ASSESSMENT OF MAF PILOT OVERABSORPTION:
EXPANSION OF THE 1999 RATED SUMMIT INTENT

GRADUATE RESEARCH PAPER

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AFIT-ENS-MS-17-J-044

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GRADUATE RESEARCH PAPER

Presented to the Faculty
Department of Operational Sciences
Graduate School of Engineering and Management
Air Force Institute of Technology
Air University
Air Education and Training Command

In Partial Fulfillment of the Requirements for the
Degree of Master of Science in Operations Management

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June 2017

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Committee Membership

Dr. Bradley C. Boehmke
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Abstract

This paper seeks to expand on the 1999 Rated Summit’s decision to increase Mobility Air Force’s (MAF) pilot production beyond requirements in order to cover Combat Air Force’s (CAF) pilot production shortfalls in order to ensure the total Air Force requirement of pilots is met. Then, as now, the Air Force was faced with a significant pilot shortfall that was projected to get worse. Up until recently, the 1999 Rated Summit strategy was successful. To that end, this paper will research and analyze the current MAF pilot production model, post-Undergraduate Pilot Training (UPT), looking for any ability to overabsorb, with costs in mind, in order to expand on the 1999 Rated Summit’s original intent. Research will focus on a historical review of rated officers, pilot production timelines to reach the ‘experienced’ level and costs associated with the different Major Weapon System (MWS) tracks (C-17 vs KC-135, etc). The goal of the research paper is to determine if additional capability exists to create more MAF pilots and to identify potential courses of action to give the Air Force an option to meet its total pilot requirements in the near and long term.
To my wife and children, thank you for your support and putting up with countless hours of me hiding in my office during this academic year. Your good humor and sense of adventure keep me going these many long days and nights.
Acknowledgments

I would like to express my sincere appreciation to my AFIT advisor, Bradley Boehmke for his superb guidance and support throughout the course of this graduate research paper. His insight and experience helped shape and keep this paper on target throughout the writing process. I would also like to thank my Air Force mentor, Col Brian Smith AMC/A3T, and the team at Air Mobility Command for their willingness to be so generous with their time. Mr. Jim ‘Coop’ Cooper and Mr Robert ‘Bob’ Neilson of AMC/A3T were indispensable, as was Mr. Joseph Windincamp of AMC/A3TR. I’d also like to thank Col Christopher Colbert and Mr. Carroll Ingram of HAF/A3O whose support was critical in completing this paper. Finally, I’d like to thank AFIT professors Lt Col Jason Anderson and Maj Benjamin Hazen for their instructional prowess and guidance throughout the year.

Jeffrey J. Pedersen
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I. Introduction

General Issue

Over the past twenty years the Air Force (AF) has, at times, struggled to produce enough experienced pilots to fulfill its requirements (Callander, 1996; Taylor, Moore, & Roll, 2000; Woodward, Curry, & Smith, 2016). Recently, numerous news outlets have stated the Air Force will be short 700 pilots by the end of 2016 and one thousand short by 2022 (Tomlinson, 2016). These statements were backed up by the Chief of Staff of the Air Force (CSAF) and the Secretary of the Air Force (SecAF) comments lamenting these challenges (Starr & Browne, 2016). This negative trend is likely to worsen before it gets better. This is, unfortunately, not the first time the Air Force has faced challenges of this magnitude.

Today’s issues are strikingly similar to 1999 when high operations tempo, force reductions, perceived worsening of quality of life on active duty, and a marked uptick in commercial airline hiring drove the AF pilot shortage to a deficit approaching one thousand (Gebicke, 1999). Comments made then could easily be viewed as being made today: “We are in the worst shape rated management-wise in the history of the AF (p. 3); significant inventory shortfalls exist and are increasing (p. 3); readiness is on a downward trend; retention levels near record lows (p. 3)” (AF/XO, 1999). The last sentence highlights the opening comments to the 1999 4-star rated summit on the challenges facing the AF’s pilot requirement to inventory mismatch. Then, as now, a
solution must be found before operational squadrons and associated staffs become dysfunctional.

The 1999 4-star rated summit looked at a variety of ways to fix the pilot shortage problem. Specifically, they looked at increasing retention through increasing the pilot bonus and flight pay, restructuring the AF so as to lessen the requirement for the number of pilots and thereby reducing the shortage, and increasing pilot production. They were successful in some of their endeavors to fix the problem but one portion of the solution provided motivation for a more in-depth look. It was acknowledged that fighter pilot production was below sustainment levels, meaning the AF was training fewer fighter pilots than it needed. Clearly this situation, if left alone, would result in dysfunction over time. The 4-star rated summit recognized this; however, instead of attacking the fighter pilot production problem directly, they opted to increase Mobility Air Force (MAF) pilot production in order to cover the Combat Air Force (CAF) pilot underproduction. Effectively this meant that they were willing to allow the CAF to slowly atrophy while creating more MAF pilots than required in order to fill non-flying jobs such as staffs, remotely piloted aircraft (RPAs), among others, previously filled by fighter pilots.

The long-lasting impact of this decision from 1999 is illustrated in the CSAF’s Rated Staff Allocation Plan (RSAP). The RSAP is reviewed on a continual basis, updated, and published in the spring of each year. The 2016 RSAP highlights the CAF pilot shortfall by severely limiting fighter pilots’ abilities to participate in AF functions outside of flying. While this may sound good on the surface - *pilots like to fly* - artificially limiting a pilot’s ability to broaden via service above the Wing level (staff) severely limits professional officer development. Specifically, the 2016 CSAF signed
RSAP acknowledges the shortfall by limiting fighter pilots to: fill only 40% of entitlements in Air and Space Operations Centers (AOCs); 81-85% of entitlements in Test flying units; 20-23% of their entitlements for office of SecDef, Joint Chiefs of Staff (JCS), and Combatant Commands (COCOMs); and 19-23% filled of all other staffs (primarily Major Commands (MAJCOMs)) of their fighter pilot entitlements.

**Problem Statement**

This research will seek to understand the impact of and analyze the potential to expand on the CSAF’s intent from the 1999 4-star rated summit. At this summit the decision was made to increase MAF pilot production such that it was generating more pilots than requirements. This research will, however, attempt to determine if the ability exists to continue and/or expand on the ’99 rated summit intent by assessing the AF’s ability to absorb MAF pilot production while taking into account training time, the time it takes to produce an experienced pilot (as defined by that major weapons system (MWS), and the costs associated with different MWS production tracks. The MAF has done a good job of meeting the 4-star’s intent, however, with an even bigger CAF shortfall upon us that is projected to get worse, combined with a potential decreasing overage in the MAF, now is the time to see if the MAF can do more than it is doing today.

**Research Focus**

In order to meet the Air Force overall rater officer requirement, MAF pilot production needs to increase. This study will focus on the historical and current MAF pilot production in order to explore alternate means to meet the 1999 4-star rated summit intent. First, a detailed literature review will be performed to provide fundamental
understanding of the problem, then an analytic assessment of current relevant data is performed to identify potential COAs for increased pilot absorption. This assessment is scoped to include only MAF MWS data which includes: training timelines; cost analysis of different MAF MWSs paths to generate an experienced pilot; and aging and absorption rates of different MAF MWSs. Furthermore, budget constraints suggest that significant increased funding is unlikely for this endeavor. Therefore this research seeks to minimize future costs of any additional pilot output. This research also identifies other critical concerns requiring future research.

Assumptions/Limitations

The primary assumption, that forms the basis of this research, is that the AF, at the most senior levels, will continue to be unwilling or unable to fix the CAF pilot shortage, specifically the fighter pilot shortage. The reason this research was conducted was to offer a solution to help the AF maintain the right number of total pilots in the AF, but not necessarily the right type of pilots. At the CSAF level, the decision has been repeatedly made since 1999 to effectively allow the CAF to slowly shrink over time by decreasing their inputs to below their losses and to ask the MAF to produce more pilots than they need in order to cover that shortfall. The assumption is that trend will not reverse anytime soon, especially in light of Congressional budget cuts across the DoD.

Another assumption deals with the amount of flying the AF has historically done since FY00 though FY16. There is no way to predict what or how much flying the AF will be required to do in the future. Just as no one could have predicted the amount of flying required to support the multiple operations in the Middle East. Therefore, we
assume uncertainty regarding how much flying will be required to support overseas contingency operations going forward. In order to mitigate some of this variance in trying to predict the future based on past operations, quartiles were used to see how levels of effort have changed over time. In the analysis portion, only the most conservative 1st quartile was used to build possible courses of action.

Research was scoped to review data pertaining to MAF MWSs only. Review of combat air force (CAF) forces, determining or verifying the number of rated officers required on various staffs, determining an AF top line rated officer requirement and determining specific requirements on how to increase (more training aircraft, more instructors, open new pilot training bases) pilot production are outside the scope of this study. Finally, this research will not include issues associated with the entire rated officer corps but is scoped to only MAF pilots as related to the 1999 Rated 4-Star Summit. Due to Air Mobility Command slowly divesting itself of navigators, they were not included in this study.

Implications

If this research is able to identify a MAF pilot overabsorption option, it could provide a possible means of increasing total rated officer (pilot) production to meet overall Air Force requirements. Additionally, when costs are included in the final calculation, it could also identify an overabsorption potential while simultaneously identifying a minimum cost path.

If the research data supports an overabsorption option, there could be several implications worth exploring. Increasing the total number of pilots produced should be a
good thing in light of current and projected shortfalls. Higher headquarters staffs, universal pilot training pipelines, RPAs, and other administrative positions should all continue to be manned at a reasonable rate. However, this research does not address the underlying problem of fighter pilot production as this is left for future research to address.

The implications of this research are:

1) Dysfunctional staffs: The purpose of having requirements for certain types of officers on various staffs is that their unique experience and understanding of their mission is needed on that staff in order to make informed decisions for that community. In this scenario of increased MAF pilot production, we could end up in a situation where most, if not all, of fighter pilot staff billets are filled with MAF pilots. For example, Air Combat Command (ACC) could, as a staff, become dysfunctional at some point because they no longer have the core experience to make decisions that are in the best interest of that organization (MAF officers making decisions on behalf of and in place of CAF officers who have little to no experience operating in a CAF environment).

2) Increased MAF discontent: At some point in the not too distant future, perhaps already, the MAF officer pilot corps is going to realize that they are going to be limited in their ability to stay in MAF cockpits due to having to cover down on CAF shortfalls across the AF (staff, UPT bases, RPAs, etc) and could elect to leave the active duty AF sooner than the historical norm. This could further exacerbate the overall pilot retention issue.
3) Increased CAF discontent: CAF officers, in the near term, if not already, will realize that they are being systematically denied broadening opportunities above the Wing level (staff) due to shortfalls in their officer corps. This lack of broadening could hinder their promotion and future leadership opportunities. It could also force them into a cycle of deployments and TDYs that will further erode their quality of life and increase the rate at which they depart active duty.

Consequently, this research seeks to understand and identify potential paths available to MAF to help balance the MAF and CAF pilot production problem.
II. Literature Review

Chapter Overview

The literature review will focus on five key areas including: environment leading up to the 1999 Rated Summit; the 1999 Rated Summit, post 9/11 effects on the MAF’s ability to overabsorb\(^1\) pilots, changing landscape that followed the drawdown in Afghanistan and Iraq, current challenges facing the MAF, and overall rated officer force in the Air Force. Figures 1 and 2 showcase the challenges the AF has faced trying to hit an ever moving pilot requirement with pilot production. Numerous unexpected combat operations have helped to keep the pilot production, pilot requirement, pilot surplus, and pilot deficit cycles out of sync.

\(^1\) Absorption is discussed later in this paper. For now, absorption refers to the ability of a MAF weapons system (i.e. C-17, KC-10) to take on new pilots and allow them to fly enough to become experienced. Too many new pilots without enough flying results in everyone talking much longer to upgrade towards becoming experienced. To over absorb is to take on more new pilots than needed to meet Air Force requirements.
Leading up to the 1999 Rated Summit

Figure 1  % Surplus and Deficit of USAF Active Duty Pilot Inventory vs Requirements
(Conetta & Knight, 1999)

Figure 2 Annual USAF Pilot Production Compared to Shortages and Surpluses as a Percentage of the Pilot Inventory
(Metrolis, 2003)

The Korean War doubled the demand for pilots between 1950 and 1951 (Conetta & Knight, 1999). By the time the Air Force was able to produce enough pilots to meet
the demand, the war had ended. Leading up to the Vietnam era, The Air Force enjoyed a surplus of pilots. However, as the United States’ combat role in Southeast Asia intensified, so did its demands for pilots. A pilot surplus quickly turned into a deficit. Many pilots who were previously filling non-rated support officer roles were pulled out of those positions and put back into more traditional rated officer roles. The wider effect of this rather sudden withdraw of talent and experience from the non-rated community caused an acute experience and manpower deficit issue. In the wake of this decision, the Air Force decided it needed a way to intelligently manage its rated force to prevent this problem from reoccurring. That deliberate process can be traced back to the early 1970s where the Air Force worked to establish the Rated Supplement under their much broader Personnel Plan. Headquarters Air Force (HAF) recognized a need for a measured way of managing the current force and predicting the needs of the rated force structure in the years to come. In 1975 General David Jones, Chief of Staff of the Air Force (CSAF), enacted the Rated Distribution and Training Management (RDTM) model (Ingram, 2004). This new model was comprised of a requirements and inventory model whose intent was to compute the projected average annual flying training requirements over a 5-year period. The RDTM had representatives from across the Air Staff, Major Commands (MAJCOMs), Air National Guard (ANG), and Air Force Reserves (AFRES). Each MWS fell into a different subcommittee that met twice a year. Their charge was to project out requirements vs inventories. The committees also looked at production capacity and absorption capacity during their reviews. The subcommittees efforts fed the RDTM’s recommendations for Undergraduate Flying Training (UFT) production rates which, in turn, fed MWS training. In order to deal with the inevitable and cyclical post-
war drawdown challenges that would arise following the end of the Vietnam war, the Rated Management Initiatives Group (RMIG) was established in 1976. (Ingram, 2004) Its purpose was to consolidate the efforts of several previously established study groups and propose initiatives to maintain reasonable experience and stability in a time of declining force structure, fiscally constrained flying hours, new system conversions, and imbalances in inventory.

The large pilot surplus of the mid 1970s approached 20% but quickly turned into a projected shortfall of close to 5% during the pilot exodus of the late 1970s and early 1980s (Conetta & Knight, 1999). The Rated Management Planning Group (RMPG) was created in this environment to examine the current force management policies. They also looked at creating a rated prioritization plan to deal with the current and projected shortfalls. Their charge was to protect rated billets and training authorizations. The RMPG also looked to create a method to prioritize and more fairly distribute the decreasing supply of pilots between multiple demanding agencies in the staffs and rated supplement categories. However, while airline hiring did take some Air Force pilots, the large projected shortfall failed to become reality. As such, the rated prioritization plan was not executed.

In the early 1980s, AETC was increasing pilot production rates. Once the pilots left pilot training they needed a follow-on aircraft to fly. The drawdown following the Vietnam War had removed a significant number of cockpits from the Air Force’s inventory. This created a new challenge: how to absorb new pilots into the limited number of available cockpits in sufficient quantity to sustain the Air Force’s requirements (Ingram, 2004). In 1981, Gen Lew Allen, CSAF, formed a new group to brainstorm...
ideas toward increasing the Air Force’s absorption abilities. The CSAF opted to pursue two initiatives that focused on absorption from the group: Career Trainer and Project Season (Ballard, 1998). Career Trainer was to increase absorption though setting aside some of the First Assignment Instructor Pilots (FAIPs) who would remain as trainers and would therefore not require flying time in an MWS in order to gain experience (Ballard, 1998). FAIPs are pilots who have graduated from pilot training but instead of being assigned to a MWS, they immediately return to a pilot training base, potentially the one they just graduated from, and teach others to become Air Force pilots. Project Season increased absorption by sending first-assignment active duty pilots and navigators to the Air National Guard (ANG) and the Air Force Reserve (AFR) units to gain experience (Ballard, 1998; Taylor et al., 2000). In 1982 the refined rated management process eliminated the previous groups and convened a new semi-annual Rated Management Executive Conference (RMEC) (Ingram, 2004). RMEC’s focus was to work rated issues faster and at lower levels in the organization than previous groups. Ideally, rated management issues were to be worked at the functional staff level (Ballard, 1998). However, if they could not come to a consensus, contentious issues were elevated to the appropriate higher decision-making authority in the organization.

The 1980s were a bit of an anomaly in the pilot surplus vs deficit narrative as depicted in Figure 1. The Air Force remained on target with respect to the number of pilots required versus inventory. In 1980, the Air Force pilot authorization level was 23,219 and gradually fell to 21,474 by 1990 (Callander, 1996). Similarly, the Air Force started with 22,297 pilots and ended with 20,917 (Callander, 1996). AETC was also producing pilots in relatively even numbers of about 1,750 per year (Callander, 1996).
In the mid-1980s, pilot retention was suffering due to sustained commercial airline hiring. Pilot projections were beginning to show a small shortage. Long-term pilot sustainability was still a major concern. Towards the end of the 1980s, it appeared that Gen Allen’s initiatives had reached their limits. The Air Force could no longer increase its absorption capabilities without additional measures taken. The six-year Active Duty Service Commitment (ADSC) was also recognized as too short. Pilots would Palace Chase\(^2\) or Palace Front, which meant they would separate from active duty to rejoin the ANG or AFR units they had previously served with as part of Project Season (Taylor et al., 2000).

To help reverse this trend several steps were taken. Formal Training Units (FTUs) began to contract out academic and simulator instructors to relieve pressure on the rated force. In 1987, the ADSC for pilot training was increased from 6 to 7 years. In 1988, it was increased again to 8 years. Air Force Deputy Chief of Staff for Plans and Operations (AF/XO) held an authorizations conference in 1988 and recommended elimination of the rated supplement. Those remaining positions that could justify permanent rated presence would be converted to rated Air Force Specialty Codes (AFSCs). Gen Larry Welch, CSAF, approved this drawdown over a 5-year period beginning in 1989 (Ingram, 2004). Aviation Career Incentive Pay (ACIP), more

\(^2\) The Palace Chase program is an early release program that allows active-duty Airmen to request to transfer to a reserve component, either the Air Force Reserve or Air National Guard. The Palace Front program is a transfer program that allows active-duty Airmen to transfer to a reserve component the day after their active duty contract ends and separate from active duty in order to join a reserve component.
commonly known as flight pay, was increased. In 1989, Aviator Continuation Pay (ACP), more commonly known as the pilot bonus, was approved (Garner & Villem, 2005). Crew ratios were reduced, primarily in airlift aircraft. At the end of the 1980s the Air Force was forecasting a five percent pilot shortfall. Previously shelved plans for rated prioritization were dusted off and pulled out for review and possible implementation between 1988 and 1990 (Ingram, 2004).

After the Berlin Wall fell in 1989, concerns over an impending shortfall were quickly supplanted by concerns over the inevitable cut in force structure that was surely coming in the next few years. Rated requirements were cut in March of 1990, but most drawdown actions were put on hold until the following year due to operations Desert Shield and Desert Storm. 1991 marked the end of Desert Storm and the Cold War with the collapse of the Soviet Union. The Air Force was now in a transition and downsize mode away from its Cold War force structure. The Air Force would exit the 1980s with 22,573 pilot requirements; by 1995, that number would be reduced to 14,792 pilot requirements (Callander, 1996).

The Air Force simply had too many pilots in its ranks following the force structure cuts of the early 1990s. It had two primary ways to deal with this problem: get pilots who were still in the Air Force out or reduce the number of pilots coming into the Air Force. The near-term challenge was how to redistribute pilots from shuttering operational units who were short of their first flying gate (HQ USAF/A3O-AT, 2013). Additionally, the accession pipeline could not be scaled down fast enough to prevent what was suddenly an overproduction of new pilots. Gen Merrill McPeak, CSAF, attempted to cancel pilot training slots for candidates who were already accessed into the
training pipeline, however his actions were blocked by Congress before they could be implemented. The result of this was a 4-year backlog of delayed entries into UPT (Ingram, 2004). Officers who were accessed as pilots into the Air Force were now having to wait to start pilot training because there were more candidates than training slots due to force structure cuts. Upon successful completion of pilot training, they still had to wait for a vacancy to open up in an operational flying unit (Ballard, 1998). Ultimately, the Air Force was unable to afford, budget wise, the cost of flying for these stacked pilots for several years until vacancies opened in operational flying units. To help alleviate this issue, Gen McPeak, CSAF, authorized the banking\(^3\) of these officers, accessed as pilots into the Air Force but who had not yet started pilot training, for up to 2 years 10 months (Ingram, 2004). In the interim, these officers would work in other non-flying required positions across the Air Force.

Several initiatives were taken to reduce the number of pilots in the Air Force. In 1991 pilots could voluntarily participate in end-strength reduction programs such as the Pilot Early Release Program (PERP). For pilots that were seen as having a low probability of staying through 20 years of service, a new business practice of ‘Feet-on-

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\(^3\) Banking refers to the backlog of officers who were selected to pilot training but, because there weren’t enough pilot training slots, had to wait up to several years to start training. Rather than forcibly separate these pilots in waiting or permanently reassigning them to other career fields, CSAF allowed them to stay in the Air Force doing other jobs until a pilot training slot opened up after which they would continue their career like any other pilot and not go back to what they were doing before.
Ramp’ was established. The Air Force targeted officers who were passed over for promotion, those who were eligible for the bonus but declined, and those who had applied for separation (Ingram, 2004). A new program, Operation Total Force (OTF), was established to assign active duty pilots into Air National Guard and Reserve units to assist with the active duty pilot surplus. Concurrently, active-duty pilot production was ramped down to about 500 per year by 1994, the minimum level acceptable to CSAF in order to preserve training infrastructure and instructor experience (Ingram, 2004). Active-duty navigator production was cut to zero in 1994 to coincide with the move of Specialized Undergraduate Navigator Training (SUNT) to Randolph AFB, with plans to ramp back up later to only 100 (Ingram, 2004). These aggressively low production rates produced a shortage or ‘bathtub’ in the affected year-groups that will impact the Air Force through at least 2025.

1995 marked a low point for Air Force Pilot production. That year only 480 pilots were produced, the lowest number since 1947 (Manning, Ashcroft, Emmons, Hussey, & Mason, 2005). 480 represented less than half of the required sustainment rate (Conetta & Knight, 1999). The cuts in pilot training between 1994 and 1998 resulted in a pilot deficit of about 1900. In late 1998, Gen Ryan, CSAF, commented “We made a terrible mistake six years ago when we reduced our pilot training to such a low level,” (Conetta & Knight, 1999).

By 1997 the economy was improving significantly. Hiring across all sectors was improving. Airline hiring was also increasing and forecasted to stay relatively high for the next few years. The large pilot surplus of the early 1990s was quickly becoming a pilot shortage in the late 90s. A pilot prioritization plan was developed to address a
forecasted pilot shortage. Previous planned rated staff cuts were now put on hold indefinitely. In addition to the economy, another leading indicator of a worsening pilot shortage problem was the pilot bonus take rate. This take rate forecasts how many current pilots would choose to stay in the Air Force. In 1994, the bonus take rate hit a high of 81%, probably a result of the grounding of pilots who were seen as likely to not be retained. By 1998, the take rate of the pilot bonus was down to 27%. The Air Force conducted surveys of pilots who were leaving the service and found out that their reasons fell into four broad categories: 19% reported high ops tempo; 14% quality of life issues; 11% airline hiring; 10% reported too much time on staff (Conetta & Knight, 1999). The first two responses were eventually lumped together as they both were rooted in too much time away from home.

As 1999 approached, it wasn’t just the rated officers who were short bodies. Record low unemployment in the United States drove the Air Force to miss its recruiting goals for the first time in 20 years. The aggressive measures of the early 1990s (banking of pilots, feet on the ramp, overhead/staff cuts) combined with high ops tempo, perceived quality of life issues, increase airline and other job opportunities, drove the 9% pilot surplus in 1993 to a 5% deficit by 1998 (Conetta & Knight, 1999). For comparison in the civilian aviation sector, total airline pilot hiring reached 14,413, which was a record high (Committee on Commerce, Science, 1999). 1999 was projected to beat that record number. To help combat this growing issue, the CSAF commissioned a Rated Management Task Force in 1998. Their task was to look at reducing requirements, optimizing absorption, maximizing retention, and aggressively managing the rated force
(Ingram, 2004). The task force’s work fed CORONA\(^4\) South in early 1999. Based on the output from those groups, the CSAF directed another Rated Summit to convene per Figure 3. CSAF direction, in conjunction with MAJCOM input, and direction from the two previously mentioned groups, culminated in a 2-star level meeting at HAF to prep the battlefield for what would be the next Rated Summit in April of 1999.

**The 1999 Rated Summit**

![Why We’re Here](image)

**Figure 3 Why We’re Here**

(AF/XO, 1999)

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\(^4\) CORONA meetings happen three times a year. It is a 4-star general level meeting that allows Air Force senior leadership an opportunity to come together for frank, open discussions and decision-making about the future of the Air Force.
The Air Force had faced manning issues in the past, however the current and longer term projected pilot shortage called for more deliberate attention. The gathering of 4-star general officers at CORONA in Figure 3 combined with the CSAF’s intent in Figure 4 left much work to be done if the Air Force was to effectively weather the current and worsening pilot shortage. It was understood that any decision that came out of the Summit would have a lasting impact on the Air Force’s rated manning. There was significant pressure and desire to get this right so as to be able to fulfill the Air Force’s operational mission in the short and over the long term.
Figure 5 Environment
(AF/XO, 1999)

Figure 5 set the stage for the 1999 4-star Rated Summit. By the time the 1999 Summit had started, the Air Force had already taken several steps since 1996 in order to strengthen overall pilot manning. The AFRC had established an IP program at two Specialized Undergraduate Pilot Training (SUPT) bases, Vance and Columbus. They were now poised to expand to all SUPT bases. The Air Force had expanded the FAIP program in order to help the CAF absorb more fighter pilots. Units were authorized to over-man in order to keep a 40% experience mix in accordance with AFI 11-412. Bomber pilots who had been trained in the T-38 aircraft were shifted to the T-1 aircraft to

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**At Program HCM**
allow for greater fighter throughput from UPT bases. Program staff cuts started in FY96\(^5\) that were to total 20% were put on hold starting in FY97. Finally, while recognizing that feet-on-the-ramp and pilot banking did accomplish their objectives, animosity left over from these programs was sufficient that both programs were completely shuttered.

![Rated Prioritization](image)

Figure 6 Rated Prioritization
(AF/XO, 1999)

\(^5\) Previously, calendar year dates were used based on source material references to historical events. The 1999 rated summit referred to itself simply as the 1999 rated summit even though it occurred as part of a fiscal year (FY) cycle. Historical events are referred to by year such as the Korean war or Vietnam war. When refereeing to a particular budget or events tied to events tied to a budget such as manning cuts, FY is terminology is utilized over just the calendar year.
Then, as now, projected shortfalls in rated manning was going to ripple across the Air Force. The 1998 CORONA South meeting outlined rated manning priorities in Figure 6 and 7, which is similar to what the RSAP does now, but before its formal existence. During that review, a concern was raised that rated manning in various staffs was approaching dysfunctional levels. Fill rates for rated manning on staffs was going to fall to 53% in FY99 from an anticipated 64% and were projected to fall all the way to 42% in FY02. For comparison, in 2015 AMC rated manning billets were filled to an average of 78.8%. That level was considered unacceptable to the AMC/CC who requested a review of capability and impact of pulling rated manning out of the MAJCOM’s operational Wings. Finally, the Air Force Deputy Chief of Staff for Plans and Operations expressed concern that such fundamentally low manning levels outside
the cockpit could potentially jeopardize the foundation of the Air Force and erode its institutional culture (AF/XO, 1999). If the projected 2000 pilot shortfall could be whittled down to only 500, many of these concerns would go from dire to manageable (AF/XO, 1999).

The intent of the Summit was to lay out a path that, over the next seven years, would ensure mission capability and address the short and long term pilot shortages (AF/XO, 1999). The Summit members recognized that any actions taken to implement a short-term fix for the pilot shortage would have lasting implications that could result in negative effects on pilot numbers in the future. As such, they were tasked to shore up short term pilot shortage issues while considering how their actions would or could affect the future pilot force.

As outlined by the Air Force Deputy Chief of Staff for Plans and Operations, the CSAF laid out several objectives for the Summit to accomplish. They were to approve a strategy and actions to mitigate the effects of the pilot shortfall and ensure readiness while reducing the impacts of a 2000 pilot shortage down to a 500 pilot shortage by FY03 (four years from the current Summit meeting). The CSAF also guided their decision-making processing by asking that they focus on: absorption, Aviation Continuation Pay (ACP), pilot requirements (operational/flying vs non-operational/non-flying), and augmenting staffs through alternative means. By reducing the pilot shortfall to less than 500 by FY02, the Air Force would transition from a 42% pilot manning level to above 80% (AF/XO, 1999), which was significantly more manageable.
Figure 8 Options for Reducing Effective Pilot Shortfall by 1500  
(AF/XO, 1999)

Figure 8 is a summary slide from the 1999 Rated Staff Summit. It provides an overview of the various options and the range of potential impacts they could have. Positive numbers indicate an increase demand for pilots and or money. Negative numbers indicate removing pilot requirements or saving money. Let’s take a closer look at two of these items as they apply to this research paper: Absorption and Requirements in the context of the 1999 Rated Summit. Retention was and still is a critical part of the total number of pilots in the USAF, however, it is beyond the scope of this research and will not be covered beyond to say it is much less expensive to retain a pilot than train a new one.
Absorption

Absorption is a critical component of the Air Force’s ability to create new experienced pilots. It can also be one of the most expensive steps in the pilot creation process (UPT-MWS FTU(s)-Aging Rates-Experienced Status Reached) shown in Figure 9. It primarily comes into play after graduation from UPT. Absorption deals with the ability of the flying units to take a brand new MWS pilot, KC-10 for example, and age them towards becoming an aircraft commander (AC).

Figure 9  Basic Aircrew Management System
(Nielsen & Widincamp, 2016)

Aging rates are how much a pilot is programmed to fly, on average, in a given month. It determines how fast a new pilot upgrades from a brand-new co-pilot (CP) to an AC. This, in turn, effects how a unit is able to fulfill its mission (AF/A3O-AT, 2011).
Absorption and aging rates are also directly tied to unit readiness (Grant, 2014). The aging rate for a pilot is calculated using Equation 1.

\[
AGING RATE = \frac{M \times E}{F \times I \times 12}
\]

Equation 1 Aging Rate

Where:

- \(M\) = number of UPT hires into a MWS from UPT
- \(E\) = Experienced Definition from MDS volume 1 in hours
- \(F\) = Force Structure Requirements
- \(I\) = % experienced
- \(12\) = is in reference to 12 months as aging rate is given in flying hours per month

The need and ability to upgrade in the jet (aging) feeds into the Air Force’s Flying Hour Program (FHP). The FHP is one of the means the Air Force used to budget flying costs for its pilots. There are several constraints to absorption.
Figure 10  Basic Aircrew Management Ops Units Experiencing
(Nielsen & Widincamp, 2016)

The ability of any MWS to absorb new pilots is based on several factors: absorbable cockpits from Figure 9, experience levels in the flying squadron from Figure 10, manning levels, and flying hours allotted as part of the FHP (AF/XO, 1999). An absorbable cockpit is one that is available to take a new pilot and allow that pilot to age such that they could eventually become experienced. Most MAF aircraft (C-17, KC-10, KC-135, C-5, C-130J) fall within this category. However, there are some aircraft and missions that do not count as absorbable cockpits as the mission requires pilots and/or crews to be already experienced. Air Force One is a prime example of this type of non-absorbable cockpit. Special Operations aircraft and some other smaller niche missions also fall within this category. If the cockpit is considered absorbable, there must be experienced pilots already in the squadron who can teach the new, incoming pilots. If
there is a sudden influx of new, inexperienced pilots into a flying squadron, aging rates will slow as there are not enough experienced pilots to fly with and teach the new pilots which will ultimately destroy the balance in Figure 10 and result in Figure 11.

![Absorption Pictorial](image)

**Figure 11 Absorption Pictorial**
(Vara, 2002)

If assigned manning is too low, this can have the same negative impact as too few experienced pilots in a squadron. For the past several years, the CSAF has prioritized operational units to be filled at 100% per his RSAP. The FHP feeds absorption by ensuring a minimum number of flying hours necessary to ensure the MAF forces are capable of proficiently meeting wartime mobility requirements (Nielsen & Widincamp, 2016). More specifically AFI 11-102 Flying Hour Program Management states “The Air Force Flying Hour Program is a requirements-based, peacetime program
consisting of the flying hours necessary to train aircrews to safely operate aircraft while sustaining them in numbers sufficient to execute the core tasked mission”. The flying hour model depicted in Figure 12 determines the number of flying hours an individual or crew needs in order to attain and maintain combat readiness.

![Figure 12 - AF Single Flying Hour Model](Nielsen & Widincamp, 2016)
Requirements

Another strategy the Summit explored was that of attacking the redline or reducing requirements.

Figure 13  1999 Redline Blueline Chart
(AF/XO, 1999)

Figure 13 is a typical redline/blue line chart used to compare current and projected requirements (red) against current and projected inventory (blue). This chart is showing actual data points for Air Force pilot requirements and inventory from 1998 and 1999. It is projecting Air Force pilot requirements vs inventory from 2000 through 2020. This data helped the Summit understand the magnitude of the problem they were facing and the length of time that a pilot shortage was forecasted. It is important to note that this chart represents the entire Air Force inventory and requirement for pilots. Wrapped up in this single chart is the entire MAF, CAF and all other flying units. To attack the red line
is to look at reducing the number of pilot requirements. This can be done in a number of ways such as fewer cockpits and/or fewer non-flying jobs for pilots but the Summit opted to explore reducing the number of non-flying jobs that currently required pilots to fill them. On the table was a review of the 1999 Air Force Staff structure. If the panel could recommend and the CSAF accepted, the pilot shortage could be fixed by adjusting the denominator. In order to get to that point the Air Force would need to make some drastic changes. General Hawley, ACC/CC, presented ACC options first. Three MAJCOMs could be reduced to one primary and two smaller commands: ACC & USAFE + PACAF. Nine Numbered Air Forces (NAFs) could be reduced from nine (8th, 9th, 12th, 3rd, 16th, 5th, 7th, 11th, 13th) to four (9th, 12th, 16th, 7th). (AF/XO, 1999) 20 Wings could be reduced down to 12 and 48 squadrons could become 38. All told, this maximum effort from ACC could reduce fighter and bomber pilot requirements by 407. Gen Robertson, AMC/CC, also presented options to reduce its non-flying pilot requirements: all FTUs were reviewed and through consolidation, realignment, and shifting some duplicate work to the Air National Guard and the Air Force Reserves plus the proposed consolidation of all OCONUS MAF assists under AMC (thereby reducing duplicate overhead in other MAJCOMs and NAFs) could result in a potential reduction of about 260 requirements. AMC had already recently accomplished reducing three NAFs to two, reallocated all NAF command and control (C2) functions into a single entity, Tanker Airlift Command and Control (TACC), consolidated 39 fixed en route support squadrons into 13 more efficient units, consolidating 18 KC-135 units into five Groups/Wings and eliminated three KC-10 Wings by consolidating down into two. (AF/XO, 1999) With significant restructuring accomplished or currently underway, AMC was now looking for ways to
become more efficient by reducing duplicate overhead and streamlining the training pipelines.

**Results**

The end result from the 1999 Rated Summit had the CSAF taking the rated force in the following directions: 1) The CAF could not absorb the full 370 required new pilots per year from the 1996 Summit without reducing pilot experience to unacceptably low levels in the squadrons, nor could the training pipeline support it. Therefore, via Project Absorb, the MAF would 1) overabsorb a total of 50 pilots with 30 redirected from fighters and 20 pure overage, 2) transition, as fast as AETC could handle, moving bomber pilots from the T-1 track to the T-38 track at pilot training bases in order to enable the MAF overabsorption plan via increased T-1 throughput to MAF, 3) shift some pilot training and absorption to the Air National Guard and Air Force Reserve, 4) reduce fighter production goal down to 330 per year, 5) set fighter squadron experience objective at 55% (this effectively restricted the number of new fighter pilots entering the squadron, this was reduced to 45% in 2001) (AF/XO, 1999; Marken et al., 2007; Robbert et al., 2015; Taylor et al., 2000). With the strategy set, it was time to make it happen.

**Operating in a Post 9/11 Environment**

The Air Force was not in good shape, pilot-number wise, prior to the terrorist attacks on September 11th, 2001. Airline hiring and a strong economy had lured many Air Force pilots away from the service. As the Rated Summit convened again in 2001, the active duty pilot requirements stood at 12,560 but the inventory only included 10,724
pilots—a 15% shortfall (Barker, 2001). Also complicating the matter was the fact that Congress had only funded Air Force pilot requirements to 97% (Barker, 2001). However, the attacks on 9/11 had a significant impact on Air Force pilot numbers as the economy slowed down considerably, airline hiring effectively stopped, and significant furloughs began. Prior to 9/11, the airlines employed almost 90,000 pilots; by 2006 that number had fallen to just under 76,000 (Mattock, Hosek, Asch, & Karam, 2016). Additionally, many military members elected to continue to serve after the homeland was attacked. In 1999 there were about 1750 pilots that separated from the Air Force. In the three years following 9/11, the number separating fell to about 700 per year (Mattock et al., 2016).

At the beginning of the 2000s, the level of effort required of MAF aircrews was decreasing. The number of total flying hours was down and trending lower. The MAF’s ability to overabsorb, per the ’99 Summit, was predicated on the ability to fly more hours that were required just to stay peacetime proficient. Those hours should have come from the Transportation Working Capital Fund (TWCF). By utilizing TWCF hours, multiple crew members could gain experience at the same time and upgrade more quickly. Most importantly, AMC did not have to pay for TWCF flying hours. A relatively high ops tempo feeds the ’99 Summit overabsorption requirement. However, at the beginning of the 2000s, the operations tempo was actually in decline. AMC was looking at having to fund the difference out of its own budget to the tune of about one billion dollars (Vara, 2002).

In the first six months following 9/11, AMC’s flying requirements doubled. This additional workload completely wiped out the six month flying deficit needed to
overabsorb pilots into the MAF (Vara, 2002). While this was the new reality in the near term, long term it meant that when the Air Force went back to a peacetime posture it would not be able to afford to pay for the additional flight time required to overabsorb.

![Figure 14 Airline hiring and USAF pilot losses 1996-2013](Mattock et al., 2016)

In terms of retention, the shattering effects 9/11 had on the United States economy had a significant impact to the commercial airline industry that was later compounded by the Great Recession that marked the end of the 2000s. Air Force pilot losses are reflective of airline hiring as shown in Figure 14. The airlines are certainly not the only place separating Air Force pilots go for post service employment. However, the airlines are representative of the U.S. economy as a whole, and of the challenges faced with finding good, or at least equivalent, employment outside of the Air Force. Civilian unemployment at the beginning of 2000 was about 4.5%. By the end of the decade unemployment had risen to 10% (U.S. Bureau of Labor Statistics, 2016). At the end of FY01, the Air Force was short 1,200 pilots or 9% (AFPC/DPAOY, 2002). By the end of FY02, the shortfall was down to 632 or 5% (AFPC/DPAOY, 2002).
In the mid to late 2000s, the Air Force’s pilot numbers generally improved as reported by AFPC. In FY02, 234 pilots were allowed to return to active duty (AFPC/DPAOY, 2002). Additionally, the Air Force instituted stop-loss for pilots from October 01 through September 02. That same timeframe had the airlines furloughing over 7,000 pilots (AFPC/DPAOY, 2002). By the end of FY03, the Air Force had swelled its pilot inventory to 13,208 (AFPC/DPAOY, 2003). Not since FY98 had the Air Force seen numbers this high. By November 2004, only 226 pilots had separated or applied to separate down from an average of 700 in years prior (AFPC/DPAOY, 2003). Pilot inventory continued to climb in FY03 to 13,208 and FY05 to 13,699 as 8238 pilots were still on furlough from the airlines (AFPC/DPAOY, 2004, 2005). In 2006, FAA changed the retirement rules for commercial airline pilots from a mandatory retirement age of 60 to 65 years old. With retention at record highs, the Air Force now looked to cautiously remove some excess with a voluntary force reduction in FY07 that shed 559 pilots (AFPC/DPAOY, 2007). As the decade closed out, the Air Forced ended with 14,937 which was a gain of about 4000 pilots from where it started. Concurrently, the Air Force started the decade with an end strength\(^6\) of 351,375 and ended with only 329,029; a loss of more than 22,000 Airmen (Air Force Personnel Center, 2016a). The economy was

\(^6\) End strength refers to the total number of active Airmen in the Air Force. It includes all officers and enlisted. It does not include any Airmen serving in the Air National Guard or Air Force Reserve.
still reeling from the 2007 financial crisis, subprime mortgage meltdown, and general recession that followed. Air Force pilots were opting to stay put for the time being.

The Current Challenge

![Pilot Redline/Blueline Chart](Active Duty)

**Figure 15** 2013 Redline/Blueline Chart
(Field, 2013)

The Budget Control Act (BCA) of 2011 was passed during the Congressional debt-ceiling arguments in 2011. The BCA directed across the board, defense and non-defense, spending cuts to the tune of around $1 trillion (112th Congress, 2011). It was poised to have a major impact on the Air Force’s budget. While passed in 2011 it didn’t come into full effect until 2013. While Congress did provide some relief, the Air Force lost about $10 billion in funding in FY14 including $3.5 billion from its operations and
maintenance account (SAF/FMB, 2013). This resulted in a 203,000 hour reduction to flying operations which delayed pilot upgrades by up to six months and deferred 70 depot maintenance\(^7\) inputs, creating a maintenance bow-wave that could take two to three years to catch up (SAF/FMB, 2013). AMC alone was looking at a reduction in its flying hour program to only 58% of requirement (AMC/A3T, 2013). This funding rate was not sustainable for the MAF, let alone provide extra to allow for overabsorption from the 1999 Rated Summit.

As the fighter pilot numbers ability continued to slip into the red, the ability of MAF forces to continue to cover down on that shortfall was being called into question as the 2014 Rated Summit convened. At that time, MAF pilots were filling 163% of their staff obligations while the CAF was down to 71% and the fighters down to only 65% (AF/A3O-AM, 2014). The ’99 Rated Summit plan was still working but cracks were starting to form as show in Figure 15. Some projections were now starting to show the MAF may not be able to keep the total number of Air Force pilots above or equal to requirements, as depicted in Figure 16, due to an anticipated airline hiring boom.

The 2014 force structure cuts hit the MAF hard. The Air Force’s budget was cut and Congress limited the actions the Air Force could take to save money. It canceled the

\(\text{\textasteriskcentered}\)

\(^7\) Depot maintenance is a major overhaul and repair or modification of components, engines, or airframes. Time frame for this kind of heavy maintenance is usually in weeks or months where normal maintenance is in hours or days.
Air Force’s attempts to divest itself of the A-10 and KC-10 MWSs among other measures. Ultimately the Air Force was forced to cut personnel in order to meet their new lower budget reality. Several aggressive measures were taken in quick succession: C-17 crew ratios were reduced from 3 to 2.5, C-130s from 2.75 down to 2.0, eight C-5s and sixteen C-17s were moved into Backup Aircraft Inventory (BAI) from Primary Aircraft Inventory (PAI), and 350 MAF pilots were targeted for Reduction In Force (RIF) measures in order to save money. (AF/A3O-AM, 2014)

“...we're at a point now where we are undermanned in many career fields because we've taken people out of them to put in other areas to shore up those areas,” -CSAF (James &
Welsh, 2015). The Air Force shrank to its smallest size ever in FY 2015 when aggressive force shaping measures took it down to an end strength of just 307,326 (Air Force Personnel Center, 2016a) as shown in Figure 17.

Figure 17  USAF End Strength and Major Events
(AFPC/DPAL, 2015)

8 BCA – Budget Control Act; CWR – Civilian Workforce Review; MHQ – Management Headquarter Redux; RMD 703 – Return civ staffing to FY10 levels; RMD 802 – Insourcing (contract to civ conversions)
In 2016 the total number of pilots fell to 13,409 (Air Force Personnel Center, 2016b). In order to see numbers that low one must go back to the late 1990s/early 2000s when pilot numbers hit a low of 11,897 in 2001 (Air Force Personnel Center, 2016b). Nonetheless, rated requirements across the Air Force continued to increase despite budget pressures and decreasing flying opportunities while 28% of active duty field grade officer pilots were serving in jobs out of their core⁹ (AFPC/DPAL, 2015). Additionally, between 2014 and 2015, there were 110 fewer rated officers serving on staffs due to shortages in that officer type (AFPC/DPAL, 2015). In years past, officers from other career fields such as logistics or maintenance could have covered that shortfall, however, there is no career field with excess capacity following the force shaping efforts of the last couple years.

---

⁹ Core refers to the officers AFSC score. For example, mobility pilots have a core AFSC 11M. A fighter pilot’s core AFSC is 11F. To say that a mobility pilot is serving outside their core (11M) as an FGO is reference to serving on a staff or other MWS (RPA) that doesn’t have 11M requirement for that position. For example: a KC-135 pilot serving on ACC staff in an 11F billet; C-17 pilot serving as an RPA pilot; a F-22 pilot serving as a 4-star general’s executive officer in a 97E billet (outside of 11F’s core AFSC).
Finally, Air Force institutional requirements have continued to grow but accessions across the officer corps have not followed suit to cover this growth.

**Institutional Requirements**

- 36C – Support Commander
- 91C/C83R – Commanders
- 80C – Cadet commander
- 16G – Operations Staff
- 16R – Plans & Programs
- 16F – Regional Affairs
- 16P – Political/Military
- 97E – Exec (AFPC mng >Wg Lvl)
- 81C – Training CC
- 81T – Instructor
- 82A – Academic Pgm Mgr
- 83R – Recruiting
- 85G – Honor Guard
- 86M – Ops Mgmt
- 86P – Command & Control
- 87G – IG
- 88A – Aide-de-Camp

Levied based on Size, Health, Current Presence
AFSCs participate at Fair Share

100% Fill Rate
Wg Internal Fill

USAF IRs exceed 3,000 officer requirements
Allocated IRs are MUST FILL = Mission Sets

**Figure 18  Air Force Institutional Requirements**
(AFPC/DPAL, 2015)

Instructional Requirements (IR), shown in Figure 18, refers to billets that have a valid requirement for an officer to fill it but the Air Force does not assess an officer to fill that billet. IR billets are filled out of hide from various officer corps, including pilots. Some are filled for developmental reasons. It is considered a good career move if an officer can earn coveted 97E executive officer billet serving a general officer.

As the 2016 Rated Summit convened, the ability of the MAF to continue to cover down on rated requirements beyond its own requirements was further called into question. The 300+ surplus of MAF pilots was projected to be gone by 2020 and a deficit of 300 MAF pilots would occur around 2023 as shown in Figure 19.
Figure 19  MAF Pilot Shortages Projection

(AMC/DA3, 2016)

Once again today’s issues are strikingly similar to 1999 when high ops tempo, force reductions, perceived worsening of quality of life on active duty, and a marked uptick in commercial airline hiring drove the pilot shortage to a deficit approaching one thousand (Gebicke, 1999). Then, as now, a solution must be found before operational squadrons and associated staffs become dysfunctional.
III. Methodology

Chapter Overview

This chapter provides an overview of the data that was available and used in seeking a MAF pilot production and overabsorption path. The chapter will discuss and describe what data was looked at for the analysis portion and how the data was prepared and employed for analysis.

Data Description

Data was acquired from a variety of sources in pursuit of this research. The data being compared and analyzed comes in these general categories: historical data, costs per flying hour, flying costs associated with formal training and aging, time to reach the experienced level, and requirements based on force structure. Moreover, if was determined if excess flying beyond requirements exists and if it does could it be used to overabsorb. Combined, these data give insight into the total time and cost to create an experienced MAF pilot. Data was gathered, applied to each MWS and then compared. The raw data comes from a variety of sources but primarily from AETC, AMC, and HAF.

The next sections are formatted in a building block narrative starting with explanations of basic datasets and ultimately moving toward modeling pilot numbers and subsequent flying requirements in order to identify any deltas between required flying and actual flying. Negative deltas would indicate the MAF isn’t flying enough to meet current requirements. Positive deltas would indicate the MAF is flying more than required based on FY17 force structure.
**Historical Data**

Historical data was sought in order to better understand present day operations. It gives context to current operations in terms of levels of effort and provides insight as to what the historical norm has looked like. Three general areas were looked at to meet the above historical data-gathering objectives: costs per flying hour per MWS over the FY08 to FY16 timeframe, amount of active duty flying per MWS over the FY00 to FY16 timeframe, percent of reimbursable flying per MWS over the FY00 to FY16 timeframe.

For costs comparisons, the fuel price timeframe, a driver of total costs per flying hour, covers several fuel price spikes and crashes. This timeframe gives insight into how costs per flying hour react to variability in fuel prices.

The amount of active duty flying per MWS and percent that flying was reimbursable to the AF timeframe gives insight into pre-9/11 flying level of effort. It also captures AF operations through several significant surges of combat operations. Finally, it gives insight into what decreased steady state levels of effort look like in a post 9/11 world but short of major combat operations. Specific to reimbursement rates, the timeframe captures the post Budget Control Act of 2011 and Sequestration environment. It also captures how those restrictions have changed the way the AF is reimbursed for a portion of its flying, primarily tankers.

**Cost per Flying Hour**

Flying hour costs used for this research were generated by HAF and accessed through AMC. The detailed process through which flying hour costs beyond the scope of this paper. Briefly, the AF executes higher directives (DoD 5000 series regulations and
Title 10 of United States Code) and policies through AFI 65-508 *Cost Analysis Guidance and Procedures*. The Air Force Costs Analysis Improvement Group (AFCAIG) informs and refines this process to feed into the President’s Budget and the Future Years Defense Plan (FYDP) (SAF/FMC, 2012). Costs are typically published once each fiscal year but can be updated more frequently if required. The C-17 and C-5 also include a charge to support the enroute structure through the Training, Test and Ferry Fund (TTF) which is budgeted under the Industrial Fund (AMC/A3TR, 2017). This drives their operational cost per flying hour higher than other MWSs who don’t have a similar charge. The C-17 does have a reduced rate for AETC. The C-5M, at the time of this writing, is in transition out of AMC and relocating back to AFRC for formal training. Once that is complete, the C-5M costs will come down similar to the AETC C-17 rate. The C-130H is being retired from the active duty Air Force but is still flown by some Air Force Reserve and Air National Guard units. It is expected the C-130J will perform in a similar role as the C-130H so their flight hours per year data were used interchangeably. However, only C-130J costs per flying hour were used in calculating costs as the C-130H is almost completely out of the active duty inventory. Despite several fuel price spikes over the last 10 years as shown in Figure 20, overall costs per flying hour have remained relatively stable as show in Figure 21. A decrease in fuel costs per gallon of about 50% have helped to keep costs per flying hour down (U.S. Energy Information Administration, 2017).
Figure 20  Jet Fuel Prices
(U.S. Energy Information Administration, 2017)

Figure 21  Costs per Flying Hour by MWS
Formal Training Time

Upgrading pilots to Aircraft Commander (AC) via formal training is used by the Air Force to track experience levels in flying squadrons. For the purposes of this research, programmed training time, not actual training time was used because actual time was not available.

Formal training timelines are derived from course syllabuses for each MWS. At the time of this writing, The C-17, KC-135, and C-130J initiate training under AETC. The KC-10’s training falls under AMC. The C-5M is in transition from AMC back to AFRC now that there are sufficient numbers of the C-5M in the Air Force inventory. Some MWSs, such as the C-130J, have in-house upgrade programs to aircraft commander. In-house upgrades tend to have more variability in length of time required to complete and number of flying hours required to complete. In these instances, squadrons were queried for data on average length of courses and associated flying time. For this research, only brand new pilots entering the MWS formal training pipeline from UPT were considered.

Each MWS has a slightly different path to become experienced. Common to them all is where the definition of experienced is outlined in their respective AFI 11-2X-XXXv1 series. For example, the C-5 requires 1000 hours in order to upgrade to AC (become experienced) while the C-130J requires 900 hours. However, these are not the number of MWS flight hours required to upgrade to AC. On average, a new pilot graduates UPT with about 200 hours. C-5M pilot initial qualification (PIQ) typically gives eight flying hours. 200 hours are creditable from the sim. This means that only
about 593 flight hours are required to be completed in the C-5 itself. Over the past
decade, the Air Force has decreased the amount of time required to upgrade to AC and
has increased the amount of sim time credible towards that goal as sim fidelity has
improved (Nielsen & Widincamp, 2016). In FY16, about $684 million was saved by
shifting some O&M flying and training into the sim (Nielsen & Widincamp, 2016).

**Flying Costs Associated with Formal Training**

Flying hour costs associated with formal training are a function of number of
flying hours required by each MWS syllabus and the costs per flying hour as published
by HAF.

\[
\text{Formal training flight costs} = (PIQ + PCO) \times CPFH
\]

*Equation 2 Flying Costs Associated with Formal Training*

Where:

- PIQ = Pilot Initial Qualification for a particular MWS
- PCO = Pilot Checkout Course for a particular MWS
- CPFH = Training cost per flying hour

There is a significant difference in C-17 costs associated with AETC flying and
operational flying. Operational flying includes en route structure costs as previously
discussed but AETC C-17 flying does not. In the cases where training costs are different
than operation costs, training costs were used to determine training flying costs and
operational flying costs were used to determine remaining experiencing costs.
**Time to Reach Experienced Level**

Time to reach experienced level was determined by looking at two data sets. First, the number of days of required training is published in each MWS’s training syllabi. Next, evaluated the programmed aging rate published by AMC against the total number of flying hours required in that MWS to reach the experienced level.

\[
Time to Experienced = (PIQ + PCO) + (EXPDEF - UPT - SIM) \times \frac{\text{aging}}{30}
\]

Equation 3 Time to Reach Experienced

Where:

- EXPDEF = Experienced Definition as defined by each MWS 11-2X-XXX-v1 series AFI
- UPT = 200 hours\(^{10}\)
- SIM = 200 hours\(^{11}\)
- Aging = AMC’s published aging rate for each MWS

**Flying Costs to Reach Experienced Level**

In order to determine the flying costs associated with reaching the experienced level, previously identified operational flying costs, as provided by AMC, were evaluated

\(^{10}\) On average, a pilot graduates from UPT with 200 flight hours.

\(^{11}\) The FAA allows for 200 hours to be credited from the sim when determining time to AC upgrade
against the number of flying hours still required after subtracting credit for UPT flying, FTU flying, and sim credit.

\[
\text{Flying Costs to Reach Experienced} = (EXDEF - UPT - PIQ - SIM) \times F
\]

Equation 4 Flying Costs to Reach Experienced Level

Where:

- \( F \) = Operational Flying Hour Costs\(^{12} \)

Determining Flying Requirements

Determining baseline requirements is critical to understanding and identifying the delta between required flying and potential excess flying. Any excess flying identified could be turned into an avenue for creating new pilots for that MWS and creating an overabsorption opportunity.

The primary method utilized for defining flying requirements was AMC/A3TR’s mathematical models. They were modified slightly to take into account MAF aircraft operations in other MAJCOMs such as USAFE and PACAF. A C-17 pilot flying in AMC has the same training and aging requirements as a pilot in USAFE or PACAF. The modification of the model is in relation to the size of the staff needed to support flying

\(^{12}\) Operational and training flight hour cost may differ depending on the MWS
operations in USAFE and PACAF that was not included in the original AMC-centric model. The AMC model is able to take many inputs and variables into account and provide outputs to answer many questions. For the purposes of this paper, the focus was limited to: force structure (number of available aircraft), number of crew authorized based on force structure (crew ratio), crew makeup based on mission (number of crews required in a squadron) and special missions (SOLL II, PNAV, etc), staff needs (API-6, API-8), maintaining experienced/inexperienced ratios in the flying squadrons (57% to 43%), aging rates (programed hours/month), and vol 1 training requirements to be mission ready in a peacetime environment. The primary input of the model is the total number of crews for each MAF MWS fleet (C-130J, C-5, C-17, KC-135, KC-10). The primary output of the model pursued was the total number of flying hours required based on the number of crews input. The output of the model was targeted to get as close as possible, but not exceed, quartile values.

**Quartiles**

Multiple data points that were sampled across time needed to be divided in such a manner as to allow for analysis in various groups in order to produce potential courses of action. To accomplish this data grouping, quartiles were utilized. The 1st quartile represents the bottom 25% of a data sample. The 2nd quartile represents the 25%-50% range of the data sample. The 3rd quartile represents the 50%-75% range, and the 4th quartile the top 25% of the data sample. This method was used to group and tie identified excess flying to model outputs showing overabsorption capability and the magnitude of that capability.
Absorption

How many extra pilots can an MWS take? This question is answered by determining what the absorption rate is programmed to be and then determining if there is any ability to exceed the published rate. AMC works through this very problem every year as part of the budgeting process as depicted in Figure 22.

Figure 22  Air Force Single Flying Hour Model  
(Nielsen & Widincamp, 2016)

The process starts with requirements set out by the Joint Mission Essential Task List (JMETL) which drive force structure. Using C-17s as an example, the JMETL informs the number of C-17s the AF has. Not all C-17s are available all the time. Some are in the ANG and AF Reserves, some are in Backup Aircraft Inventory (BAI) status. In terms of absorption and this research, only C-17s available to active duty as Primary Aircraft Inventory (PAI) were considered. Next, AF determines how to operate that
equipment (C-17s) and sets the number of pilots needed to operate the C-17 via crew ratios. The C-17, at the time of this writing, has a crew ratio of 2.5. A C-17 crew has two pilots, one AC and one CP. The CP is not experienced yet and needs to gain flying experience in order to qualify for AC upgrade and become experienced. Each MWS has different experience tiers for their pilots. Less experienced pilots are required to complete more training events more often. This is taken into account when matching AFI 11-2X-XXX\textsuperscript{13} v1 series training events with different pilot experience categories. More experienced pilots don’t need to fly as much to maintain their war readiness. The FHP is based on maintaining a peacetime ready force and aging new pilots at a reasonable rate so they too become experienced to replace experienced pilots who have left the flying squadron. Next AMC determines how many training events are required based on experience level and determines how many flight hours are required to meet those training objectives while maintaining the target aging rate. For the C-17, target aging rate for inexperienced pilots is 25 hours per month. Adding up the training hours for the number of pilots dictated by force structure, crew ratio, and experience level gives a minimum number of flying hours required to keep the C-17 crews combat ready in a peacetime situation while aging new pilots at a sufficient rate to become experienced and

\textsuperscript{13} AFI 11-2X-XXX Volume 1 series gives guidance on aircrew training, standardization and evaluation, and general operations structure. It covers USAF training policy for the MWS aircrews to safely and successful accomplish worldwide mobility missions.
replace those pilots who leave the squadrons to do other things. The difference between the number of flying hours needed based on requirements and the actual number of flying hours is the delta.

\[ \textit{Delta} = A - R \]

Equation 5 Determining the Delta

Where:

- \( A \) = Actual Flying Hours
- \( R \) = Required Flying Hours

If the delta is positive, that extra flying time could be used to overabsorb into that MWS. If the delta is negative, that indicates that the MWS is not flying enough hours to maintain peacetime war readiness and/or is not aging new pilots fast enough to replace the experienced ones who are moving on to do other things. Flying costs will be associated with excess flying to determine the costs associated with each MWS track. Once the ability to overabsorb is determined and the costs associated with that, a recommendation can be developed as to how to overabsorb.

Summary

Data selected for this paper was done so in order to build sufficient knowledge so to gain insight into cost, timing, and capacity questions with regard to possible increased overabsorption into the MAF. If sufficient excess flying can be identified and can be related to requirements, time, and cost, it may be possible to generate courses of action (COAs) outlining levels of overabsorption capabilities.
IV. Analysis and Results

Chapter Overview

This chapter will detail the analysis and resulting data produced during the building block approach toward feeding the flying requirements model in order to determine if any excess flying exists in the MAF beyond requirements and if there is enough excess to overabsorb pilots into that MWS. Furthermore, this section identifies if there is excess in any MWS, how many extra pilots could that MWS absorb and if there are multiple MWSs with excess capacity, which path could produce the greatest number of new pilots for the least cost. The impact of these results and recommendations will be discussed in the analysis and results section for the C-17 and touches on other MWSs to note differences or exceptions. At the end of the chapter similar results obtained for the other MAF MWSs are presented.

Historical Data

Historical data covers three general areas: costs per flying hour per MWS, amount of active duty flying per MWS, and percent of reimbursable flying per MWS. Cost per flying hour data was gathered from AMC and is depicted in Figure 24 below. Over this timeframe, costs are relatively stable, as noted in Figure 24, with a maximum
deviation from the average of 20% noted for the KC-10 and a low deviation from the average of 11% for the C-5.

Figure 23  MWS Reimbursement Rates FY00 – FY16

Reimbursement rates, as depicted in Figure 23, across the MWSs averaged 71%. The C-5 had the highest average over that time of 88% and the C-130 had the lowest at 51%. Both the KC-10 and KC-135 have, historically, flown almost entirely under O&M hours which means the AF funds their flying. After the Budget Control Act of 2011 and the subsequent sequestration impact that followed, the KC-10 and KC-135 overseas contingency operations (OCO) directed-flying now gets reimbursed. Prior to this new budgeting practice, the average reimbursement rate for the KC-135 from FY00-FY13 was 2.6% and the KC-10 was 11%. Our assumption is the current budgeting practice will remain; therefore, the more recent percentages are used for the remainder of this paper of
63.4% for the KC-135 and 67.4% for the KC-10. Since the C-17 is used throughout this section, its data is listed in Table 1.

### Table 1 Average Flying Hours per FY and Reimbursement Rate

<table>
<thead>
<tr>
<th></th>
<th>C-17</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY00 - FY16</td>
<td></td>
</tr>
<tr>
<td>Avg % Reimbursed</td>
<td>84%</td>
</tr>
<tr>
<td>Avg flying hours per FY</td>
<td>103,542.61</td>
</tr>
</tbody>
</table>

**Cost Per Flying Hour**

![Figure 24 Flying Hour Costs by MWS (FY08-FY17)](image)

Costs per flying hour per MWS are published by HAF each year. MAF historical MWS flying hour costs were obtained from AMC for the FY08-FY17 timeframe. During this timeframe, average annual aircraft fuel prices have surpassed $3 a gallon in FY08, FY11, FY12 but have also dropped to as low as $1.25 a gallon in FY16. (U.S. Energy Information Administration, 2017) During this timeframe, operational flying hour costs only fluctuated 15% while fuel prices fluctuated 32%. C-130H flying hour costs are
provided for reference but C-130J costs were used for all calculations. On average the C-130H cost 2.6 times as much as the newer C-130J.\(^{14}\)

**Formal Training Time**

Formal training time data was pulled from AETC and AMC. Together they publish training syllabi that cover initial pilot training referred to as Pilot Initial Qualification (PIQ), aircraft commander upgrade referred to as Pilot Check Out (PCO), and instructor pilot upgrade referred to as Instructor Aircraft Commander (IAC). Length of each MWS course is accessible through the Education & Training Course Announcements (ETCA) website operated by AETC/A3Z. For the purposes of this study, only PIQ and PCO course data was used. IAC course occurs after a pilot becomes experienced and is beyond the purpose of this study. For example, the C-17 PIQ course is projected to take 68 days to complete and the PCO course 14 days. The total projected formal training time of 82 days is then required to reach the experienced level. Similar logic was applied to the other MWSs to determine their formal training timelines. Actual training times were sought but were not available. Therefore, projected training times were used. There is some variability in training times due to outside forces such as

\(^{14}\) The C-130J is brand new when compared to the much older C-130H. The C-130J still has parts under factory warranty. Some of the heavy maintenance that is usually conducted at a depot, at high costs, is currently not required yet. It is expected that the C-130J flying hour costs will slowly approach C-130H flying hour costs over the next decade as parts come out of warranty and heavier maintenance is required.
weather, simulator or aircraft breaking, and students who need extra time learning.

Courses can go faster or slower than projected. However, further into the analysis it will become apparent that this potential variability is not a relevant factor. Table 2 Flying Training Costs and Time to Aircraft Commander in the next section shows the training timelines for each of the MAF MWSs.

**Flying Costs Associated with Formal Training**

Determining flying costs associated with formal training involves multiplying the flying hour costs against the projected flying hours required for that training. Similar to programed training days from AETC and AMC, PIQ and PCO syllabi also list projected flight time total to meet training objectives. The total training times and flight times for PIQ and PCO courses were totaled, per MWS, and multiplied by flying costs to produce the below table.

<table>
<thead>
<tr>
<th></th>
<th>C-130J</th>
<th>C-5M</th>
<th>C-17</th>
<th>KC-135</th>
<th>KC-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flying Hr costs for training/AETC/AFRC (FY17)</td>
<td>$2,418</td>
<td>$15,270</td>
<td>$6,950</td>
<td>$5,778</td>
<td>$6,513</td>
</tr>
<tr>
<td>MWS Flying Training Costs</td>
<td>$105,183</td>
<td>$549,720</td>
<td>$337,075</td>
<td>$270,988</td>
<td>$453,305</td>
</tr>
<tr>
<td>MWS Flying Training Time (months)</td>
<td>3.67</td>
<td>2.63</td>
<td>2.73</td>
<td>3.80</td>
<td>7.63</td>
</tr>
</tbody>
</table>

The C-5M and C-17 both have different flying hour costs associated with training than with operational flying. The cost differential is not tied to the type of flying per se, but to who is paying for the flying. AETC and AFRC do not pay the training, test, and ferry (TTF) rate because they don’t pay the enroute surcharge that AMC does. For FY17 the difference is substantial. AETC rate for the C-17 is $6,950 per hour while the AMC TTF rate is $20,971 per hour. (AMC/A3TR, 2017) The C-5M is similarly divergent with
AFRC paying $15,270 per hour and AMC paying the TTF rate of $37,950. (AMC/A3TR, 2017)

**Time to Reach Experienced Level**

The time to reach the experienced level is calculated by subtracting credits from the total number of flying hours required to upgrade to AC in any MAF MWS. The required number of hours is published in the vol 1 for each MWS. To illustrate, we present an example using the C-17. AFI 11-2C-17v1 *Flying Operations* C-17 Aircrew Training publishes 1,000 hours total flight time as the minimum amount of experience required to upgrade to AC. Total flight time is further defined from the v1 as “all flying time logged aboard a fixed wing aircraft as a military pilot including SUPT student and other time but does not include time in another aircrew specialty”. On average, UPT graduates receive 200 hours of flight training. Up to 200 sim hours are creditable toward the 1000-hour target. Eighteen hours of flight time are programed into the previously accomplished C-17 PIQ course. Mapping this out for the C-17 produces Table 3.

<table>
<thead>
<tr>
<th>C-17</th>
<th>11-2-C-17v1 Req'mnt</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPT credit</td>
<td>-200.00</td>
<td></td>
</tr>
<tr>
<td>PIQ credit</td>
<td>-18</td>
<td></td>
</tr>
<tr>
<td>SIM credit</td>
<td>-200</td>
<td></td>
</tr>
<tr>
<td>Req'd C-17 flight time</td>
<td>582</td>
<td></td>
</tr>
</tbody>
</table>

Similar methodology was applied to the rest of the MAF MWSs. Next, in order to convert 582 hours into time (months), one more data point is needed. How many hours per month is an inexperienced pilot expected to fly? AMC publishes target program aging rates as shown in Table 4. Continuing with the C-17 example, a new C-17 pilot is
expected to fly at the rate of 25 hours per month. Applying similar logic to the other MAF MWSs produces Table 4.

Table 4  MWS Required Flight Hours and Time to Aircraft Commander

<table>
<thead>
<tr>
<th></th>
<th>C-130</th>
<th>C-5M</th>
<th>C-17</th>
<th>KC-135</th>
<th>KC-10</th>
</tr>
</thead>
<tbody>
<tr>
<td># of flight hours req’d for PCO after credits removed</td>
<td>469</td>
<td>592</td>
<td>582</td>
<td>569.5</td>
<td>566.4</td>
</tr>
<tr>
<td>AMC Programed Aging Rates (hrs/mo)</td>
<td>24</td>
<td>22</td>
<td>25</td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>Time to get experienced (months)</td>
<td>19.54</td>
<td>26.91</td>
<td>23.28</td>
<td>28.48</td>
<td>24.63</td>
</tr>
<tr>
<td>Total time (months) to AC</td>
<td>23.21</td>
<td>29.54</td>
<td>26.01</td>
<td>32.28</td>
<td>32.26</td>
</tr>
</tbody>
</table>

Total time to experienced is calculated by combining the training data and the aging data to produce the total time to experienced as represented by the green line in Table 4.

**Flying Costs to Reach Experienced Level**

The previous section walked through an example of calculating the number of C-17 hours required to reach the minimum number of flight hours to qualify for PCO and become an experienced pilot. Multiplying the MWS operational cost per flying hour by the number of MWS flight hours needed to qualify for PCO produces the cost associated with required aging beyond UPT, PIQ, and sim credit. As previously mentioned, the C-5M and C-17 have different operating costs depending on who is operating them.

Now, the TTF rate is used for both aircraft to establish the costs associated with getting the remaining flight time needed for PCO. Applying a similar method to all MWSs yields the results in Table 5.
Determining Requirements

AMC/A3TR’s MDS models were used to set the baseline number of crews required based on current force structure for each MWS. C-17 force structure and crew ratios drive a requirement for 270 crews. 270 crews then become the initial data point for input into the model. As mentioned previously, the model takes into account all the requirements those 270 crews will need, on an annual basis, and produces a flying hour requirement from the crew input. For the C-17 in FY17, this equates to 68,581 hours.

Ability to Overabsorb

The ability to overabsorb is based on determining if there are more hours being flown than required. If this is the case, those extra flying hours could be used to bring in new pilots and age them toward being experienced. To that end, the C-17 historical flying data from FY00 to FY16 was broken out into quartiles as shown in Table 6.

<table>
<thead>
<tr>
<th>C-17 Quartiles (FY00 - FY16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Quart</td>
</tr>
<tr>
<td>88,938</td>
</tr>
</tbody>
</table>

Based on FY17 C-17 force structure requirements that drive flight hour requirements of 68,581 hours per year, there appears to be more flying occurring than required even in the 1st quartile. These quartile values are now the target output of AMC/A3TR’s model and
the number of crews input becomes the variable. A C-17 basic crew is composed of two pilots: one experienced, the AC; and one not, the CP. The model results of the quartile targets for the C-17 are shown in Table 7.

Table 7  C-17 Flying Hour Quartiles Equated to Extra Pilots

<table>
<thead>
<tr>
<th>C-17 Model (FY00 - FY16)</th>
<th>1st Quart</th>
<th>2nd Quart</th>
<th>3rd Quart</th>
<th>4th Quart</th>
<th>force structure # of crews</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>358</td>
<td>412</td>
<td>517</td>
<td>627</td>
<td># of crews supt'd by flying hours</td>
</tr>
<tr>
<td></td>
<td>88</td>
<td>142</td>
<td>247</td>
<td>357</td>
<td>Extra Crews</td>
</tr>
<tr>
<td></td>
<td>176</td>
<td>284</td>
<td>494</td>
<td>714</td>
<td>Extra Pilots</td>
</tr>
</tbody>
</table>

The last line of Table 7 indicates the number of pilots that could potentially absorb into the C-17 for each quartile. The overabsorption shown above is based on the fact that there is more actual flying occurring in the C-17 community than is required based on current force structure. Similar methods were used for all MWSs. They all demonstrated flying above requirements even in the 1st quartile. This indicates there is overabsorption opportunity in each MWS. Looking at the 1st quartile for each MWS, the KC-135 indicated the greatest overabsorption opportunity at 346 extra pilots and the C-5 indicated the lowest overabsorption opportunity at only 24 extra pilots. Applying a similar method to all MWSs produces the below absorption chart in Table 8.

Table 8  Absorption Potential Based on Quartile and MWS

<table>
<thead>
<tr>
<th></th>
<th>C-130J</th>
<th>C-5M</th>
<th>C-17</th>
<th>KC-135</th>
<th>KC-10 Total per Quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absorption 1st Quartile</td>
<td>238</td>
<td>24</td>
<td>176</td>
<td>346</td>
<td>916</td>
</tr>
<tr>
<td>Absorption 2st Quartile</td>
<td>330</td>
<td>42</td>
<td>284</td>
<td>464</td>
<td>1272</td>
</tr>
<tr>
<td>Absorption 3st Quartile</td>
<td>622</td>
<td>246</td>
<td>494</td>
<td>512</td>
<td>2098</td>
</tr>
<tr>
<td>Absorption 4st Quartile</td>
<td>850</td>
<td>518</td>
<td>714</td>
<td>680</td>
<td>3066</td>
</tr>
</tbody>
</table>

Because the data covers FY00 to FY17, where the majority of the flying is combat related the higher quartiles capture surge, peak, and combined operations in Afghanistan and
Iraq. It is unlikely that such flying can be counted on to happen again anytime in the near future. However, the 1st quartile captures some pre-9/11 flying along with lower periods of combat operations associated with just operations in Afghanistan, Iraq, or post both with a focus on ISIS. Thus, even flying rates synonymous to some of the lowest levels over the past 17 years allows for potential overabsorption of 916 MAF pilots. The next question of concern is if we can potentially overabsorb this many pilots, how will this financially impact the AF?

**Costs to Over Absorb**

The Air Force builds its Flying Hour Program (FHP) based on peacetime requirements in order to train aircrews to safely operate aircraft while sustaining them in sufficient numbers to execute the core tasked mission. (AF/A3O-AT, 2011) AMC programs the minimum number of hours to meet the AF objective and to ensure mobility forces are capable of proficiently meeting wartime mobility requirements as defined by the JMETL. (Nielsen & Widincamp, 2016)
It is important to understand that the FHP is built against authorized force structure which is, in turn, based on requirements from the JMETL. Figure 25 shows how the C-17 flying hours, currency requirements and aging requirements, were forecast for FY16. At the 1999 Rated Summit, the CSAF directed the MAF to overabsorb, or build more pilots than was authorized by mission requirements alone. This plan was generally fiscally viable to the MAF because it was able to get others to fund a large portion of its flying costs.
Figure 26  % of C-17 That Was Reimbursable

The C-17 provides a good example of what is possible when seeking an option of increased flying without necessarily attributing the cost of that flying to the AF. Looking at Figure 26 across FY00 to FY16, the average reimbursement rate was 84%. This means that, on average, 84% of the total number of C-17 hours flown in a given fiscal year were reimbursable or, to put it another way, were paid by an entity other than AF. In the case of the C-17, the reimbursement funding source is the Transportation Working Capital Fund (TWCF). This fund is simply a mechanism for the MAF to be reimbursed by another entity who requests and is granted airlift.
Figure 27  C-17 Annual Flying Totals FY00 to FY16

If the Army wants to move personnel and equipment from the continental United States to the Middle East via C-17, it pays for that airlift via TWCF. Airlift aircraft all have the majority of their flight hours reimbursed in this manner. The tankers were handled differently such that a look at them is warranted. Because the KC-135 and KC-10 operate very similarly, only the KC-135 will be used in the below example and in Figures 28 and 29.
Figure 28 % of KC-135 Flying That Was Reimbursable

Figure 29 KC-135 Annual Flying Totals FY00 to FY16

Looking at the KC-135 breakout, its reimbursement rate averaged 2.6% from FY00 to FY13. Figure 28 above indicates how the rate deviated from the FY13 to FY16 average. After the Budget Control Act was passed by congress and enforced via sequestration, the AF budget was decreased dramatically. Congress allowed the AF to
start paying for Overseas Contingency Operations (OCO) via a new funding method. Historically the AF would cover KC-135 flying hours out of its Operations and Maintenance (O&M) budget. Now it is able to shift those costs such that a large portion of KC-135 flying costs are reimbursable. Applying similar logic to all the MWSs produces Table 9.

<table>
<thead>
<tr>
<th>FY00 - FY16</th>
<th>C-130J</th>
<th>C-5</th>
<th>C-17</th>
<th>KC-135</th>
<th>KC-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg % Reimbursed</td>
<td>51%</td>
<td>88%</td>
<td>84%</td>
<td>63%</td>
<td>67%</td>
</tr>
<tr>
<td>Avg reimbursable flying</td>
<td>38,514</td>
<td>24,342</td>
<td>87,654</td>
<td>10,760</td>
<td>9,191</td>
</tr>
</tbody>
</table>

The AF only pays for 16% of the total C-17 flying, on average, in a given year when looking at FY00 to FY17. Therefore, if a significant portion of the total flying hours required to reach the experienced level could be reimbursable, then the total cost to the Air Force decreases significantly and could further the intent from the 1999 rated Summit. Applying this same logic across all the MWSs generates Table 10.

<table>
<thead>
<tr>
<th>Total flying costs to AC</th>
<th>$1,239,225.00</th>
<th>$23,832,600.00</th>
<th>$12,542,197.00</th>
<th>$3,561,559.20</th>
<th>$4,142,268.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total time (months) to AC</td>
<td>23.21</td>
<td>29.54</td>
<td>26.01</td>
<td>32.28</td>
<td>32.26</td>
</tr>
<tr>
<td>Average % of total flying that was reimbursable</td>
<td>51%</td>
<td>88%</td>
<td>84%</td>
<td>63%</td>
<td>67%</td>
</tr>
<tr>
<td>Effective AF Bill after reimbursed flying taken out</td>
<td>$659,729.54</td>
<td>$4,107,100.80</td>
<td>$2,255,720.18</td>
<td>$1,475,337.19</td>
<td>$1,654,800.11</td>
</tr>
</tbody>
</table>

The “Total flying costs to AC” line in Table 10 above indicates what a new pilot would have cost the AF if it had to cover all flying costs associated with formal training and flying associated with experiencing. Because a large portion of flying is reimbursable, it reduces the costs to the AF dramatically. In the cases of the KC-135 and
KC-10, only the increased reimbursement rate was used, as budgeting under sequestration is expected to continue to drive reimbursement from OCO funds.

The 1st quartile for the C-17 indicated an excess in flying above requirements that equated to the flying requirements of an extra 176 pilots. Each new C-17 pilot does cost the AF money. If all 176 new pilots were absorbed into the C-17 community and aged to the experience level it would cost the AF $397,006,751. Applying the same method to all MAF MWSs produces Table 11.

<table>
<thead>
<tr>
<th>Table 11 Costs per Quartile per MWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-130</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>1st Quartile</td>
</tr>
<tr>
<td>2nd Quartile</td>
</tr>
<tr>
<td>3rd Quartile</td>
</tr>
<tr>
<td>4th Quartile</td>
</tr>
</tbody>
</table>

Where to target overabsorption efforts

The FY16 Rated Staff Allocation Plan (RSAP) is the CSAF’s plan for allocating all AF rated officers across AF flying billets, SAF/HAF staffs, MAJCOM staffs, Command and Control entities such as 618th AOCs, USAFA, OSD staff, COCOM staffs, NATO staffs, AF, and other intragovernmental agencies. This plan is necessary as there are not enough rated officers to cover all rated requirements for flying and staff. It prioritizes placement of rated officers, in varying percents, into the aforementioned categories. It authorized 100% fill rate to line flying billets. At the end of FY16 the plan indicated the active duty AF was short about 500 rated officers for service beyond the line units. Line unit billets are typically associated with operational units like the 15th Airlift Squadron at Charleston AFB or the 19th Fighter Squadron at Hickam AFB.
With a target of 500 pilots to fill now set as the overabsorption target, there are several options available to fill the demand. The two that are explored below are based on the lowest total cost option and the option that spreads out the overabsorption challenge across all the MWSs. Table 8 indicates the 1st quartile maximum absorption rate is 916. This is already above the target of 500. Utilizing the 1st quartile from Table 8 plus data from Table 10 we can establish COA 1 as illustrated in Table 12.

Table 12  COA 1 – Minimum Costs to Add 500 Pilots to the MAF

<table>
<thead>
<tr>
<th>1st Quartile</th>
<th>C-130J</th>
<th>C-5</th>
<th>C-17</th>
<th>KC-135</th>
<th>KC-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Absorption</td>
<td>238</td>
<td>24</td>
<td>176</td>
<td>346</td>
<td>132</td>
</tr>
<tr>
<td>Pilots per MWS</td>
<td>238</td>
<td>0</td>
<td>0</td>
<td>262</td>
<td>0</td>
</tr>
<tr>
<td>Cost per MWS</td>
<td>$157,015,630.04</td>
<td>$386,538,342.73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Cost</td>
<td>$543,553,972.78</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 12 uses an optimized absorption path, with a focus on minimizing cost, which indicates the least expensive option is it utilize 100% of C-130J overabsorption capacity and 76% of the KC-135 overabsorption capacity. This results in a cost to the AF of about $543.6M. Using the same figures again but spreading the overabsorption across all the MWSs produces COA 2 in Table 13.

Table 13  COA 2 – Equal Distribution across MWSs to Add 500 Pilots to the MAF

<table>
<thead>
<tr>
<th>1st Quartile</th>
<th>C-130J</th>
<th>C-5</th>
<th>C-17</th>
<th>KC-135</th>
<th>KC-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Absorption</td>
<td>238</td>
<td>24</td>
<td>176</td>
<td>346</td>
<td>132</td>
</tr>
<tr>
<td>Cost per pilot</td>
<td>$659,729.54</td>
<td>$4,107,100.80</td>
<td>$2,255,720.18</td>
<td>$1,475,337.19</td>
<td>$1,654,800.11</td>
</tr>
<tr>
<td>% Distribution</td>
<td>54.5%</td>
<td>54.5%</td>
<td>54.5%</td>
<td>54.5%</td>
<td>54.5%</td>
</tr>
<tr>
<td>Pilots per MWS</td>
<td>130</td>
<td>13</td>
<td>96</td>
<td>189</td>
<td>72</td>
</tr>
<tr>
<td>Cost per MWS</td>
<td>$85,573,518.37</td>
<td>$53,720,878.46</td>
<td>$216,368,679.51</td>
<td>$278,204,333.16</td>
<td>$119,046,320.22</td>
</tr>
<tr>
<td>Total Cost</td>
<td>$752,913,729.73</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Using an equal distribution\textsuperscript{15} drives up the cost 72\% to $752.9M. If the AF wants to fill all pilot billets, these are two options that could meet that demand. Finally, the target number of pilots to absorb, 500, was based on a snapshot in time, FY16. As UPT production goes up and down along with increased retention efforts, the 500 pilot target will continue to be a moving target.

**Summary**

This section took us through the analysis of MAF MWSs using the C-17 as an example. It touched on the differences, where they existed, from the C-17. The historical review of flying over varying conditions produced the flying hour quartiles. A similar review of flying costs over time gave insight into aircraft costs per flying hour. This data was utilized to determine the costs of training and experience for each MWS. Next, a baseline flying requirement was determined utilizing AMC/A3TRs model. Further analysis demonstrated that there is excess flying occurring currently and going back to FY00 relative to requirements. Even at the 1\textsuperscript{st} quartile there was sufficient excess flying to indicate overabsorption capability in all MAF MWSs. When costs to experienced were compared across MAF MWSs, it was determined that the C-130J was

\begin{center}
\text{-----------------------------}
\end{center}

\textsuperscript{15} In table 13 - equal distribution is based on total capacity of each MWS to overabsorb. An equal percent distribution was utilized so as not to unduly burden a particular MWS with respect to its overabsorption capacity in the 1\textsuperscript{st} quartile.
the lowest cost option in overabsorbing new MAF pilots. However, the KC-135
demonstrated the greatest ability to overabsorb out of all the MAF MWSs. Finally, two
options, lowest cost and equal distribution, were explored while trying to hit the 500 pilot
short fall indicated in FY16.
V. Conclusions and Recommendations

Chapter Overview

This chapter will review the results from the previous chapters and attempt to put them into context. It will highlight the significant results, the impact to the AF, and recommendations for future research.

Conclusions of Research

This research sought to understand rated shortfalls and determine if there was any overabsorption capability in the MAF in order to continue supporting the 1999 Rated Summit decision and, if so, where the Air Force could target overabsorption efforts. The results of the data clearly show that there is overabsorption capability in all MAF MWSs. This is a direct result of the Air Force flying more than is required to maintain war readiness in a peacetime environment. The data also shows that overabsorption efforts should initially be targeted at the C-130J. Even though the Air Force would pay extra for a lower reimbursement rate, the significantly lower overall costs per pilot suggests this option should be targeted first between all the MAF MWSs options. A higher reimbursement rate could be achieved if C-130Js were utilized on more TWCF missions.

The lowest option cost was still $543.6M and is not realistic in that it would cause an almost certain degradation in the C-130J experienced to inexperienced pilot ratios in squadrons. The results of this would mean there would not, at least initially, be enough experienced pilots around to teach the new pilots. Additionally, there would be challenges physically allocating space for 238 new C-130J pilots and 262 new KC-135 pilots without expanding current squadron and base infrastructure.
The second option at $752.9M is probably more likely implementable in that it spreads out pilots across multiple MWSs and bases. In order to determine the exact impact of these two courses of action, further research is required.

**Significance/Impact of Research**

If this research was utilized to increase MAF pilot overabsorption, it is possible that the Air Force could meet its rated officer requirement. In this scenario, it is assumed the CAF would continue to not meet its pilot requirement and the MAF would continue to exceed its requirement. While this research does show the second course of action is likely feasible, it may not be advisable in the long run.

As the number of CAF pilots, specifically fighter pilots, decreases, the CAF’s ability to develop those officers for future leadership opportunities diminishes because all available pilots would be required to stay in cockpits. Service above the Wing level, such as staff, is seen as a place to broaden beyond operations in order to later compete for command opportunities. Successful command at the squadron level is required in order to command at a higher level. With few exceptions, a rated Lt Col cannot be promoted to Colonel without having commanded as a Lt Col. Once CAF pilots begin to realize they are not being afforded development opportunities at the same rate as MAF pilots, they will likely leave the Air Force in greater numbers sooner in their careers than currently. This would further exacerbate the pilot shortage problem. Additionally, there are good reasons why some staff positions are allotted to CAF pilots. They require some level of knowledge that only a CAF pilot would possess. If CAF pilots are required to stay in the cockpit and their staff positions are increasingly filled by MAF pilots, those staffs could
become dysfunctional at some point when the expertise to do the work is no longer present.

In conjunction with that, MAF pilots may begin to realize that they will only be allowed to fly a MAF aircraft for shorter and shorter periods of their careers as they are forced to fill CAF jobs at ever increasing rates. If that is not palatable to the majority of MAF pilots, they too will begin to leave the Air Force at ever increasing numbers earlier in their careers further exacerbating the pilot shortage problem. Finally, creating an experienced pilot means creating an aircraft commander. Instructor pilot is currently the common requirement typically needed to be eligible for jobs outside the squadron such as Group training or Wing executive officer for development. Furthermore, if a MAF officer meets his or her Major’s board without having attained instructor pilot qualification in a major weapon system, it is generally viewed in negative light at the promotion board. MAF officers getting pulled out of squadrons as ACs is already happening in small numbers. It remains to be seen how these MAF officers will perform long term when, through no fault of their own, they meet their Major’s board having never been an MWS IP. If this plan were fully implemented it is highly likely that an increased number of MAF pilots would be pulled out of MAF flying billets to backfill CAF non-flying and UPT flying billets. This too could further exacerbate pilot retention problems.

**Recommendations for Action**

In the short term, in order to meet pilot requirements across the AF, this research identifies two potential COAs that could be implemented: (1) a lowest cost COA and (2)
a most feasible COA. The C-130J presents an opportunity to produce a large quantity of pilots for significantly less cost than any other MAF MWS and certainly less cost than any fighter pilot option. Even if the entire 1st quartile of 238 overabsorption potential C-130J pilots was not used, even a portion of that total could make a significant impact in total AF pilot requirements. Regardless of the course of action selected for overabsorption into the MAF, the true problem of the CAF producing fewer fighter pilots each year then it loses must be addressed.

**Recommendations for Future Research**

This research was scoped to look at possible overabsorption capability in MAF MWSs. It did not look at several areas that would almost certainly be impacted by increasing the number of MAF pilots overabsorbed. Areas identified for future research include: impacts and abilities of UPT bases to generate more pilots to feed MAF overabsorption, impacts and abilities of MAF bases to absorb these extra pilots (buildings to work in, places to live, base support agencies ability to support more pilots, etc), ability for the Air Force to pay for these extra MAF pilots, and, possibly most importantly, a study into how to fix the CAF, specifically the fighter pilot, shortfall.

**Conclusion**

The Air Force has struggled to find a way to consistently balance its rated inventory, new pilot production, and retention of experienced pilots against its rated requirements, flying and non-flying, since its inception. The current situation is not unique but does call for increased action. The research showed that the MAF could
overabsorb more than it is doing now and at a reasonable cost. The challenge and perhaps the question for senior leadership, as it always has been, is if the current impending crisis warrants redirecting funds to this course of action from other parts of the Air Force.
### Appendix A: MWS Flying Hour Quartiles

#### C-17 Quartiles (FY00 - FY16)

<table>
<thead>
<tr>
<th>1st Quart</th>
<th>2nd Quart</th>
<th>3rd Quart</th>
<th>4th Quart</th>
<th>Avg total flying hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>88,938</td>
<td>101,161</td>
<td>125,475</td>
<td>150,762</td>
<td>103,543</td>
</tr>
</tbody>
</table>

#### KC-135 Quartiles (FY00 - FY16)

<table>
<thead>
<tr>
<th>1st Quart</th>
<th>2nd Quart</th>
<th>3rd Quart</th>
<th>4th Quart</th>
<th>Avg total flying hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>78,885</td>
<td>99,129</td>
<td>104,654</td>
<td>123,680</td>
<td>91,555</td>
</tr>
</tbody>
</table>

#### KC-10 Quartiles (FY00 - FY16)

<table>
<thead>
<tr>
<th>1st Quart</th>
<th>2nd Quart</th>
<th>3rd Quart</th>
<th>4th Quart</th>
<th>Avg total flying hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>42,337</td>
<td>44,667</td>
<td>52,946</td>
<td>62,103</td>
<td>46,203</td>
</tr>
</tbody>
</table>

#### C-5 Quartiles (FY00 - FY16)

<table>
<thead>
<tr>
<th>1st Quart</th>
<th>2nd Quart</th>
<th>3rd Quart</th>
<th>4th Quart</th>
<th>Avg total flying hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>13,796</td>
<td>15,681</td>
<td>40,102</td>
<td>72,575</td>
<td>27,507</td>
</tr>
</tbody>
</table>

#### C-130 Quartiles (FY00 - FY16)

<table>
<thead>
<tr>
<th>1st Quart</th>
<th>2nd Quart</th>
<th>3rd Quart</th>
<th>4th Quart</th>
<th>Avg total flying hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>58,376</td>
<td>69,669</td>
<td>105,573</td>
<td>133,372</td>
<td>80,689</td>
</tr>
</tbody>
</table>
## Appendix B: MWS Overabsorption Quartiles

### C-17 Model (FY00 - FY16)

<table>
<thead>
<tr>
<th>1st Quart</th>
<th>2nd Quart</th>
<th>3rd Quart</th>
<th>4th Quart</th>
<th># of crews supt'd by flying hours</th>
<th>force structure # of crews</th>
</tr>
</thead>
<tbody>
<tr>
<td>358</td>
<td>412</td>
<td>517</td>
<td>627</td>
<td></td>
<td>270 FY16</td>
</tr>
<tr>
<td>88</td>
<td>142</td>
<td>247</td>
<td>357</td>
<td>Extra Crews</td>
<td></td>
</tr>
<tr>
<td>176</td>
<td>284</td>
<td>494</td>
<td>714</td>
<td>Extra Pilots</td>
<td></td>
</tr>
</tbody>
</table>

### KC-135 Model (FY00 - FY16)

<table>
<thead>
<tr>
<th>1st Quart</th>
<th>2nd Quart</th>
<th>3rd Quart</th>
<th>4th Quart</th>
<th># of crews supt'd by flying hours</th>
<th>force structure # of crews</th>
</tr>
</thead>
<tbody>
<tr>
<td>373</td>
<td>432</td>
<td>456</td>
<td>540</td>
<td></td>
<td>200 FY16</td>
</tr>
<tr>
<td>173</td>
<td>232</td>
<td>256</td>
<td>340</td>
<td>Extra Crews</td>
<td></td>
</tr>
<tr>
<td>346</td>
<td>464</td>
<td>512</td>
<td>680</td>
<td>Extra Pilots</td>
<td></td>
</tr>
</tbody>
</table>

### KC-10 Model (FY00 - FY16)

<table>
<thead>
<tr>
<th>1st Quart</th>
<th>2nd Quart</th>
<th>3rd Quart</th>
<th>4th Quart</th>
<th># of crews supt'd by flying hours</th>
<th>force structure # of crews</th>
</tr>
</thead>
<tbody>
<tr>
<td>174</td>
<td>184</td>
<td>220</td>
<td>260</td>
<td></td>
<td>108 FY16</td>
</tr>
<tr>
<td>66</td>
<td>76</td>
<td>112</td>
<td>152</td>
<td>Extra Crews</td>
<td></td>
</tr>
<tr>
<td>132</td>
<td>152</td>
<td>224</td>
<td>304</td>
<td>Extra Pilots</td>
<td></td>
</tr>
</tbody>
</table>

### C-5 Model (FY00 - FY16)

<table>
<thead>
<tr>
<th>1st Quart</th>
<th>2nd Quart</th>
<th>3rd Quart</th>
<th>4th Quart</th>
<th># of crews supt'd by flying hours</th>
<th>force structure # of crews</th>
</tr>
</thead>
<tbody>
<tr>
<td>56</td>
<td>65</td>
<td>167</td>
<td>303</td>
<td></td>
<td>44 FY16</td>
</tr>
<tr>
<td>12</td>
<td>21</td>
<td>123</td>
<td>259</td>
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### C-130 Model (FY00 - FY16)

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<th>2nd Quart</th>
<th>3rd Quart</th>
<th>4th Quart</th>
<th># of crews supt'd by flying hours</th>
<th>force structure # of crews</th>
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<td>238</td>
<td>330</td>
<td>622</td>
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## Appendix C: MWS Overabsorption Quartile Costs

<table>
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Appendix D: Quad Chart
Bibliography


AF/A3O-AT. (2011). AFI 11-102 FLYING HOUR MANAGEMENT.


AFPC/DPAOY. (2002). Rated Officer Retention Analysis.

AFPC/DPAOY. (2003). Rated Officer Retention Analysis.

AFPC/DPAOY. (2004). Rated Officer Retention Analysis.

AFPC/DPAOY. (2005). Rated Officer Retention Analysis.

AFPC/DPAOY. (2007). Rated Officer Retention Analysis.


Nielsen, B., & Widincamp, P. (2016). AMC/DA3 Flying Hours Briefing. AMC/A3D.


**Title:** ASSESSMENT OF MAF PILOT OVERABSORPTION: EXPANSION OF THE 1999 RATED SUMMIT INTENT

**Authors:** Pedersen, Jeffrey J., Major, USAF

**Abstract:**
This paper seeks to expand on the 1999 Rated Summit’s decision to increase Mobility Air Force’s (MAF) pilot production beyond requirements in order to cover Combat Air Force’s (CAF) pilot production shortfalls in order to ensure the total Air Force requirement of pilots is met. Then, as now, the Air Force was faced with a significant pilot shortfall that was projected to get worse. Up until recently, the 1999 Rated Summit strategy was successful. To that end, this paper will research and analyze the current MAF pilot production model, post-Undergraduate Pilot Training (UPT), looking for any ability to overabsorb, with costs in mind, in order to expand on the 1999 Rated Summit’s original intent. Research will focus on a historical review of rated officers, pilot production timelines to reach the ‘experienced’ level and costs associated with the different Major Weapon System (MWS) tracks (C-17 vs KC-135, etc). The goal of the research paper is to determine if additional capability exists to create more MAF pilots and to identify potential courses of action to give the Air Force an option to meet its total pilot requirements in the near and long term.

**Subject Terms:**
Rated Summit, Pilot Shortage, Pilot Retention, Absorption, Overabsorption, Mobility Air Force, Quartile

**Security Classification:**
- Report: U
- Abstract: U
- This Page: U

**Confidentiality:**
- Limitation of Abstract: UU
- Number of Pages: 100