and a t-value for the null hypothesis (t-value for H0). They also include measures of effectiveness for the model including R^2 and F-value. The model R^2 measures the goodness-of-fit of the regression model by measuring the proportion of the total variation in dependent variable (CR) explained by the regression model. All of the models reveal a relatively low R^2 which is due to the fact that the model probably suffers from some degree of specification bias in that it has omitted some significant factors that determine retention behavior. Some of these factors are omitted because of the difficulty in quantifying certain variables such as "quality of life" concerns. The F-value of the model is a measure of the overall significance of the estimated regression. It tests the null hypothesis (H0) that each of the estimated coefficients are jointly equal to zero (Turner, 1995). For all of the models, the calculated F-value is statistically significant with a 99 percent confidence interval. This allows us to reject the null hypothesis and accept the fact that the estimated coefficients do not jointly equal zero, leading us to believe that despite the low R^2 values, the models are effective in explaining the variation in continuation rates.

The parameter estimates for the *UNEMP, HIRES, BONUS* and aircraft type are included in both tables. Based on the a priori hypothesized effects of each explanatory variable, a one-tail test of statistical significance is used to test the significance of the regression coefficients (Gujarati, 1995). A single asterisk (*) in the "PROB > | T | " column indicates statistical significance at a minimum of 90 percent. Two asterisks (**) indicate statistical significance at a 95 percent confidence interval. Three asterisks (***) indicate statistical significance at a 99 percent confidence interval, which is the highest level of significance observed. The absence of an asterisk indicates that the result was not statistically significant at any of the levels tested.

Table 5.1

OLS Results Including the MSR Variable (Excluding ADSO)

For All Pilots, Regardless of Eligibility to Leave the Service

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T VALUE FOR HO	PROB > |T|
INTERCEPT	88.888139	4.30372476	20.654	0.0001
UNEMP	0.594842	0.61881673	0.961	0.3365
HIRES	-0.003454	0.01530122	-0.226	0.8214
BONUS	-5.845889	1.23877721	-4.719	0.0001***
JET	2.556968	0.69390039	3.685	0.0002***
HELO	5.356146	0.72813617	7.356	0.0001***
MSR	-5.398758	0.62216549	-8.677	0.0001***

$R^2 = 0.0507$
Sample Size (N) = 3150
F-Value = 27.994***

Table 5.2

OLS Results Including ADSO (Excluding MSR)

For All Pilots, Regardless of Eligibility to Leave the Service

AQD	PARAMETER ESTIMATE	STANDARD ERROR	T VALUE FOR HO	PROB > |T|
INTERCEPT	83.240413	4.35522786	19.113	0.0001
UNEMP	0.531436	0.62853207	0.846	0.3979
HIRES	-0.003904	0.01554146	-0.251	0.8017
BONUS	-5.025818	1.26043478	-3.987	0.0001***
ADSO6	2.941810	0.82265887	3.576	0.0004***
ADSO7	4.673808	0.85306858	5.479	0.0001***
ADSO8	7.730814	0.99688916	7.755	0.0001***
JET	1.848047	0.79404477	2.327	0.0200**
HELO	5.721704	0.74692130	7.660	0.0001***

$R^2 = 0.0563$
Sample Size (N) = 3066
F-Value = 22.810***

Table 5.3

OLS Results Restricted to Those Eligible to Leave the Service

AQD	PARAMETER ESTIMATE	STANDARD ERROR	T VALUE FOR HO	PROB > |T|
INTERCEPT	97.735740	5.93763302	16.460	0.0001
UNEMP	-1.567020	0.85891942	-1.824	0.0682*
HIRES	-0.035109	0.02123562	-1.653	0.0984*
BONUS	-5.379433	1.41886936	-3.791	0.0002***
JET	2.343224	0.96923744	2.418	0.0157**
HELO	6.466380	1.00709885	6.421	0.0001***

$R^2 = 0.0268$
Sample Size (N) = 2100
F-Value = 11.537***

As in Kostiuk's study of *Aviator Retention in the Marine Corps* (Kostiuk, 1989), the analysis of the statistical model shows that the impact of a change in a variable depends on the estimated parameter coefficient, the starting level continuation rate, and the size of the change in the variable. For a given change in the variable and a constant coefficient, the change in retention will be greater the closer the continuation rate is to 0.5. As continuation rates increase, the impact of any variable change diminishes. Kostiuk uses the example of expecting a change in pay to be less when continuation rates are already high because there are fewer people to be persuaded to stay by the increase in pay. This example can be applied to these models in that, on the whole, because the continuation rates used in this study are relatively high, we can expect the effects of different variables may be less than originally hypothesized. We can also expect more significant results to be produced by the model examining only those eligible to leave the service than those incorporating all pilots, regardless of their eligibility status.

A. UNEMPLOYMENT

The *unemployment* variable is not a statistically significant factor in explaining continuation rates for pilots unless the "eligibility problem" is resolved. When the model was executed for only those individuals eligible to leave the service, the resultant estimate was statistically significant with a 90 percent confidence interval. Although the relationship is not statistically significant for all pilots, regardless of eligibility, it is positive indicating that as the total unemployment rate increases, pilots are more likely to remain in the service, which is the hypothesized direction. For those eligible to leave the service, the relationship is inverse in that an increase in unemployment decreases continuation rates. This contradicts the original hypothesis, but may be attributable to the fact that the pilot community represents such a relatively small segment of total employment opportunities and their behavior is not representative of society on the whole. One possible problem with this variable is its highly aggregated nature. *UNEMP* only varies across years. This lack of variation may explain its poor performance.

B. AIR TRANSPORTATION INDUSTRY HIRES

For the *air transportation industry hires* variable, the estimates are again not statistically significant at any confidence interval unless controlling for the eligibility problem. When the model is executed for only those eligible to leave the service, the relationship is significant with a 90 percent confidence interval. The relationship that exists is in all models inverse in that a decrease in air transportation industry hiring rates induces a slight increase in continuation rates. This supports the original hypothesis that the growth of the industry should produce decreased continuation rates. Unfortunately, the same problem of aggregation level affects *HIRES* that affects *UNEMP* which leads to a probable bias in the estimates.

C. BONUS

The *BONUS* variable provides unexpected results. Statistically significant results are obtained in each model with a 99 percent confidence interval. This result reveals an inverse relationship between continuation rates and ACP policies which indicates that an increase in the possibility of a bonus being offered decreases continuation rates. Although specification bias was previously discussed, this result remains counter-intuitive. One would hypothesize that an increase in bonus availability would lead to higher rather than lower continuation rates. This opposite result may be attributable to the fact that bonuses are targeted at sub-communities with predicted retention problems. This causes a simultaneity bias in the estimate as it is attempting to predict the effect the bonus has while simultaneously solving the retention problem. To compensate for this bias, a Two-Stage Least Squares model was constructed where in the first stage, *BONUS* is estimated as a function of all exogenous variables analyzed (*UNEMP, HIRES, JET, PROP,* and *HELO*). In the second stage, the dependent variable is estimated as a function of the *BONUS* estimate from the first stage. The advantage of this method is that it eliminates the simultaneity bias in the coefficient of the bonus. Tables 5.4 through 5.6 present the results of this model. In the second stage results we can now see that the effect of the bonus on retention is now positive, although it is not statistically significant. Table 5.7 presents the

Table 5.4

Two-Stage Least Squares - First Stage Results

Using Continuation Rate as the Dependent Variable

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T VALUE FOR HO	PROB > |T|
INTERCEPT	100.778689	5.956507	16.919	0.0001
UNEMP	-1.761739	0.856764	-2.056	0.0399**
HIRES	-0.031182	0.021195	-1.471	0.1414
JET	-0.597162	1.107923	-0.539	0.5899
PROP	-4.502519	1.332472	-3.379	0.0007***
HELO	4.071867	1.163077	3.501	0.0005***

$R^2 = 0.0254$
Sample Size (N) = 2100
F-Value = 10.927***

Table 5.5

Two-Stage Least Squares - First Stage Results

Using BONUS as the Dependent Variable

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T VALUE FOR HO	PROB > |T|
INTERCEPT	-0.205574	0.091638	-2.243	0.0250
UNEMP	0.036197	0.013181	2.746	0.0061***
HIRES	-0.000730	0.000326	-2.239	0.0253**
JET	0.186508	0.017045	10.942	0.0001***
PROP	0.026786	0.020499	1.307	0.1915
HELO	0.085034	0.017893	4.752	0.0001***

$R^2 = 0.0897$
Sample Size (N) = 2100
F-Value = 41.244***

Table 5.6

Two-Stage Least Squares - Second Stage Results

Using Continuation Rate as the Dependent Variable

AQD	PARAMETER ESTIMATE	STANDARD ERROR	T VALUE FOR HO	PROB > |T|
INTERCEPT	88.979000	0.593413	149.944	0.0001
BONUS	0.075556	4.578904	0.017	0.9868

Table 5.7

Two-Stage Least Squares - First Stage Results

Using JET, PROP, and HELO to Identify BONUS

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T VALUE FOR HO	PROB > |T|
INTERCEPT	101.339754	6.033392	16.796	0.0001
BONUS	3.229439	5.403111	0.598	0.5501
UNEMP	-1.878636	0.893042	-2.104	0.0355**
HIRES	-0.028824	0.021914	-1.315	0.1885

$R^2 = 0.0021$
Sample Size (N) = 2100
F-Value = 1.494

results of the model when using JET, PROP, and HELO to identify BONUS. This suggests that simultaneity bias is a problem and that more variables are required to properly identify the model.

Another possible explanation for these unexpected results is related to the fact that the intent of the bonus program is to compensate for low retention by offering monetary incentives to remain in the service. The monetary compensation associated with the ACP policies had not been updated since 1989 and has thus become undervalued by approximately 38 percent (Moore, 1997). Recently the compensation has been increased to a maximum of $25,000 to rectify this matter. In this analysis, results may indicate that previous policies have not been as successful as hoped. However, note that this variable is also highly aggregated and subject to different types of bias. The *BONUS* variable equals "1" for the entire fiscal year during which a bonus may have been available to a targeted community. This indicates that every pilot in that year group was technically eligible for

ACP while only a select few individuals may have accepted it. Because of this, these preliminary results must be viewed as inconclusive in actually estimating the true impact of ACP on retention. Factoring in the simultaneity bias that precludes discerning the true impact of the variable on continuation rates with the quality of the data forces us to examine this estimate with skepticism.

D. ADSO6

. The *ADSO6* policy variable is statistically significant at the 99 percent confidence interval when referenced to the *ADSO5* policy variable. The relationship between this estimate and continuation rates is positive, corresponding with the original hypothesis that the variable would have a positive effect on pilot continuation rates.

E. ADSO7

This policy variable also reveals statistically significant results at a 99 percent confidence interval. The estimate reveals a positive relationship between continuation rates and the policy enacted in 1987 of increasing the ADSO from six to seven years for helicopter and propeller pilots. This reaffirms the initial hypothesis that increasing required obligated service would serve to increase continuation rates.

F. ADSO8

Like the *ADSO6* and *ADSO7* variables, this policy variable provides a statistically significant parameter estimate. This estimate is also positive indicating that the increase in obligated service has a positive effect on increasing continuation rates for jet pilots because they were the only pilots subject to this policy.

G. JET, PROP AND HELO

The specific aircraft type variables reveal statistically significant estimates at a 99 percent confidence interval when controlling for *MSR* and not including the *ADSO* variables. When the *ADSO* variables are included, there is still a significant relationship between aircraft type and continuation rates but for the *JET* community that confidence interval is reduced to 95 percent, as compared to the *PROP* community. These estimates are nonetheless positive in both models, indicating that the specific community origin positively impacts continuation rate behavior, although more so for helicopter pilots than for jet pilots when referenced to propeller pilots.

H. MSR

The *MSR* coefficient indicates that whether or not an individual is eligible to make the stay or leave decision is statistically significant at a 99 percent confidence interval. This relationship is inverse, confirming the original hypothesis that continuation rates should decrease once an individual is no longer subject to any form of obligated service and is eligible to leave the service. When the model is executed for only those individuals eligible to leave the service, each variable reveals statistically significant estimates for every variable. This

VI. CONCLUSIONS AND RECOMMENDATIONS

This thesis examines the relationship between various institutional and non-institutional factors that affect Naval aviator retention and the continuation rates of pilots in year groups 1984 through 1989. A unique, pooled database was created that will allow future analysts to further study aviator retention rates. The specific factors analyzed are unemployment rates, air transportation industry hiring data, ACP policies implemented between 1991 and 1996, and various MSR policies affecting pilots' active duty service obligation. The continuation rates, computed by sub-community, year group and commissioning source, are examined for 1990 through 1996 to determine the effect of various factors on the retention behavior of pilots.

The analysis found a statistically significant relationship between the offering of a bonus and continuation rates. Unfortunately this analysis must be viewed with skepticism due to significant problems with the model and data specification. The relationship revealed is inverse in that the offering of a bonus is associated with lower pilot continuation rates. This is difficult to accept as true due to the intuitive theory that if we pay someone enough money, they will remain in the service. The results obtained may be correlated to the fact that bonuses are targeted towards communities with historically unsatisfactory continuation rates and to problems associated with the statistical analysis previously discussed. A possible inference from this result, if it were true, is that bonuses are currently being offered to individuals who would most likely remain in the service without a bonus or that the bonus is not a significant enough factor alone to affect individuals considering whether or not to leave the service. From these results however, we can not conclude with any degree of confidence that the ACP structure pertaining to this study was relatively effective or ineffective in impacting continuation rates. It is important to note that the ACP program has recently been updated by increasing the monetary compensation available to eligible aviators. This change may remedy some of the ineffectiveness of the prior program and actually serve to increase continuation rates, thus satisfying the intent of the program. Previous studies have proven the effectiveness of incentive programs in increasing retention. Considering the updated ACP program and resolving problems with the statistical analysis should allow analysts to refine their studies of continuation behavior and determine the true impact bonuses have on retention.

Both the *unemployment* and *air transportation industry hiring rates* provide statistical significance in explaining pilot continuation rates only when examining the pilots eligible to leave the service. These variables reveal negative relationships with continuation rates indicating that an increase in unemployment rates and airline hiring rates actually decreases continuation rate behavior. Prior studies, including Kostiuk's Marine Corps study, have indicated that unemployment and civilian airline hiring have had significant effects on aviator retention. The differences in this study and those prior studies is most likely attributable to the fact that as continuation rates increase, the impact of any variable change diminishes. The continuation rates used were generally high, which leads us to expect these variables to exhibit less of an effect on continuation rates than intuitively expected. The unexpectedly negative relationship between continuation rates and unemployment rates may be attributed to the relative insignificance the pilot community has in impacting total unemployment rates. This possibility should be examined in future studies.

The lack of statistical significance for the *unemployment* and *air transportation industry hires* estimates when not isolating the model to include only those eligible to leave indicates that these variables have no significant impact on overall pilot continuation rates unless they are eligible to leave. This supports that aviators are relatively insensitive to changes in the non-institutional environment affecting them, and rejects the theory that aviators are more likely to leave the service when the airline industry is hiring pilots at increased rates. This result is probably due to the fact that only a relatively small percentage of aviators leaving the service actually seek employment in the airline industry and the data used in this study is of a highly aggregated nature leading to possible bias in the statistical analysis.

Results from the analysis of changing ADSO policies support the original hypothesis that increasing obligated service commitments will tend to increase continuation rates. The increase of obligated service lengths from five to six, seven and eight years has become more statistically significant as the length of service increases. Referenced to the five-year ADSO policy, the six-year ADSO policy implemented in 1987 and the seven and eight-year ADSO policy implemented in 1988 for all pilots are all statistically significant at a 99 percent confidence interval indicating that the policies have been effective in increasing desired continuation rates.

The *MSR* variable estimate also confirms that individuals eligible to leave the service are much more likely to leave than those not eligible. The estimate is negative and statistically significant at a 99 percent confidence interval proving the original hypothesis and indirectly reaffirming the fact that MSR policies do effectively induce higher continuation rates.

These results may be considered trivial because the individuals concerned are legally bound to stay in the service therefore revealing significant effects. Restricting the model to study only those eligible to leave eliminates some of the bias and allows analysts to focus their study on true continuation rate behavior. The results from the model examining only the individuals eligible to leave reaffirms this point by revealing more statistically significant results than the models not controlling for the eligibility problem.

Summary and Recommendations

This study suggests that the institutional factors analyzed have had a greater impact on Naval aviator continuation rates than the non-institutional factors. Increases in obligated service requirements have probably caused continuation rates to be unexpectedly high as individuals are not eligible to make a stay or leave decision until later in their careers. There is also a bias evident in this study due to the fact that the data file is based on pooled, aggregate data and cannot be applied to every individual. This problem could be rectified by including a reliable variable in the Officer Master File that would allow analysts to monitor and examine eligibility and predict retention behavior on an individual basis. Once this eligibility problem is resolved on an individual level and the aggregation bias is reduced, a clearer understanding of factors affecting aviator retention will be possible. On an individual level, the specific reasons for leaving the service could also be analyzed. Currently the database does not discriminate between various reasons for leaving the service, it only considers overall "strength losses". With a greater understanding of the reasons for leaving the service, analysts will be better able to predict retention behavior. Until then, decision makers should continue to exercise their influence in the form of policy guidance to ensure adequate retention rates are maintained and the investment in human capital made to train pilots is protected.

With regard to the ACP program, inadequacies of this study have been addressed and future studies should examine the impact of the revised program on pilot retention to determine its effectiveness.

Future studies should also examine the impact of military-civilian pay differentials as possible causes for retention behavior to increase or decrease. An annualized cost of leaving (ACOL) model could be used to measure the perceived and actual differences in earnings between the civilian and military pay structures. The earnings figures would have to be annualized or summarized to include expected future earnings because if only starting salaries are considered, results would lead analysts to conclude that the lower salaries in the airline industry may actually induce lower continuation rates. This is due to the fact that historically, military pilots would be forced to accept a reduction in earnings if hired by the airline industry. Once the future earnings (which traditionally have been significantly higher for the civilian sector) are factored in, the results would become much more intuitively believable.

APPENDIX: CONTINUATION RATE DATA

AQD	COMM	YG	CR90	CR91	CR92	CR93	CR94	CR95	CR96
VQJ	USNA	89	100	100	100	100	100	100	100
VQJ	NROTC	89	100	100	100	100	100	100	100
VQJ	AOCS	89	100	100	100	100	100	100	100
VQJ	USNA	88	100	100	100	100	100	100	100
VQJ	NROTC	88	100	100	100	100	100	100	100
VQJ	AOCS	88	100	100	100	100	100	100	100
VQJ	USNA	87	100	100	100	100	100	100	100
VQJ	NROTC	87	100	100	100	100	100	100	100
VQJ	AOCS	87	100	100	100	75	66.66667	0	100
VQJ	USNA	86	100	100	100	100	100	0	100
VQJ	NROTC	86	100	100	100	100	100	100	0
VQJ	AOCS	86	100	75	66.66667	100	50	0	100
VQJ	USNA	85	100	100	100	100	100	100	100
VQJ	NROTC	85	100	100	100	100	100	100	100
VQJ	AOCS	85	33.33333	100	100	100	100	100	100
VQJ	USNA	84	100	100	100	100	100	100	100
VQJ	NROTC	84	50	100	100	0	100	100	100
VQJ	AOCS	84	50	100	100	100	100	100	100
FSJ	USNA	89	100	100	100	100	100	100	100
FSJ	NROTC	89	100	100	100	100	100	100	100
FSJ	AOCS	89	100	100	100	100	100	100	100
FSJ	USNA	88	100	100	100	100	100	100	100
FSJ	NROTC	88	100	100	100	100	100	100	50
FSJ	AOCS	88	100	100	100	100	85.71429	72.72727	42.85714
FSJ	USNA	87	100	100	100	100	100	0	100
FSJ	NROTC	87	100	100	100	0	100	100	100
FSJ	AOCS	87	100	90	87.5	85.71429	50	81.81818	90
FSJ	USNA	86	100	100	100	100	100	100	100
FSJ	NROTC	86	100	100	100	66.66667	50	100	66.66667
FSJ	AOCS	86	100	100	66.66667	100	100	85.71429	88.88889
FSJ	USNA	85	100	100	100	100	0	100	100
FSJ	NROTC	85	66.66667	100	100	100	100	100	0
FSJ	AOCS	85	50	0	100	100	100	50	100
FSJ	USNA	84	100	100	100	100	100	100	100
FSJ	NROTC	84	100	100	0	100	100	100	100
FSJ	AOCS	84	62.5	60	100	100	33.33333	85.71429	83.33333
JO	USNA	89	100	100	100	100	100	100	75
JO	NROTC	89	100	100	75	100	100	100	100
JO	AOCS	89	100	100	100	100	100	80	25
JO	USNA	88	100	100	100	100	100	100	66.66667
JO	NROTC	88	100	100	100	83.33333	100	66.66667	100
JO	AOCS	88	100	96.77419	100	100	85.71429	75	100

JO	USNA	87	100	100	100	100	100	100	100
JO	NROTC	87	100	100	88.88889	100	100	83.33333	100
JO	AOCS	87	97.61905	100	88.23529	70	100	66.66667	100
JO	USNA	86	100	100	100	100	100	100	100
JO	NROTC	86	100	100	50	100	100	100	50
JO	AOCS	86	100	100	100	75	66.66667	100	100
JO	USNA	85	100	0	100	100	100	100	100
JO	NROTC	85	100	75	100	100	0	100	100
JO	AOCS	85	66.66667	100	100	100	100	100	100
JO	USNA	84	100	100	50	100	100	100	100
JO	NROTC	84	100	100	100	50	0	100	100
JO	AOCS	84	50	0	100	100	100	100	100
TOTJ	USNA	89	100	100	100	94.73684	98.14815	100	91.83673
TOTJ	NROTC	89	100	100	96	100	100	95.06173	100
TOTJ	AOCS	89	100	98.30508	100	95.16129	86.44068	92.30769	78.7234
TOTJ	USNA	88	100	100	100	97.33333	97.26027	92.95775	91.04478
TOTJ	NROTC	88	100	96.38554	100	97.77778	97.77778	94.25287	88.09524
TOTJ	AOCS	88	99.41176	96.42857	97.53086	89.30818	92.14286	83.07692	76.14679
TOTJ	USNA	87	100	100	95.58824	95.3125	95.16129	79.66102	93.02326
TOTJ	NROTC	87	98.8764	97.70115	98.83721	95.34884	87.95181	86.11111	77.41935
TOTJ	AOCS	87	99.17012	97.09544	92.85714	90.90909	79	74.07407	81.35593
TOTJ	USNA	86	100	96.8254	93.65079	92.1875	83.33333	84	80.95238
TOTJ	NROTC	86	98.24561	96.42857	83.92857	94.33962	71.15385	87.17949	75.75758
TOTJ	AOCS	86	98.64253	86.87783	76.26263	91.33333	79.56204	85.04673	86.02151
TOTJ	USNA	85	98.11321	80.76923	74.4186	97.14286	82.35294	92.85714	87.5
TOTJ	NROTC	85	92.85714	87.17949	88.88889	87.87879	93.54839	100	65.38462
TOTJ	AOCS	85	82.19178	71.18644	78.57143	88.23529	90	78.57143	86.95652
TOTJ	USNA	84	91.83673	80.43478	79.48718	93.54839	96.55172	85.18519	100
TOTJ	NROTC	84	71.11111	66.66667	72.72727	87.5	71.42857	88.88889	100
TOTJ	AOCS	84	68.18182	62.13592	76.1194	97.95918	91.48936	91.83673	93.18182
VAW	USNA	89	100	100	100	100	100	100	85.71429
VAW	NROTC	89	100	100	87.5	90.90909	100	100	100
VAW	AOCS	89	100	100	93.33333	72.72727	100	87.5	100
VAW	USNA	88	100	100	100	100	100	87.5	71.42857
VAW	NROTC	88	100	100	100	100	100	100	90.90909
VAW	AOCS	88	100	100	93.75	91.66667	83.33333	90.90909	100
VAW	USNA	87	100	100	100	100	66.66667	100	100
VAW	NROTC	87	100	100	100	90	77.77778	83.33333	60
VAW	AOCS	87	100	94.33962	82.35294	96.77419	77.41935	76	94.44444
VAW	USNA	86	100	100	100	100	66.66667	100	100
VAW	NROTC	86	100	80	80	100	66.66667	100	50
VAW	AOCS	86	100	79.16667	81.25	100	69.23077	90.90909	100
VAW	USNA	85	100	100	100	100	100	100	33.33333
VAW	NROTC	85	100	75	100	100	100	100	50
VAW	AOCS	85	66.66667	100	100	100	100	100	0
VAW	USNA	84	100	100	66.66667	100	100	100	100

VAW	NROTC	84	85.71429	50	50	100	100	100	100
VAW	AOCS	84	65	75	100	100	87.5	71.42857	80
VP	USNA	89	100	97.5	100	97.72727	97.72727	83.72093	69.44444
VP	NROTC	89	100	98.75	98.75	95.12195	97.4359	90.78947	74.28571
VP	AOCS	89	100	96.42857	96.2963	92.59259	92.30769	86.36364	84.21053
VP	USNA	88	100	97.61905	97.56098	100	92.68293	66.66667	74.07407
VP	NROTC	88	100	96.25	93.58974	97.53086	91.13924	72.22222	80.39216
VP	AOCS	88	100	90.58824	93.50649	91.66667	72.30769	70	76.66667
VP	USNA	87	100	93.75	93.18182	95.12195	66.66667	80.76923	75
VP	NROTC	87	100	96.72131	100	90.16393	78.18182	72.09302	90.32258
VP	AOCS	87	100	89.16667	85.84906	69.56522	50.79365	80	85.18519
VP	USNA	86	97.22222	100	94.44444	77.14286	69.23077	94.11765	81.25
VP	NROTC	86	100	93.18182	82.92683	52.94118	83.33333	86.66667	91.66667
VP	AOCS	86	99.18033	67.5	74.39024	50	68.96552	100	94.73684
VP	USNA	85	100	74.35897	67.85714	94.73684	88.88889	80	81.81818
VP	NROTC	85	92.5	60.52632	73.91304	76.47059	92.30769	75	55.55556
VP	AOCS	85	80.88235	59.25926	65.625	94.73684	88.23529	86.66667	100
VP	USNA	84	78.7234	63.15789	62.5	93.33333	92.30769	81.81818	100
VP	NROTC	84	78.125	40	66.66667	100	83.33333	60	100
VP	AOCS	84	71.62162	50.9434	74.07407	94.73684	77.77778	85.71429	100
VQP	USNA	89	100	100	100	100	100	83.33333	80
VQP	NROTC	89	100	100	100	100	83.33333	100	75
VQP	AOCS	89	100	100	100	88.88889	77.77778	100	100
VQP	USNA	88	100	75	100	100	100	66.66667	50
VQP	NROTC	88	100	100	100	100	100	91.66667	72.72727
VQP	AOCS	88	94.11765	94.44444	88.23529	78.57143	80	55.55556	100
VQP	USNA	87	100	100	100	100	50	50	100
VQP	NROTC	87	100	85.71429	100	87.5	85.71429	83.33333	72.72727
VQP	AOCS	87	100	88.23529	65.51724	84.21053	64.70588	100	100
VQP	USNA	86	100	71.42857	100	100	100	75	66.66667
VQP	NROTC	86	100	80	87.5	75	83.33333	100	100
VQP	AOCS	86	84.21053	25	60	75	75	100	100
VQP	USNA	85	50	50	50	100	100	100	100
VQP	NROTC	85	33.33333	100	0	100	100	0	100
VQP	AOCS	85	37.5	25	100	100	0	100	100
VQP	USNA	84	57.14286	80	66.66667	100	100	100	100
VQP	NROTC	84	50	100	100	66.66667	66.66667	100	100
VQP	AOCS	84	50	66.66667	100	100	66.66667	100	100
FSP	USNA	89	100	100	100	100	87.5	100	100
FSP	NROTC	89	100	100	100	100	80	80	75
FSP	AOCS	89	100	100	100	100	88.88889	87.5	85.71427
FSP	USNA	88	100	100	75	100	100	0	100
FSP	NROTC	88	100	100	83.33333	100	66.66667	60	66.66667
FSP	AOCS	88	100	100	100	100	71.42857	33.33333	0
FSP	USNA	87	100	100	80	66.66667	100	100	0
FSP	NROTC	87	100	100	100	100	33.33333	100	100

FSP	AOCS	87	100	93.75	75.75758	68	56.25	100	70
FSP	USNA	86	100	100	100	66.66667	100	100	50
FSP	NROTC	86	100	80	85.71429	50	100	50	100
FSP	AOCS	86	91.66667	27.27273	16.66667	100	100	100	66.66667
FSP	USNA	85	100	25	100	100	100	100	50
FSP	NROTC	85	100	25	100	100	0	100	100
FSP	AOCS	85	62.5	40	100	66.66667	100	50	100
FSP	USNA	84	100	100	0	100	100	100	100
FSP	NROTC	84	60	0	100	100	100	100	100
FSP	AOCS	84	30.76923	25	100	100	100	0	100
PO	USNA	89	100	100	100	100	100	100	100
PO	NROTC	89	100	100	100	100	100	100	100
PO	AOCS	89	100	100	100	100	100	50	100
PO	USNA	88	100	100	100	100	100	100	100
PO	NROTC	88	100	100	100	85.71429	83.33333	66.66667	100
PO	AOCS	88	100	100	100	100	100	100	100
PO	USNA	87	100	100	100	0	100	100	100
PO	NROTC	87	100	100	100	100	100	100	100
PO	AOCS	87	100	100	100	100	100	100	100
PO	USNA	86	100	100	100	100	100	100	100
PO	NROTC	86	100	100	100	100	100	100	66.66667
PO	AOCS	86	0	100	100	100	100	100	100
PO	USNA	85	100	100	100	100	100	100	100
PO	NROTC	85	100	0	100	100	100	100	100
PO	AOCS	85	100	100	100	100	100	100	100
PO	USNA	84	100	100	100	100	100	100	100
PO	NROTC	84	100	100	100	100	100	100	100
PO	AOCS	84	0	100	100	100	100	100	100
TOTP	USNA	89	100	98.36066	100	98.48485	96.9697	87.5	76.78571
TOTP	NROTC	89	100	99.0566	97.14286	95.2381	95.9596	91.57895	77.27273
TOTP	AOCS	89	100	98.33333	96.55172	89.65517	91.07143	86.66667	89.18919
TOTP	USNA	88	100	96.66667	96.49123	100	94.64286	66.66667	72.97297
TOTP	NROTC	88	100	97.3913	94.73684	97.4359	90.51724	76.41509	81.25
TOTP	AOCS	88	99.19355	92.74194	93.04348	90.82569	74.73684	69.23077	81.25
TOTP	USNA	87	100	95.08197	92.98246	92.45283	65.30612	78.125	72
TOTP	NROTC	87	100	96.25	100	90.36145	77.02703	75	87.80488
TOTP	AOCS	87	100	90.58296	80.69307	76.19048	59.84252	82.35294	86.44068
TOTP	USNA	86	97.82609	95.74468	95.55556	80.85106	76.92308	89.65517	76.92308
TOTP	NROTC	86	100	88.4058	83.60656	58.82353	83.87097	86.95652	85.71429
TOTP	AOCS	86	96.62921	62.5731	71.55963	60.49383	70.83333	97.14286	93.93939
TOTP	USNA	85	96.15385	72	72.22222	96.15385	91.66667	85.71429	72.22222
TOTP	NROTC	85	90.56604	58.33333	74.07407	80	88.23529	70.58824	61.53846
TOTP	AOCS	85	75	56.92308	70.27027	92	86.36364	83.33333	93.33333
TOTP	USNA	84	77.9661	68.75	61.29032	94.44444	93.75	85.71429	100
TOTP	NROTC	84	75	43.24324	68.75	90.90909	81.81818	77.77778	100
TOTP	AOCS	84	64.03509	54.16667	81.08108	96.66667	80	78.26087	94.44444

HS2	USNA	89	100	100	100	100	100	88.23529	100
HS2	NROTC	89	100	100	100	100	90.32258	100	88.46154
HS2	AOCS	89	92.30769	100	100	84.21053	94.11765	93.33333	84.61538
HS2	USNA	88	100	100	100	100	93.33333	69.23077	77.77778
HS2	NROTC	88	100	100	90	100	100	100	100
HS2	AOCS	88	100	97.67442	95.2381	100	82.05128	77.41935	86.95652
HS2	USNA	87	100	100	100	100	66.66667	100	100
HS2	NROTC	87	100	95.65217	100	91.66667	82.35294	91.66667	100
HS2	AOCS	87	98.18182	98.18182	94.33962	86.27451	62.5	78.94737	100
HS2	USNA	86	100	94.11765	75	90.90909	100	100	75
HS2	NROTC	86	100	100	86.66667	85.71429	100	88.88889	71.42857
HS2	AOCS	86	100	96.77419	75.86207	86.36364	83.33333	100	75
HS2	USNA	85	100	88.88889	71.42857	100	100	66.66667	100
HS2	NROTC	85	100	100	90	100	100	100	80
HS2	AOCS	85	100	84.61538	81.81818	100	100	66.66667	100
HS2	USNA	84	90	77.77778	100	100	100	50	100
HS2	NROTC	84	100	87.5	100	100	100	50	100
HS2	AOCS	84	81.25	69.23077	100	100	75	66.66667	100
HS6	USNA	89	100	100	100	100	100	86.95652	95
HS6	NROTC	89	100	100	100	100	96.92308	98.4127	88.70968
HS6	AOCS	89	100	100	93.33333	80	78.57143	90.90909	100
HS6	USNA	88	100	100	100	100	95.2381	95.2381	100
HS6	NROTC	88	100	100	100	100	93.93939	78.78788	88.46154
HS6	AOCS	88	100	100	92.68293	100	91.66667	71.42857	76.92308
HS6	USNA	87	100	100	90.90909	90	77.77778	100	100
HS6	NROTC	87	95.45455	100	100	95	82.6087	90	94.73684
HS6	AOCS	87	100	93.75	95.65217	87.23404	75	87.80488	97.14286
HS6	USNA	86	100	100	100	90.90909	100	100	81.25
HS6	NROTC	86	100	96.15385	84.61538	77.27273	100	95	77.77778
HS6	AOCS	86	100	81.81818	80.55556	90	92.85714	100	80.76923
HS6	USNA	85	100	94.73684	94.44444	81.25	100	85.71429	83.33333
HS6	NROTC	85	100	82.35294	92.85714	92.30769	92.30769	100	92.30769
HS6	AOCS	85	85.71429	100	77.77778	100	85.71429	83.33333	100
HS6	USNA	84	85.71429	100	85.71429	100	100	70	100
HS6	NROTC	84	100	100	100	87.5	100	100	100
HS6	AOCS	84	84.61538	95.45455	100	90	61.11111	100	100
HS	USNA	89	100	100	85.71429	100	100	100	71.42857
HS	NROTC	89	100	100	100	100	95.2381	95	94.73684
HS	AOCS	89	100	100	100	83.33333	72.72727	100	100
HS	USNA	88	100	100	100	100	94.44444	94.11765	87.5
HS	NROTC	88	100	100	100	100	91.66667	95.45455	100
HS	AOCS	88	100	93.54839	93.10345	92.59259	76.92308	90.47619	100
HS	USNA	87	100	100	100	75	66.66667	75	100
HS	NROTC	87	100	95.83333	95.65217	91.30435	95.83333	91.30435	95
HS	AOCS	87	98.11321	88.46154	93.47826	80	91.89189	93.93939	100
HS	USNA	86	100	100	92.30769	66.66667	100	100	87.5

HS	NROTC	86	100	100	84.61538	83.33333	100	100	80
HS	AOCS	86	100	95.45455	100	85.71429	94.44444	100	88.23529
HS	USNA	85	100	100	66.66667	100	100	100	100
HS	NROTC	85	100	91.66667	90.90909	90	100	100	50
HS	AOCS	85	100	86.66667	66.66667	100	100	87.5	100
HS	USNA	84	92.30769	91.66667	86.36364	95	89.47368	94.11765	93.75
HS	NROTC	84	82.35294	61.53846	100	100	87.5	71.42857	100
HS	AOCS	84	95	86.84211	100	96.66667	86.66667	88.46154	95.65217
FSH	USNA	89	100	100	100	100	100	100	100
FSH	NROTC	89	100	100	100	100	100	100	100
FSH	AOCS	89	100	100	100	100	100	100	100
FSH	USNA	88	100	100	100	100	100	100	100
FSH	NROTC	88	100	100	100	100	100	100	100
FSH	AOCS	88	100	100	100	50	100	100	100
FSH	USNA	87	100	100	100	100	100	100	100
FSH	NROTC	87	100	100	100	100	100	100	100
FSH	AOCS	87	100	100	100	100	100	100	100
FSH	USNA	86	100	100	100	100	100	100	100
FSH	NROTC	86	100	100	100	100	0	100	100
FSH	AOCS	86	66.66667	100	100	100	100	100	100
FSH	USNA	85	100	0	100	100	100	100	100
FSH	NROTC	85	100	50	100	0	100	100	100
FSH	AOCS	85	100	100	100	100	100	100	100
FSH	USNA	84	100	100	100	100	100	100	100
FSH	NROTC	84	100	100	100	100	100	100	100
FSH	AOCS	84	0	100	100	100	100	100	100
HCV	USNA	89	100	100	94.44444	94.44444	93.75	100	100
HCV	NROTC	89	100	100	100	100	97.67442	97.61905	92.68293
HCV	AOCS	89	100	100	94.11765	87.5	82.14286	94.73684	77.77778
HCV	USNA	88	96	100	96.55172	93.33333	92	76.19048	93.75
HCV	NROTC	88	100	100	97.36842	100	88.57143	73.33333	91.30435
HCV	AOCS	88	100	93.02326	97.56098	97.5	72.22222	85.18519	95.65217
HCV	USNA	87	100	100	100	100	77.77778	71.42857	100
HCV	NROTC	87	100	100	96.42857	100	84	77.27273	94.11765
HCV	AOCS	87	97.22222	94.02985	89.0625	77.58621	77.09302	80.64516	95.65217
HCV	USNA	86	100	100	85.71429	100	100	83.33333	100
HCV	NROTC	86	100	100	66.66667	90.90909	100	90.90909	87.5
HCV	AOCS	86	93.87755	92.68293	89.18919	71.875	78.26087	94.11765	76.47059
HCV	USNA	85	100	88.23529	80	63.63636	100	100	85.71429
HCV	NROTC	85	100	84.61538	86.36364	100	94.44444	81.25	69.23077
HCV	AOCS	85	96.15385	81.81818	84.21053	93.33333	92.30769	81.81818	77.77778
HCV	USNA	84	90	75	100	100	80	50	100
HCV	NROTC	84	93.33333	92.30769	91.66667	90	88.88889	100	100
HCV	AOCS	84	76.47059	80.76923	100	89.47368	56.25	88.88889	100
HMV	USNA	89	100	100	100	100	100	100	80
HMV	NROTC	89	100	85.71429	100	100	100	100	100

HMV	AOCS	89	100	100	100	80	100	100	100
HMV	USNA	88	100	100	100	0	100	100	100
HMV	NROTC	88	100	100	100	100	100	100	100
HMV	AOCS	88	100	85.71429	100	100	77.77778	71.42857	100
HMV	USNA	87	100	100	100	100	85.71429	50	100
HMV	NROTC	87	100	100	100	66.66667	100	50	100
HMV	AOCS	87	100	86.66667	91.66667	91.66667	91.66667	75	100
HMV	USNA	86	100	100	100	100	100	100	100
HMV	NROTC	86	100	100	100	100	0	100	100
HMV	AOCS	86	100	83.33333	100	83.33333	60	100	100
HMV	USNA	85	100	100	75	66.66667	100	100	100
HMV	NROTC	85	100	100	100	100	100	100	100
HMV	AOCS	85	100	75	100	100	100	60	66.66667
HMV	USNA	84	100	100	100	100	100	50	100
HMV	NROTC	84	100	50	100	100	100	100	100
HMV	AOCS	84	83.33333	80	75	100	100	100	100
HO	USNA	89	100	100	100	100	100	100	100
HO	NROTC	89	100	100	100	100	100	100	100
HO	AOCS	89	100	100	100	100	100	100	100
HO	USNA	88	100	100	100	100	100	100	100
HO	NROTC	88	100	100	100	100	100	100	100
HO	AOCS	88	100	100	100	100	100	100	100
HO	USNA	87	100	100	100	100	100	100	100
HO	NROTC	87	100	100	100	100	100	100	100
HO	AOCS	87	100	100	100	100	100	100	100
HO	USNA	86	100	100	100	100	100	100	100
HO	NROTC	86	100	100	100	100	100	100	100
HO	AOCS	86	100	100	100	100	100	100	100
HO	USNA	85	100	100	100	100	100	100	100
HO	NROTC	85	100	100	100	100	100	100	100
HO	AOCS	85	100	100	100	100	100	100	100
HO	USNA	84	100	100	100	100	100	100	100
HO	NROTC	84	100	100	100	100	100	100	100
HO	AOCS	84	100	100	100	100	100	100	100
TOTH	USNA	89	100	100	97.05882	98.52941	98.48485	92.53731	93.65079
TOTH	NROTC	89	100	99.36709	100	100	95.75556	98.06452	90.84967
TOTH	AOCS	89	98.24561	100	96.34146	84.33735	83.78378	94.82759	89.09091
TOTH	USNA	88	98.64865	100	98.78049	96.34146	93.67089	84.93151	91.93548
TOTH	NROTC	88	100	100	98.0198	100	92.23301	83.15789	93.58974
TOTH	AOCS	88	100	95.80838	95.15556	97.41935	80.82192	79.33884	89.47368
TOTH	USNA	87	100	100	97.72222	93.02326	75	80	100
TOTH	NROTC	87	98.96907	97.93814	97.95918	93.87755	86.81319	86.07595	95.45455
TOTH	AOCS	87	98.36066	93.24895	92.76018	83.09859	76.13636	85.29412	98.23009
TOTH	USNA	86	100	97.87234	87.23404	85.36585	100	97.14286	84.84848
TOTH	NROTC	86	100	98.66667	81.08108	83.60656	96.07843	94	79.06977
TOTH	AOCS	86	97.35099	90.41096	86.25954	83.03571	86.02151	98.66667	81.33333

TOTH	USNA	85	100	91.07143	82	79.48718	100	89.65517	88.46154
TOTH	NROTC	85	100	86.76471	90	94.33962	95.83333	93.02326	75.60976
TOTH	AOCS	85	96.9697	85.9375	80	97.56098	95	78.78788	88.88889
TOTH	USNA	84	90.90909	88	90.69767	97.4359	92.10526	77.14286	96.2963
TOTH	NROTC	84	92.15686	82.22222	97.2973	94.28571	93.75	90	100
TOTH	AOCS	84	84.55285	84.61538	98.83721	93.82716	73.33333	90	97.77778
UNK	USNA	89	100	100	90	100	100	100	100
UNK	NROTC	89	100	100	100	100	100	100	100
UNK	AOCS	89	100	100	100	100	100	100	100
UNK	USNA	88	100	100	100	100	100	100	50
UNK	NROTC	88	100	100	100	0	100	100	100
UNK	AOCS	88	100	100	100	100	100	100	100
UNK	USNA	87	100	100	100	100	100	100	100
UNK	NROTC	87	100	100	100	100	100	100	100
UNK	AOCS	87	100	82.6087	93.33333	100	100	100	100
UNK	USNA	86	100	100	84.61538	100	100	100	100
UNK	NROTC	86	100	100	100	100	100	100	100
UNK	AOCS	86	100	100	60	100	100	100	100
UNK	USNA	85	100	100	100	100	100	100	100
UNK	NROTC	85	100	100	100	100	100	100	100
UNK	AOCS	85	100	100	100	100	100	100	100
UNK	USNA	84	100	0	100	100	100	100	100
UNK	NROTC	84	100	100	100	100	100	100	100
UNK	AOCS	84	100	0	100	100	100	100	100
ALL	USNA	89	100	99.39024	98.42932	97.46193	97.93814	93.12169	88.06818
ALL	NROTC	89	100	99.36508	98.28571	98.5755	96.83908	95.50898	89.375
ALL	AOCS	89	99.11504	99.01478	97.56098	89.16256	86.84211	91.71975	85.8156
ALL	USNA	88	99.32432	99.08676	98.64253	97.66355	95.2381	83	86.90476
ALL	NROTC	88	100	97.98658	97.38562	98.08307	93.20388	84.07778	87.60331
ALL	AOCS	88	99.57537	95.31915	95.50562	92.67139	83.46457	78.41945	82.21344
ALL	USNA	87	100	98.25581	95.26627	93.75	80.13245	79.33884	89.13043
ALL	NROTC	87	99.25094	97.37828	98.86792	93.25843	84.27419	83.17308	87.05882
ALL	AOCS	87	99.18589	93.37017	89.20118	84.05316	73.26733	79.8913	89.00344
ALL	USNA	86	99.4186	97.10983	91.66667	86.84211	85.8209	89.47368	81.18812
ALL	NROTC	86	99.52607	94.73684	83.33333	79.51807	83.7037	90.17857	79.38144
ALL	AOCS	86	97.71529	80.72072	77.67857	81.34111	80.21583	91.74312	85.64356
ALL	USNA	85	98.11321	81.64557	76.74419	90	90.90909	89.74359	83.82353
ALL	NROTC	85	95.12195	78.06452	86.17886	89.62264	93.75	90.90909	70
ALL	AOCS	85	83.77193	71.42857	76.86567	93	91.30435	79.74684	89.23077
ALL	USNA	84	86.58537	78.6269	78.76106	95.45455	93.9759	81.57895	98.36066
ALL	NROTC	84	79.86111	65.51724	84	91.93548	85.96491	87.5	100
ALL	AOCS	84	72.12276	68.21429	87.43455	95.625	80.26316	88.52459	95.3271
VF	USNA	89	100	100	100	93.75	100	100	92.30769
VF	NROTC	89	100	100	94.73684	100	100	95	100
VF	AOCS	89	100	100	100	100	100	91.66667	90.90909
VF	USNA	88	100	100	100	94.73684	100	90	88.88889

VF	NROTC	88	100	91.66667	100	100	100	95.2381	90
VF	AOCS	88	100	97.61905	100	86.36364	92.30769	82.85714	72.41379
VF	USNA	87	100	100	100	91.66667	100	75	85.71429
VF	NROTC	87	95	100	100	95.2381	94.73684	90	55.55556
VF	AOCS	87	100	98.21429	96.42857	98.21429	78.57143	76.59574	69.69697
VF	USNA	86	100	100	93.33333	82.35294	86.66667	91.66667	81.81818
VF	NROTC	86	100	93.33333	86.66667	100	57.14286	87.5	100
VF	AOCS	86	100	90.19608	80.85106	94.59459	77.14286	80.64516	83.33333
VF	USNA	85	100	100	71.42857	100	85.71429	100	80
VF	NROTC	85	90	55.55556	80	100	100	100	33.33333
VF	AOCS	85	94.11765	75	66.66667	77.77778	100	83.33333	66.66667
VF	USNA	84	100	71.42857	80	100	100	100	100
VF	NROTC	84	45.45455	80	75	100	100	100	100
VF	AOCS	84	57.57576	42.10526	75	100	100	100	100
VAL	USNA	89	100	100	100	100	100	100	100
VAL	NROTC	89	100	100	100	100	100	100	100
VAL	AOCS	89	100	94.73684	100	94.73684	84.21053	100	83.33333
VAL	USNA	88	100	100	100	94.44444	100	89.47368	100
VAL	NROTC	88	100	95.2381	100	100	96.42857	92.59259	88
VAL	AOCS	88	100	96.875	97.56098	97.77778	90.90909	85.36585	80
VAL	USNA	87	100	100	89.47368	100	90	83.33333	85.71429
VAL	NROTC	87	100	100	100	94.73684	90	90	88.23529
VAL	AOCS	87	100	97.14286	85.91549	85.71429	72.72727	76.19048	87.5
VAL	USNA	86	100	93.75	87.5	88.88889	93.75	93.75	93.33333
VAL	NROTC	86	100	100	88.88889	100	77.77778	100	37.5
VAL	AOCS	86	95.12195	76.47059	64.10256	84.61538	86.36364	86.95652	90
VAL	USNA	85	100	85.71429	83.33333	100	93.33333	92.85714	84.61538
VAL	NROTC	85	100	100	90.90909	70	100	100	71.42857
VAL	AOCS	85	80	93.33333	92.85714	92.30769	84.61538	80	87.5
VAL	USNA	84	88.88889	82.35294	86.66667	92.30769	100	75	100
VAL	NROTC	84	80	50	80	100	75	100	100
VAL	AOCS	84	66.03774	78.78788	81.48148	95.45455	90.47619	95.45455	90
VAM	USNA	89	100	100	100	85.71429	100	100	80
VAM	NROTC	89	100	100	100	100	100	81.25	100
VAM	AOCS	89	100	100	100	100	66.66667	75	100
VAM	USNA	88	100	100	100	100	83.33333	90	88.88889
VAM	NROTC	88	100	94.11765	100	100	94.44444	94.11765	86.66667
VAM	AOCS	88	100	96.2963	96.42857	81.48148	95.2381	89.47368	93.75
VAM	USNA	87	100	100	100	100	92.30769	84.61538	100
VAM	NROTC	87	100	90.90909	100	100	60	75	100
VAM	AOCS	87	100	93.75	97.14286	93.93939	86.66667	79.16667	80
VAM	USNA	86	100	100	93.33333	100	71.42857	90	87.5
VAM	NROTC	86	100	100	88.23529	88.23529	62.5	70	100
VAM	AOCS	86	97.36842	89.47368	82.92683	94.11765	78.125	85	76.47059
VAM	USNA	85	87.5	57.14286	80	100	60	66.66667	100
VAM	NROTC	85	85.71429	100	87.5	100	85.71429	100	60

VAM	AOCS	85	80	53.84615	75	100	100	85.71429	100
VAM	USNA	84	85.71429	85.71429	71.42857	80	75	100	100
VAM	NROTC	84	100	83.33333	80	100	50	0	100
VAM	AOCS	84	80	72.72727	66.66667	100	100	75	100
VAQ	USNA	89	100	100	100	100	100	100	100
VAQ	NROTC	89	100	100	100	100	100	100	100
VAQ	AOCS	89	100	100	100	100	88.88889	100	40
VAQ	USNA	88	100	100	100	100	100	100	100
VAQ	NROTC	88	100	100	100	100	100	100	87.5
VAQ	AOCS	88	100	100	100	72.72727	100	71.42857	42.85714
VAQ	USNA	87	100	100	83.33333	80	100	75	100
VAQ	NROTC	87	100	85.71429	100	100	100	75	83.33333
VAQ	AOCS	87	90	88.88889	100	91.66667	81.81818	100	100
VAQ	USNA	86	100	100	100	100	60	66.66667	66.66667
VAQ	NROTC	86	100	0	100	100	100	100	100
VAQ	AOCS	86	100	94.11765	88.23529	80	75	100	77.77778
VAQ	USNA	85	100	80	75	66.66667	100	100	100
VAQ	NROTC	85	100	100	100	100	100	100	100
VAQ	AOCS	85	100	66.66667	100	100	100	100	100
VAQ	USNA	84	100	100	66.66667	100	100	100	100
VAQ	NROTC	84	42.85714	66.66667	50	100	100	100	100
VAQ	AOCS	84	66.66667	57.14286	75	100	100	100	100
VS	USNA	89	100	100	100	100	85.71429	100	100
VS	NROTC	89	100	100	85.71429	100	100	100	100
VS	AOCS	89	100	100	100	71.42857	60	75	100
VS	USNA	88	100	100	100	100	100	100	84.61538
VS	NROTC	88	100	100	100	90.90909	100	100	91.66667
VS	AOCS	88	95.23809	88.88889	87.5	85.71429	92.30769	83.33333	81.81818
VS	USNA	87	100	100	100	100	100	80	100
VS	NROTC	87	100	100	100	100	90.90909	90	66.66667
VS	AOCS	87	100	100	97.14286	94.28571	84.84848	57.69231	80
VS	USNA	86	100	90	100	100	88.88889	62.5	40
VS	NROTC	86	88.88889	100	62.5	100	100	83.33333	100
VS	AOCS	86	100	87.23404	70.73171	96.42857	81.48148	86.66667	100
VS	USNA	85	100	87.5	42.85714	100	75	100	100
VS	NROTC	85	100	100	100	83.33333	100	100	66.66667
VS	AOCS	85	100	55.55556	60	66.66667	50	100	100
VS	USNA	84	85.71429	80	100	100	100	0	100
VS	NROTC	84	100	20	100	100	100	100	100
VS	AOCS	84	81.25	52	64.28571	100	100	85.71429	100

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