AN ANALYSIS OF THE EFFECT OF PERSONNEL DRAWDOWN INITIATIVES ON AIRCREW EXPERIENCE

THESIS

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THESIS

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Master of Science in Logistics Management

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Preface

The purpose of this thesis was to examine the effect of Air Force personnel reductions on aircrew experience. Through statistical analysis of personnel reductions and flying hour data, we attempted to establish a relationship between personnel reductions and aircrew experience. We believe that this is a timely subject, given the rate and magnitude of the personnel reductions that have occurred in the Air Force over the last three years.

The statistical tests conducted to establish this relationship between personnel reductions and aircrew experience involved several difference of means tests. The objectives of the tests were to determine if the experience level of the selected population had significantly changed over the time of the study.

We would like to thank our thesis advisors, Major Robert E. Pappas and Dr. David K. Vaughan, for providing the guidance needed to complete this study and for allowing us to accomplish the study in such an independent manner. We also would like to thank Captain Jeff Wiseman, of the Force Analysis Branch at the Air Force Manpower and Personnel Center, for his crucial aid in obtaining the data for this study. Finally, we want to thank our families for their unwavering support through this entire process.

Keith L. Hedgepeth and Lennie J. Simpson

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Abstract

This study analyzed the effects of personnel reduction initiatives on aircrew experience levels of Air Force pilots and navigators. Four key measures of experience were defined, including total flight hours, flying hours in Primary Assigned Aircraft (PAA), total hours at time of upgrade to instructor, and total PAA hours at time of upgrade to instructor. Three objectives were established for this study. These objectives measured the degree of change in overall aircrew experience for pilots and navigators in six major weapon systems, to determine if changes in aircrew experience varied by weapon system, and if changes in aircrew experience varied by aeronautical rating. Fifty-five statistical tests were conducted to determine if significant decreases in experience had occurred.

For the first objective, significant decreases in experience were, except for one, related to total or PAA hours at time of upgrade. The exception was a decrease in experience attributed to total PAA hours. Tests for the second objective indicated that the AC-130H and the E-3C experienced significant changes over all other weapon systems. Finally, no significant differences were revealed between aeronautical ratings.

AN ANALYSIS OF THE EFFECT OF PERSONNEL DRAWDOWN INITIATIVES ON AIRCREW EXPERIENCE

I. Introduction

Chapter Overview

This chapter contains background information on the issues related to the effects of U.S. Air Force personnel drawdown initiatives on aircrew experience. The research problem statement is introduced along with the research objectives, investigative questions, and hypotheses. This chapter also defines the scope of the research and provides the operational definitions used in measuring aircrew experience. Detailed background information supporting the general issues is provided in Chapter II.

General Issue

The dissolution of the Soviet Union along with a growing federal budget deficit has called for the Department of Defense to reduce its operating budget by 32 percent since 1987 (1:1-4). This reduction in operating funds has resulted in the largest personnel reduction since the end of the Korean War (2:36).

Between the years of 1987 and 1997, total DOD active duty personnel will be reduced by 25 percent (1:1-12). The Air Force is required to reduce its personnel strength from a high of 607,000 members in 1987 to a projected force of 430,000 members by 1997 (1:1-13). The Air Force has used several programs to reduce its personnel strength. To entice officers to leave the military voluntarily, Voluntary Separation Incentives / Special Separation Bonuses (VSI/SSB) packages have been offered. These packages allowed officers to choose between annuities and lump-sum payments as compensation for separation. Although many choose these options, not enough volunteered to meet the reduced personnel strength requirements. Therefore, more drastic measures were taken. The Defense Authorization Act of 1992 gave the services the authority to use Selective Early Retirement Boards (SERBs) to force out retirement-eligible captains and majors (3:3). In the past, the services were authorized to use SERBs only for lieutenant colonels and colonels.

The VSI/SSB and SERB programs did not separate the required number of officers from active duty; therefore, the Air Force resorted to the Reduction in Force (RIF) action. The RIF board involuntarily separated over fifteen hundred junior officers to meet required personnel strength levels (4:3).

There are many questions concerning the relationship between force reductions and mission readiness. One significant question is: If the experience level of the Air Force is reduced by the force reductions, how will mission readiness be affected? This research addresses the question of whether the experience level of pilots and navigators has been affected by force reductions.

Existing research shows a positive correlation between aircrew experience and aircraft mishap rates. Research also shows a positive correlation between aircrew experience and the performance of specific aircrew duties. A Navy study showed that more experienced pilots had a lower probability of pilot error mishaps than those pilots with little flight experience (5:i). Additionally, a study performed by the Air Force showed that A-10 and F-16 pilots' bombing accuracy was positively correlated to mission flying experience (6:13).

These two studies suggest that there are undesireable consequences to fielding a less experienced flying force. This study will attempt to measure the change in aircrew experience due to personnel reductions.

Statement of Problem

The Department of Defense (DoD) is striving to maintain current operating tempos and sustain mission capability both during and after the drawdown initiatives, but the ability to do so is questionable. At some point in time, reductions in personnel, weapon system acquisition, operation and maintenance funding, and base operating support will have a significant impact on military operating capabilities (7:504). From the beginning of the drawdown initiative, Air Force leadership has been concerned with the effect of the drawdown on the Air Force's ability to maintain a high state of mission readiness.

Building and maintaining high levels of aircrew experience within flying squadrons has always been a key factor contributing to the overall level of Air Force operational readiness. A highly experienced force allows commanders of flying units to select qualified individuals for contingency taskings, as well as to serve as instructors and flight examiners. Specifically, Air Force leadership is concerned that personnel reductions have already affected and will continue to affect aircrew experience levels (8:23).

Research Question

In this study, the research question is: To what extent has the aircrew experience level of pilots and navigators changed due to the personnel drawdown initiatives?

Research Objective

The objective of this study is to gather and analyze data to assess whether the aircrew experience of pilots and navigators from six different weapon systems has changed due to the personnel drawdown initiatives.

Investigative Questions and Hypotheses

To answer the research question, the following questions and hypotheses will be examined:

1. To what degree has the overall aircrew experience of pilots and navigators for each weapon system changed due to personnel drawdown initiatives?

Hypothesis: The overall aircrew experience of pilots and navigators for each weapon system has changed.

2. Has the change in aircrew experience varied by weapon systems?

Hypothesis: The change in aircrew experience varies by weapon system.

3. Does the change in aircrew experience vary by aeronautical rating?

Hypothesis: The change in aircrew experience varies by aeronautical rating.

Scope and Limitations of Research

This study analyses the effect of personnel drawdown initiatives on the aircrew experience of pilots and navigators. To obtain a representative sample of officer aviators, pilots and navigators of six aircraft types were selected. The aircraft types were chosen to ensure that each of the major operational missions performed by the Air Force was represented. These missions are airlift, air superiority, battlefield interdiction/close air support, reconnaissance/battle management, and special operations. As a result, the changes in aircrew experience of pilots and navigators were analyzed in the following weapon systems: AC-130H, C-130E/H, E-3C, F-15C, F-15E, and KC-135.

A primary concern for this research was the ability to operationally define and measure experience levels. In this study, aircrew experience is operationally defined as:

1) Total Flying Hours
2) Flying hours in Primary Assigned Aircraft (PAA)
3) Total hours at time of upgrade to Instructor
4) Total PAA hours at time of upgrade to Instructor

These factors have been used in previous research efforts (5:i) when measuring aircrew experience and by leadership in operational units when selecting individuals for upgrade to instructors and evaluators. These reasons led the researchers to select these four factors as determinants of aircrew experience.

Initially, this research attempted to measure the change in experience levels for air weapons controllers assigned to the E-3C and EC-130E weapon systems. The required data for these officers are not currently collected by Air Force Manpower and Personnel Center (AFMPC), and they are also unavailable at the base level. Besides the operational definitions of experience used, the researchers attempted to include the measurement of total instructor hours. This data were also unavailable from AFMPC for all data points before calendar year 1993.

Summary

This chapter has identified the issues concerning the effect of the personnel drawdown on aircrew experience of pilots and navigators. Also introduced were the research and investigative questions and the intended scope of the research. Chapter II will examine previous research concerning U.S. Air Force personnel drawdown initiatives and the potential effect of personnel reductions on military readiness. Chapter III will detail the research methodology. Chapter IV will include the findings and analysis of the data collected for this research. Finally, Chapter V will present the conclusions and recommendations.

II. Literature Review

Chapter Overview

This chapter reviews previously conducted research that describes the DoD force reduction efforts, the impact the reductions have had on the Air Force, and the relationship between military aircrew experience and aircrew performance.

The review examines four issues. The first two issues are concerned with the drawdown initiatives and the impact that the initiatives have had on the Air Force aviation community. The third issue examines the correlation between flight experience and aircrew mishap rates. This research seeks to quantitatively determine if aircraft mishap rates are reduced as an aircrew member gains flight experience. The fourth issue concerns the correlation between flight experience and the performance of specific aircrew duties. The research in this area seeks to quantitatively measure how aircrew performance is affected by flight experience.

Department of Defense Drawdown Plan

The DoD has been faced with downsizing the military force structure since the mid-1980s. This objective was achieved through natural attrition and reduced recruiting rates (2:37). In 1991, with the end of the Cold War and the subsequent decline of the Soviet threat, the DoD incorporated a new military strategy. This strategy, shifting its focus from global wars to regional conflicts, allowed the United States to continue to respond to global threats, while continuing its manpower reduction efforts (1:1-1).

The goal of the force reduction program is to cut the total DoD active duty military end strength by 25 percent between fiscal year (FY) 1987 and FY 1997. At the end of FY 1992, 67 percent of the total force reductions had already been accomplished (1:1-12). The Air Force, required to drop from 607,000 members in 1987 to a projected force of 430,000 members by the end of FY 1997, has already achieved 77.4 percent of its required reductions (1:1-13).

Though all military forces have been targeted for reduction, active duty Army and Air Force personnel have been hit the hardest. DoD studies estimate that the Air Force will be cut by 29 percent, a level that is 4 percent higher than the total force requirement. The result is a decrease in the number of Air Force fighter-wing equivalents from 24 to 15. The primary reason for the imbalance in reductions is that Army and Air Force units strategically positioned throughout Europe to counter the declining Soviet threat are no longer needed (1:1-12). In addition, more than 30 continental United States base closures, reduced operational and maintenance expenditures, reduced training, and reduced research funding have led to significant Air Force cuts (1:1-2).

Sources of Reduction

Beyond natural attrition and reduced recruiting efforts, the 1992 DoD reduction initiatives called for a larger and more rapid force reduction plan. To accomplish this plan, the DoD announced a twofold program. The first element of the plan involved the VSI/SSB exit bonus plan consisting of an annuity or lump-sum payment. This bonus was offered to most of the officers to entice them to leave the military short of retirement (9:4). The second element was an involuntary Reduction in Force (RIF) which immediately followed the exit bonus initiative. The RIF initiative targeted officers with total active duty time between seven and 11 years, with those officers in the more senior year groups having a greater probability of being terminated from service. For example, those officers in the 1980 to 1984 year groups faced a 95% probability of involuntary separation. In contrast, younger officers in the 1988 and 1989 year groups only faced a 6% probability of involuntary separation (10:3).

The separation bonus initiative was a partial success, reducing the impact of an involuntary reduction (9:4). Of those who decided to remain on active duty 1,595 were forced to leave involuntarily due to the RIF (4:3). Personnel officials believe that the 1992 RIF will encourage officers to participate in future reduction programs, because it illustrated that the DoD is committed to meeting its end-year mandates, whatever the cost (4:3). Future reduction programs will include a second round of the exit bonus program and an early retirement program for those with at least 15 years but less than 20 years of active duty (11:3). Key military officials have been concerned with the impact of future reductions. Christopher Jehn, the Deputy Director of Defense personnel chief in 1992, stated in an interview that not only would readiness and manning levels fall to dangerously low levels, but many more involuntary separations would have to occur to accelerate the drawdown by 200,000 more members in two years (9:4).

It is evident that the military will continue to downsize its force structure to meet changing political and economic objectives. Starting 1 February 1994, the Air Force began reducing the officer corps by an additional 2,300 members above normal attrition levels to meet fiscal 1995 end strength requirements. These reductions will be accomplished through several incentive packages, including a temporary, early retirement plan for officers with at least 15 years but less than 20 years active duty, a voluntary separation incentive and a special separation benefit program, as well as a Selective Early Retirement Board (SERB). In addition to the SERB, the Air Force stopped selective continuation of majors twice deferred for promotion (12:9).

Although this reduction effort was similar to previous reduction efforts, a significant difference existed. All pilots and navigators, as well as non-rated officers in the

F-15E, F-4G, E-3C, B-1B, and EF-111 weapon systems, were determined ineligible for the separation packages (12:9). This exclusion could imply that reductions in these career fields have reached a critical level and can go no further without a detrimental impact on the readiness of the Air Force.

Impact of Personnel Reductions

The rapid cuts made to meet force reduction requirements have had a significant impact on the Air Force and its ability to conduct its mission. In 1992, Lieutenant Colonel Edwards, then the chief of the separations branch at the Air Force Military Personnel Center, stated that personnel losses occurred at an unprecedented rate. These rapid personnel losses resulted in critical shortages in key operational career fields, such as the F-15E weapons systems officer (13:3).

Although many of these losses occurred due to the RIF, many highly trained, experienced pilots, navigators and nonrated crew members have left the military due to the uncertainties of their futures. Of those leaving, experienced pilots with six to 11 years of service are passing up substantial yearly bonuses designed to keep them on active duty. Many cite the uncertainties of the future, continued drawdowns and the lack of leadership positions needed to make rank as the primary reasons for leaving the Air Force (14:13).

New accessions have been affected by the drawdown initiatives as well. The undergraduate pilot training program has been cut by half, to less than 800 trainees per year. Of those, 65 percent are becoming *banked* pilots, performing nonrated jobs until open cockpits are available. For experienced pilots, fewer jobs exist. The Air Force is losing ten tactical fighter wings over the next five years, leaving many pilots without jobs (2:39). The impact is significant. As the Air Force loses more pilots and fewer are being trained, the ability to effectively respond to a crisis of the magnitude of Desert Storm or simultaneous crises will become harder to maintain. In addition, as budgetary reductions continue, funds dedicated to maintain current flying hour programs could become more limited. Prior research suggests that the procedure of scaling back flying hour allocations to operational squadrons could adversely affect experience levels. These effects will be described in the following sections.

Aircrew Experience and Mishap Rates

Several studies have attempted to link aircrew experience with aircraft mishap rates. Two studies were completed by the United States Navy. The first study, conducted by Michael S. Borowsky, determined the impact of flight hour reductions on aircraft mishap rates (5:i).

Analysis of aircraft mishaps and pilot flight experience suggested that more experienced aviators had a lower probability of pilot error mishaps than those aviators with little flight experience (5:i). Borowsky identified high risk levels for aviators in five categories of naval aircraft, including fighter, attack, single and multiple seat tactical air, and helicopter (5:i).

For fighter pilots, the mishap rates were significantly (statistically) related to total flying hours, but were not significantly related to the number of hours in the current model of aircraft (5:3). Fighter pilots with less than 450 total hours had the highest mishap rate. In the remaining four types of aircraft, mishap rates were significantly related to total flying hours, but mishap rates were significantly related to hours in model for only single seat TACAIR and helicopter pilots (5:4-7).

Another Navy study on this topic also showed that pilot error mishap rates for instructor pilots, while flying with students, significantly decreased as hours flown in training aircraft increased (15:68). The Naval Training Command had 90 major flight mishaps during the years 1977-1983. Over 60 percent of these accidents involved pilot error (15:65). New instructors had a significantly higher mishap rate than those with more extensive trainer aircraft experience. The mishap rates were particularly high for instructors with less than 300 hours in trainers and less than 450 total hours (15:68).

Aircrew Experience and Performance (Air Force Study)

Besides the research relating aircrew experience with mishap rates, some research relates aircrew experience to the specific performance of aircrew duties. Intuitively, it appears obvious that the more often a pilot performs a task, the better the pilot will become at that task. Several studies have attempted to quantitatively measure the relationship between experience and performance. One Air Force study measured the relationship between bombing accuracy of A-10 and F-16 pilots and various flight-related factors. These factors were hours and sorties flown per month, number of times a training event is accomplished, total flying hours, total hours in model, mission flying experience (time in fighters), and type of aircraft avionics suite (6:4).

Of the factors listed, mission flying experience had the highest correlation with increased bombing accuracy for both the A-10 and F-16 (6:1). Bombing events accomplished per month and the type of avionics suite used were also positively correlated to bombing accuracy (6:13). There was little correlation between flying hours per month and bombing accuracy for either aircraft (6:7).

The researchers in this study used the data to develop a model to describe pilot capability given the value of certain experience factors, such as total flying time. The results showed that a measurable increase in capability occurs at approximately 900 hours of mission time for the

F-16 and fourteen hundred hours for the A-10 (6:2). The capability model results support the conclusion reached in the correlational analysis. F-16 pilots with more than 900 hours and A-10 pilots with more than fourteen hundred hours displayed an increase in bombing accuracy with increases in practice frequency (6:13).

Aircrew Experience and Performance (Navy Study)

The United States Navy has conducted research in this area also. One Navy study developed quantitative relationships between flying hours and aircrew performance (16:1). Two empirical investigations of this Navy study were the quality of carrier landings for F-14 and A-7 aircrews and the bombing accuracy of Marine Corps aviators (16:1-2). The Marine Corps study was similar to the Air Force study of A-10 and F-16 bombing accuracy.

In the analysis of carrier landings, data was collected on 4,351 landings by 60 pilots (16:3). The data suggest that both recent and long-term flying experience is associated with better performance. Long-term flying experience was more statistically significant than recent experience (16:3).

In the analysis of Marine Corps bombing accuracy, data was collected from 649 bombing missions (16:11). The central hypotheses of the analysis were that pilots with more career experience drop their bombs more accurately and that recent flight experience is associated with accurate bombing (16:12). The result of the analysis was that bombing accuracy increased with both an increase in career flying hours and recent flying hours (16:14-16). These results are consistent with the results of the Air Force study of A-10 and F-16 bombing accuracy.

In the Navy study, additional flying appears to improve aircrew performance in two ways. In the short run it hones skills and prevents their deterioration. Eventually it permits the attainment of higher level of mastery that is reflected in better performance (16:1).

Summary

This literature review examined the available research on the DoD drawdown initiatives and the relationship between aircrew experience and performance. Previous research suggests that the rapid rate and persistence of the drawdown initiatives may have affected the ability of the Air Force to effectively conduct its mission, with the total impact yet to be seen.

As for the relationship between aircrew experience and performance, there is a limited amount of research on this subject. In general, the studies show a positive correlation between flying experience and reduced mishap rates. Previous research also suggests a positive correlation between flying experience and better aircrew performance in air-to-ground weapons delivery and carrier landings.

This information is relevant to this thesis. This study will attempt to determine the effect of personnel reductions on aircrew experience levels. Prior research suggests that with changes in experience levels, associated changes in aircrew performance and safety levels may also occur.

III. Methodology

Chapter Overview

This chapter describes the methodology used to determine if changes in aircrew experience levels have occurred due to the personnel reduction initiatives. It includes a justification and description of the methodology, a description of the population, a description of the chosen sample, and a brief description of the statistical analyses performed on the data.

Methodology

Several methodologies were considered for use to determine the best manner to answer the research question. Because the data required was historical in nature and consisted of different measures of flight hours, the researchers determined that surveys and/or interviews administered to pilots and navigators were inappropriate for two reasons. First, not all pilots or navigators of the defined period of study are still on active duty. Second, due to the nature of the research questions, the results of a survey or interview would quite possibly be inaccurate, biased, or "best guess" data. As a result, a search for sources of data of this nature resulted in the use of an archival data base maintained by the Force Analysis Branch of the Air Force Military Personnel Center (AFMPC). The accuracy and availability of the data led to the choice of archival data as the best and most convenient source for this study.

To answer the investigative questions posed in Chapter I, the researchers conducted an ex-post-facto study to measure the change in aircrew experience due to personnel reduction initiatives. The purpose of the research is to describe the change in aircrew experience given that force reductions have occurred. Although personnel reductions are projected to continue through 1997, the period chosen for this study is limited to September 1990 to September 1993. The period of personnel reductions was defined as 30 September 1991, the beginning of the force reduction initiatives, through 31 December 1992, the final date for separation from active duty for members selected by the 1992 RIF board. Although future reduction initiatives could have an impact on aircrew experience levels, the RIF and voluntary reduction efforts during the defined period were the most significant to date.

For this study, aircrew experience is defined by four elements, including: 1)total number of flying hours, 2)total number of hours in the primary assigned aircraft(PAA), 3)total number of flying hours at the time of instructor upgrade, and 4)total number of PAA hours at the time of instructor upgrade.

To perform a trend analysis of the aircrew experience of pilots and navigators, the researchers obtained measurements at six points in time for the four operational definitions for aircrew experience. The three points before the drawdown were 30 September 1990, 31 March 1991, and 30 September 1991. The three points after the drawdown were 31 March 1993, 30 June 1993, and 30 September 1993. One-hundred percent sampling of the population was conducted by AFMPC personnel, and the data from the sampling were provided to the researchers in descriptive format only, including mean, standard deviation, minimum, and maximum values. The data in this format could not be used to determine the change in aircrew experience, but it was used to perform the trend analysis.

To measure the actual change in experience, random samples from two of the six data points were used. These data points were 30 September 1991 and 30 June 1993. The sampling plan is covered further in the sample description section.

Population

The population of the study includes all pilots and navigators in the Air Force assigned to the following aircraft: AC-130H, C-130E/H, E-3C, F-15C, F-15E, and KC-135. The population does not include enlisted aircrew members because they were not subjected to the same reduction initiatives. Additionally, nonrated officer aircrew members were considered, but flight hour data were not available for the study.

This population was categorized into five operational aviation missions performed by the Air Force. To alleviate redundancy and to keep the size of the population manageable, select aircraft were chosen from each stratified category to provide a representative sample of each mission type. When a mission was performed by more then one weapon system, the aircraft with the most representative role or the aircraft that provided the largest population for study was chosen. The stratified categories with their representative aircraft are shown in Table 3-1 (17:41).

TABLE 3-1. Aircraft Population

Airlift	C-130E/H
Air Superiority (OCA/DCA)	F-15C
Air Refueling (AAR)	KC-135
Battlefield Interdiction / Close Air Support(BAI/CAS)	F-15E
Reconnaissance / Battle Management (C^3/I)	E-3C
Special Operations (SOF)	AC-130H

The total number of pilots and navigators flying each aircraft type was obtained from HQ AFMPC at Randolph AFB Texas. The numbers include all pilots and navigators on active duty during the time of the study. A summary is provided in Tables 3-2 and 3-3.

These tables show that several weapon systems experienced an increase in manning levels over the time of the study. This fact seems to contradict the basic premise of the research--that the number of pilots and navigators has decreased. A closer look at the total numbers, including all weapon systems, of pilots and navigators on active duty on these two dates reveals that the number of pilots decreased approximately 12% and the number of navigators decreased approximately 10% (17:41).

Crew members assigned to weapon systems that were targeted for a reduction in the number of authorized aircraft, such as the B-52G/H, were reassigned to other weapon systems. This migration of crew members was one reason for defining aircrew experience as related to PAA hours. A measurement of PAA hours identifies those crew members with experience in their current weapon system.

TABLE 3-2. Pilot Population

	30 Sep 91	30 Jun 93
AC-130H	46	50
C-130E/H	945	948
E-3C	171	182
F-15C	840	663
F-15E	174	243
KC-135	1523	1266

TABLE 3-3. Navigator Population

	30 Sep 91	30 Jun 93
AC-130H*	79	78
C-130E/H	475	377
E-3C	92	69
F-15E	160	238
KC-135	909	677

*Includes Fire Control and Electronic Warfare Officers

Sample

Several sampling methods were considered for this research. The most obvious method was to conduct a random sample of all pilots and navigators on active flying status. This method would have resulted in an overall measurement of the change in aircrew experience, but it would not have identified the specific weapons system that experienced the change. The random sample method of all pilots and navigators would have been too broad and would convey little management information.

The chosen sampling method was a stratified random sample across the Air Force operational missions. This sampling method results in the identification of specific weapon systems that undergo a change in aircrew experience. The sample size for each statistical test was based on a confidence level of .90.

The required sample sizes for the statistical tests were computed with the following formula (18:607-610).

$$n = \frac{N(Z^2) * .25}{d^2 *(N-1)) + (Z^2 * .25)}$$

where:

n = required sample size

N = total population size

d = desired confidence level

Z = corresponding Z factor for desired confidence level

Because the researchers were limited by AFMPC resource contraints, the exact sample size needed for the set confidence level was not always obtained. Because the actual sample size was close to the desired sample size, the researchers believed that this discrepancy did not significantly affect the power of the statistical tests or the validity of the research.

Statistical Analysis

The three investigative questions posed in Chapter I were evaluated by statistically analyzing the data provided by AFMPC. The combined results of these questions allowed the authors to draw conclusions and answer the research question "to what extent have aircrew experience levels changed due to the personnel drawdown initiatives?"

To answer investigative question one, "has the overall experience levels of pilots and navigators changed?" and investigative question three, "has the change varied by aeronautical rating?" paired t-Tests were used. This method was chosen for its ability to measure differences in sample means of dependent samples. To answer investigative question two, "has the change in experience levels varied by weapon system?" an Analysis of Variance (ANOVA) test was conducted, comparing the mean change of each experience factor for each weapon system. The statistical analysis package included with the Microsoft Excel program and Statistix, a statistical software package, were used to conduct the statistical tests and to calculate the descriptive statistics required to perform the trend analyses. An alpha level of .05 was used to determine if sufficient evidence existed to infer that a change, positive or negative, had occurred due to the reduction initiatives.

Summary

This chapter detailed the methodology used to collect, measure, and analyze the data on aircrew experience, and the population of pilots and navigators studied to measure the change in aircrew experience due to personnel reduction initiatives. Also identified were the four variables that define aircrew experience. Finally, the tools used to conduct the statistical analysis were outlined. Chapter IV describes in detail the data analysis performed to measure the change in aircrew experience.

IV. Data Analysis

Chapter Overview

This chapter describes in detail the statistical analyses conducted to answer the investigative questions raised in the previous chapters. The chapter is divided into four major sections corresponding to the three investigative questions and one section covering trend analyses. Within each section, the statistical tests are presented by weapon system and/or crew position.

Investigative Question One

To answer the question whether the experience of individual crew positions from the selected population had changed, the paired t-test, a statistical test used to detect a difference in population means, was used. The reported p-values are for two-tail tests, and the significance level used is 0.05 ($\alpha = 0.05$).

AC-130H Pilot. Table 4-1 depicts the results of the t-test used to test the difference in means of total flying hours for AC-130H pilots. The p-value of 0.99 indicates no statistical difference in mean total flying time. Table 4-2 shows a p-value of 0.51 for the test of a difference in mean PAA hours for AC-130H pilots. This difference is not statistically significant. Tables 4-3 and 4-4 report the results of the t-test for total hours at the time of upgrade to instructor pilot and PAA hours at the time of upgrade to instructor pilot respectively. The p-value for both tests, 0.78 and 0.29, is not statistically significant. Although there is a sizable difference, approximately 400 hours, between PAA hours at upgrade for September 1991 and June 1993, the t-test did not find this difference significant. One reason for this result could be the small sample size available for the test.

Table 4-1. AC-130H Pilot Total Hours

	Total Hours 30 Sep 91	Total Hours 30 Jun 93
Mean	1884	1888
Standard Deviation	1400	1220
Required Sample Size	28	29
Sample Size	46	50
P(T<=t)	0.99	

Table 4-2. AC-130H Pilot PAA Hours

	PAA Hours 30 Sep 91	PAA Hours 30 Jun 93
Mean	684	625
Standard Deviation	603	584
Required Sample Size	28	29
Sample Size	46	50
P(T<=t)	0.51	

Table 4-3. AC-130H Pilot Total Hours at Upgrade

	Total Hours at Upgrade 30 Sep 91	Total Hours at Upgrade 30 Jun 93
Mean	2061	1946
Standard Deviation	866	304
Required Sample Size	5	5
Sample Size	5	5
P(T<=t)	0.78	

Table 4-4. AC-130H Pilot PAA Hours at Upgrade

	PAA Hours at Upgrade 30 Sep 91	PAA Hours at Upgrade 30 Jun 93
Mean	1035	654
Standard Deviation	874	602
Required Sample Size	5	5
Sample Size	5	5
P(T<=t)	0.29	

AC-130H Navigator. The next set of tables show the results from the tests on AC-130H navigators. This population includes fire control and electronic warfare officers. Tables 4-5 and 4-6 show the results of the tests for a difference in total hours and PAA hours respectively. The p-value for the test on total hours is 0.71, and it is 0.79 for the test on PAA hours. The difference between means for both tests is not statistically significant. Tables 4-7 and 4-8 show the results of the tests on the difference between total hours and PAA hours at upgrade for the AC-130H Navigators. The p-value for the test of a difference in total hours at the time of upgrade to instructor navigator is 0.73. This difference is not statistically significant. The p-value for the test of a difference in PAA hours at the time of instructor upgrade is 0.03. This p-value indicates that the difference between PAA hours at upgrade is statistically significant.

Table 4-5. AC-130H Navigator Total Hours

	Total Hours 30 Sep 91	Total Hours 30 Jun 93
Mean	1715	1642
Standard Deviation	1460	1321
Required Sample Size	37	37
Sample Size	74	74
P(T<=t)	0.71	

Table 4-6. AC-130H Navigator PAA Hours

	PAA Hours 30 Sep 91	PAA Hours 30 Jun 93
Mean	631	610
Standard Deviation	507	539
Required Sample Size	37	37
Sample Size	74	74
P(T<=t)	0.79	

Table 4-7. AC-130H Navigator Total Hours at Upgrade

	Total Hours at Upgrade 30 Sep 91	Total Hours at Upgrade 30 Jun 93
Mean	2122	1977
Standard Deviation	953	342
Required Sample Size	4	4
Sample Size	4	4
P(T<=t)	0.73	

Table 4-8. AC-130H Navigator PAA Hours at Upgrade

	PAA Hours at Upgrade 30 Sep 91	PAA Hours at Upgrade 30 Jun 93
Mean	1206	485
Standard Deviation	907	541
Required Sample Size	4	4
Sample Size	4	4
P(T<=t)	0.03	

C-130E/H Pilot. The next set of tables reports the results of the difference in means tests on the C-130E/H pilot. Tables 4-9 and 4-10 show that the p-value for the test for a difference in total hours is 0.38 and the test for a difference in PAA hours is 0.15. The difference from both tests is not statistically significant. Tables 4-11 and 4-12 report the results from the tests involving the number of hours at the time of upgrade to instructor pilot in the C-130E/H. The p-value for the test for a difference in total hours at the time of instructor upgrade is 0.58 and the p-value for the test on PAA hours at the time of instructor upgrade is 0.40. The difference from both tests is not statistically significant.

Table 4-9. C-130E/H Pilot Total Hours

	Total Hours 30 Sep 91	Total Hours 30 Jun 93
Mean	2015	1816
Standard Deviation	1155	1157
Required Sample Size	64	64
Sample Size	51	51
P(T<=t)	0.38	

Table 4-10. C-130E/H Pilot PAA Hours

	PAA Hours 30 Sep 91	PAA Hours 30 Jun 93
Mean	1387	1111
Standard Deviation	927	1119
Required Sample Size	64	64
Sample Size	51	51
P(T<=t)	0.15	

Table 4-11. C-130E/H Pilot Total Hours at Upgrade

	Total Hours at Upgrade 30 Sep 91	Total Hours at Upgrade 30 Jun 93
Mean	2268	2353
Standard Deviation	780	814
Required Sample Size	64	64
Sample Size	50	50
P(T<=t)	0.58	

Table 4-12. C-130E/H Pilot PAA Hours at Upgrade

	PAA Hours at Upgrade 30 Sep 91	PAA Hours at Upgrade 30 Jun 93
Mean	1736	1614
Standard Deviation	574	853
Required Sample Size	64	64
Sample Size	50	50
P(T<=t)	0.40	

C-130E/H Navigator. Tables 4-13, 4-14, 4-15, and 4-16 show the difference in means test results for C-130E/H navigator. The p-value for the tests for a difference in means in total hours and PAA hours is 0.92 and 0.65 respectively. The difference from both tests is not statistically significant. The values for total hours and PAA hours at the time of upgrade to instructor navigator increased during the time of the study. With a p-value of 0.71 for total hours and 0.91 for PAA hours, these increases are not statistically significant.

Table 4-13. C-130E/H Navigator Total Hours

	Total Hours 30 Sep 91	Total Hours 30 Jun 93
Mean	2120	2091
Standard Deviation	1234	1222
Required Sample Size	60	58
Sample Size	41	41
P(T<=t)	0.92	

Table 4-14. C-130E/H Navigator PAA Hours

	PAA Hours 30 Sep 91	PAA Hours 30 Jun 93
Mean	1954	1830
Standard Deviation	1142	1307
Required Sample Size	60	58
Sample Size	41	41
P(T<=t)	0.65	

Table 4-15. C-130E/H Navigator Total Hours at Upgrade

	Total Hours at Upgrade 30 Sep 91	Total Hours at Upgrade 30 Jun 93
Mean	1942	2042
Standard Deviation	519	934
Required Sample Size	16	16
Sample Size	19	19
P(T<=t)	0.71	

Table 4-16. C-130E/H Navigator PAA Hours at Upgrade

	PAA Hours at Upgrade 30 Sep 91	PAA Hours at Upgrade 30 Jun 93
Mean	1740	1773
Standard Deviation	523	1036
Required Sample Size	16	16
Sample Size	19	19
P(T<=t)	0.91	

F-15C Pilot. The next set of tables shows the results from the difference of means tests for the F-15C pilot. Table 4-17 shows that the difference in means for total hours is not statistically different, the p-value equals 0.66. Table 4-18 shows that PAA hours actually increased from September 1991 to June 1993. This increase is not statistically significant. Tables 4-19 and 4-20 show the results for difference in means tests for total hours and PAA hours at the time of upgrade to F-15C instructor Pilot. The change in the number of total hours and PAA hours at the time of instructor upgrade is not statistically significant. The p-values are 0.33 and 0.71 respectively.

Table 4-17. F-15C Pilot Total Hours

	Total Hours 30 Sep 91	Total Hours 30 Jun 93
Mean	1554	1481
Standard Deviation	835	838
Required Sample Size	63	62
Sample Size	53	53
P(T<=t)	0.66	

Table 4-18. F-15C Pilot PAA Hours

	PAA Hours 30 Sep 91	PAA Hours 30 Jun 93
Mean	576	659
Standard Deviation	451	725
Required Sample Size	63	62
Sample Size	53	53
P(T<=t)	0.31	

Table 4-19. F-15C Pilot Total Hours at Upgrade

	Total Hours at Upgrade 30 Sep 91	Total Hours at Upgrade 30 Jun 93
Mean	1882	1682
Standard Deviation	569	631
Required Sample Size	18	18
Sample Size	23	23
P(T<=t)	0.33	

Table 4-20. F-15C Pilot PAA Hours at Upgrade

	PAA Hours at Upgrade 30 Sep 91	PAA Hours at Upgrade 30 Jun 93
Mean	905	944
Standard Deviation	242	404
Required Sample Size	18	18
Sample Size	23	23
P(T<=t)	0.71	

F-15E Pilot. The next set of tables shows the test results for the F-15E pilot. Table 4-21 shows that the difference between total hours for the two data points is not significant. The p-value is 0.42. Table 4-22 shows that the difference between PAA hours is also statistically insignificant. The p-value is 0.39. Tables 4-23 and 4-24 show that the difference in total hours and PAA hours at the time of upgrade to F-15E instructor pilot is not statistically significant. The p-values are 0.29 and 0.94 respectively.

Table 4-21. F-15E Pilot Total Hours

	Total Hours 30 Sep 91	Total Hours 30 Jun 93
Mean	1531	1394
Standard Deviation	925	810
Required Sample Size	49	54
Sample Size	53	53
P(T<=t)	0.42	

Table 4-22. F-15E Pilot PAA Hours

	PAA Hours 30 Sep 91	PAA Hours 30 Jun 93
Mean	376	325
Standard Deviation	249	360
Required Sample Size	49	54
Sample Size	53	53
P(T<=t)	0.39	

Table 4-23. F-15E Pilot Total Hours at Upgrade

	Total Hours at Upgrade 30 Sep 91	Total Hours at Upgrade 30 Jun 93
Mean	2015	1790
Standard Deviation	439	390
Required Sample Size	11	11
Sample Size	12	12
P(T<=t)	0.29	

Table 4-24. F-15E Pilot PAA Hours at Upgrade

	PAA Hours at Upgrade 30 Sep 91	PAA Hours at Upgrade 30 Jun 93
Mean	615	624
Standard Deviation	144	360
Required Sample Size	11	11
Sample Size	12	12
P(T<=t)	0.94	

F-15E Weapon Systems Officer (WSO). The results from the tests conducted on the F-15E WSO are presented in Tables 4-25 through 4-28. Tables 4-25 and 4-26 show that the difference in the number of total hours and the difference in the number of PAA hours are both statistically insignificant. The p-values are 0.46 and 0.72 respectively. Table 4-27 shows that the difference between total hours at the time of upgrade to F-15E instructor WSO is statistically significant. The difference in sample means is over 500 hours, and the p-value is 0.03. The results from the test on the difference between PAA hours at the time of upgrade to instructor WSO, shown in Table 4-28, indicate that the difference is not significant. The p-value is 0.42.

Table 4-25. F-15E WSO Total Hours

	Total Hours 30 Sep 91	Total Hours 30 Jun 93
Mean	1391	1280
Standard Deviation	763	726
Required Sample Size	48	53
Sample Size	41	41
P(T<=t)	0.46	

Table 4-26. F-15E WSO PAA Hours

	PAA Hours 30 Sep 91	PAA Hours 30 Jun 93
Mean	377	399
Standard Deviation	205	361
Required Sample Size	48	53
Sample Size	41	41
P(T<=t)	0.72	

Table 4-27. F-15E WSO Total Hours at Upgrade

	Total Hours at Upgrade 30 Sep 91	Total Hours at Upgrade 30 Jun 93
Mean	1904	1322
Standard Deviation	315	508
Required Sample Size	7	7
Sample Size	7	7
P(T<=t)	0.03	

Table 4-28. F-15E WSO PAA Hours at Upgrade

	PAA Hours at Upgrade 30 Sep 91	PAA Hours at Upgrade 30 Jun 93
Mean	622	480
Standard Deviation	161	351
Required Sample Size	7	7
Sample Size	7	7
P(T<=t)	0.42	

E-3C Pilot. The next set of tables shows the results from the tests on the E-3C pilot data. Tables 4-29 and 4-30 show that the change in total hours and the change in PAA hours are both statistically insignificant. The p-values are 0.64 and 0.23 respectively. Table 4-31 shows the change in the number of total hours at the time of upgrade to E-3C instructor pilot is statistically significant. The difference in sample means is over fourteen hundred hours, and the p-value is 0.004. Table 4-32 shows that the change in the number of PAA hours at the time of upgrade to instructor pilot is also statistically significant. The difference in sample means is approximately sixteen hundred hours, and the p-value is 0.002.

Table 4-29. E-3C Pilot Total Hours

	Total Hours 30 Sep 91	**Total Hours 30 Jun 93**
Mean	2889	2723
Standard Deviation	1784	1742
Required Sample Size	49	50
Sample Size	52	52
P(T<=t)	0.64	

Table 4-30. E-3C Pilot PAA Hours

	PAA Hours 30 Sep 91	PAA Hours 30 Jun 93
Mean	1858	1534
Standard Deviation	1402	1398
Required Sample Size	49	50
Sample Size	52	52
P(T<=t)	0.23	

Table 4-31. E-3C Pilot Total Hours at Upgrade

	Total Hours at Upgrade 30 Sep 91	Total Hours at Upgrade 30 Jun 93
Mean	4081	2639
Standard Deviation	1662	1032
Required Sample Size	14	14
Sample Size	16	16
P(T<=t)	0.004	

Table 4-32. E-3C Pilot PAA Hours at Upgrade

	PAA Hours at Upgrade 30 Sep 91	PAA Hours at Upgrade 30 Jun 93
Mean	2755	1160
Standard Deviation	1373	831
Required Sample Size	14	14
Sample Size	16	16
P(T<=t)	0.002	

E-3C Navigator. Tables 4-33 through 4-36 show the results from the tests on the data for the E-3C navigator. The tests for a difference in total hours and PAA hours, tables 4-33 and 4-34, both show an increase in these values. The p-values are 0.81 and 0.60, and therefore the increases are not statistically significant. Both Tables 4-35 and 4-36 show a sizable decrease in total hours and PAA hours respectively. Because of the small sample sizes and/or the large sample variances, these changes are not statistically significant.

Table 4-33. E-3C Navigator Total Hours

	Total Hours 30 Sep 91	Total Hours 30 Jun 93
Mean	2490	2565
Standard Deviation	1543	1483
Required Sample Size	40	35
Sample Size	46	46
P(T<=t)	0.82	

Table 4-34. E-3C Navigator PAA Hours

	PAA Hours 30 Sep 91	PAA Hours 30 Jun 93
Mean	1959	2091
Standard Deviation	1192	1236
Require Sample Size	40	35
Sample Size	46	46
P(T<=t)	0.60	

Table 4-35. E-3C Navigator Total Hours at Upgrade

	Total Hours at Upgrade 30 Sep 91	Total Hours at Upgrade 30 Jun 93
Mean	3060	2398
Standard Deviation	971	2415
Required Sample Size	7	7
Sample Size	7	7
P(T<=t)	0.54	

Table 4-36. E-3C Navigator PAA Hours at Upgrade

	PAA Hours at Upgrade 30 Sep 91	PAA Hours at Upgrade 30 Jun 93
Mean	2812	1738
Standard Deviation	806	1529
Require Sample Size	7	7
Sample Size	7	7
P(T<=t)	0.17	

KC-135 Pilot. Tables 4-37 through 4-40 show the results from the tests on the data for the KC-135 pilot. Table 4-37 shows that the difference in the number of total hours is not statistically significant. The p-value is 0.11, which is close to the significance threshold of 0.10. Table 4-38 shows that the difference in the number of PAA hours is significant. The difference in sample means is over 300 hours, and the p-value is 0.04. Tables 4-39 and 4-40 show that the difference in total hours and PAA hours is statistically significant. The p-values are 0.16 and 0.50 respectively.

Table 4-37. KC-135 Pilot Total Hours

	Total Hours 30 Sep 91	Total Hours 30 Jun 93
Mean	2218	1882
Standard Deviation	1200	1058
Required Sample Size	65	65
Sample Size	54	54
P(T<=t)	0.11	

Table 4-38. KC-135 Pilot PAA Hours

	PAA Hours 30 Sep 91	PAA Hours 30 Jun 93
Mean	1649	1327
Standard Deviation	1040	772
Required Sample Size	65	65
Sample Size	54	54
P(T<=t)	0.04	

Table 4-39. KC-135 Pilot Total Hours at Upgrade

	Total Hours at Upgrade 30 Sep 91	Total Hours at Upgrade 30 Jun 93
Mean	1767	1544
Standard Deviation	915	717
Required Sample Size	65	65
Sample Size	60	60
P(T<=t)	0.16	

Table 4-40. KC-135 Pilot PAA Hours at Upgrade

	PAA Hours at Upgrade 30 Sep 91	PAA Hours at Upgrade 30 Jun 93
Mean	1191	1120
Standard Deviation	689	523
Required Sample Size	65	65
Sample Size	60	60
P(T<=t)	0.50	

KC-135 Navigator. The next set of tables, 4-41 through 4-44, shows the test results for the data on the KC-135 navigator. Tables 4-41 and 4-42 show that the change in total hours and PAA hours is not statistically significant. The p-values are 0.99 and 0.97 respectively. Table 4-43 shows that the change in the number of PAA hours at the time of upgrade to E-3C instructor navigator is significant. The difference in sample means is 215 hours, and the p-value is 0.07. The change in the number of PAA hours at the time of upgrade to instructor navigator, Table 4-44, is not significant. The p-value is 0.14.

Table 4-41. KC-135 Navigator Total Hours

	Total Hours 30 Sep 91	Total Hours 30 Jun 93
Mean	1439	1436
Standard Deviation	942	792
Required Sample Size	64	62
Sample Size	55	55
P(T<=t)	0.99	

Table 4-42. KC-135 Navigator PAA Hours

	PAA Hours 30 Sep 91	PAA Hours 30 Jun 93
Mean	1232	1237
Standard Deviation	828	649
Required Sample Size	64	62
Sample Size	55	55
P(T<=t)	0.97	

Table 4-43. KC-135 Navigator Total Hours at Upgrade

	Total Hours at Upgrade 30 Sep 91	Total Hours at Upgrade 30 Jun 93
Mean	1552	1337
Standard Deviation	649	639
Required Sample Size	24	24
Sample Size	35	35
P(T<=t)	0.07	

Table 4-44. KC-135 Navigator PAA Hours at Upgrade

	PAA Hours at Upgrade 30 Sep 91	PAA Hours at upgrade 30 Jun 93
Mean	1239	1084
Standard Deviation	517	317
Required Sample Size	24	24
Sample Size	35	35
P(T<=t)	0.14	

Investigative Question Two

To determine whether the change in experience levels of pilots and navigators varied by weapon systems, an Analysis of Variance (ANOVA) test was conducted on each of the four operational definitions of aircrew experience. For each random sample taken, the difference in flight hours was measured by subtracting the September 1991 hour value from the June 1993 hour value. An increase in flight hour activity is reported with a positive value, while a decrease in flight hour activity is reported with a negative value. The differential value was used in the ANOVA calculations, resulting in a total of eight tests being conducted. To determine if a significant difference existed, the reported p-values for two-tailed tests were compared to a significance level of 0.05 ($\alpha = 0.05$).

Pilot Total Hours. The ANOVA test conducted on pilot total hours resulted in a p-value of 0.91, indicating that no statistical difference in mean pilot total hours existed between the six weapons systems. Table 4-45 shows the results of the test.

Table 4-45. Pilot Total Hours

Aircraft	Sample Size	Mean change in Hours
AC-130H	70	30
C-130E/H	51	-199
E-3C	52	-166
F-15	53	-73
F-15E	53	-136
KC-135	54	-336
P(T<=t)	0.91	

Pilot PAA Hours. The ANOVA test for pilot PAA hours resulted in a p-value of 0.35, indicating that no statistical difference in pilot PAA hours for the weapon system types existed. Table 4-46 shows the results of the test.

Table 4-46. Pilot PAA Hours

Aircraft	Sample Size	Mean Change in Hours
AC-130H	70	-60
C-130E/H	51	-276
E-3C	52	-274
F-15	53	83
F-15E	53	-51
KC-135	54	-322
P(T<=t)	0.35	

Pilot Total Hours at Upgrade. The comparison of pilot total hours at instructor upgrade resulted in a p-value of 0.001, indicating that a significant difference existed between the weapon systems. The results of the test are reported in Table 4-47.

Table 4-47. Pilot Total Hours at Upgrade

Aircraft	Sample Size	Mean Change in Hours
AC-130H	5	-116
C-130E/H	50	85
E-3C	16	-1442
F-15	23	-314
F-15E	12	-225
KC-135	60	-223
P(T<=t)	0.001	

To determine where the differences occurred, the Tukey Pairwise comparison of Means test was used. The results of the Tukey Pairwise comparison, provided in Table 4-48, indicate that two groupings exist, with E-3C and AC-130H PAA Hours in Group I and the AC-130H, C-130E/H, E-3C, F-15, F-15E, and KC-135 in Group II. The test results indicate that the E-3 and AC-130H pilot PAA hours at instructor upgrade are significantly different than the rest of the population sample PAA hours at upgrade.

Table 4-48. Tukey Pairwise Comparison of Means

Aircraft	Mean Change in PAA Hours at Upgrade	Homogenous Groups
E-3C	-1442	Group I
AC-130H	-116	Group I and II
C-130E/H	85	Group II
KC-135	-223	Group II
F-15	-314	Group II
F-15E	-225	Group II

Pilot PAA Hours at Upgrade. As can be seen in Table 4-49, the comparison of pilot PAA hours at instructor upgrade for each weapon system in the sample results in a p-value of 0.0000, indicating that a significant difference in experience levels among weapon systems existed. To determine where the actual difference occurred, the Tukey Pairwise comparison of Means test was again used, resulting in the same groupings reported in Table 4-48, for the PAA hours at instructor upgrade, with the E-3C and AC-130H in Group I and the AC-130H, C-130E/H, E-3C, F-15, F-15E, and KC-135 in Group II.

Table 4-49. Pilot PAA Hours at Upgrade

Aircraft	Sample Size	Mean Change in Hours
AC-130H	5	-381
C-130E/H	50	-122
E-3C	16	-1596
F-15	23	-18
F-15E	12	10
KC-135	60	-70
P(T<=t)	0.0000	

Navigator Total Hours. The p-value for navigator total hours was 0.95. This difference is not statistically significant. Table 4-50 shows the results of the ANOVA test.

Table 4-50. Navigator Total Hours

Aircraft	Sample Size	Mean Change in Hours
AC-130H	65	-124
C-130E/H	41	-28
E-3C	46	76
F-15E	41	120
KC-135	55	-3
P(T<=t)	0.95	

Navigator PAA Hours. The p-value for navigator PAA hours was 0.89. This difference is not statistically significant. The results of the ANOVA test are reported in Table 4-51.

Table 4-51. Navigator PAA Hours

Aircraft	Sample Size	Mean Change in Hours
AC-130H	65	14
C-130E/H	41	-124
E-3C	46	131
F-15E	41	89
KC-135	55	5
P(T<=t)	0.89	

Navigator Total Hours at Upgrade. The p-value for navigator total hours at instructor upgrade was 0.39. This difference is not statistically significant. Table 4-52 shows the results of the ANOVA test.

Table 4-52. Navigator Total Hours at Upgrade

Aircraft	Sample Size	Mean Change in Hours
AC-130H	7	401
C-130E/H	19	100
E-3C	7	-662
F-15E	7	-199
KC-135	35	-215
P(T<=t)	0.39	

Navigator PAA Hours at Upgrade. The p-value for navigator PAA hours at instructor upgrade is 0.11. This difference is not statistically significant. Table 4-53 shows the results of the ANOVA test.

Table 4-53. Navigator PAA Hours at Upgrade

Aircraft	Sample Size	Mean Change in Hours
AC-130H	7	159
C-130E/H	19	33
E-3C	7	-1074
F-15E	7	59
KC-135	35	-155
P(T<=t)	0.11	

Investigative Question Three

To answer the question whether the change in aircrew experience varied by aeronautical rating, the paired t-test was used. Before the t-test could be conducted, it was necessary to determine if the samples had equal or unequal variances. The results would determine the type of t-test required. For this determination the F-test was conducted, and in all cases, the test reported equal variances. The t-test for equal variances among samples was then used to detect differences in population means, reporting p-values for two-tail tests. The p-values were then compared to a 0.05 level of significance, to determine if changes in experience varied by aeronautical rating.

For each random sample taken, the difference in flight hours was measured by subtracting the September 1991 hour value from the June 1993 hour value. An increase in flight hour activity was reported with a positive value, while a decrease in flight hour activity was reported with a negative value.

Total Hours. The p-value for the comparison of total hours for pilots and navigators equaled 0.35. This value indicates that no significant difference in mean total hours existed. The results of the test are reported in Table 4-54.

Table 4-54. Total Hours

	Pilots	Navigators
Mean	-138	-4
Standard Deviation	1731	1652
Sample Size	333	248
P(T<=t)	0.35	

PAA Hours. The p-value for the comparison of PAA hours for pilots and navigators equaled 0.09. This value indicates that no significant difference in mean PAA hours existed. The results of the test are reported in Table 4-55.

Table 4-55. PAA Hours

	Pilots	Navigators
Mean	-145	23
Standard Deviation	1135	1204
Sample Size	333	248
P(T<=t)	0.09	

Total Hours at Upgrade. The p-value for the comparison of total hours at instructor upgrade for pilots and navigators equaled 0.40. This value indicates that no significant difference in mean total hours at upgrade existed. The results of the test are reported in Table 4-56.

Table 4-56. Total Hours at Upgrade

	Pilots	Navigators
Mean	-257	-117
Standard Deviation	1218	1128
Sample Size	166	75
P(T<=t)	0.40	

PAA Hours at Upgrade. To conduct the paired t-test, the increase or decrease in PAA hours at instructor upgrade was calculated for both pilots and navigators for all aircraft in the sample. These values were used in the t-test, with a resulting p-value equaling 0.55. This difference is not statistically significant. The results of the test are reported in Table 4-57.

Table 4-57. PAA Hours at Upgrade

	Pilots	Navigators
Mean	-229	-144
Standard Deviation	1020	1012
Sample Size	166	75
P(T<=t)	0.55	

Trend Analysis

As described previously in Chapter III, descriptive statistical data were provided by AFMPC personnel. Provided were the mean values for the population of pilots and navigators for each operational factor used to define experience. These data points included three points prior to the force reduction initiatives, and three points after. Data points prior to the reduction included quarterly averages for the period ending September 1990, March 1991, and September 1991. Data points after the reduction included quarterly averages for the period ending March 1993, June 1993, and September 1993. Although a random sample of data has been statistically analyzed to answer the investigative questions, trend analysis provides significant amplifying information for use when making managerial assessments of flight hour activity. For example, the rate of change of flight hour activity might be statistically insignificant, but a visual representation shows that an increase or decrease has occurred. This ability to detect changes is critical for assessing the impact of force reduction initiatives on aircrew experience levels.

The trend analysis was conducted on two experience factors, total hours and total PAA hours. Because these two factors provide an overall picture of flight activity, the trend analysis was limited to these factors. A total of eleven graphs was produced containing both total and PAA hours, one for each crew position/aircraft combination. The series of graphs was divided into three categories including increases in flight hours, decreases in flight hours, and no significant change. Each of these categories will be described in the following sections and is summarized in Table 4-58.

Table 4-58. Changes in Flight Hour Activity

Increase	Decrease	No Significant Change
C-130E/H Nav Total	AC-130H Pilot Total	AC-130H Nav PAA
C-130E/H Nav PAA	AC-130H Pilot PAA	F-15E WSO Total
E-3C Nav Total	AC-130H Nav Total	KC-135 Pilot Total
E-3C Nav PAA	C-130E/H Pilot Total	KC-135 Pilot PAA
F-15 Pilot Total	C-130E/H Pilot PAA	
F-15 Pilot PAA	E-3C Pilot Total	
F-15E Pilot Total	E-3C Pilot PAA	
F-15E Pilot PAA		
F-15E WSO PAA		
KC-135 Nav Total		
KC-135 Nav PAA		

Increases in Flight Hour Activity. As stated previously, the change in flight activity was plotted in a series of line graphs for each crew position/weapon system combination. The most significant of the combinations reported in Table 4-58 is the data for the E-3C navigator. The data are presented in Figure 4.1. The graph illustrates that the mean flight hour activity, for both total and PAA hours, has been increasing steadily since September 1990. This rate of increase was the most significant of the combinations reported in Table 4-58. The KC-135 navigator showed similar rates of change. The remaining graphs are reported in Appendix A.

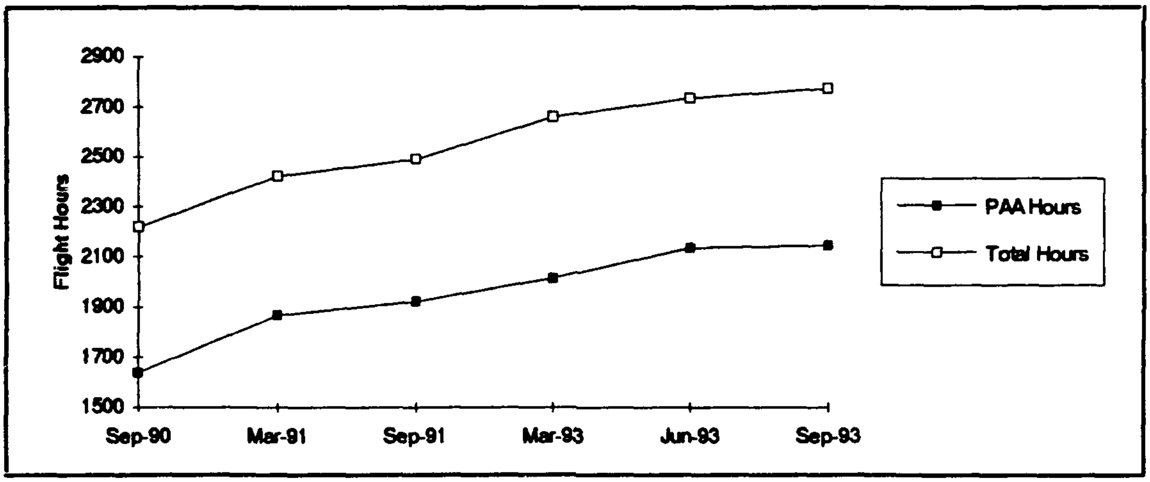

Figure 4-1. E-3C Navigator Flight Hour Activity

Decreases in Flight Hour Activity. The second largest category of change was the decrease in flight hour activity. The crew position/weapons system combination that illustrates this change best is the E-3C Pilot Total and PAA hours. As can be seen in Figure 4-2, an increase in flight hour activity was occurring before the drawdown period. A significant drop in flight hour activity occurred during the drawdown. Since the drawdown, the mean flight hour activity has continued to decrease. The remaining combinations reported in Table 4-58 experienced similar changes. The remaining graphs are reported in Appendix B.

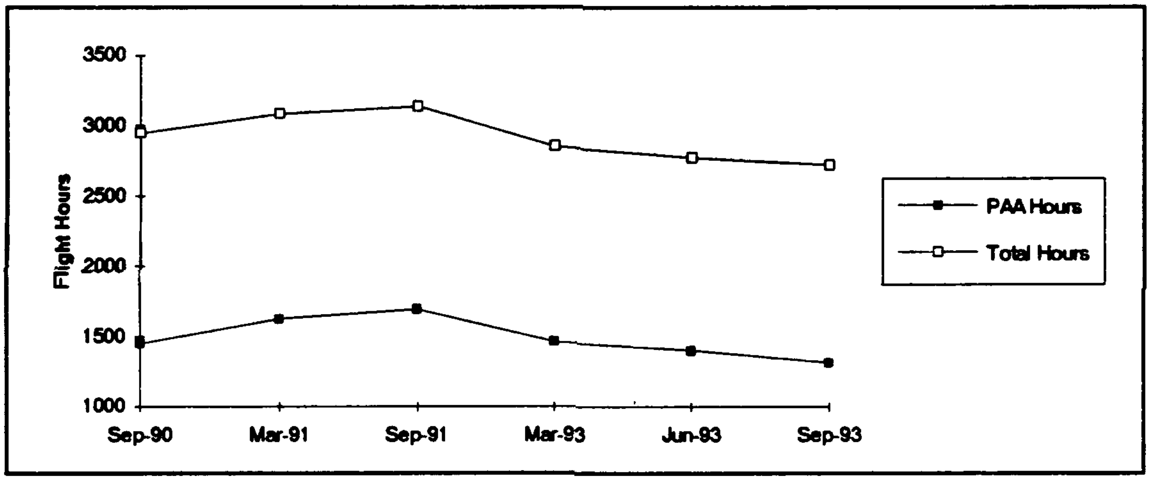

Figure 4-2. E-3C Pilot Flight Hour Activity

No Significant Changes in Flight Hour Activity. As shown in Table 4-58, several crew position/weapons system combinations experienced insignificant changes. The combination that represents this category that best fits this description is the AC-130H Navigator. Figure 4-3 illustrates this category. The remaining graphs are reported in Appendix C.

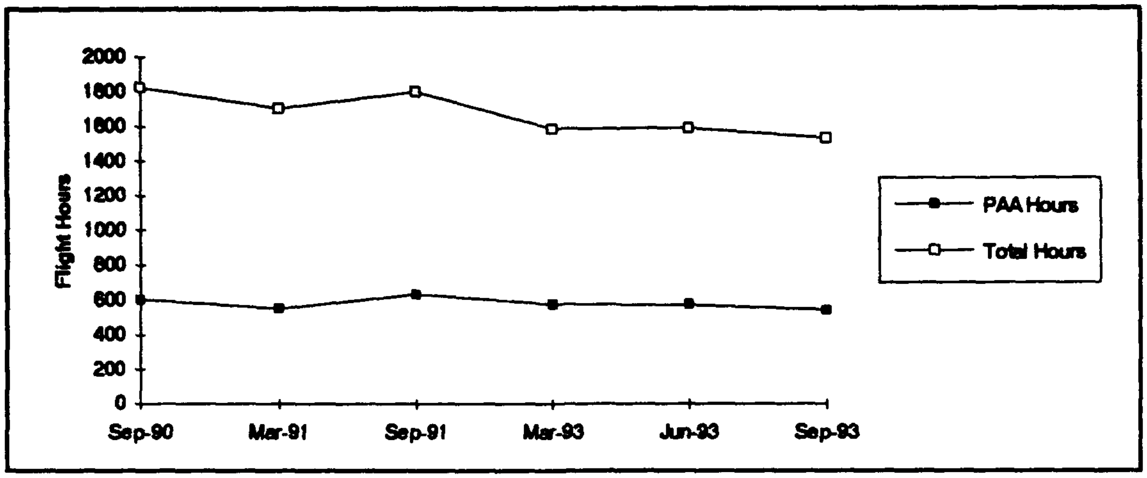

Figure 4-3. AC-130H Navigator Flight Hour Activity

Summary

This chapter has presented the statistical analyses conducted to answer the three investigative questions addressed in Chapter I. Investigative Question One is "to what degree has the overall aircrew experience of pilots and navigators for each weapon system changed." The statistical test conducted identified significant decreases in experience for AC-130H navigators (PAA hours at upgrade), F-15E WSOs (Total hours at upgrade), E-3C pilots (Total and PAA hours at upgrade), and KC-135 pilots (PAA hours).

Investigative Question Two is "has the change in aircrew experience varied by weapon system." The ANOVA test conducted identified a significant difference in aircrew experience across weapon systems for pilot total hours and PAA hours at upgrade. The first distinct group was comprised of the AC-130H, C-130E/H, F-15C, F-15E, and

KC-135. For Navigators, there were no significant differences in the change in aircrew experience across weapon systems.

Investigative Question Three is "does the change in aircrew experience vary by aeronautical rating." The statistical test conducted revealed no significant differences in the change in experience levels between pilots and navigators.

This chapter has presented the results from the statistical tests conducted to answer the Investigative Questions presented in Chapter I. Chapter V integrates these results with the material presented in the literature review to answer the research question "to what extent has the aircrew experience level of pilots and navigators changed due to the personnel drawdown initiatives?" Chapter V will also present recommendations for further research in this area.

V. Conclusions and Recommendations

Chapter Overview

The purpose of this chapter is to present the conclusions that were reached based on the literature review presented in Chapter II and the statistical analysis conducted and reported in Chapter IV. These conclusions were used to answer the research question and the associated investigative questions presented in Chapter I.

The chapter is divided into three main sections. The first section is dedicated to discussing the statistically significant findings of each investigative question. The second section addresses the research question that has been the impetus for this research effort. The final section recommends additional research topics in the area of aircrew experience and force readiness.

In the discussion of investigative question one, the conclusions are presented by aircraft/crew position combination, similar to the format used in chapter IV. For investigative question two, the results are presented by crew position, and for investigative question three, the results are presented by sample population. That is, the entire sample population of pilots was compared to the entire sample population of navigators. Because the results from all the statistical tests were thoroughly discussed in

Chapter IV, only statistically significant results are discussed in Chapter V.

Significant Findings

Investigative Question One. To what degree has the overall aircrew experience of pilots and navigators changed due to personnel drawdown initiatives?

To answer this question, the researchers formed the hypothesis: The overall aircrew experience of pilots and navigators for each weapon system has changed. Data were collected and analyzed, and the results are presented in Chapter IV. The significant findings will be discussed in detail in the following section. Additionally, the findings are summarized in Table 5-1.

AC-130H Navigator. Table 4-8 shows that the mean value for PAA hours at the time of upgrade to instructor navigator decreased over 700 hours between 30 September 1991 and 30 June 1993. The p-value for the t-test conducted on this difference was 0.03, which is significant at the 0.05 level. From these results, it appears that gunship navigators are upgrading to instructor status at a much earlier stage in their flying career than they did before the drawdown initiatives. In fact, with the average number of PAA hours just below 500 hours, the average AC-130H navigator who upgraded to instructor in the third quarter of fiscal year 1993 would have required a waiver to the minimum PAA hours required for upgrading to instructor navigator.

The governing regulation, AFSOCR 51-130, states that the minimum PAA hours for this upgrade is 500 hours.

F-15E WSO. Table 4-27 shows that the mean value for total hours at upgrade decreased approximately 600 hours between September 1991 and June 1993. This difference is significant. It indicates that the F-15E weapon systems officer was less experienced in June 1993 than in September 1991 based on total hours at upgrade.

E-3C Pilot. Tables 4-31 and 4-32 show that both the changes in total hours and PAA hours are statistically significant. The mean values for these two variables decreased over 1,000 hours from September 1991 to June 1993. Again, these results suggest that the E-3C pilot was less experienced in June 1993 than he or she was in September 1991. Specifically, the results show that E-3C squadrons were upgrading aircraft commanders to instructor pilots in 1993 with significantly less total hours and PAA hours than in September 1991.

KC-135 Pilot. Table 4-38 shows that the change in PAA hours over the drawdown period is statistically significant. These results are significant for one other reason. The KC-135 pilot was the only aircraft/crew position combination that exhibited a significant decrease in flying hour activity for either total hours or PAA hours. All other decreases in flying hour activity were associated with either total hours or PAA hours at the time of instructor upgrade.

Table 5-1. Summary of Test Results for Investigative Question One

	Total Hours	PAA Hours	Total Hours at Upgrade	PAA Hours at Upgrade
	p-value	p-value	p-value	p-value
AC-130H				
Pilot	.99	.51	.78	.29
Nav	.71	.79	.73	<u>.03</u>
C-130E/H				
Pilot	.38	.15	.58	.40
Nav	.92	.65	.71	.91
F-15C				
Pilot	.66	.31	.33	.71
F-15E				
Pilot	.42	.39	.29	.94
WSO	.46	.72	<u>.03</u>	.42
E-3C				
Pilot	.64	.23	<u>.004</u>	<u>.002</u>
Nav	.82	.60	.54	.17
KC-135				
Pilot	.11	<u>.04</u>	.16	.50
Nav	.99	.97	.07	.14

Note: Significant results are underlined.

Investigative Question Two. Has the change in aircrew experience varied by weapon system?

To answer this question, the researchers formulated the hypothesis: The change in aircrew experience varies by weapon system. Significant decreases in aircrew experience across weapon systems were found for pilots only. Table 5-2 summarizes the findings presented in Chapter IV.

Pilots. The results of the data analysis presented in Chapter IV, specifically Tables 4-47 and Table 4-49, indicate that two weapon systems were statistically different from the others for pilot total hours at upgrade and PAA hours at upgrade. The tests indicate that E-3 pilots and AC-130H pilots exhibited a decrease in the amount of hours required to upgrade to instructor when compared to the other weapon system positions.

Several possible reasons for the decrease in flight hours required at the time of upgrade exist. First, both weapon systems have experienced an influx of experienced pilots from retired weapon systems such as the B-52. As these pilots enter the weapon system, the time required to achieve proficiency is significantly shorter than that of pilots arriving directly from undergraduate pilot training (UPT).

A second possible reason for the decrease in flight hours required for upgrade can be attributed to UPT program reductions. To meet DoD force reduction requirements, the number of pilot candidates for UPT has dramatically decreased, resulting in several UPT base closings. As with the pilots of retired weapon systems, the cadre of UPT instructor pilots has migrated to other weapon systems, including the E-3 and AC-130H. On average, these experienced pilots require significantly lower amounts of flight time before upgrading to instructor than pilots arriving to the weapon system directly from UPT.

Table 5-2. Summary of Test Results for Investigative Question Two

	Total Hours p-value	**PAA Hours** p-value	**Total Hours at Upgrade** p-value	**PAA Hours at Upgrade** p-value
Pilots	.91	.35	.001	.0000
Navigators	.95	.89	.39	.11

Investigative Question Three. <u>Does the change in aircrew experience vary by aeronautical rating?</u>

To answer this question, the following hypothesis was formed: The change in aircrew experience varies by aeronautical rating. Statistical testing for each category of experience revealed that no significant differences existed between pilots and navigators. Table 5-3 summarizes the results published in Chapter IV.

Table 5-3. Summary of Test Results for Investigative Question Three

	Total Hours p-value	PAA Hours p-value	Total Hours at Upgrade p-value	PAA Hours at Upgrade p-value
Pilots /Navigators	.35	.09	.40	.55

Research Question

The objective of this study was to answer the research question: To what extent has the aircrew experience level of pilots and navigators changed due to personnel drawdown initiatives?

The data collected and analyzed for this research yield inconclusive evidence to support the hypothesis that overall aircrew experience has declined. Fifty-five statistical tests were conducted to measure the change in experience for each crew position and/or weapon system. Of these fifty-five tests, only four resulted in a significant decrease in flying hour activity and only one revealed a difference between weapon systems. None of the tests resulted in any significant increases in flying hour activity, although there were several statistically insignificant increases in flying hour activity.

The significant decreases in flying hour activity were all related to the number of total or PAA hours at the time of upgrade to instructor, except in one crew position. The lone exception was the KC-135 pilot. This crew position exhibited a significant decrease in the number of PAA hours from September 1991 to June 1993. A question that arises from these results is: Why are the significant decreases in aircrew experience related to the operational definitions associated with flying hours at the time of instructor upgrade?

The researchers believe that the answer to this question is related to the manner in which the rated force is managed by squadron leadership. Although the number of flying hours at the time of upgrade to instructor status gives an indication of the experience level of a squadron's flight instructors, this variable is easily manipulated by a squadron's commander. For example, if a commander must choose between a pilot with 2,000 total hours and one with 1,000 hours to become the next instructor pilot, his decision will affect the experience variable, total hours at upgrade. It will not affect the overall experience level of the squadron's pilots, but it does affect the experience level of the commander's flight instructors.

Because the number of pilots and navigators has decreased by approximately 10% since 1987, squadron commanders have had a smaller pool of candidates to choose from in terms of filling flight instructor billets. This smaller population of candidates could necessitate the selection of a crew member with fewer flying hours than normally desired.

Another question that the results of this research raises is: Why do the majority of the statistical tests show insignificant changes in aircrew experience? A plausible cause for these tests results is related to the decrease in the number of aircraft in the USAF inventory and to the subsequent need for the Banked Pilot Program. Because of force restructuring, the USAF has reduced its inventory of aircraft from 6189 in September 1991 to 4896 in September 1993 (19:40). This 19 percent reduction in the number of aircraft has called for a reduction in the number of crew members to operate these systems.

One method utilized by the USAF to reduce aircrew numbers is the Banked Pilot Program. Instead of bringing new, inexperienced pilots onto active flying status, these officers were assigned to nonflying billets. From May 1991 to October 1993, approximately 900 pilots were assigned to nonflying jobs (20:3). These pilots will eventually be given flying assignments. With no increases in the number of aircraft in the USAF inventory planned, experienced pilots will have to be removed from active flying status to make room for the younger, less experienced pilots. This changing of the force structure will obviously change the experience level of the pilots in the Air Force.

Another possible reason for the inability of the statistical tests to detect a change in aircrew experience is the limited sample sizes available and the large sample standard deviations encountered. These two factors significantly increase the statistical power required to detect a difference in means of two populations. This shortcoming in the research data leads to an area for further research.

Implications of Findings

It is important to note the timing of this research effort. This research was performed in the middle of a force restructuring period, and the full impact of personnel reduction initiatives has not been felt entirely. Few published studies were found on this or closely related subjects. This lack of published material could imply that the significance of these reductions is not fully known. One report that has been published is the "Readiness Watch" by the Hollow Force Update Task Force. This task force is comprised of four Republicans in the House of Representatives (21:1). These representatives are concerned about, and committed to preventing, a return to the hollow military of the late 1970s. A hollow force is one that looks strong on paper but lacks the necessary manpower, training, and material readiness to accomplish its mission. This hollow military was a direct result of defense and personnel spending reductions following the Vietnam war. Although these issues are not directly tied to aircrew experience, they can be viewed as a forewarning to future aircrew experience levels.

The Department of Defense budget has been reduced by approximately 30 percent since 1986, and if the cuts continue as projected, FY 1998 will reflect a total reduction of 46 percent. As in the 1970s, these reductions are leading to reduced operations and maintenance budgets, reduced quality of recruits, and most importantly, the reduction of the readiness of our forces (22:1).

Numerous military service leaders agree that the budgetary and personnel cuts already have had, and will continue to have, a devastating impact on our forces' readiness. Several examples exist to support these claims. For example, the backlogs of equipment waiting for regular depot maintenance are growing because the services cannot afford the necessary repairs. In its 1994 budget, the Army can fund only 58 percent of its depot requirement. The Navy can only fund 73 percent, down from 93 percent in 1993 (23:1).

A second example involves OPTEMPO, the leading measure of training time used to gauge a force's readiness. The current five-year budget calls for cuts in each service component's OPTEMPO. The Air Force is reducing to 15 fighter wing equivalents, and will have to cut deeply into air defense, bomber, and mobility missions (23:1). As stated by General Joseph Hoar, Commander-in-Chief U.S. Central Command, before the Senate Armed Services Committee in March 1994, "Airlift in this country is broken right now . . . I'm not sure it's workable for one major regional contingency" (21:1).

The task force has given much attention to the dramatic defense spending and personnel reductions made by the Clinton Administration in an attempt to reduce the national debt. It believes that the Administration's most recent five-year defense budget severely undermines the military's ability to maintain its two-war strategy and inadequately supports the present force structure. If the statement made by General Hoar has any validity, the U.S. military posture is in grave danger.

The most significant impact seen to date resulted from the Department of Defense "bottom-up" review, conducted in the Spring of 1993. The objective of this review was to establish the resource requirements for each service component based on its defined roles and missions. Apparently, the review did not occur as planned. Instead of developing a budget to meet these needs, the services were forced to reduce their budgets to meet a preconceived budgetary limit. This budgetary limit resulted in dramatic personnel reductions for each service (24:2). The Clinton Administration believes that the military can compensate for fewer soldiers by depending on system modernization that have not yet been procured. That is, "they plan to make up for shortfalls in manpower by packing more firepower and better intelligence into those that remain with system modernization that will be bought at some point down the road" (25:1).

The impact of these findings is significant. As the world becomes less secure, the need for American conventional forces is becoming greater, not less. Unfortunately, our current course of reduction initiatives has the potential to extend our forces abroad under circumstances where our personnel do not have the proper training, equipment, nor the readiness to do what is expected of them. It is vital that the Air Force, as well as the other services, remain strong not just to fight battles but to deter battles from happening. The defense budget cuts make the armed forces less secure and our interests less secure in the world as well (24:3). As stated by Representative Jim Talent, the Clinton Administration has two options. The first is to finance the armed services at a level which supports their stated missions. The second is to structure our foreign policy around the reality of the United States as a hemispheric, rather than an international power. "The worst choice is the one the administration is pursuing, increasing our commitment abroad while hollowing out our military, thus assuring American involvement in confrontations that we cannot win" (26:1).

Recommendations for Further Study

This study provides two possible areas for further research.

1. A more comprehensive, follow-up study using the same methodology could be conducted. A census of the selected population would provide a more detailed picture of the population's experience level, and would counter the small sample sizes and large standard deviations encountered in this research effort. On the negative side, this type of study would probably require that the researchers travel to AFMPC and provide the labor needed to collect the data from the databases. Although this research effort would require more time and money than the original research, it would yield more comprehensive results concerning the effects of personnel reductions on aircrew experience.

2. A more ambitious research effort related to this area would be one associated with the relationship between aircrew experience and aircrew performance. This type of study would be ambitious because it would most likely require an experimental design methodology, instead of the familiar ex post facto or case study design.

What little research that has been performed in this area was conducted with single-seat, fighter aircraft (6:4). The effects of aircrew experience on performance in multi-crew aircraft have not been quantitatively measured.

Summary

The purpose of this chapter was to answer the research question proposed in Chapter I. This question was: To what extent has the aircrew experience level of pilots and navigators changed due to the personnel drawdown initiatives? Three investigative questions were formed to guide the research effort. From the data analysis performed in Chapter IV, the researchers concluded that the overall experience level of the selected population has not yet been affected by personnel reductions.

Again, it is important to note the timing of this research effort. This research was performed in the middle of a force restructuring period. As of the completion of this study, the USAF was still faced with further personnel reductions which may or may not affect its aircrew experience levels.

Appendix A: Trend Data for Increases in Flight Activity

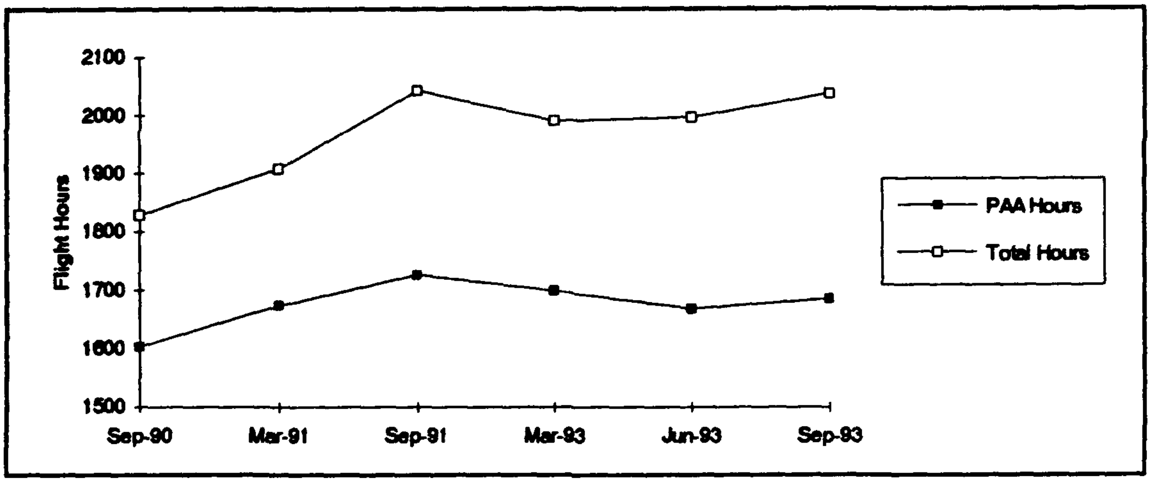

Figure A-1. C-130E/H Flight Activity

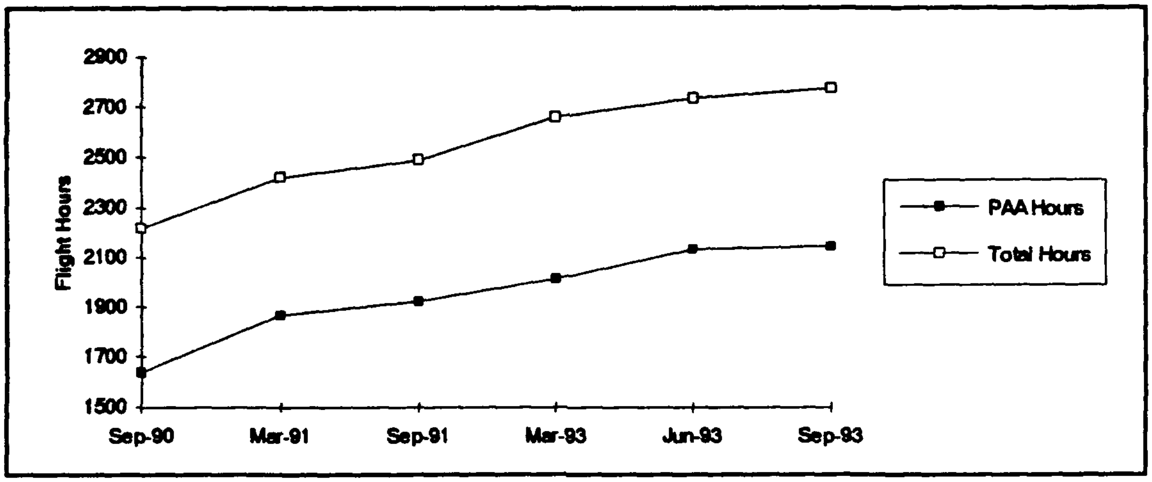

Figure A-2. E-3C Navigator Flight Activity

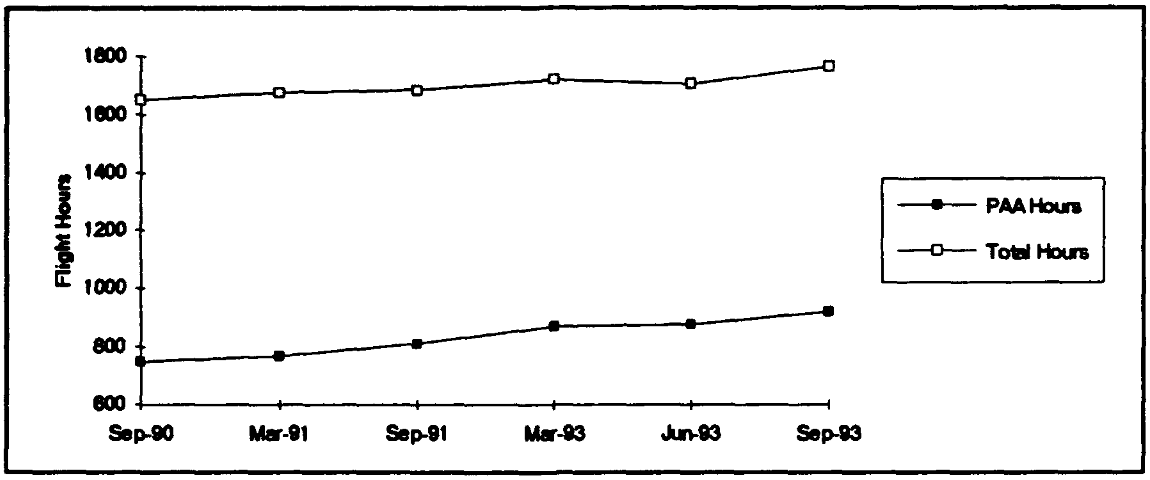

Figure A-3. F-15 Pilot Flight Activity

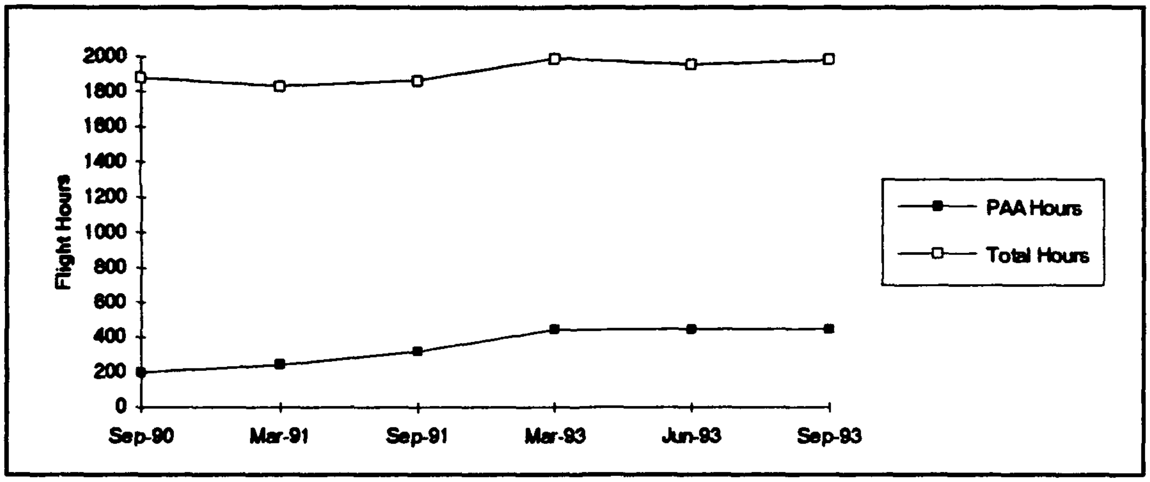

Figure A-4. F-15E Pilot Flight Activity

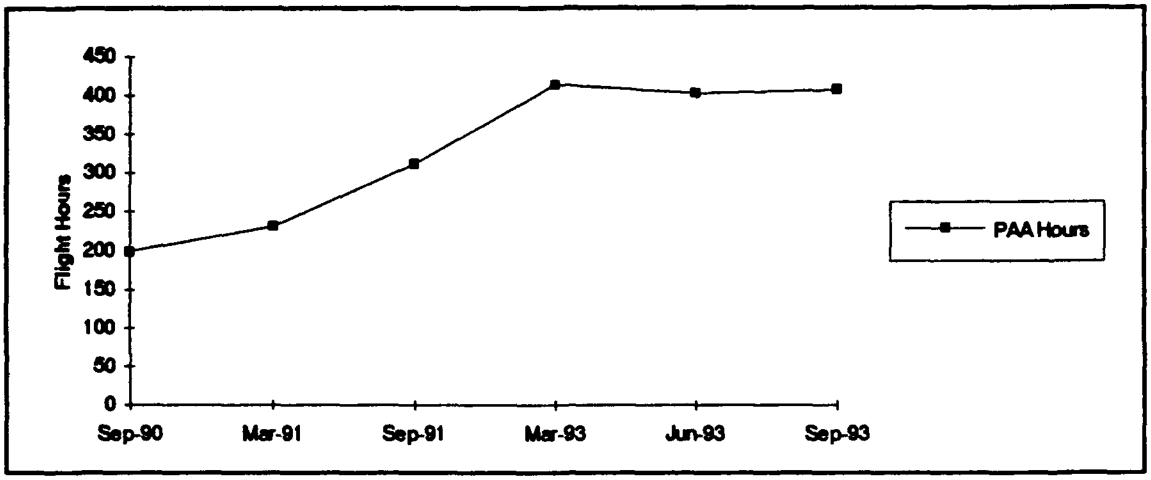

Figure A-5. F-15E WSO Flight Activity

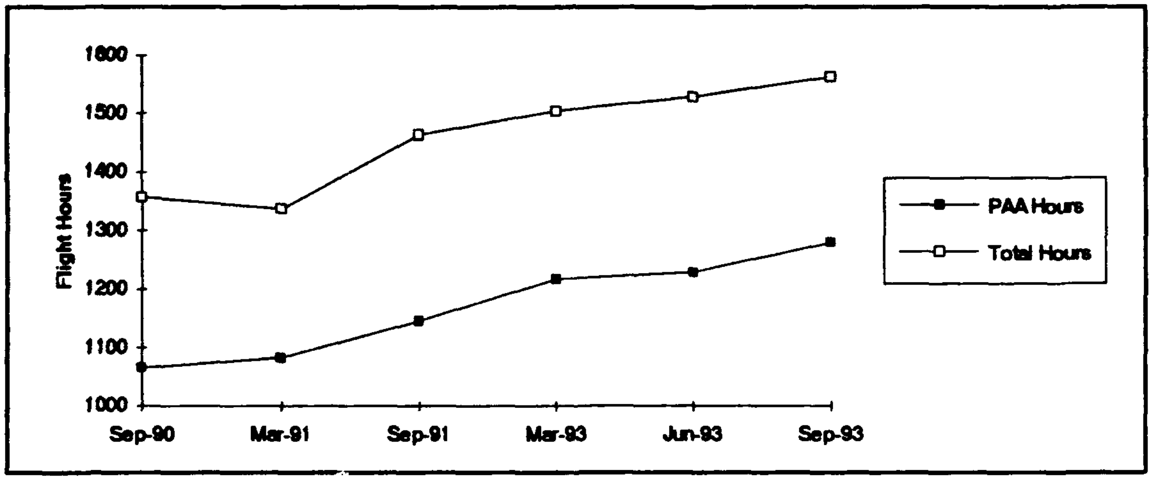

Figure A-6. KC-135 Navigator Flight Activity

Appendix B: Trend Data for Decreases in Flight Activity

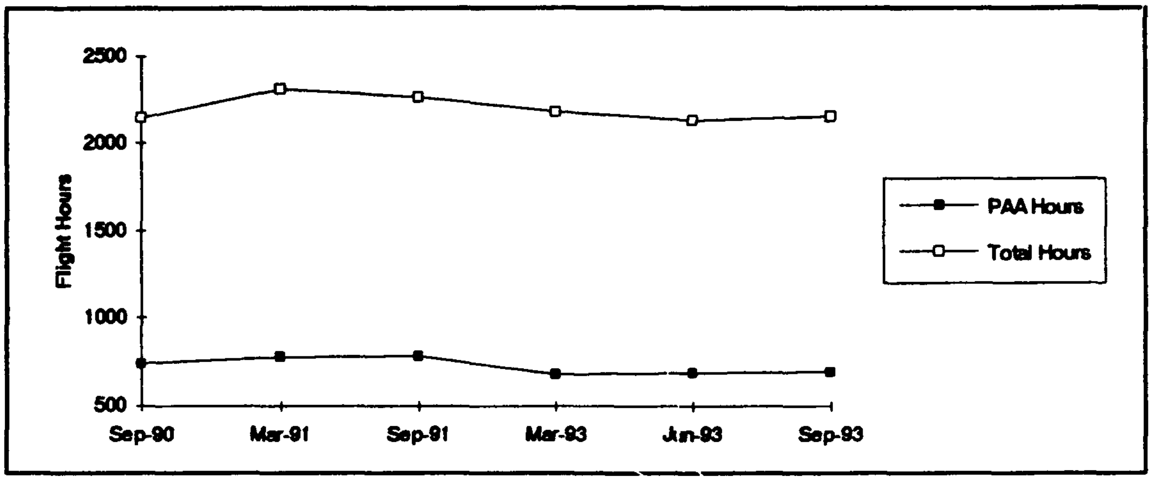

Figure B-1. AC-130H Pilot Flight Activity

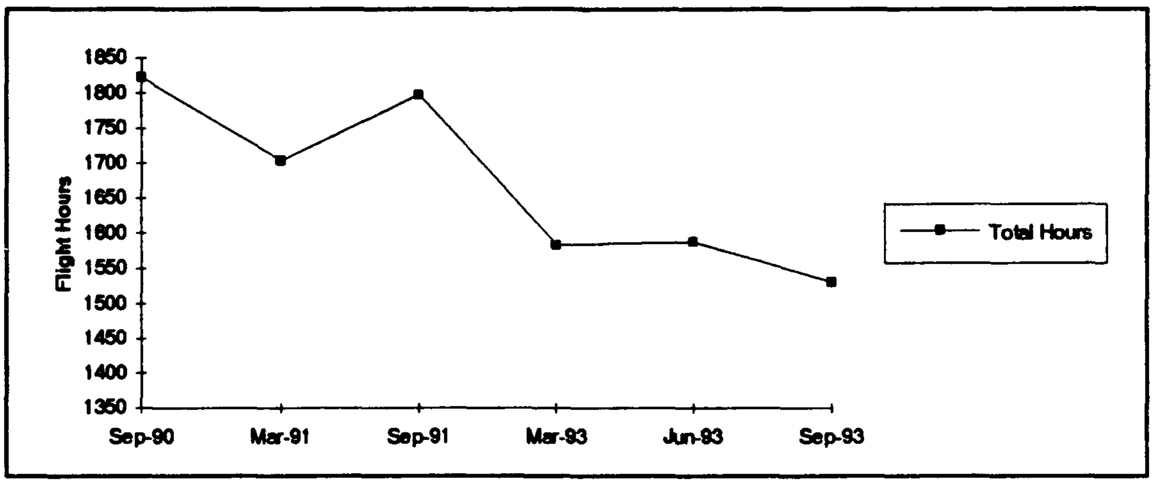

Figure B-2. AC-130H Navigator Flight Activity

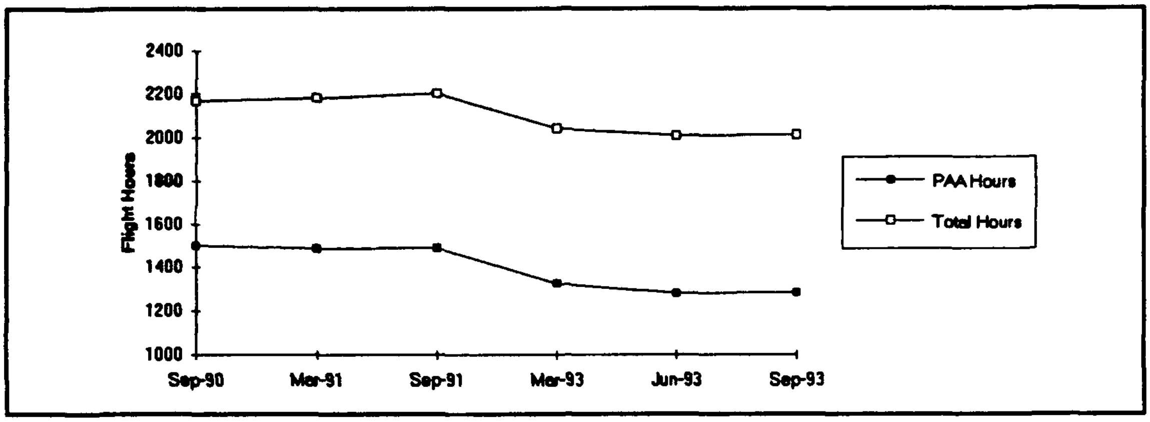

Figure B-3. C-130E/H Pilot Flight Activity

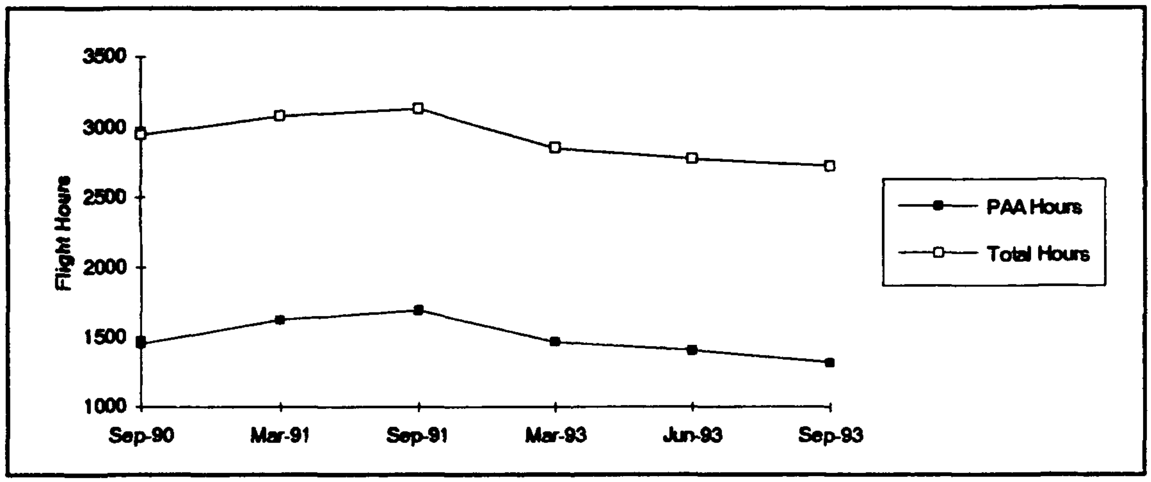

Figure B-4. E-3C Pilot Flight Activity

Appendix C: Trend Data for No Significant Changes in Flight Activity

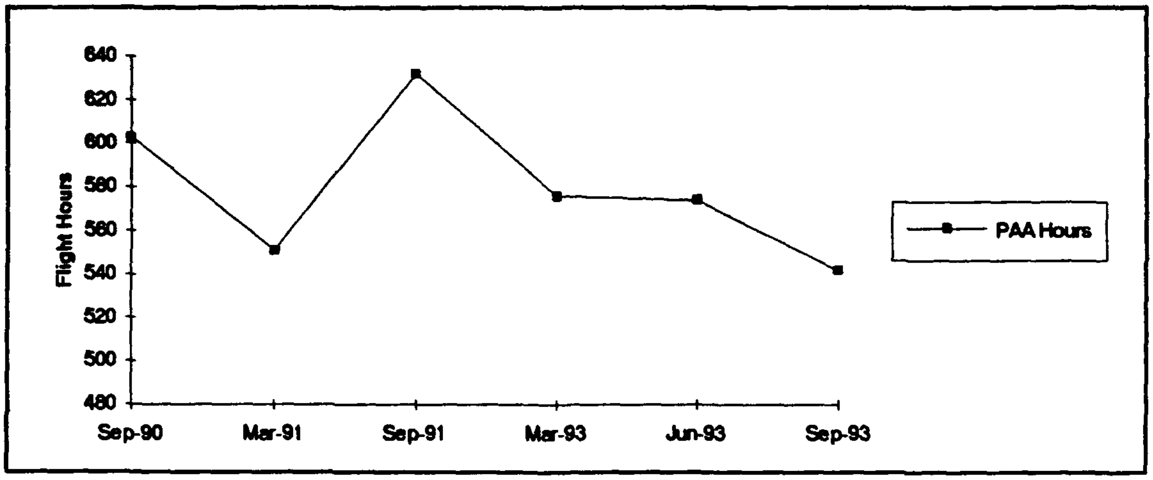

Figure C-1. AC-130H Navigator Flight Activity

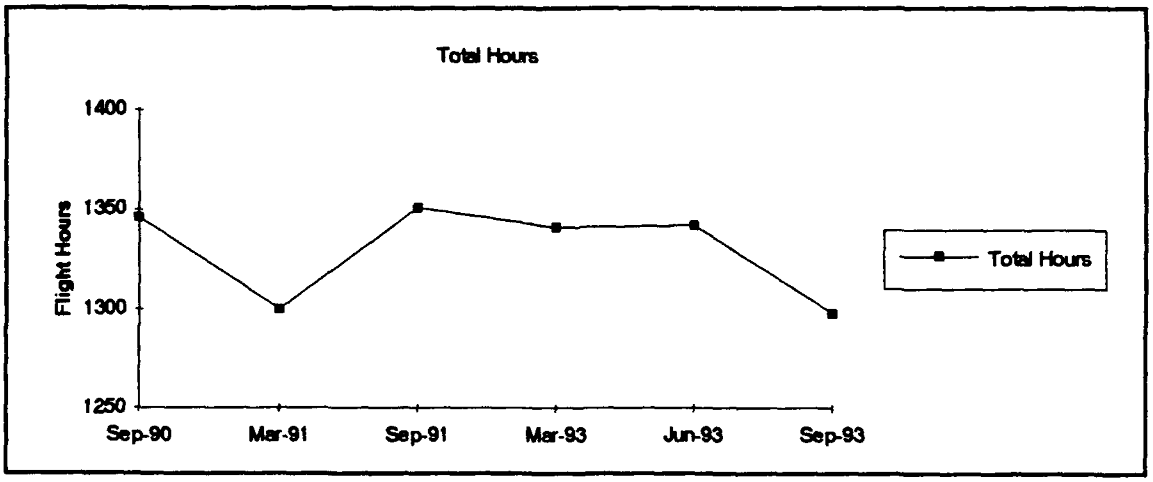

Figure C-2. F-15E WSO Flight Activity

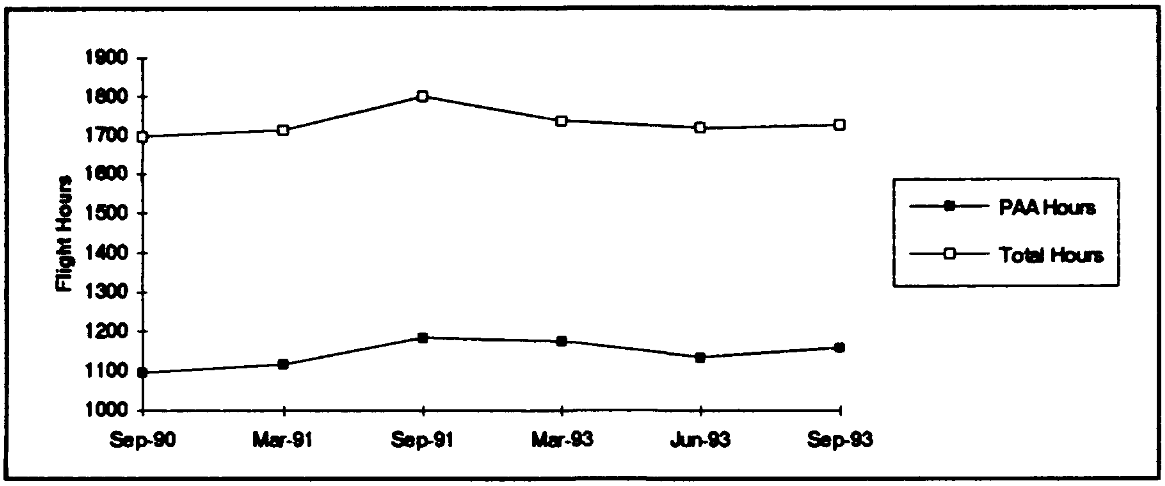

Figure C-3. KC-135 Pilot Flight Activity

Bibliography

1. Greenburg, Irv and others. The DoD Drawdown: Planned Spending and Employment Cuts. Bethesda MD: Logistics Management Institute, January 1993 (AD-A266816).

2. Callander, Bruce D. "Going: A Fifth of the Air Force," *Air Force Magazine*, *74*: 37 (February 1991).

3. West, Joe. "2,400 AF majors, captains to face SERBs," *Air Force Times*, *52*: 3 (9 March 1992).

4. West, Joe. "RIF board picks 1,595," *Air Force Times*, *53*: 3 (31 August 1992).

5. Borowsky, Michael S. Readiness and Retention: Pilot Flight Experience and Aircraft Mishaps. Final Report, 1977-1985. Norfolk VA: U.S. Naval Safety Center, June 1986 (AD-A173911).

6. Cedel, Thomas E. and Ronald P. Fuchs. An Analysis of Factors Affecting Pilot Proficiency. Final Report, 1984-1986. Washington DC: Fighter Division, Directorate of Theater Force Analyses, Air Force Center of Studies and Analysis, December 1986 (AD-A109757).

7. Jones, L.R. "Management of Budgetary Decline in the Department of Defense in Response to the End of the Cold War," *Armed Forces and Society*, *19*: 504 (Summer 1992).

8. Dudney, Robert S. "Forty percent and dropping," *Air Force Magazine*, *76*: 23 (August 1993).

9. Willis, Grant. "Jehn: Bonuses to save 25,000 force-outs," *Air Force Times*, *53*: 4 (28 September 1992).

10. West, Joe. "Risk of RIF declines for some," *Air Force Times*, *52*: 3 (27 July 1992).

11. Maze, Rick. "CBO: 50,000 would retire after 15 years," *Air Force Times*, *53*: 3 (31 August 1992).

12. "95 drawdown plan expands early-out criteria," *Skywrighter*, 9 (7 January 1994).

13. West, Joe. "Air Force slowing officer early outs for 1993," *Air Force Times*, *53*: 3 (30 November 1992).

14. West, Joe. "Experience important, but won't guarantee job," *Air Force Times*, *53*: 13 (8 February 1993).

15. Borowsky, Michael S. "Naval Training Command Mishaps and Instructor Experience," *Aviation, Space and Medicine*, *57*: 65-70 (January 1986).

16. Hammon, Colin P. and Stanley A. Horowitz. Flying Hours and Aircrew Performance, Final Report, July 1987-December 1989. Alexandria VA: Institute for Defense Analyses, March 1990 (AD-A228582).

17. "Aircraft, Type, Total, and Primary Aircraft Authorized," *Air Force Magazine*, *76*: 41 (May 1993).

18. McClave, James T. and P. George Benson, *Statistics for Business and Economics*, Fifth Edition, Dellen Publishing Company, 1991: 443.

19. "Aircraft Inventory," *Air Force Magazine*, *77*: 40 (May 1994).

20. Hudson, Neff. "Into the wild blue yonder...Finally," *Air Force Times*, *53*: 4 (18 October 1993).

21. Talent, Jim and others. Readiness Watch, Hollow Force Update Task Force, *1*: 1 (March 1994).

22. Talent, Jim and others. Hollow Forces Update Committee Report #3, Congress of the United States, House of Representatives (January 1994).

23. Talent, Jim and others. Hollow Forces Update Committee Report #1, Congress of the United States, House of Representatives (June 1993).

24. Congressional Record. Proceedings and Debates of the 103d Congress. First Session, *139*: 161 (18 November 1993).

25. Talent, Jim and others. Hollow Forces Update Committee Report #2, Congress of the United States, House of Representatives (18 November 1993).

26. Talent, Jim. "What It Costs the Military to Do the Job," *The New York Times*, 2 February 1994, sec B:4.

Vita

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Vita

Captain Lennie J. Simpson was born on 14 February 1965 at Langley AFB, Virginia. He graduated from South Young High School in Knoxville, Tennessee and attended the University of Tennessee, graduating with a Bachelor of Science Degree in Industrial Engineering in December 1987. Upon graduation, he received his commission in the USAF and was assigned to Tinker AFB, Oklahoma as an Air Weapons Controller aboard the E-3C Airborne Warning and Control (AWAC) Platform, 965th AWAC Squadron. While there he served as a weapons director, instructor weapons director, senior director, and instructor senior director. Additionally, he served as a wing current operations officer and wing DO executive. Before departing Tinker AFB, he served as an instructor in the 966th AWAC Training Squadron, where he directed senior director academic, flight, and similar training for initial and upgrade personnel. He entered the School of Systems and Logistics, Air Force Institute of Technology, in May 1993. Captain Simpson and his wife Karen have one child, Joshua.

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This study analyzed the effects of personnel reduction initiatives on aircrew experience levels of Air Force pilots and navigators. Four key measures of experience were defined, including total flight hours, flying hours in Primary Assigned Aircraft (PAA), total hours at time of upgrade to instructor, and total PAA hours at time of upgrade to instructor. Three objectives were established for this study. These objectives measured the degree of change in overall aircrew experience for pilots and navigators in six major weapon systems, to determine if changes in aircrew experience varied by weapon system, and if changes in aircrew experience varied by aeronautical rating. Fifty-five statistical tests were conducted to determine if significant decreases in experience had occurred. For the first objective, significant decreases in experience were, except for one, related to total or PAA hours at time of upgrade. The exception was a decrease in experience attributed to total PAA hours. Tests for the second objective indicated that the AC-130H and E-3C experienced significant changes over all other weapon systems. Finally, no significant differences were revealed between aeronautical ratings.

14. SUBJECT TERMS
Aircrew Experience, Personnel Reduction Initiatives, Pilots, Navigators

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