



PROJECT AIR FORCE

Understanding Demographic Differences in Undergraduate Pilot Training Attrition

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Preface

U.S. Air Force policymakers aim to recruit and maintain a force that reflects the demographic diversity of the nation it serves. Prior research has noted that the Air Force officer population tends to underrepresent female and nonwhite personnel and that this gap grows as rank increases. One factor that contributes to this relationship between demographics and rank is an officer's occupation: Officers in rated (i.e., flying) occupations tend to have more opportunities at the senior levels of the Air Force, and data show that women and racial and ethnic minorities are not well represented in rated occupations. The goal of this study was to better understand the barriers to becoming pilots that are unique to minority and female candidates.

This report examines one aspect of the pipeline for becoming a rated officer by looking at demographic differences in Undergraduate Pilot Training (UPT) completion. The report presents findings from a series of focus groups conducted with current UPT students and instructors to better understand potential challenges that women and racial and ethnic minorities might face in entering and completing UPT. The report also documents findings from a quantitative examination of demographic differences in attrition rates, reasons for attrition, and an analysis of whether certain individual characteristics (e.g., test scores, prior flying experience) account for differential rates of attrition. Finally, the report concludes with initial recommendations for improving current Air Force policies and practices to try to improve female and racial and ethnic minority representation in pilot career fields.

The research reported here was commissioned by the Office of the Assistant Secretary of the Air Force for Manpower and Reserve Affairs and the Deputy Chief of Staff of the Air Force for Manpower, Personnel and Services and conducted within the Manpower, Personnel, and Training Program of RAND Project AIR FORCE as part of a fiscal year 2016 project Improving the Demographic Diversity of Air Force Active Duty Military Members.

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Summary

Across the U.S. Department of Defense, senior leaders have emphasized the importance of improving demographic diversity at the highest levels of leadership. This emphasis is a response to the reality that personnel data statistics show a decline in representation for female and minority officers at the highest levels (Asch, Miller, and Malchiodi, 2012). One reason for this pattern in the Air Force, as noted in Lim et al., 2014, is that female and minority officers are less likely to be in career fields that require aeronautical ratings (e.g., pilot), which have the highest promotion rates. The study reported there noted that the reasons for this sorting are not fully clear and need to be better understood.

To become a pilot, generally speaking, officers must compete for the opportunity to enter pilot training and survive the arduous training pipeline. Although prior work has shown that differences in occupational preferences limit minority and female representation among those entering training (Schulker, 2010), data also show that there are demographic differences in the completion rates for Undergraduate Pilot Training (UPT). The Office of the Assistant Secretary of the Air Force for Manpower and Reserve Affairs and the Deputy Chief of Staff of the Air Force for Manpower, Personnel and Services asked the RAND Corporation to conduct a study to better understand the barriers to becoming pilots that are unique to minority and female candidates. This report documents finding from that study.

The report presents findings from a series of focus groups conducted with current UPT students and instructors to better understand potential challenges that women and racial and ethnic minorities might face in entering and completing UPT. The report also provides an overview of demographic differences in attrition rates, reasons for attrition, and an analysis of whether certain individual characteristics (e.g., test scores, prior flying experience) can account for differential rates of attrition. Finally, we conclude with key findings and initial recommendations for improving current Air Force policies and practices aiming to raise female and racial and ethnic minority representation among Air Force pilots and, in turn, Air Force senior leaders.

An Overview of Undergraduate Pilot Training

The Pilot Candidate Selection Process

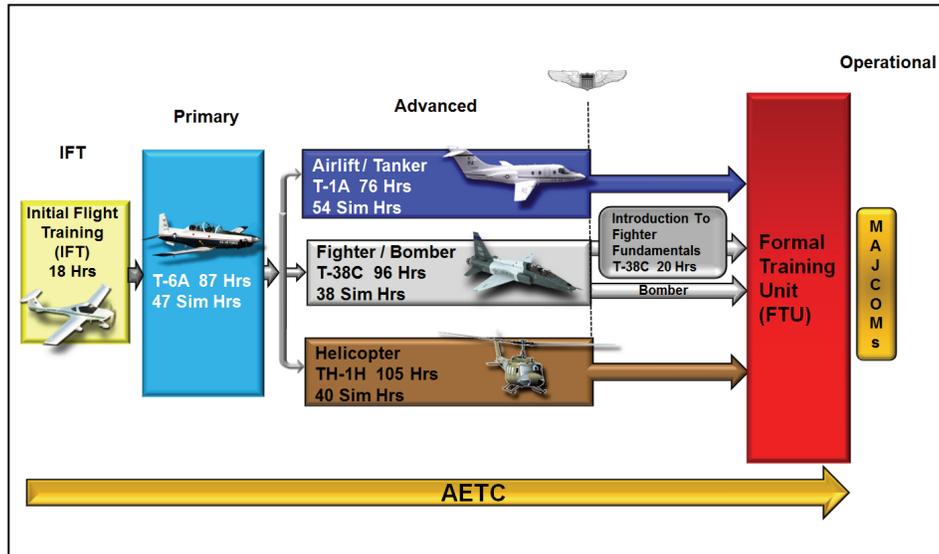
The most common way for active-duty officers to enter pilot training is to compete for a pilot slot prior to commissioning. The processes for allocating pilot slots to desiring candidates differ by commissioning source, but, in general, a selection board awards pilot opportunities according to merit criteria, such as undergraduate academic performance.

Candidates from Reserve Officer Training Corps programs and candidates commissioning through Officer Training School undergo a test battery that specifically measures pilot potential. The overall score that enters into the selection process, known as the Pilot Candidate Selection Method (PCSM) score, combines information from multiple sources. One component of PCSM comes from the Air Force Officer Qualifying Test (AFOQT), which is a pencil-and-paper test measuring general aptitude and knowledge (e.g., arithmetic reasoning), as well as knowledge of aviation-specific information. Candidates also undergo a separate computer-assisted test battery known as the Test of Basic Aviation Skills (TBAS), which, according to Carretta, 2011, assesses “psychomotor skills, multitasking, and spatial orientation” (p. 4). PCSM combines AFOQT scores with TBAS scores and hours of flying experience into a single score that has been shown to correlate with UPT performance over many years (Carretta, 2011).

The Undergraduate Pilot Training Pipeline

A candidate seeking to become a pilot in the Air Force must successfully navigate a multiyear training process with several distinct phases, illustrated in Figure S.1. Candidates start with Initial Flight Training (IFT), which is a primer that features course material similar to what one would encounter in obtaining a private-pilot certificate. Candidates who complete IFT then enter UPT, which consists of a “primary” phase that uses the T-6A training aircraft, and an “advanced” phase in which candidates are tracked according to different classes of aviation (i.e., airlift and tanker, fighter and bomber, and helicopter).

Figure S.1. The Traditional Pilot Pipeline



SOURCE: Abatti, undated.

NOTE: sim = simulation. AETC = Air Education and Training Command. Hours noted beside an aircraft designation are those in the aircraft. Sim hours are in addition to those hours. The vertical line with wings indicates completion of UPT, when the pilot receives an aeronautical rating.

Potential Barriers to Increasing Minority and Female Representation in Pilot Career Fields

We conducted focus groups with UPT students and instructor pilots (IPs) to explore potential unique challenges that minority and female officers face in entering pilot training and becoming successful pilots. Focus groups took place at three of the four main UPT locations: Laughlin Air Force Base (AFB), Texas; Vance AFB, Oklahoma; and Columbus AFB, Mississippi.¹ Student participant sessions consisted of three types of groups—white male, minority male, and female—and we held sessions of each type in both the primary (T-6A) and advanced (T-1A and T-38C) phases of training. We also conducted focus groups with white male, minority male, and all female instructors.² In total, we conducted 43 focus groups with students and instructors. This included 214 participants (169 students and 45 IPs) across the three locations.

¹ We did not conduct focus groups at the fourth main training base (Sheppard AFB, Texas) in large part because of the presence of the elite Euro–North Atlantic Treaty Organization Joint Jet Pilot Training program, which enjoys relatively low attrition rates. Also, the population includes students and instructors from North Atlantic Treaty Organization member countries who might not experience diversity-related issues similar to those that U.S. students and instructors experience.

² Because of the relatively small number of female students and IP participants, we did not further divide these groups by race or ethnicity.

The research questions focused on identifying specific factors that initially draw students to the pilot field and what challenges student pilots face during the training experience. Key themes emerged from these discussions regarding factors they believed contributed to success or difficulties completing UPT, as well as specific challenges that women or minorities might face.

Motivation to Enter Pilot Training

UPT students broadly cited external influences (e.g., family, friends, media) and the desire to fly (e.g., enjoyment of being in the air, not wanting a desk job) as key motivators for the desire to become an Air Force pilot. References to desire to fly arose broadly, in 82 percent of student groups. References to external influences as a key reason that students wanted to become Air Force pilots arose in 94 percent of student groups. Yet, minority and female student groups were less likely than white-male groups to cite family as a key influence to their wanting to become Air Force pilots. White-male groups, in contrast, reported a variety of people—family, coaches, and nonfamily military members—with whom they talked or who had influenced their motivation to become Air Force pilots. If this discrepancy reflects that minorities and women are less likely to have family members who are either pilots or in the military, it might then suggest that they have fewer influences to encourage them to become pilots.

Challenges to Completing Training

We asked students and instructors about the factors they thought led to success in completing pilot training or that contributed to challenges in doing so. They cited peer support and personal traits (e.g., possessing confidence, being prepared, time management, ability to accept failure, and not taking criticism personally) as key completion factors. Work/life balance was also emphasized as a needed break from studying (e.g., going to the gym, pursuing outside interests) and to provide emotional and other support. Finally, students in 85 percent of all groups cited having the right attitude, including humility, not dwelling on mistakes or taking things too seriously, and managing expectations and stress.

Patterns in how they reported several of these themes also pointed to lack of confidence among female students. Female instructors reported lack of confidence among female students, especially compared with men. Several instructors said that female students seemed to be poorer performers or that they had heard other instructors say that, particularly in terms of flying performance (as opposed to academics, general knowledge, or knowledge of instruments). As with instructors, female students also suggested that they might have a harder time than their male counterparts shaking off criticism. In addition, when we asked about factors that made pilot training challenging, female groups were more likely than male groups to list a broader range of challenges (e.g., instructor shortcomings and flying ability). When asked, female groups also expressed more doubts than white- and minority-male groups that they would complete training.

Specific Challenges for Women and Minorities

Besides general challenges associated with pilot training, we also asked focus group participants whether women or minorities faced specific challenges. White-male groups were more likely to respond to this question by saying that women and minorities did not face any specific challenges, while female and minority-male group members highlighted several unique challenges they faced, as discussed below.

Contending with the Majority or Prevailing Culture

By far the most frequently mentioned theme was that students faced pressure to fit in with the predominant culture, much of which the majority of candidates, who were white men, dominated. Sixty-six percent of the student focus groups discussed minority and female pilot trainees as pressured to understand, accept, fit in, and flourish within the demographically dominant group culture. In particular, 81 percent of female focus groups discussed this. These experiences dealing with the predominant culture consisted of a process by which minority and female students, for example, had to navigate a male-dominated environment; were exposed to and enveloped by white-male cultural norms; were only peripherally included in white-male “bro jokes”; and were compelled to accept a paradigm of white male as the typical pilot.

Simulation Instructors

Twenty-one percent of the student focus groups discussed negative behaviors from sim instructors that were directed toward female or minority pilots and that they regarded as racist or sexist in nature. They attributed these comments to sim instructors being “generationally unaware” of what could be construed as offensive and condescending language. (In contrast, they attributed no such comments to flight-line instructors).

Individual Attitudes

When we asked about unique challenges for female and minority students, some participants responded in ways that suggested that they did not perceive specific burden for female and minority students. These students felt that the individual attitudes and dispositions of their peers (e.g., confidence, social aptitude, and optimism) contributed more than race or gender to difficulties in training. Students from all race and gender groups were equally likely to say that individual attitudes contributed more than race or gender to difficulties in training.

Burden on the Majority or Prevailing Culture

When asked about specific challenges for women or minorities, some students in majority groups (e.g., males or white males) reported that they were obliged to expend effort to adjust their language and actions when interacting with minority and female peers. Some interpreted this as obligatory empathy or sensitivity. In fact, it was suggested in 42 percent of white-male groups that emphasis on diversity caused a burden on whites and men for having to adapt and adjust their behaviors, such as when a woman was around.

Cognitive Burden

Students said that minorities and women felt pressure to perform, specifically on account of their gender or ethnicity. They typically described this “cognitive burden” as self-imposed. For instance, women and minorities described feeling singled out and that their successes or failures reflected not just on themselves but on an entire group. Students also described being highly visible and “in the spotlight” because of their minority status. Other students mentioned wanting to not disappoint people back home or future women or minorities who might look to them as role models.

Race and Gender Stereotyping

Women and minorities reported some instances of gender and race stereotyping and, in some cases, even overtly racist and sexist statements. Students described difficulties in avoiding falling into gender stereotypes, noticing disapproval for engaging in stereotypically “female” matters. Implicitly acknowledging perceptions that female students were less qualified, students also speculated that female students appeared to get special treatment. Male students suggested that schedules were altered so that struggling female students would fly with less strict instructors or receive more opportunities to pass check rides (flights on which an instructor evaluates student performance; see “Process for Managing Student Progress” in Chapter Two). In some cases, minority and female students reported instances in which other students or instructors made statements or behaved in ways that they construed as racist or sexist.

Mentors, Peer Relationships, and Other Sources of Support

Support networks and other resources play an important role in helping students overcome many of the physical, emotional, and mental stresses of the program. Guidance and mentorship come in a variety of forms, including base resources, family and friends outside the program, IPs and flight commanders, peers, and informal networks. Participants tended to say that they themselves had sufficient access to tools and instructors, but white-male students were more likely than minority or female students to say that their peers had equal access. White-male students were also more likely to say that access to resources was dependent on individuals or that it was somehow up to the individual whether or not they had access. Female and minority students were far more likely than white males to report that such base resources represented a source of support.

Peer Relationships

During UPT, student pilots might spend more time with each other than they do their families, the shared experience bringing them together in ways to which few outside their training groups might be able to relate. Accordingly, students and instructors broadly cited peers as critical sources of support. Developing solid peer groups is also an institutionalized part of the UPT culture. Students’ willingness to assist one another during the rigors of training feeds into

the commander's ranking of each student. Students raised the possibility that active-duty status was a factor that led students to compete against their peers rather than help and collaborate with them. Female and minority students seemed to particularly appreciate having peers of the same gender or race around as support.

Mentors

Students generally agreed that instructors and flight commanders were valuable sources of professional mentorship and support. Yet female students also alluded to several reasons for holding back from seeking help from instructors. For instance, students were sometimes reluctant to reach out to instructors for guidance, fearing, for instance, that their peers would view mentoring as favoritism. Echoing concerns about perceived favoritism, both students and instructors pointed to concerns about fraternization—and even the appearance of it—as a deterrent to more-formalized mentoring.

Female and Minority Affiliation Groups

Affiliation groups, such as Supergirls, Lean In, and SUFR (which participants said to be “Shut Up and Fly Right,” “Stand Up and Fly Right,” or “Straighten Up and Fly Right”) appear to provide an important social resource (online and occasional in-person meetings) for women and minorities. They seemed to provide a positive overall impact on their experiences, boosting confidence and knowledge, offering networking opportunities, and bolstering other support systems. Female and minority students reported that informal networks and affiliation groups served as important supplementary sources of mentorship and support.

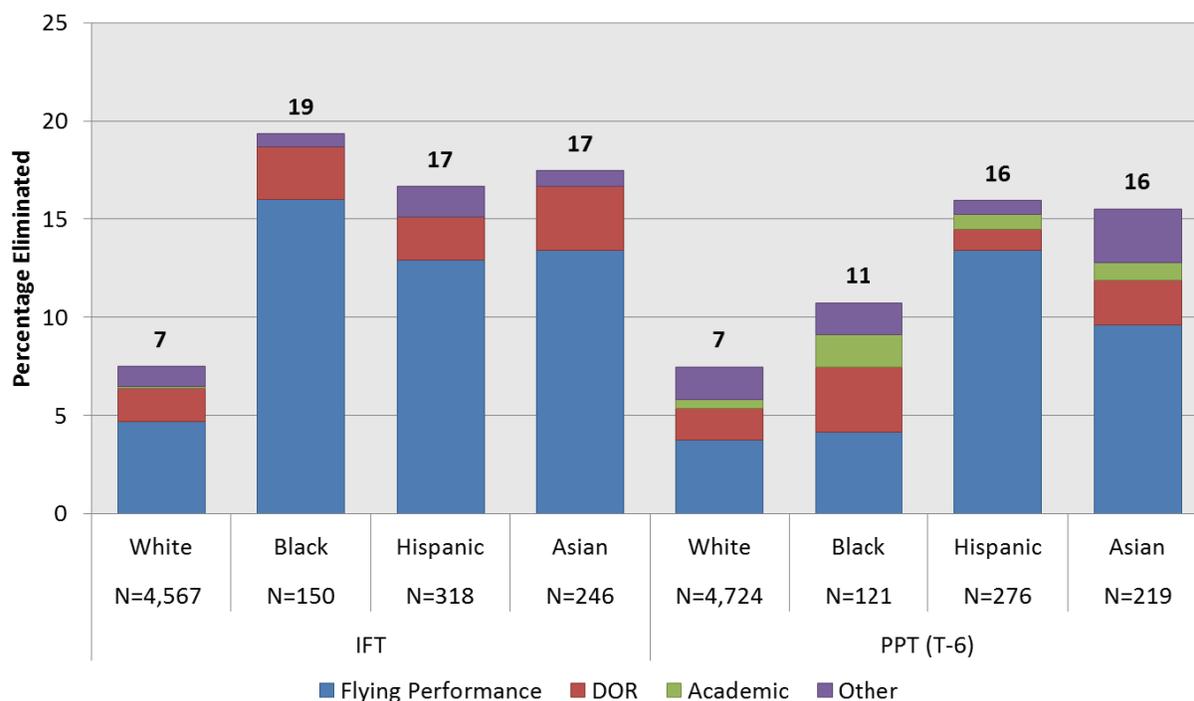
Attitudes About Diversity

We asked focus groups whether it was important for them to see ethnic minorities and women both in their cohorts and in leadership positions. Some students stated that peer diversity was unimportant or that they did not perceive it to be. Also, many students emphasized that an individual's (peer or leader) aptitude, performance, or ability to meet standards was more important than his or her race or gender. In doing so, these students also seemed to make an implicit distinction between diversity and achieving the mission (e.g., “The mission isn't to make diversity,” “I'd rather have an Air Force that can do the mission than an Air Force that is diverse”), implying that “diverse people” were less qualified. Another implicit assumption that emerged was that diversity efforts entailed mainly making quotas for women or minorities. Other focus group participants noted that diversity could provide certain benefits, such as applying multiple perspectives to problem-solving. Finally, students described why it was meaningful for them to see ethnic and gender diversity among senior leadership, including providing role models for them or future recruits.

Demographic Differences in Pilot Training Attrition

Using AETC-provided data on candidates engaging the UPT pipeline from 2009 to 2014,³ we calculated rates of attrition (by attrition reason) for each race and ethnicity and gender group (see Figure S.2 and Figure S.3). These calculations show that minority and female candidates tend to have higher rates of attrition in both IFT and primary pilot training (PPT). The documented reasons for attrition show that the only category that differs substantially by demographic group is the flying category.

Figure S.2. Initial Flight Training and Primary Pilot Training Attrition, by Elimination Reason and Race and Ethnicity

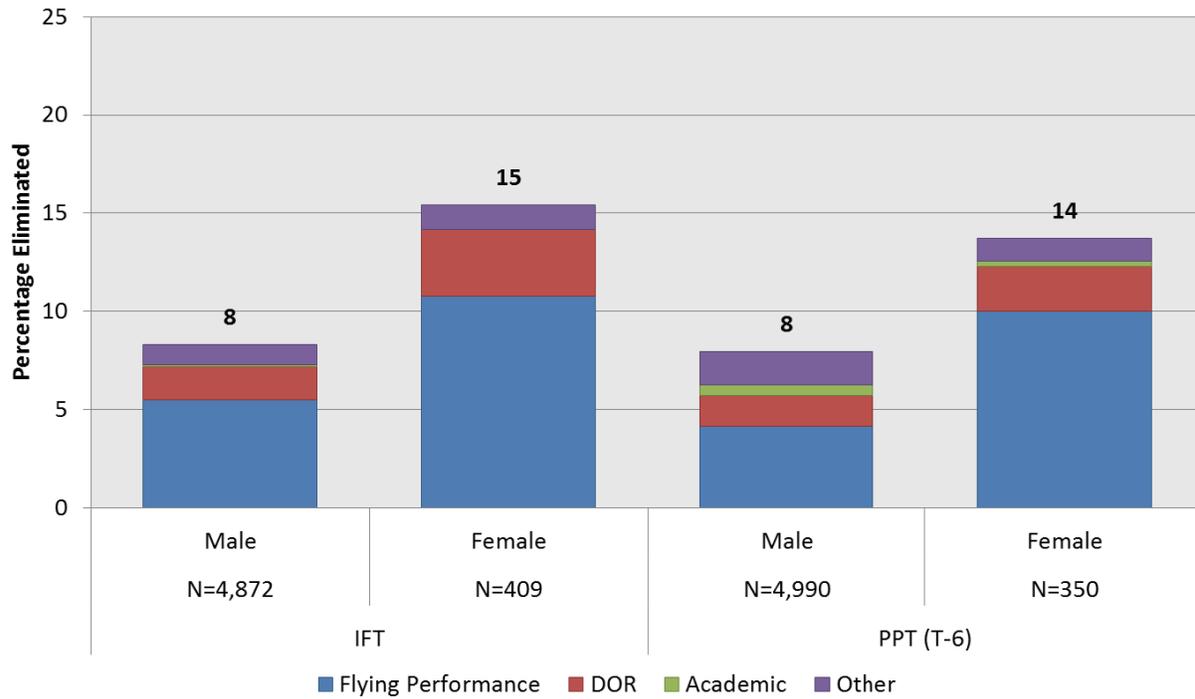


SOURCE: Authors' calculations from AETC data.

NOTE: DOR = drop on request (drop out of training at the trainee's request). For IFT, the difference in the overall rate between each minority group and the white group is statistically significant at the 0.05 level. For PPT, only the differences for Hispanic and Asian candidates are statistically significant. When conducting significance testing separately by attrition reason, we found that only differences in attrition due to flying were statistically significant.

³ It is important to note that, starting in 2015, AETC made changes to the structure of IFT such that it is no longer intended as a screening-out phase, which could have reduced attrition in IFT. At the time of this study, not enough classes had completed all phases of UPT to analyze how this change would affect attrition rates in the remaining phases and any demographic differences. Because there are no planned changes to later phases, we believe that the historical data on pilot training demographics presented here still provide useful context to understanding attrition differences.

Figure S.3. Initial Flight Training and Primary Pilot Training Attrition, by Elimination Reason and Gender



SOURCE: Authors' calculations from AETC data.

NOTE: Both gender differences in the proportion eliminated due to flying performance are statistically significant. The IFT difference in the proportion eliminated due to DOR was also statistically significant at the 0.05 level.

Attrition's Effect on Graduate Demographic Representation

When interpreting differences in attrition rates, however, it is also important to bear in mind that minority and female candidates are a very small proportion of the population entering training. Thus, differences in attrition rates as large as those in Figures S.2 and S.3 do not dramatically affect representation in the final pool of graduates. Table S.1 illustrates this pattern; it compares each demographic group's representation in the final pool of graduates with what the group's representation would have been if the group's candidates had the same attrition rate as the white or male candidates. The end result is that representation does not change by more than 1 percentage point among IFT or PPT graduates as a result of the relatively high attrition rates among minority and female candidates.

Table S.1. The Effect That Higher Attrition Has on the Demographic Composition of Graduates

Training	Group	Actual Graduates		At White and Male Attrition Rates	
		Number	Representation (%)	Additional Graduates	Difference in Representation (%)
IFT	Black	121	2.5	18	0.4
	Hispanic	265	5.5	29	0.6
	Asian	204	4.2	24	0.5
	Female	346	7.2	29	0.6
PPT	Black	108	2.2	4	0.1
	Hispanic	232	4.7	23	0.4
	Asian	185	3.8	18	0.4
	Female	304	6.2	20	0.4

SOURCE: Authors' calculations from AETC data.

Can Other Characteristics Account for Demographic Differences in Attrition?

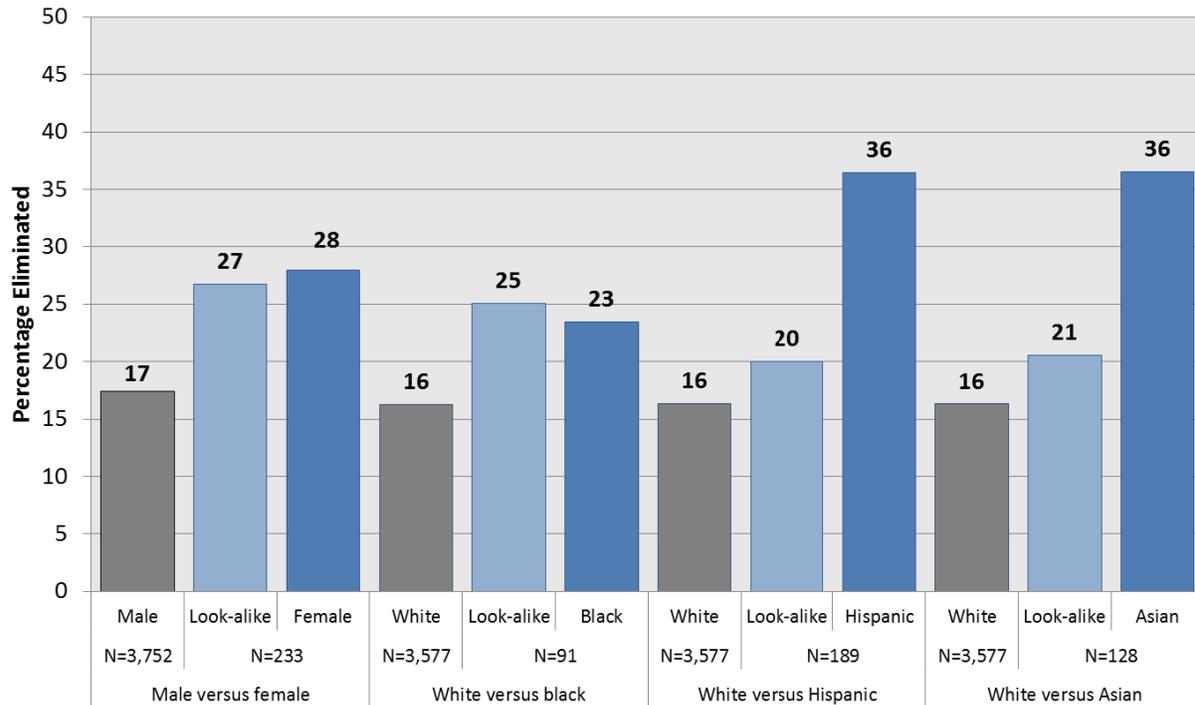
Although Figures S.2 and S.3 note large demographic differences in training attrition, it is important to fully investigate the relationship between all available characteristics and training attrition before concluding that the patterns are driven by demographics alone. Raw differences between demographic groups could result from group differences in benign background characteristics, such as flying ability or experience. The most appropriate policy for addressing higher attrition among minority and female candidates hinges on the underlying cause, which could be different for each group.

Demographics and training outcomes, the data that AETC provided to RAND include some measures of candidate flying aptitude and experience used in the pilot selection process for certain candidates.⁴ This information permitted an exploratory analysis of whether the higher minority and female attrition rates relate to differences in pretraining candidate characteristics. To examine this question, we conducted a “look-alike” analysis, in which we compared the predicted attrition rate for each minority group with the predicted rate for a hypothetical cohort of base-group candidates (i.e., white candidates for race and ethnicity comparisons and male candidates for gender comparisons) who had identical characteristics to the minority group of interest. In addition to race and ethnicity and gender, the look-alike analysis adjusted for candidate scores on the AFOQT and TBAS, prior flight experience, source of commission, and whether the candidate was a “distinguished graduate” of his or her commissioning source.

⁴ The data include the components of PCSM, which was required only for pilot candidates from Reserve Officer Training Corps and Officer Training School during the time period covered in our data.

Figure S.4 summarizes the results of these comparisons, showing predicted attrition rates for each minority group compared with the predicted rate for base-group candidates with similar characteristics, whom we dubbed the look-alike candidates. The results show that differences in candidate characteristics can plausibly explain the higher attrition for female and black candidates, but significant unexplained gaps remain between Hispanic and Asian candidates and their look-alike comparison groups.

Figure S.4. Estimated Overall Attrition Rates, by Demographic Group, Versus Look-Alike Comparison Groups



SOURCE: Authors' calculations from AETC data.

NOTE: The regression analysis could include only candidates from sources other than U.S. Air Force Academy (USAFA) (which did not use PCSM to allocate pilot slots during the time period covered in our data). We use the nonparametric bootstrap to calculate standard errors used for significance testing. The only groups that are significantly different from the look-alike group are Hispanic and Asian candidates.

The reason for this pattern is that the female and black candidates entering UPT tended to have lower scores on pretraining measures of flying aptitude. For example, we employed decomposition analysis to test which characteristics play the strongest role in accounting for the gaps in attrition, and the results show that scores on the TBAS alone could account for the entire male–female difference and 72 percent of the white–black difference in IFT attrition rates. Decompositions of the differences at the PPT stage were less informative because of a limited

minority sample size and the fact that pretraining measures are not as strongly related to attrition in PPT.

In addition to potentially contributing to the demographic differences in attrition, the correlation between demographics and flying aptitude or experience is relevant to the qualitative findings. Focus group participants noted several perceptions about minority and female students lacking confidence or being more likely to fail and indicated that such perceptions add to the stress and burden that all members of underrepresented groups face.

Key Findings

The information gathered from current students and instructors, combined with the data analysis, point to several key findings:

- *Women and minorities appear to face unique challenges to becoming pilots.* Focus groups indicated that female and minority officers have fewer external influences to become pilots and face difficulties adapting to the dominant culture in UPT.
- *Minority and female candidates have relatively high attrition due to flying performance.* Data confirm that female and minority candidates are at higher risk for attrition in UPT, stemming from eliminations due to flying performance.
- *Minority and female representation among UPT graduates would be low even if all groups had similar attrition levels.* In a hypothetical counterfactual scenario in which all groups had the same attrition rates, representation among graduates changed by less than 1 percentage point for each group.
- *Candidate characteristics could account for higher attrition among female and black candidates.* Attrition for female and black candidates was no higher than those for male and white candidates with similar characteristics, but attrition rates for Hispanic and Asian candidates were significantly higher than that for similar white candidates.
- *More information is needed in several areas.* A full understanding of demographic differences in UPT attrition requires more specific information on what occurs during training, as well as information on the characteristics of USAFA graduates (who were not assessed by PCSM during the time period covered in our data).

Recommendations

When considered together, these findings point to the following recommendations:

- Improve pilot training experiences for women and minorities.
- Continue to increase the number of minority and female candidates entering pilot training. Consider ways to raise the TBAS scores of incoming minority and female candidates.
- Review training progress–management policies to determine whether less prepared candidates with potential have the opportunity to succeed.
- Conduct research to identify the causes of higher attrition rates among Hispanic and Asian candidates and to further assess differences among USAFA graduates.

The qualitative portion of this study highlighted many aspects of the UPT climate and culture that are likely of interest to policymakers, independent of their direct effects on attrition rates. To address these issues and improve pilot training experiences for underrepresented groups, policymakers could connect sim instructors and flight instructors to minimize teaching discrepancies, increase instructor accountability for offensive behavior, expand affiliation groups across UPT bases and minority groups, clarify appropriate mentoring strategies, and explore use of “casual” time (when students are on base but have not begun training) to provide flying experience or study materials.

The demographic patterns in UPT show that significantly increasing minority and female representation among Air Force pilots requires an increase in the number of minority and female candidates entering pilot training. In addition to being a necessary component of the strategy to increase long-run diversity among senior Air Force leaders, increasing the flow of minority and female candidates could reduce some of the adjustment burden and isolation that minority and female candidates expressed in focus groups. At the same time, findings also show that achieving higher numbers by drawing on candidates who are less likely to succeed could have unintended consequences, such as creating negative perceptions that negatively affect all female or minority candidates.

Although policies aiming to reduce minority and female attrition are unlikely to increase representation on their own, such policies could help to maximize the effectiveness of increasing the number of minority and female candidates entering training. Our results indicate that efforts to address candidate preparation should focus on increasing the prevalence of TBAS-related skills among minority and female candidates. The Air Force could examine selection board procedures for ways to select minority and female candidates with higher TBAS scores (Carretta, 2000) or attempt to bolster TBAS-related skills among selected candidates. In developing new preparatory efforts, the Air Force should conduct additional groundwork to understand whether it is possible to increase the skills that the TBAS measures through an intervention, as well as to identify the best method to increase such skills.⁵ The design of a new preparatory effort could also include an analysis of the content areas in which most underprepared students tend to struggle. Regardless of the approach, designing an effective course will likely require careful planning. These results indicate that improving a candidate’s likelihood of success requires more than increasing the candidate’s general familiarity with flying: small changes in flying experience did not significantly relate to attrition, conditional on other factors.

An alternative to attempting to affect candidate success prior to training is to adjust the policies governing how candidate progress is managed. The current policies emphasize quickly eliminating candidates who cannot keep up with the rapid pace of training. Although this process might be efficient, it also might eliminate some candidates (from all demographic groups) who

⁵ At the time of this research, the Air Force Personnel Center was conducting an experimental study on whether providing candidates with an online aviation course increases candidate test scores and pilot training performance.

had the potential to succeed. An alternative process could offer less prepared candidates who have the requisite desire and potential to succeed additional opportunities to practice areas of difficulty. Policymakers could also explore an adaptive training approach, in which students with different levels of aptitude and preparation receive tailored instruction. If a customized curriculum could improve the success prospects of at-risk students, historical data show, this approach could disproportionately benefit female and minority candidates.

Finally, imperfection of information constrains current options. Without understanding the attrition gaps for all demographic groups, the Air Force cannot identify candidates with the best chance of success or add to their preparation in a way that is likely to reduce attrition. Thus, we recommend further research to understand the attrition patterns of Hispanic and Asian candidates. Further, our understanding of all demographic differences in UPT attrition might not generalize to USAFA graduates: We lack information on how flying aptitude relates to attrition in this group. To remedy these research gaps, one potential approach would be to identify a representative sample of candidates prior to the beginning of training and follow them through the process while collecting information on their backgrounds and experiences. Another option would be to conduct a randomized study across bases, using the high tempo of student cohorts to test interventions to improve student experiences, as we have described above. Such information could help to pinpoint the precise causes of the higher attrition and identify policy remedies to improve the prospects of these fast-growing minority groups.

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Abbreviations

AETC	Air Education and Training Command
AETCI	Air Education and Training Command instruction
AFB	Air Force base
AFOQT	Air Force Officer Qualifying Test
AFSC	Air Force specialty code
APT	Advanced Pilot Training
CAP	Commander's Awareness Program
CR	Commander's Review
DG	distinguished graduate
DOR	drop on request
EC	elimination check
ENJJPT	Euro–North Atlantic Treaty Organization Joint Jet Pilot Training
FTU	Formal Training Unit
IFF	Introduction to Fighter Fundamentals
IFT	Initial Flight Training
IP	instructor pilot
IQT	Initial Qualification Training
MAJCOM	major command
MLE	maximum likelihood estimator
MQT	Mission Qualification Training
MWS	major weapon system
NATO	North Atlantic Treaty Organization
OTS	Officer Training School
PAF	RAND Project AIR FORCE
PC	progress check
PCSM	Pilot Candidate Selection Method

PPT	primary pilot training
ROTC	Reserve Officer Training Corps
RPA	remotely piloted aircraft
sim	simulation
SUFR	Shut Up and Fly Right, Stand Up and Fly Right, or Straighten Up and Fly Right
SUPT	Specialized Undergraduate Pilot Training
TBAS	Test of Basic Aviation Skills
UPT	Undergraduate Pilot Training
USAFA	U.S. Air Force Academy

Chapter One. Introduction

Across the U.S. Department of Defense, senior leaders have emphasized the importance of improving demographic diversity at the highest levels of leadership. Air Force policy describes diversity as a “military necessity” and states that “Air Force capabilities and warfighting skills are enhanced by diversity among its personnel” (Air Force Policy Directive 36-70, 2010). The Air Force defines *diversity* broadly as including “personal life experiences, geographic background, socioeconomic background, cultural knowledge, educational background, work background, language abilities, physical abilities, philosophical/spiritual perspectives, age, race, ethnicity and gender,” but the policies note that the broad definition includes demographic diversity and the policies direct all leaders to be “directly engaged in and accountable for all aspects of diversity initiatives and their implementation, including barrier analysis” (Air Force Policy Directive 36-70, 2010). This report falls within the realm of barrier analysis, focusing on race, ethnicity, and gender, but the reader should view this focus as a piece of a larger Air Force diversity effort.

Although demographic diversity receives significant top-level emphasis in the Air Force, personnel data statistics show lower representation of female and minority officers at the highest levels of leadership than in the junior ranks (Asch, Miller, and Malchiodi, 2012). One reason for this pattern that is common to all services is that senior leaders are disproportionately drawn from occupations that have low levels of minority and female representation (Military Leadership Diversity Commission, 2011). In the Air Force, as noted in Lim et al., 2014, female and minority officers are less likely to be in rated career fields (i.e., career fields, such as pilot, that require aeronautical ratings), which have historically had the highest promotion rates. That study noted that the reasons for this sorting are not fully clear and need to be better understood.

Officer candidates desiring to be pilots must compete for the opportunity to enter pilot training while at their commissioning sources and, after obtaining a pilot slot, survive the arduous training pipeline. The low levels of minority and female representation in the rated career fields could stem from demographic differences in candidates who receive pilot slots, as well as group differences in training success rates. Prior work has shown that demographic differences in occupational preferences limit minority and female representation among those who receive pilot slots (Schulker, 2010), but no published work to date has examined the patterns of training completion among those who are afforded the opportunity to enter the pipeline.

The Office of the Assistant Secretary of the Air Force for Manpower and Reserve Affairs and the Deputy Chief of Staff of the Air Force for Manpower, Personnel and Services asked the RAND Corporation to conduct a review of barriers to Undergraduate Pilot Training (UPT) completion for minority and female officers. A better understanding of potential barriers will

inform policies seeking to improve demographic diversity in the pilot career field in the near term, with the ultimate goal of boosting the number of minority and female officers with the requisite experience to become Air Force senior leaders.

Study Approach

This study took both a qualitative and quantitative approach to understanding potential barriers to UPT completion for minority and female Air Force officers. The qualitative portion of the study focused on identifying potential barriers by collecting the perspectives of current UPT students and instructor pilots (IPs) through focus groups. This information helped to identify any unique challenges that female and minority officers face that could contribute to demographic differences in attrition but also yielded insights about the training environment that are likely of interest to policymakers independent of their impact on attrition. The quantitative portion examined historical training data to summarize the characteristics of recent pilot candidates and document demographic differences in attrition rates for the major phases of UPT. We then conducted an exploratory analysis to examine whether group differences in characteristics contribute to differences in attrition rates using the factors included in the Air Force system for pilot selection, known as the Pilot Candidate Selection Method (PCSM). Finally, we developed recommendations based on the implications of our results for increasing minority and female representation in rated career fields.

Policy Changes in 2015 Could Affect the Applicability of These Findings

It is important to note that, starting in 2015, there were some significant changes to the first phase of pilot training, known as Initial Flight Training (IFT). As we show in Chapter Four, IFT had recently been one of the phases with the highest attrition rates. However, starting in 2015, training pipeline managers adjusted the intent of IFT because they desired to shift the focus from screening out candidates with low-success prospects to preparing all candidates for the rest of the training pipeline. Therefore, attrition in IFT could have decreased after the window observed in the data, and, at the time of this study, it was too early to assess the impact of this change on the entire pipeline. This change in policy would tend to limit the applicability of our findings going forward if it significantly alters attrition overall or the relationship between candidate characteristics and attrition. For instance, if the adjusted program remediates deficiencies among candidates whom the old system would have screened out, overall attrition could decrease and demographic patterns could change. As is always the case, if a policy dramatically changes a complex system, policymakers should view research on the old system with caution.

Still, information to date indicates that these findings will likely continue to be applicable. Our understanding is that the structure and curriculum of the remaining phases remain unchanged. Therefore, it is expected that screening out fewer candidates in IFT might shift some attrition to the next phase because the former purpose of IFT was to screen out candidates who

would not be successful in subsequent phases. The fact that candidates eliminated in IFT tended to have lower scores on PCSM (see Chapter Five), which has been shown to predict success in later phases (Carretta, 2011), also suggests that many of the candidates who would have been eliminated in IFT under the old system might still be eliminated. Because the characteristics measured in the pilot candidate selection process will likely remain very relevant to attrition, we would expect the overall findings regarding whether group differences in candidate characteristics or experience play a role in understanding differences in attrition rates to still be relevant.

Organization of This Report

The remainder of this report is organized as follows. Chapter Two provides an overview of UPT and the processes set forth in regulations for overseeing student progress. Chapter Three discusses pilot training experiences and specific challenges for women and minorities, based on focus group discussions with UPT students and instructors. Chapter Four provides summary statistics of demographic differences in attrition through the various phases of UPT, while Chapter Five explores the degree to which these differences are attributable to group differences in candidate characteristics among the subset of candidates that had measures of flying aptitude and experience available. Chapter Six concludes with a summary of key findings and recommendations. The report also includes several appendixes. Appendix A and Appendix B provide detailed descriptions of the quantitative methodologies employed in Chapter Five. Appendix C provides greater detail regarding the focus group methodology, and Appendix D presents the focus group protocols.

Chapter Two. An Overview of Undergraduate Pilot Training

In this chapter, we provide an overview of Air Force UPT. The chapter begins with a discussion of the basic processes and screening assessments involved in pilot candidate selection prior to UPT, which are relevant to subsequent analyses. Then, we provide an overview of the UPT pipeline. As part of this overview, this chapter also discusses other important aspects of flying training outside of UPT, such as IFT, which happens prior to UPT, and Formal Training Units (FTUs) that follow UPT and are specific to each major weapon system (MWS) (i.e., aircraft). Additionally, because this report focuses on demographic differences in training completion, we describe the administrative process that training leadership typically uses to oversee student progress and manage student eliminations.

The Pilot Candidate Selection Process

The most common way for active-duty officers to enter pilot training is to compete for a pilot slot prior to commissioning. Pilot slots are allocated to each commissioning source, where a selection board evaluates candidates based on merit criteria. The particular criteria vary by source, but each has a system that ranks all candidates according to their pilot potential and combines this information with the subjective judgment of the board members (see Carretta, 2000, for a detailed description of the processes at each source).

In addition to generic merit criteria, such as academic or military performance, candidates competing through Reserve Officer Training Corps (ROTC) and Officer Training School (OTS) undergo a battery of tests as part of PCSM. The resulting measure, known as the PCSM score, is a weighted composite of three other composite measures—the Air Force Officer Qualifying Test (AFOQT) pilot composite, the Test of Basic Aviation Skills (TBAS) composite, and a measure of prior flying experience (Carretta, 2011). Candidates' PCSM scores do not directly determine whether they will receive a pilot slot, but they provide information to board members on each candidate's potential for success.

The AFOQT is a pencil-and-paper test battery of 11 cognitive subtests, and the pilot composite aggregates the information in the Arithmetic Reasoning, Math Knowledge, Instrument Comprehension, Table Reading, and Aviation Information subsets into a single measure (Drasgow et al., 2010). The TBAS, on the other hand, is a computer-administered evaluation of “psychomotor skills, multitasking, and spatial orientation” designed to directly measure pilot aptitude (Carretta, 2011). The PCSM score combines the AFOQT pilot composite and the TBAS composite with the number of hours of flying experience each candidate possesses to form the overall score that enters into the selection process. Since its inception, the PCSM score has been

shown to correlate with many aspects of pilot training performance (Carretta, 2005; Carretta, 2011).

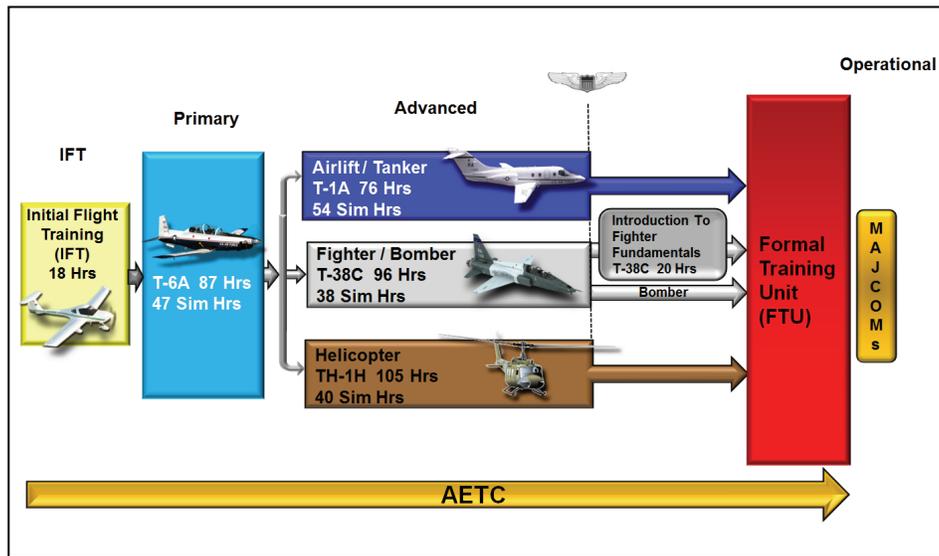
The Undergraduate Pilot Training Pipeline

Once selected to become pilots, candidates enter the UPT pipeline. Figure 2.1 summarizes the training pipeline in a way that represents the most-common paths that Air Force pilots take. All pilots must successfully complete IFT,⁶ which Doss Aviation conducts in Pueblo, Colorado. After completing IFT, a prospective pilot typically proceeds to one of three main UPT bases: Laughlin Air Force Base (AFB), Texas; Vance AFB, Oklahoma; or Columbus AFB, Mississippi. The UPT curriculum includes primary training that is common to all pilots and an advanced course that is specialized according to three general classes of aviation:⁷ airlift and tanker, fighter and bomber, and helicopter. At the completion of the advanced course, the student receives his or her aeronautical rating (Air Education and Training Command [AETC], 2012a) and proceeds to an FTU that is specific to his or her assigned MWS. Prior to attending the FTU, each fighter pilot must complete the Introduction to Fighter Fundamentals (IFF) course at Joint Base San Antonio–Randolph, Texas; Columbus AFB, Mississippi; or Sheppard AFB, Texas (Ricks, 2011). The pilot is fully qualified to perform his or her assigned mission after successfully completing Initial Qualification Training (IQT) at the FTU and Mission Qualification Training (MQT) at his or her operational unit. AETC typically manages the nodes of the training process up through the FTU before passing pilots to the major command (MAJCOM) that manages their respective MWSs. For some MWSs, the MAJCOM manages the FTU portion of training as well. We discuss each of these points in the training pipeline in more detail below.

⁶ Source documents also refer to IFT by its previous name, Initial Flight Screening. The updated name appears on the welcome packet but has not made it into guidance at the time of this report.

⁷ Publicly available AETC descriptions identify academic or ground training, primary flying training, and advanced flying training as three phases of Specialized UPT (SUPT). However, the individual syllabi seem to differentiate between primary pilot training (PPT) (with the T-6A aircraft), and SUPT, with the T-1A, T-38C, or TH-1H aircraft (depending on the pilot's specialization track). To avoid confusion, this chapter uses *UPT* to refer collectively to primary and advanced flying training.

Figure 2.1. The Traditional Pilot Pipeline



SOURCE: Abatti, undated.

NOTE: sim = simulation. We use the term *traditional* in describing the figure to contrast this path with the new training pipeline that is specifically designated for career remotely piloted aircraft (RPA) pilots. Hours noted beside an aircraft designation are those in the aircraft. Sim hours are in addition to those hours. The vertical line with wings indicates completion of UPT, when the pilot receives an aeronautical rating.

Initial Flight Training

The first step to becoming an Air Force pilot, known as the “Gateway to Air Force Aviation,” is IFT at Pueblo, Colorado. IFT prepares flight candidates for Undergraduate Flying Training and encompasses distinct training programs for pilot candidates, RPA pilot candidates, and combat systems officer candidates. Although a military chain of command administratively oversees students, external contractors conduct the actual training. Currently, Doss Aviation conducts all flight training under an Air Force contract using the Diamond DA20-C1 aircraft. The syllabus for the pilot IFT course includes 22 training-days of instruction and gives students approximately 18 hours of flight training time (including a half-hour of solo time). The IFT course material features content that is qualitatively similar to a basic civilian private-pilot course. Indeed, candidates who happen to already possess a private-pilot certificate are actually exempt from IFT (AETC Instruction [AETCI] 36-2205, Vol. 3, 2012). Some example maneuvers that students are expected to perform on a final check ride include takeoffs and landings (under varying conditions), stalls, slow flight maneuvering, steep turns, and traffic patterns (AETC, 2013a). As noted previously, AETC has made changes to the structure of IFT such that it is no longer intended as a screening-out phase and is now focused on preparing students for later phases of training.

Undergraduate Pilot Training

After completing IFT, the standard path through the pipeline routes pilot candidates to Laughlin AFB, Vance AFB, or Columbus AFB for UPT. UPT includes both a primary portion that is common to all pilots and an advanced portion in which pilots specialize according to the general category of military aviation that matches their ultimate destination (AETC, 2014c).

All PPT takes place in the T-6A Texan II aircraft. The course includes 31 academic or ground training days followed by 90 flying training days, and it usually lasts approximately 28 calendar weeks (AETC, 2014b). The PPT portion involves about 87 hours of total flight time in the T-6A. In contrast to IFT, which briefly exposes candidates to some flying basics, PPT provides candidates with foundational flying skills necessary to enter the advanced tracks. PPT requires students to master competencies, such as aircraft control; instrument flying, approaches, and navigation; three-dimensional maneuvering; and basic formation skills (AETC, 2014b).

Candidates who successfully complete PPT then move on to advanced flying training (to which course syllabi refer as SUPT). Advanced training has three possible tracks, each of which corresponds to a different training aircraft. Prospective fighter or bomber pilots conduct advanced training in the T-38C, while prospective airlift or air refueling pilots go through an advanced course in the T-1A.⁸ Candidates in both the fighter/bomber track and the airlift/tanker track continue to train at their assigned locations. Prospective helicopter pilots move on to Fort Rucker, Alabama, to complete their advanced training in the TH-1H aircraft. All advanced courses are 120 training days long, and the amount of flying time ranges from 76.4 flying-hours for the T-1A to 105 mission-hours in the TH-1H.

Regardless of track, all candidates who successfully complete advanced flying training receive the aeronautical rating of pilot (AETC, 2012a), but they are not yet qualified to perform any operational mission for the Air Force.

Formal Training Units

Having completed UPT, a rated pilot typically proceeds to an FTU location that corresponds to his or her assigned MWS. As described earlier and shown in Figure 2.1, the exception to this rule involves fighter pilots, who complete the IFF course (also utilizing the T-38C) before proceeding to their respective FTUs. FTUs (sometimes colloquially referred to as *schoolhouses*) vary in size and location. Some examples include the F-16 FTU at Luke AFB, Arizona, and the C-130 schoolhouse at Little Rock AFB, Arkansas (AETC, 2014c).

FTUs specialize in conducting IQT courses, which are defined as “training needed to qualify for basic aircrew duties in an assigned crew position for a specific aircraft, *without regard for the unit’s operational mission*” (Air Force Instruction 11-202, Vol. 1, 2013). IQT contrasts with the

⁸ Lim et al., 2014, shows that being a fighter pilot is predictive of promotion to major and being awarded a “definitely promote” rating for major, lieutenant colonel, and colonel. Therefore, demographic differences in track selection could also influence the long-run makeup of senior leaders.

follow-on training that pilots receive in their operational units, which is known as MQT. The purpose of MQT is to qualify pilots in a particular mission, which could vary across commands or units, even for pilots flying the same aircraft.

Euro-NATO Joint Jet Pilot Training

A somewhat nonstandard route to becoming an Air Force pilot is the elite Euro–North Atlantic Treaty Organization (NATO) Joint Jet Pilot Training (ENJJPT) program, housed at Sheppard AFB, Texas. As the program’s name would suggest, ENJJPT students and instructors are a mix of officers from the U.S. and NATO allied armed forces (AETC, 2014c). ENJJPT students do a slightly longer course in the T-6A before moving on to train in the T-38C (Abatti, undated). Pilots assigned to fighter aircraft can also complete the follow-on IFF course while assigned to Sheppard, while other pilots would proceed to their FTUs directly after completing UPT through the ENJJPT program.

An officer candidate must volunteer for ENJJPT in his or her application for a rated Air Force specialty code (AFSC) (Air Force Reserve Officer Training Corps Instruction 36-2011, 2013), and only a small fraction of the officers who will attend pilot training receive the opportunity (awarded via special selection boards) to go through the ENJJPT program. ENJJPT’s appeal lies in both the career development experience gained from training alongside NATO officers and the guarantee that all ENJJPT trainees move on to the T-38C following the PPT course (although this does not guarantee trainees a fighter/bomber assignment following training).

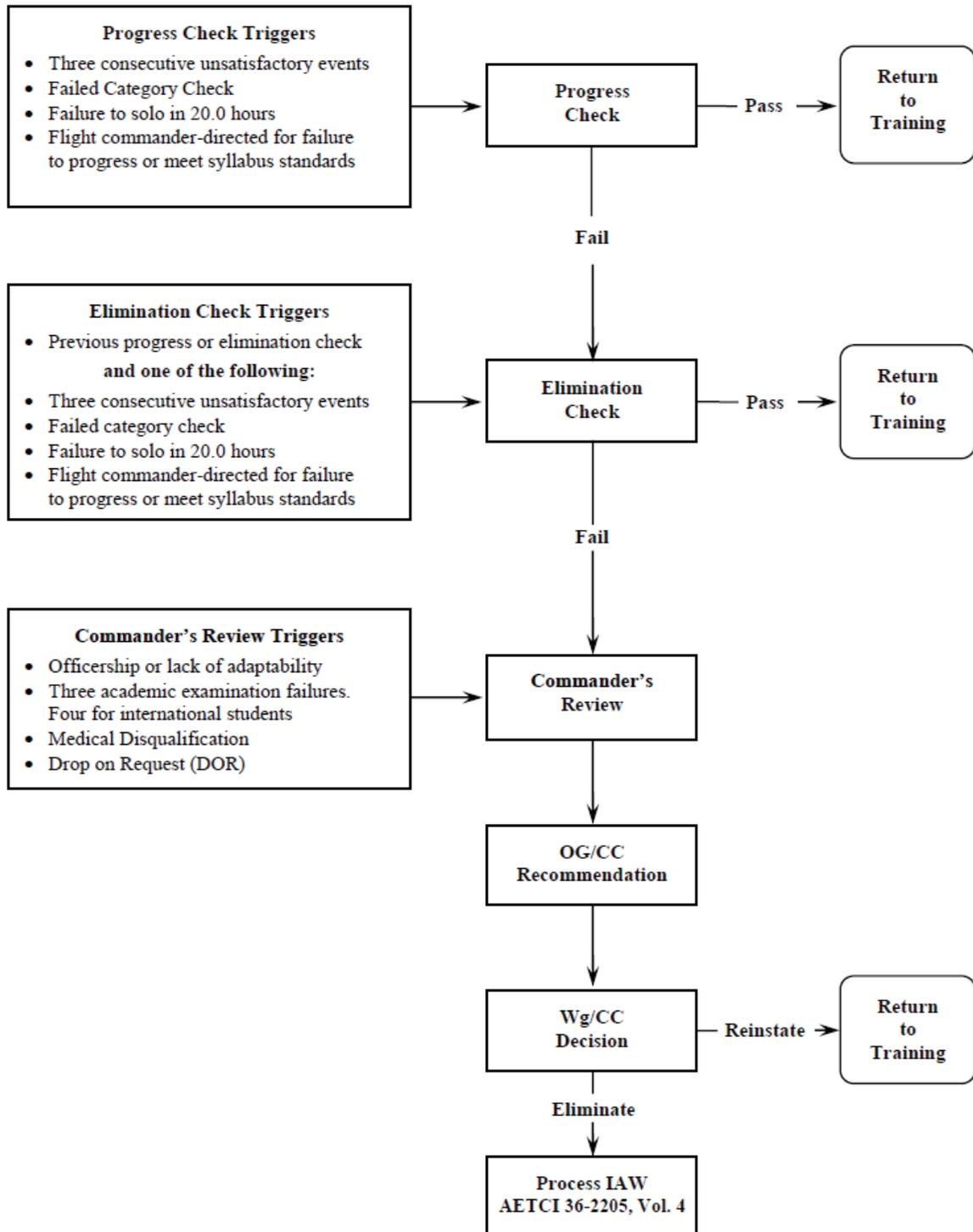
Process for Managing Student Progress

In every phase of flight training, there is a formal process known as the Commander’s Awareness Program (CAP) that local military leadership uses to oversee student progress. Details on these processes can be found in AETCI 36-2205 (which has individual volumes that correspond to the different phases of training). According to the guidance, “the objective of CAP is to focus supervisory attention on a student’s progress in training/screening, specific deficiencies, and potential to complete the program” (Vol. 3, p. 7). Generally speaking, when students have difficulty progressing in training, they are placed on CAP and given a customized plan to address the cause of the difficulty. AETCI 36-2205 groups potential training problems into one of six categories, which include flying or airmanship deficiencies, substandard knowledge, substandard academic performance, airsickness (or other physiological issues), substandard military or professional behavior, or other personal issues (AETCI 36-2205, Vol. 1, 2013). In practice, this plan might include mandatory study time, assigning students to more-experienced instructors, or limiting assignments to certain instructors for greater consistency in teaching styles.

Although CAP provides a framework that theoretically identifies struggling students and prescribes additional help, it is not intended to help students who perpetually fall behind. CAP is recommended only for issues that can be resolved in less than two weeks (AETCI 36-2205, Vol. 1, 2013). For students with long-term problems, the guidance instead recommends that local leadership set up events to test them so that the leadership can determine whether they have the potential to ultimately succeed. These events are known as progress checks (PCs) and elimination checks (ECs). As stated in AETC's guidance on UPT, "PCs/ECs are full mission-profile sorties during which a student's performance is observed, rated potential is evaluated, and ability to complete the course within syllabus constraints is considered" (AETCI 36-2205, Vol. 4, 2014). A combination of PC and EC grades, recommendations, and oversight from military leaders ultimately determines how many opportunities students receive before they are eliminated from training.

Figure 2.2 summarizes the process for overseeing student training difficulties in the primary phase (syllabi for other phases of training contain very similar diagrams). Some of the criteria for requiring students to complete a PC or an EC are fixed (e.g., "failure to solo in 20 hours"), while other criteria are at the discretion of the leadership. As shown in the figure, students who continue to struggle will eventually undergo the Commander's Review (CR) process to determine whether they will be eliminated from training. If the CR results in an elimination, the officer might be reclassified into another AFSC or separated from the Air Force. This determination depends on the circumstances surrounding the elimination (which a board of field-grade officers review), as well as on manpower demands in other areas (Air Force Instruction 36-2101, 2013).

Figure 2.2. The Commander's Review Process for Primary Pilot Training



SOURCE: AETC, 2014b.

NOTE: OG/CC = commander of the operations group. Wg/CC = wing commander. IAW = in accordance with.

Summary

This chapter provided an overview of the Air Force pilot training process. In general, pilots receive their first introductions to flying in IFT before proceeding to one of several locations for primary and advanced flight training. Students who complete IFT and UPT programs are then prepared to enter the FTU for their assigned MWSs, in which they take their first steps toward earning qualifications to perform Air Force missions.

At any point in training, military leaders have a variety of tools to identify struggling candidates and offer assistance or make a determination about whether they can ultimately be successful in their rated career fields. These tools are prescribed in AETCIs, and they include opportunities for the candidate to demonstrate satisfactory performance, as well as oversight at multiple echelons of the military chain of command.

Chapter Three. Potential Barriers to Increasing Minority and Female Representation in Pilot Career Fields

By conducting focus groups with current UPT students and instructors, we explored potential unique challenges that minority and female officers face in entering pilot training and becoming successful pilots. Qualitative information on UPT experiences could yield insights that help to explain why so few minority and female officers enter training and why there are demographic differences in attrition (both of which we detail in subsequent chapters). Further, the open-ended format often elicits contextual information that is of interest to policymakers in its own right, even if it is not directly linked to demographic differences in attrition. First, we briefly describe the focus group methodology, and then we summarize the key themes that emerged and discuss the more-specific concerns and considerations identified within each of these broader categories.

Focus Group Methodology

Focus groups can provide rich information about participants' concerns that might then be used to inform policy decisions. Thus, to provide a comprehensive picture of the pilot training experience, the study team incorporated qualitative research with quantitative analysis that we detail later in this report. We conducted focus groups with current students and instructors at three of the four main UPT bases: Laughlin AFB, Texas; Vance AFB, Oklahoma; and Columbus AFB, Mississippi.⁹ Student participant sessions at each location consisted of groups based on demographics and course phase: three types of groups of students in the primary (T-6A) phase (white male, minority male, and female) and three types of groups of students in the advanced (T-1A and T-38C) phase (white male, minority male, and all female). We also conducted focus groups with white male, minority male, and all female instructors.¹⁰ We included white-male groups as a counterpoint, to explore whether they would raise different challenges or experiences from those that female or minority groups raised. In total, we conducted 43 focus groups with students and instructors. This included 214 participants (169 students and 45 IPs) across the three locations. Focus groups typically included six to ten participants. Overall demographics of the focus group participants are shown in Table 3.1.¹¹

⁹ We did not conduct focus groups at the fourth main training base (Sheppard AFB, Texas) in large part because of the presence of the elite ENJJPT program, which enjoys relatively low attrition rates. Also, the population includes students and instructors from NATO member countries who might not experience diversity-related issues similar to those that U.S. students and instructors experience.

¹⁰ Because of the relatively small number of female students and IP participants, we did not further divide these groups by race or ethnicity.

¹¹ We asked participants to self-identify by race.

Table 3.1. Focus Group Demographics and Training Phase

Participants	Gender		Race or Ethnicity					Airframe		
	Female	Male	White	Black	Asian	Biracial	Unknown	T-6A	T-1A and T-38C	Unknown
Students	53	116	110	14	16	27	2	97	69	3
IPs	17	28	33		3	8	2	N/A	N/A	N/A

NOTE: N/A = not applicable.

The research questions focused on identifying specific factors that initially draw students to the pilot field and what challenges student pilots face during the training experience. In particular, we asked about students’ experiences in the pilot training program, including the most and least enjoyable aspects of training, factors that led to success or difficulties in completing training, the importance of diversity among peers and leadership, and specific challenges for women and minorities. Finally, we sought student and instructor suggestions on how the Air Force might improve its ability to support female and minority student pilots. We asked participants to discuss their experiences in the primary (T-6A) phase of instruction, which is where most UPT attrition is likely to occur now that changes have been made to IFT. Appendix D presents the focus group protocols. Insights gleaned from these discussions, along with frequencies with which the coded themes appeared across the groups, formed the basis of the findings and recommendations reported here.

Focus Group Limitations

There are also important limitations to this focus group methodology. Because we asked open-ended questions, participants could raise topics they found important. This also meant that not every member of a focus group answered every question. Further, although focus groups do not provide precise statistical estimates that afford direct comparison, describing the focus group findings as percentages of groups in which a topic was mentioned can give an overall sense of how frequently a theme was discussed and suggest general insights regarding key UPT completion factors. Another important limitation is that there are small numbers of women and minorities in any one class at UPT. Our findings therefore represent a snapshot of current student experiences at the time of the study. We could not follow a cohort of students or conduct groups with multiple cohorts given the length of the training pipeline and the study timeline. Similarly, it was beyond the scope of the current study to conduct interviews with candidates who had previously been eliminated from UPT. Instead, the focus groups concentrated on the experiences of current students and instructors. Appendix C provides greater detail on the focus group methodology.

Key Themes

In this chapter, we describe the themes that emerged from these discussions regarding factors that students and instructors believed contributed to success or difficulties completing UPT, as well as any specific challenges that women or minorities might face. Themes that emerged from the focus groups fell into three main areas:

- *motivation and influences to become an Air Force pilot*: The reasons students gave for wanting to become a pilot might shed light on who is likely to join, as well as reveal students' motivations to complete training.
- *challenges to completing training*: Students might face multiple barriers or circumstances that might limit the support they receive, motivation, or perceived ability to complete pilot training. These included specific challenges for women and minorities, such as pressure to fit in with the majority culture.
- *mentors and peer relationships*: Support from fellow students, instructors, or other resources was mentioned as a key social and practical resource.

Motivation to Enter Pilot Training

Although many students mentioned similar reasons for wanting to become Air Force pilots, there appeared to be group differences in whether minority and female students perceived this to be a viable career option. UPT students broadly cited (1) external influences (e.g., family and friends, media) and (2) the desire to fly (e.g., enjoyment of being in the air, not wanting a desk job) as key motivators for their desire to become Air Force pilots. References to desire to fly arose broadly, in 82 percent of student groups. Said one student, “I worked with computers but found myself staring at the skies.”

Students also named a range of other influences on their motivation to become Air Force pilots. Some liked that Air Force pilots were perceived positively, both within the Air Force and in the surrounding community. Others mentioned wanting the challenge of trying to be the best. Finally, other influences included job opportunities (e.g., civilian pilot) and believing in the Air Force mission (i.e., wanting to serve the country).

References to external influences as a key reason that students wanted to become Air Force pilots arose in 94 percent of student groups. Yet, minority and female student groups were less likely than white-male groups to cite family as a key influence to their wanting to become Air Force pilots. White-male groups, in contrast, reported a variety of people—family, coaches, or nonfamily military members—with whom they talked or who had influenced their motivation to become Air Force pilots. If this discrepancy reflects that minorities and women are less likely to have family members who are either pilots or in the military, it might then suggest that they have fewer influences to encourage them to join the Air Force or to become pilots. As one female student noted, “If you never see what flying is like, you never even consider doing it. Breaking down misconceptions about flying persuaded me to go through with it.”

A minority student concurred: “I didn’t grow up with my parents telling me to be a pilot. They told me to be a doctor—typical Asian thing.” Several minority students mentioned the specific influence of exposure to other minorities in the military:

I got to go to the Tuskegee airmen’s conference. I don’t know many pilots . . . where I’m from, so the academy helped me see those experiences. And then I saw people who looked like me doing it. And I thought it was possible.

I think, if you see a role model, someone who’s similar to you, it’s easier to envision yourself doing it. That’s the reason fewer minorities and women are pilots, I think, is because there aren’t many people like them in those positions. Before coming here, I met three black pilots. It was a lot harder envisioning myself being a pilot without having that sense of, “That guy is [from] where I’m from. That guy looks like me. I can probably do that.”

Lack of early exposure to the Air Force and pilot culture might serve as a barrier for women and minorities to enter pilot training. This might have the dual effect of reducing both the incoming number of women and minority students and their perceived support and thus motivation to complete training.

Challenges to Completing Training

We asked students and instructors about the factors they thought led to success in completing pilot training or that contributed to challenges in doing so. Across demographic groups, students and instructors broadly cited personal traits, work/life balance, and proper attitude as key factors to success—or, if lacking, as key challenges. Personal traits, discussed in 55 percent of all student groups, included possessing confidence, being prepared, time management, ability to accept failure, and not taking criticism personally. These traits, participants felt, helped to keep students moving along the accelerated pace of UPT. For instance, students stated that the ability to accept failure and to not take criticism personally was necessary to keep up with the “fire hose of information” that was inherent to the initial academic portion of training. Work/life balance (mentioned in 48 percent of student groups) was also emphasized as a needed break from studying (e.g., going to the gym, pursuing outside interests) and to provide emotional and other support. Seventy-eight percent of student groups discussed that having support (e.g., peers, family, faith) was a key factor. Yet, students also described needing to ensure that personal “life” would not adversely imbalance the “work” part of the equation: “You hope nothing personally happens, like with your marriage or parents, because anything that can take your focus away can throw you.”

Finally, students in 85 percent of all groups discussed having the right attitude, including humility, not dwelling on mistakes or taking things too seriously, and managing expectations and stress. Proper attitude, according to these students, included being willing to help others but also willing to ask for help, both of which would help to build peer-group camaraderie.

References to several other challenges arose as well. Students mentioned flying difficulties (39 percent of groups), unavailable or unhelpful instructors (33 percent of groups), academic difficulties (33 percent of groups), inconsistent or uncertain scheduling (18 percent of groups), and having to be constantly evaluated. As one white male student said,

Helmet fire going on; what I need to remember. Danger being in the air and the guy in the back is grading you the whole time. That's my future in the back of the plane: He decides if I get my fighter. The constant knowledge that every action I make is a piece in the puzzle that determines my life.

Potential Lack of Confidence Among Female Students

The above challenges were discussed broadly across demographic groups. However, patterns in how several of these themes were reported pointed to a greater likelihood of lack of confidence among female students. As several students mentioned, if instructors perceive female students as lacking confidence or ability to succeed, they might then evaluate them more stringently.

When we asked about factors that made pilot training challenging, female groups were more likely than male groups to list a broader range of challenges (e.g., CAP, instructor shortcomings, and flying ability). When asked, female groups expressed more doubts that they would complete training—doubts about completing training were expressed in 55 percent of female groups, compared with 17 percent of white-male and 20 percent of minority-male groups.

In addition, both female groups themselves and instructors discussed a lack of confidence among female students, especially compared with men. For example, a female instructor opined that female students lacked the confidence of their male counterparts:

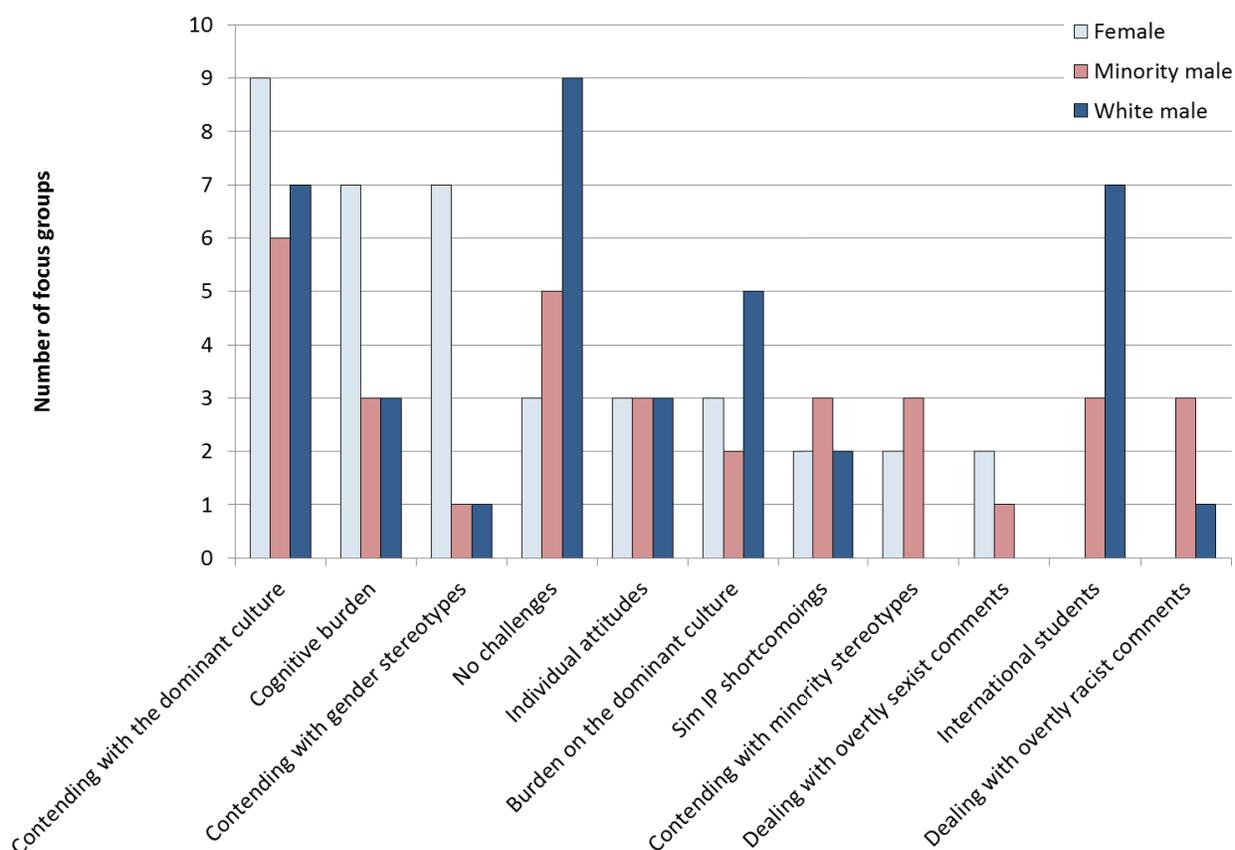
The confidence on the whole is not as high throughout the women as it is with the guys. I don't know how to fix that after teaching for four years. A guy can have a bad ride and still tell himself and his friends that he's awesome. A girl can have a good ride and tell herself and her friends that she's the worst. I don't know a way to fix that other than to just be aware of it.

As with instructors, female students also suggested that they might have a harder time than their male counterparts in shaking off criticism. For example, one female student pilot explained that male student pilots “can move on much faster because they don't think about things all the time like we do.” Another female student stated, “I think the hardest thing for me was learning to forgive myself.” Finally, instructors often perceived that female students lacked ability. Several instructors said that female students seemed to be poorer performers or that they had heard other instructors say that, particularly in terms of flying performance (as opposed to academics, general knowledge, or knowledge of instruments). A white male instructor, responsible for splitting classes as they entered the next training phase, recalled as he “split up classes and tr[ie]d to balance gender and minorities,” “There is a perception that females perform at a lower level. I'm often asked by flight-room IPs how many girls I am sending them.”

Specific Challenges for Women and Minorities

Besides general challenges associated with pilot training, we also asked focus group participants whether women or minorities faced specific challenges. White-male groups were more likely to respond to this question by saying that women and minorities did not face any specific challenges. As shown in Figure 3.1, nine out of 12 white-male focus groups, or 75 percent of groups, tended to discuss that their peers did not contend with ethnicity- or gender-related problems. Note that the percentages in this figure represent the number of groups that discussed a particular factor. This does not mean that everyone in the group mentioned or agreed about that factor. For instance, a white male student stated, “When you’re here wearing the uniform, you get respect for being here. I don’t think you’re highlighted as a minority.”

Figure 3.1. Specific Challenges for Women and Minorities



Several white male instructors echoed the notion, stating that they did not take gender or race into consideration when teaching and evaluating students. They also felt that the Air Force’s focus on diversity was overemphasized. However, student (including white male, minority male, and female) groups described a range of challenges that they believed affected UPT experiences for women and minorities.

Contending with the Majority or Prevailing Culture

By far, the most frequently mentioned theme when we asked about specific minority or female challenges was that students faced pressure to fit in with the predominant culture, much of which was male-dominated. Sixty-six percent of the student focus groups discussed minority and female pilot trainees as pressured to understand, accept, fit in, and flourish within the demographically dominant group culture. In particular, 81 percent of female focus groups discussed feeling this to be the case. These experiences dealing with the predominant culture included a process by which minority and female students, for example, had to navigate a male-dominated environment; were exposed to and enveloped by white-male cultural norms; were only peripherally included in white-male “bro jokes”; and were compelled to accept a paradigm of white male as the typical pilot. Said one female student,

A big thing about pilot training is that people think the work to make diversity happen has been done because we’re here and allowed to do this job. But the culture was made only for straight white men, so it’s inherently exclusive.

Another female student described specific ways in which the prevailing culture could manifest a lack of inclusion for others:

The language and the culture, not the cussing; I don’t care about that. People use words I hadn’t heard since high school. “Gay,” “faggot,” “retarded.” I thought people were more in tune with marginalized communities. But it was kind of a backslide coming here. I’m used to it now, and it doesn’t affect me as much, but, in the beginning, it took some getting used to. It’s not that they’re homophobic, but the language just hasn’t caught up with it yet. Now that I know everyone, they’re all great, and I can focus more on training.

Instructors described the prevailing pilot culture in similar ways. As one mixed-race male instructor explained, “It’s this whole [pilot] culture—as a minority, you feel some pressure to fit in with this white male–dominated culture. I’m a [first-assignment IP], and this is just my perception from guys who come through.”

Female students also described a lack of understanding or concern for women’s health issues. One female student described this lack of empathy:

I know when I get my period, and I get really bad cramps and am in a bad mood, that’s been a big challenge. I feel like I can’t be like, “I can’t fly today; my ovaries hurt.” Or people will be like, “You’re being distant; what’s wrong?” No one is going to understand or feel sympathy for you.

Another female student noted that instructors seemed to frown on women becoming pregnant or women (but not men) having children.

Simulation Instructors

Twenty-one percent of the student focus groups discussed negative behaviors from sim instructors that were directed toward female or minority pilots and that they regarded as racist or

sexist in nature.¹² They attributed this to sim instructors being “generationally unaware” of what could be construed as offensive and condescending language. (In contrast, they attributed no such comments to flight-line instructors). A minority student described an encounter in which a sim instructor, lamenting the current state of identity politics, asked him, “Do you know the only reason you’re in the Air Force?” A female student suggested that such behavior was sufficiently widespread that female students warned incoming students to be aware of it:

There is a generational thing in the sim building. They need a generation of the people now. They’re meaner or don’t know how to deal with people. You learn that the sim IPs hate women. Expect it, avoid it, and ignore it. I wish I didn’t have to tell females coming in, having to warn them about it. We shouldn’t have to warn them.

Students raised additional issues with sim instructors that went beyond those related to race or gender, which might suggest broader issues. For instance, a minority student referred to generally harsh treatment from sim instructors:

How can you decide it’s okay to talk to people like that? It’s the worst I’ve ever been treated in a professional environment. Flight line is a different world. Great group of folks over here. That sim building is like hell going over there. I don’t know how you fix that.

Like in the above quote, another theme that emerged was a strong distinction between sim instructors and flight instructors. There were specific mentions of sim IPs as “from an older generation” or “out of touch” and not understanding that they were often behaving in offensive ways or according to stereotypes. One white male student emphasized the generation gap:

For instruments, I’ve had to learn sim procedures and flight line procedures at the same time. Sim is like giving your grandpa an iPhone. I’m sure those old guys are great at flying, but they’re antiquated and don’t know the new technology that is more efficient. There are two generations, and there’s a gap. Some don’t know how GPS [Global Positioning System] works.

Although differences in instruction can create training problems overall, comments perceived as either racist or sexist also contribute to a negative, unsupportive culture for women and minorities.

Individual Attitudes

When we asked about unique challenges for female and minority students, some participants responded in ways that suggested that they did not perceive specific burdens for female and minority students and, in fact, felt that emphasis on diversity caused a burden on themselves. Some students, for instance, felt that the individual attitudes and dispositions of their peers (e.g., confidence, social aptitude, and optimism) contributed more than race or gender to difficulties in

¹² Only flight instructors participated in the focus groups; we did not include sim instructors because they were not part of the planned sample at the beginning of the study.

training. Students of different races and both genders were equally likely to say that individual attitudes contributed more than race or gender to difficulties in training. For example, a white male student explained, “If you choose to alienate yourself regardless of background, that’s on you, and I think it’s more of a personality thing regardless of race or nationality. Anyone can get together and be a team player.”

Another white male student stated that ethnicity or gender “issues would probably be self-imposed and not external. I could see them internalizing stress. It takes a certain attitude to almost die and then five seconds later then go on to the next thing.”

Burden on the Majority or Prevailing Culture

When asked about specific challenges for women or minorities, some students in majority groups (e.g., males or white males) reported that they were obliged to expend effort to adjust their language and actions when interacting with minority and female peers. Some interpreted this as an obligatory empathy or sensitivity. In fact, it was suggested in 42 percent of white-male groups that emphasis on diversity caused a burden on whites and men for having to adapt and adjust their behaviors, such as when a woman was around. One white male participant explained that such adjustments were necessary, albeit burdensome: “People do talk and act differently when there is a female in the room. That’s out of necessity on our sake. When it’s just guys, we’ll joke, but, if a girl comes in, we’ll clam up.”

Cognitive Burden

Students said that minorities and women felt pressure to perform, specifically on account of their gender or ethnicity. This “cognitive burden” was typically described as self-imposed and was discussed in 63 percent of female focus groups, 30 percent of minority-male groups, and 25 percent of white-male groups as a specific challenge. For instance, women and minorities described feeling singled out and that their successes or failures reflected not just on themselves but on an entire group. According to one female student, “Subconsciously, you feel the pressure. If you are doing badly people will be like, ‘Oh, it’s because she’s a girl.’”

Students also described being highly visible and “in the spotlight” because of their minority status. A female student mused that “our struggles are a little more noticeable.” A participant from the same female student group explained,

I think it’s because you’re a minority numerically—if you fail something or screw up, it’s a lot more obvious and noticeable because we can’t blend in. And it’s easy for people to say it’s because of our gender. I think part of it is that they already expect girls to be bad at things. If a guy does bad, no one would say it’s because he’s a guy, but, if you’re a girl, then your failures are because you’re a girl.

Other students mentioned wanting to not disappoint people back home or future women or minorities who might look to them as role models. Describing the burden he felt, a minority male student alluded to his desire to serve as a role model for other minorities:

[There is] added pressure to succeed because you don't have someone in front of you to look up to. One thing we talked about [is that] minorities quit the academy the most. I talked to my boss, and she said, "You're doing a lot for your people." Sometimes I feel like I have to make it through training because other people might look up to me one day. That can get to me sometimes, but I try not to think about it and focus on flights, but it definitely plays a role. As I get comfortable later, it may be easier but it weighs a little on my mind.

Race and Gender Stereotyping

Women and minorities reported some instances of gender and race stereotyping and, in some cases, even overtly racist and sexist statements. Students noticed disapproval for engaging in stereotypically "female" matters. For example, a female student described difficulties in avoiding falling into gender stereotypes:

You go in accepting that there's a way you should act and behave. Even if there were more women, you'd still try and meet that expectation. There's a lot of stereotypes that you don't want to fall into. As a single woman, you could be fun but promiscuous or not fun and uptight—those are two possible female stereotypes you could fall into. If you're emotional in the flight room, that would also be bad. It's a fine line you walk either way.

Minorities and women felt that others thought that they were less than qualified because of their races or gender. One minority student said, "I get a lurking, insidious impression that people think less of me because of the color of my skin."

Several students mentioned hearing speculation that female students received coveted fighter (T-38C) slots not because they were qualified but because they were female and "they need girls over there." Implicitly acknowledging these perceptions that female students were less qualified, students also speculated that female students appeared to get special treatment. Male students suggested that schedules were altered so that struggling female students would fly with less strict instructors or receive more opportunities to pass check rides. A female participant described situations in which she felt that she was seen as less knowledgeable than men:

People will ask a question, and they'll second-guess you and ask a guy. I just told you the answer; I don't want to think it's because I'm a girl, but maybe I've felt like that sometimes. I don't want to say it's because I'm a girl. I don't get taken seriously.

In some cases, minority and female students reported instances in which other students or instructors made statements or behaved in ways that they construed as racist or sexist. For instance, one minority instructor described experiencing racist behavior during his own time at pilot training:

I've definitely been denying my Asian-ness because I don't want there to be any suspicion that I'm anything less than 100 percent loyal to the U.S. For me personally, I endured racism all the time from my classmates during pilot training, and the instructors just kind of accepted it.

A minority male student mentioned that sexist statements seemed commonplace, more so than racist statements:

It seems more acceptable these days to make sexist comments than racist comments. People are more careful about being seen as offensive toward international students or people of color. But a lot of comments about women are thrown around casually, that we as men wouldn't think of as men. It's good to think about whether things can come off as offensive. But talking to women, female pilots, things that are said and done, running jokes, it gives them extra things to think about in addition to everything else, makes their training different from ours, not equitable.

A minority male student alluded to instances of sexual harassment or assault and pointed to a lack of empathy or understanding among male instructors:

It's a fact that people here do not feel respected because they're women. And I have to think of that more than just about policies. Things are said even in briefings of sexual assault, prefaced by "I know no one in this room would do that," and there are women there where it's happened to them.

In another instance, a minority male student described overhearing public conversations featuring racial comments and stereotypes:

Could be millions of things specific to me other than skin color, but the reason I feel it's that is that it seems like a lot of other things I do are similar to other students, but it's not directed at me but directed to "othering" people in general. Sometimes there's news on the TV where we get ready and the senior officer briefs us. They'll say things [while watching the news] that are othering towards black people, like "that guy probably deserved to get shot." "No way that guy would've gotten into that school; they probably reserved the seat for him."

The above quotes in which female and minority students discuss comments or behavior based on race or gender stereotypes reflect the broader set of themes that were raised about minority- or female-specific challenges. Many of these students described these behaviors and situations in ways that suggest that they might contribute to difficulties in working through and succeeding in pilot training. For instance, being one of only a few minority or female students could cause those students to be "singled out," making any struggles that much more salient. Those students then internalized the pressure to succeed, causing additional stress and burden. Furthermore, if racist or sexist comments from similar instructors reflected how they actually taught

and evaluated students, minority and female students might receive subpar training, unduly strict evaluations, and fewer opportunities to succeed.

Overall, to the degree that these experiences might affect perceived career fit, as well as reflect both perceived and actual support for women and minorities becoming pilots, they might also play a role in motivation and successful completion of training.

Mentors and Peer Relationships

Support networks and other resources play an important role in helping students overcome many of the physical, emotional, and mental stresses of the program. Guidance and mentorship comes in a variety of forms, including base resources, family and friends outside the program, instructors and flight commanders, peers, and informal networks.

Access to Tools and Instructors

We asked about whether students felt that they had access to the support and resources they needed to be successful. A theme that emerged was that people were likely to say that they themselves had what they needed, but white male students more likely than minority or female students to say that their peers had equal access to tools and instructors as they did. White male students were also more likely to say that access to resources was dependent on individuals and that it was somehow up to the individual whether or not they had access (e.g., attitude, not being part of the group or socializing or studying with others). Some also suggested that it was “how they’re raised culturally” and that asking for help might be seen as a weakness in some cultures. This might reflect that, although members of a majority group assume that everyone has equal opportunity to become part of the group, minority members do not share that perception. For instance, one female student mentioned being unable to find studying partners: “I don’t like to ask for help, but no one would ever take me up on invitations to study with me.”

Other factors beyond race or gender might also affect access to resources, such as tools and instructors. For instance, several students reported that struggling students received different treatment from instructors. Thus, if certain students typically struggle at the outset of training, the way in which instructors respond could exacerbate those differences. For instance, one student mentioned that “high performers get more information from IPs sometimes.” Another student described his own experiences in the beginning of training:

I started the program and had a lot of trouble and struggled a lot. The instructors picked up on it, let me drown a little bit, which provided motivation, but I still have the stigma of “he’s not that good.” So I’m not scheduled as much; everyone else has been pushed through the syllabus quicker. Frustrating, and my fault for not succeeding in the beginning, but [there is] that stigma, just getting rid of it.

Base Resources

Focus group participants noted that the training bases provided a range of tools and resources to help students work through some of the challenges they face during UPT. Female and minority students were far more likely than white males to report that such base resources represented a source of support, which might serve as a substitute for other support to which white males might have access, such as larger group networks or belonging to the majority culture. Female student pilots were forthcoming about the perceived benefits and potential risks of utilizing available base resources. For instance, one female student described hesitation in reaching out to the base chaplain but also feeling that it was helpful and did not result in the stigma about which she had worried. Other female students emphasized the value of the Military and Family Life Counselor. This participant noted that these counselors, who were “specific to pilot training,” allowing them to understand the lingo students use and the unique pressures they might face. Although these professionals were cited as helpful sources of support, students recognized the limitations of these resources, such as stigma associated with using base resources. According to a minority male student,

[t]here is that stigma that people are afraid to mention they see a life counselor, but the counselor is really good at what she does. When you speak with her, she seems knowledgeable in her field, understanding, having talked to so many people who have gone through pilot training. She draws from those experiences to understand where you’re coming from. That support system is available to anyone on base.

Peer Relationships

During UPT, student pilots might spend more time with each other than they do their families, the shared experience bringing them together in ways that few outside their training groups might be able to relate. Students study and train together and offer a trusting and understanding environment to blow off steam. Accordingly, students and instructors broadly cited peers as critical sources of support. Said one instructor, “With peers you can vent to them about what’s happening; usually, your family doesn’t have any idea what’s happening. Peers are the best way to work through your problems.”

Developing solid peer groups is also an institutionalized part of the UPT culture. Students’ willingness to assist one another during the rigors of training feeds into the commander’s ranking of each student. As one instructor explained, “It’s a chance for the flight commander to say if this is a good person. And students know they are being looked at in that way.” Another instructor reinforced the point: “We always say you don’t graduate as an individual but as a class.”

Yet there were some exceptions in which students' competitiveness prevailed. A female student described one such situation:

In my sister flight, people stopped helping each other out and talking to each other. When I ask them about how things are, they're really guarded about how they did on a check flight. It's their personalities. We got to pick which flight we were in. I'm glad I picked the right one. They're very self-centered—not all of them—but, in general, over there, they have bad attitudes.

Students raised the possibility that commissioning source was a factor that led students to compete against their peers, rather than help and collaborate with them. Students who arrive at UPT from the Air National Guard or Air Force Reserve are typically guaranteed a pilot job when they complete training and return to their home units. Importantly, they have a guaranteed assignment of airframe, which provides a measure of clarity that other students might not have. Because of this guarantee, some students noted perceptions that active-duty students appeared to be more competitive, while those from the guard or reserves behaved in more-collaborative ways. A female student said that, coming from the Air National Guard, she was “not into the competitiveness of the program.” A few guard students noted that this, in turn, might have affected other students' behaviors toward them: “Maybe people are willing to help me and show me their scores because I'm not a threat, being in the guard.”

Although it appeared that peer groups tended to form easily among classmates, female students indicated at times feeling a sense of marginalization from their male peers:

All the guys are less apt to seek me out or hang out one on one. I get it; they want to have their bro time. But I grew up having guys as friends, so it's frustrating. I think it's that competitive factor. If I do better than them at something, because I'm a girl and doing better than them, it's more awkward. They're not rude; they just all have their little guy groups.

Possibly because of this, female and minority students seemed to particularly appreciate having peers of the same gender or race around as support. Female students, for instance, said that it was “nice” to “be yourself,” citing this as important in their own comfort levels and that having more women in a cohort also appeared to affect the overall group culture in ways they considered positive. And a minority male student explained, “Someone like you can sometimes explain things better or relate to you better. Sometimes that's what you need to grow.”

We also asked focus groups whether it was important for them to see ethnic minorities and women in their cohort. There was a notable discrepancy between views on diversity, which might reflect—or result in—differing student experiences that affect completion. White-male focus groups were more likely (83 percent of groups) to discuss diversity as not being important to see minority and female peers in their cohorts, compared with 40 percent of minority-male groups and 46 percent of female groups. Some students stated that peer diversity was unimportant or that they did not perceive it. Asked whether it was important to see diversity among peers, one white male responded, “What do you mean? I don't look around the room and think there's a lack of minorities here.” Another white male noted that his class was fairly

diverse but that “it doesn’t change anything; the feeling in the flight room wouldn’t be different.” A female student made a similar statement about not perceiving minority status:

You don’t see people as a minority sometimes because you just see people as classmates. But the Air Force sometimes is like, “Oh, you have a black student in your flight.” And you’re like, “What? Oh yeah, I guess he is black.”

Conversely, a white male said about female students, “I don’t see a girl; I see one of the boys.” Yet, one minority male pointed out that not perceiving diversity was not necessarily a good thing:

I know the briefers don’t think of themselves as sexist or racist, and again there’s a difference between old and modern, which is colorblindness and the benevolent “I accept you because we’re all the same.” No—we’re not the same, and that’s a good thing. If you have that form of privilege, you’re blind to it, but we’re all aware of privilege we lack.

As these quotes illustrate, although increasing officer diversity might be a key Air Force priority, some students view it as unimportant at best and possibly actively harmful at worst. Another major theme regarding the importance of diversity was that the mission was far more important. Several students emphasized performance over race or gender as a matter of grave importance for pilots entrusted with the responsibility for flying—and not crashing—planes. In other words, many students emphasized that someone’s aptitude, performance, or ability to meet standards was more important than his or her race or gender. In doing so, these students also seemed to make an implicit distinction between diversity and achieving the mission (e.g., “The mission isn’t to make diversity,” “I’d rather have an Air Force that can do the mission than an Air Force that is diverse”), implying that “diverse people” were less qualified. As noted in the previous section, these views were further reflected in the experiences of minorities and women, who discussed feeling that others thought that they were less than qualified because of their races or genders. Another implicit assumption that emerged was that diversity efforts mainly entailed making quotas for women or minorities. According to one white male,

All we care about are diversity numbers, and we’re sacrificing so much because we want different people in different positions. Special Forces letting women in: fine. If they can meet the standards, then great, but don’t give them extra training or extra chances. If there are two Special Forces teams and one is A+ but white and another is a B but diverse, I want the A+ team.

On the other hand, some students noted that diversity could also provide certain benefits. Fifty-eight percent of white-male groups discussed positive aspects to training with minorities and women. One such benefit was the advantage of having multiple perspectives. A few students referred to studies showing that diversity benefited teamwork and emphasized its impact on learning and problem-solving. According to a minority male student, “I think it’s better with diversity because it’s easier to relate and there are different ways to explain and learn things. I don’t know how to explain it very well, but it’s nicer, in my experience.” He continued,

[M]inorities provide a refreshing perspective on how to take on challenges because they grew up differently. Like showing different ways to study to your classmates. You need to keep your nose to the grind. You worked this hard to get here; why let loose when you should be studying for that test tomorrow? That mentality that “My parents worked this hard to get me here,” I’m not going to give up on them. What they did to get here. Some guys have it really easy. Their parents were already established; my parents immigrated here. They grew up in a more affluent area—they got access to everything they needed. I grew up in a rural poor county, which was especially weird. You have to work hard to get out of that place then work hard in college to get here. In an affluent area, you have that system that helps you out. I bring that work-hard mentality.

The ability to relate to other cultures was also noted as a benefit of diversity in the Air Force. According to one male minority student,

Take any culture, Latino [for example]. We [the Air Force] do missions around the world. It’s refreshing in a foreign country to have that connection. When I was enlisted, we did a mission to [a Latin American country]. I was the only Latino, and I was able to interact and engage with [people there] in ways that others couldn’t. They loved seeing me on the crew and interacting. Because we conduct missions to different areas, it’s important for public affairs.

Mentors and Role Models

A complex set of discussions arose around the issue of how and whether students should seek mentorship or guidance from instructors, particularly about personal issues. For the most part, students agreed that instructors and flight commanders were valuable sources of professional mentorship and support. One student asserted, “They want us to do well as badly as we want to.” Other participants described instructors as “knowledgeable,” “helpful,” “supportive,” and “approachable”:

I feel like I really lucked out with the group of IPs I got—some days I feel like they care more about our success and training than we do, which is awesome. They really go to bat for us. No matter how late it is, they’ll sit there and answer every question we have.

Indeed, instructors appeared genuinely sympathetic to their experiences and personal difficulties. Some stated that they felt that it was important that students keep them informed of external factors so they could take them into consideration and try to help:

I tell them, “Hey guys, my door is open . . . Come talk to me about anything. Call me day, night, leave, whenever” . . . It does none of us any good to stand in front of the wing commander to find out in front of him that your wife kicked you out three weeks ago and moved back to Kentucky.

Yet, female student pilots also alluded to several reasons for holding back from seeking help from instructors. Some female students, for instance, feared that their peers would view mentoring as favoritism: “An IP wouldn’t take special interest. The perception for everyone would be weird. Like ‘Why is that IP giving you special treatment?’”

Other female students reported not trusting the confidentiality of conversations they might have with instructors. Others were concerned that sharing their personal difficulties with instructors or flight commanders risked unfairly affecting their grades. There were also hesitations related to gender issues, such as discomfort in talking about gender-related issues or gender-related stigma that led women to not seek help: “As a female, you also feel like you don’t want to look weaker. That’s the hard part about talking to instructors—you don’t want them to think you are weaker than others in your flight.”

Instructors also acknowledged an inherent tension between students sharing too much or too little information with them. They described situations in which struggling students openly expressed doubt about continuing in the program, raising questions in their minds about the students’ commitment to the program and whether they should continue to invest in training those students:

I had another [student], struggling a little bit, talked to some instructors . . . He starts struggling more and more. The flight commander and I talked with him. Found out there’s stuff going on at home. He admitted he’s not sure it was what he wanted to do. That’s a dangerous thing to mention . . . We put in a lot of time [with] each [student]. Ninety flight hours plus everything else. If we hear uncertainty, we start to think, “Let’s figure this out now instead of wasting more time.”

Many students seemed to accept that a level of personal distance would exist between students and instructors, as one explained: “Their job isn’t to make sure you’re emotionally okay. That’s your job—to show up ready to fly. You’re kind of expected to take care of those things on your own.” In this regard, female student pilots overwhelmingly mentioned reaching out to peers to help them with a range of both personal and UPT challenges.

Echoing concerns about perceived favoritism, both students and instructors pointed to concerns about fraternization—and even the appearance of it—as a deterrent to more-formalized mentoring. Several students referred to (but did not specify) incidents that had led to policies intended to prevent fraternization, which also had the effect of deterring instructors from attempting to reach out to students. According to one student, “It’s unfortunate that our IPs are

limited in their mentoring capability, with so many recent issues of unprofessional relationships that it's very segregated. A lot of instructors want to be your mentor; career and personal and flying.”

In response to whether it was important for them to see minorities and women in leadership positions, 58 percent of white-male focus groups discussed preferring leaders with high aptitude, performance, stringent qualifications, or the ability to meet standards, rather than leaders of any particular ethnicity or gender. Said one white male,

That comes back to, do you put a women or minority in a high leadership position so a few people can look up and feel good? Or put in the best person? For me, that's not even close. Put the best person there to defend our country.

Some minority and female students echoed this stance. According to one female student, “As long as the person is a great leader, that's what matters.” Another student similarly opined, “I was raised to embrace both sides of me—black and white. I don't care about it [a leader's race or gender]. It's performance. If you deserve to be there, you should be.”

Other focus group participants described why it was meaningful for them to see ethnic and gender diversity among senior leadership. According to one white male trainee,

I think everyone should be able to see a hero. That's why faceless heroes are so popular [so that everyone can relate to them]. It's important that everyone has someone to look up to. The more similar they are to you, the better. It's easier to identify with them.

Another female student similarly mentioned the importance of role models:

For me, I want to be a good role model. I want to share my experience with people so they can be prepared and open up the field to more women. It's growing, but a lot of women aren't pilots. If I'm a pilot, I can probably inspire others to want to be pilots too . . . I take a lot of pride in that. I don't want to let people down. It took a lot to get here, and I don't want to let anyone down.

Female and Minority Affiliation Groups

Female and minority students reported that informal networks and affiliation groups served as important supplementary sources of mentorship and support. Students set up group text-based communications (e.g., GroupMe) as a way to coordinate study groups or for communicating good news, such as their first successful solo flights. Others reached outside the online military pilot community; one female student identified a civilian female pilot Facebook group as a good resource.

Students also mentioned face-to-face affiliation groups as valuable sources of mentorship and support. Several minority students at Vance AFB described SUFR (said to be “Shut Up and Fly Right,” “Stand Up and Fly Right,” or “Straighten Up and Fly Right”) as a minority (primarily black) group based on the experiences of the Tuskegee Airmen. The group was said to consist of students, as well as pilots elsewhere in the Air Force, who offered general guidance in online forums and occasional in-person meetings.

Several female student pilots described attending “Lean In Circles,” which are part of a nationwide gender-centric movement based on a book by Facebook executive Sheryl Sandberg.¹³ The forums foster female leadership by providing educational resources and confidential outlets for discussing gender issues, sharing experiences, and providing advice on overcoming challenges. In September 2015, the Department of Defense formalized a partnership with Lean In (Ferdinando, 2015), and it appears to have gained traction at UPT. Female students described these groups as providing valuable peer and mentor support:

I have liked going to that “Lean In” thing. It’s gal pilots coming together—and it’s held by a number of senior pilots here, women who have learned a good leadership style and used very effective tools to do well in the Air Force. It was one of my better experiences with the women I’ve met here in the pilot community.

In September 2015, female instructors at Vance AFB formed a similar initiative called Supergirls. The informal group aims to provide a trusted platform for female pilots and student pilots to talk about issues they experience at UPT. Participants described Supergirls as “a good network for us here” and a forum “to help us grow as female pilots in a male-dominated field.”

In particular, they said that these types of groups offered the support of same-gender peers, which might, in part, mitigate issues dealing with prevailing (i.e., male-dominated) culture:

You get here and there isn’t a lot of guidance in the transition to come here, especially if you’re new to the Air Force. [Supergirls is] also a good way to learn about UPT. Also, if you run into a problem in training or just want to cry about hooking a ride or something, you’re in a room full of males, but if you start with the tears, it’s going to weird them out. If you have females that you can talk to, they won’t freak out about tears.

It’s a male-dominated career field, so it’s nice to see women who have pushed through and been successful—and probably done so when it was even harder to make it through as a woman. It’s nice to have a group to vent to. I’d recommend it to any woman going through pilot training.

Notably, however, that some female participants were reluctant to attend Supergirls meetings, contending that it was unhelpful to appear “too girly” or otherwise isolate themselves by gender (e.g., “I don’t like all girl-centric conversations”). However, others noted that Supergirl meetings were broadly helpful and not “just about being a girl.” Yet, although the group encourages attendees to talk about a range of topics, many of the discussions appeared to discuss issues specific to the female experience: “The cool thing about the meetings is like things we wouldn’t talk to a male instructor about, like when would you consider getting pregnant?”

¹³ For additional information, see Lean In, undated.

Female instructors also joined Supergirl sessions, with some using it to get to know students without perceived concerns about receiving special treatment: “By putting my face out there through Supergirls, they are more comfortable asking me questions.” This participant continued,

Anyone can go, and, because I’m not in the flight day in and day out, I’ve had a couple guys come chat, but it’s really the Supergirls where I’ve gotten to know people. It’s women who I met that way.

Indeed, one female student tied her interest in attending Supergirls with concerns about going to instructors for guidance:

I agree: It’s hard to go to the instructors. You would think, “Since I told them this one thing, are they looking at me differently?” You share it with people you can trust. We have a group here—Supergirls. It’s a group of all female pilots here. They get together once a month to talk about some issues and items we experience as female pilots. It’s a time for us to learn from others’ experiences. To help us grow as female pilots in a male-dominated field. It’s just an after-hours group—we wear regular clothes, eat, and sit and talk. We can talk to instructor pilots—maybe T-1, not necessarily T-6—we just get together and discuss things. It’s a good network for us here.

Affiliation groups, such as Supergirls, Lean In, and SUFR, appear to provide an important social resource for women and minorities. They seemed to provide a positive overall impact on their experiences, boosting confidence and knowledge, offering networking opportunities, and bolstering other support systems.

Summary

UPT students and instructors described factors that, in their view, contribute to either success or difficulties in completing pilot training. Peer support and individual traits (e.g., humility, work ethic, strong commitment) were cited as key completion factors, although access to support and instructors is perceived to be uneven. Focus group participants suggested that women and minorities might face certain unique challenges, such as being marginalized in a white male-dominated culture, sim instructors being “generationally unaware” of what could be construed as offensive and condescending language toward women and minorities, and perceptions that women and minorities are unqualified or receive special treatment. Affiliation groups served as important supplementary sources of mentorship and support for female and minority students, offering networking opportunities, and boosting confidence and knowledge. Taken together, these factors reflect a set of experiences that offer insight about specific challenges that women and minorities might face in entering and completing pilot training.

Chapter Four. Demographic Differences in Pilot Training Attrition

Becoming a pilot requires a unique combination of knowledge, dexterity, and adaptability, and candidates who cannot quickly overcome deficiencies in any single area will most likely be eliminated from training. Any candidate who seeks to complete Air Force UPT must persevere through roughly two years of physical and mental challenges. Many of these challenges might not be equally distributed across candidate subgroups. As Chapter Three highlighted, current students and instructors identified many aspects of the UPT environment and climate that could disproportionately affect female and minority candidates and could lead to higher attrition rates among these groups. This chapter summarizes the general categories of attrition by race and ethnicity and gender. The chapter begins with an overview of how attrition reasons differ by training phase, location, and demographic group. We then explore the impact that differential attrition rates can have on the demographic composition of training graduates.

We generated the following results from a data set that AETC provided us. The data include course-completion and attrition information on pilot training candidates from 2009 through 2014. The data also include demographic information, as well as test scores and flying experience. Although the data included information on other types of Undergraduate Flying Training, as well as information on Air National Guard and Air Force Reserve trainees, these results focus on active-duty traditional (i.e., non-RPA) pilots only.

As discussed in Chapter Three, the training process consists of three major phases: IFT, PPT, and Advanced Flying Training. IFT is a basic, contractor-operated course in which candidates are exposed to a UPT-like environment while learning to perform basic maneuvers in the DA20 aircraft. PPT is the first phase of UPT, in which candidates learn to fly the T-6A Texan II. Candidates who complete PPT proceed to Advanced Flying Training, which consists of specialized “tracks” for different types of operational aircraft that candidates will ultimately fly (i.e., fighter or bomber, tanker or airlift, or helicopter) (AETC, 2014c). This chapter focuses primarily on attrition in IFT and PPT because very few candidates who make it to the advanced phase are eliminated from training, so attrition information in the advanced course is less informative than results from the other phases. However, as mentioned in the introduction, the recent changes to IFT might have reduced attrition in the initial phase, which could also have shifted some portion of attrition to the primary (T-6A) phase (although precise numbers on these effects were unavailable at the time of this study). Nevertheless, these changes affect only a small proportion of the training pipeline, so historical data on pilot training demographics and attrition patterns should provide useful context to understand attrition differences and are therefore presented here.

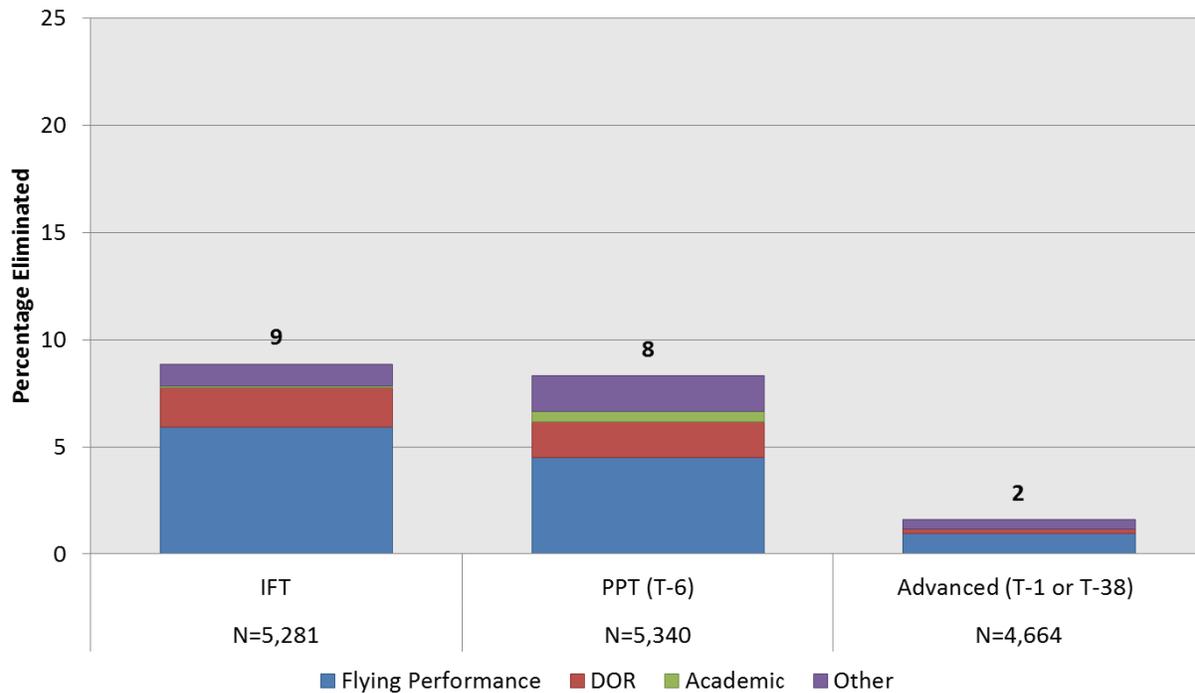
Summary of Attrition Patterns

Overall Reasons for Attrition, by Phase of Training

When a candidate is recommended for elimination from training, the candidate's squadron commander documents the recommendation on a form that includes a reason for the recommendation that the candidate be eliminated from training. A candidate can be eliminated for a lack of performance (either flying or academic), for a medical condition that disqualifies him or her from rated service, because the candidate chose to drop out of training (known as a DOR), or for other reasons (e.g., fear of flying, inability to overcome airsickness, poor military conduct, or personal reasons).

Figure 4.1 provides a summary of attrition in each phase of pilot training. The overall height of the stacked bars represents the total attrition rate for all reasons over the period recorded in the data: 9 percent for IFT, 8 percent for PPT, and 2 percent for advanced training. The colored sections of each bar break the attrition down by the reason recorded for each student who was eliminated from training. For example, the IFT bar shows that 6 percent of all students were eliminated because of flying performance, 2 percent because they initiated DORs, and 1 percent were eliminated for other reasons, while the remaining 91 percent successfully completed the training. Throughout the figures, the N values list the total number of trainees in the respective group.

Figure 4.1. Attrition, by Elimination Reason, for Each Phase of Pilot Training



SOURCE: Authors' calculations from AETC data.

NOTE: The overall height of the stacked bars represents the total attrition rate for all reasons over the period recorded in the data: 9 percent for IFT, 8 percent for PPT, and 2 percent for advanced training. The colored sections of each bar break the attrition down by the reason recorded for each student who was eliminated from training. For example, the IFT bar shows that 6 percent of all students were eliminated because of flying performance, 2 percent because they initiated DORs, and 1 percent for other reasons, while the remaining 91 percent successfully completed the training. Throughout the figures, the N values list the total number of trainees in the respective group.

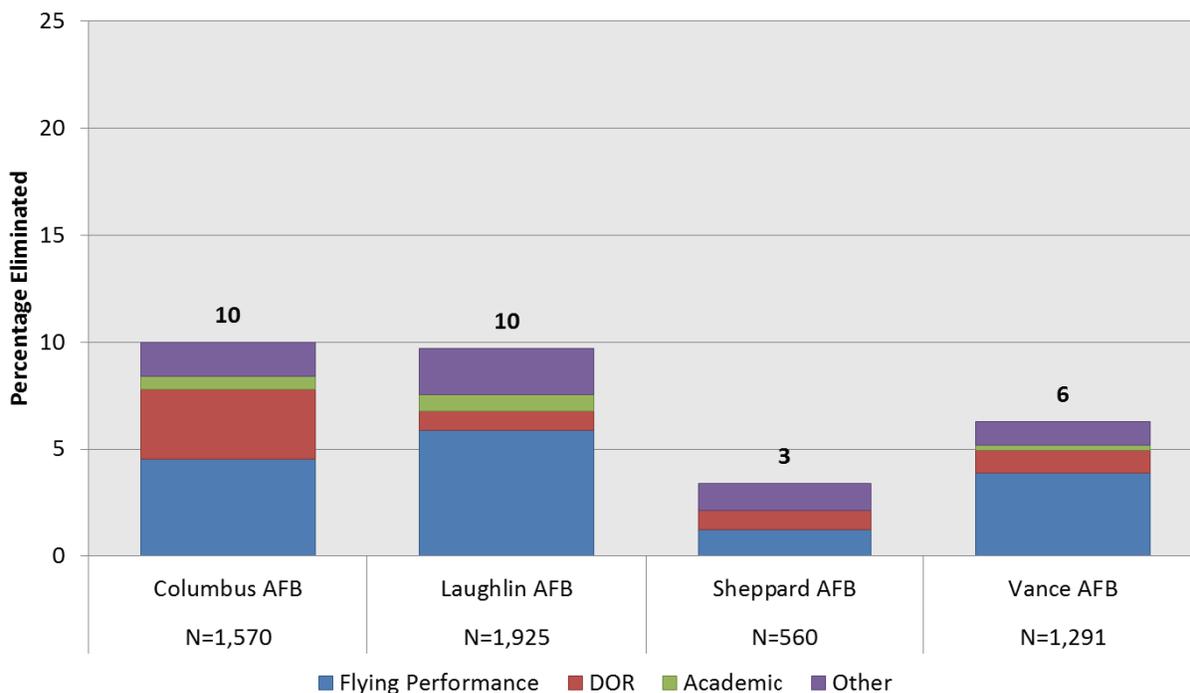
In every phase, flying performance is the most common reason for attrition; more than half of all training eliminations in each phase were due to flying deficiencies. Attrition due to DOR occurred at similar rates in IFT and PPT, whereas students were eliminated for academic and other reasons at higher rates in PPT. Figure 4.1 also shows that attrition in the advanced phase is much lower than the other phases. For this reason, subsequent charts focus on IFT and PPT, in which most attrition takes place.

Attrition, by Pilot Training Location and Commissioning Source

In addition to the phase of pilot training, the base to which candidates are assigned for PPT is correlated with overall attrition and with the type of attrition that occurs. Figure 4.2 shows these patterns by depicting attrition by training location in the same format as Figure 4.1, with different reasons for attrition being represented by the colored sections of the stacked bars. From 2009 to 2014, Columbus AFB and Laughlin AFB had very similar overall rates of attrition, but students at Columbus were about three times more likely than students at Laughlin to be

eliminated because of DOR. Attrition at Sheppard AFB and Vance AFB tends to be lower than at Columbus and Laughlin. Although it is not necessarily surprising that candidates selected for the elite ENJJPT program at Sheppard AFB would have lower attrition, there should be no average differences in candidate pilot potential across the other three bases. In fact, summary statistics of PCSM scores by base show similar average and median scores for Columbus, Laughlin, and Vance but higher scores for Sheppard.

Figure 4.2. Primary Pilot Training Attrition, by Elimination Reason, for Each Undergraduate Pilot Training Base



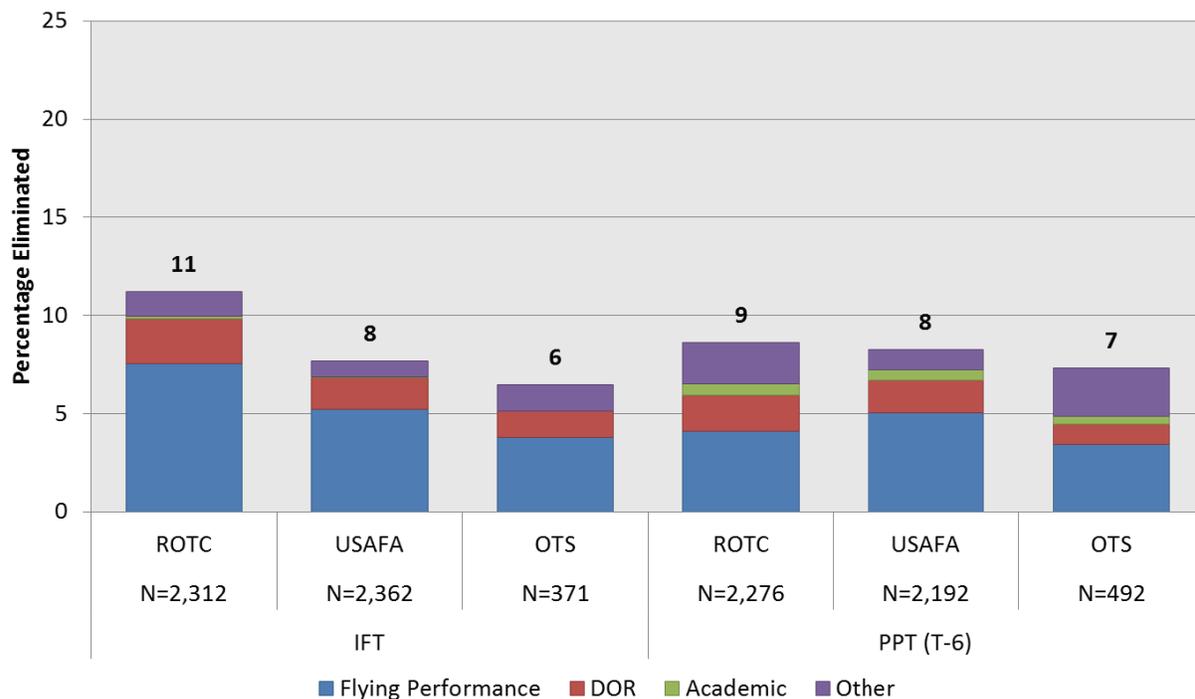
SOURCE: Authors' calculations from AETC data.

NOTE: Only the difference in DOR between Laughlin and Columbus is statistically significant at the 0.05 level. A statistically significant result, in this context, is a difference that can be confidently distinguished from random noise, given the type of statistic and the sample size. The significance level denotes the probability of incorrectly determining a result significant when no difference actually exists. Candidates at Sheppard were significantly less likely than candidates at Columbus to be eliminated overall and because of flying and DOR. For Vance, overall attrition and attrition due to DOR were statistically significantly different from Columbus.

Although there are differences in attrition across pilot training locations, these differences do not tend to correlate with race or ethnicity and gender in a way that would raise attrition rates for minority and female candidates relative to those for white candidates. Non-ENJJPT candidates who are white, black, or Asian have similar proportions assigned to Vance, while Hispanic and female candidates are more likely than others to be assigned to Vance.

One might also expect there to be differences in attrition patterns across candidates who came from the different commissioning sources. Candidates who commission through the U.S. Air Force Academy (USAFA), for example, receive much more exposure to military training and influence (and potentially flying opportunities) than candidates from ROTC or OTS do. Recent data show some differences across commissioning sources in IFT attrition but few differences for PPT. Figure 4.3 demonstrates that candidates who commissioned through ROTC are eliminated at higher rates than candidates from USAFA or OTS in IFT, but the three commissioning sources show similar attrition rates in PPT. Unlike the differences by base, differential attrition rates in IFT across sources of commission are rooted in differences in attrition due to flying performance.

Figure 4.3. Attrition, by Elimination Reason and Source of Commission, for Each Phase of Pilot Training



SOURCE: Authors' calculations from AETC data.

NOTE: For IFT, USAFA and OTS overall attrition and attrition due to flying performance is significantly less than ROTC attrition at the 0.05 level. For PPT, USAFA attrition due to other factors is significantly less than ROTC, while no differences between OTS and ROTC are statistically significant.

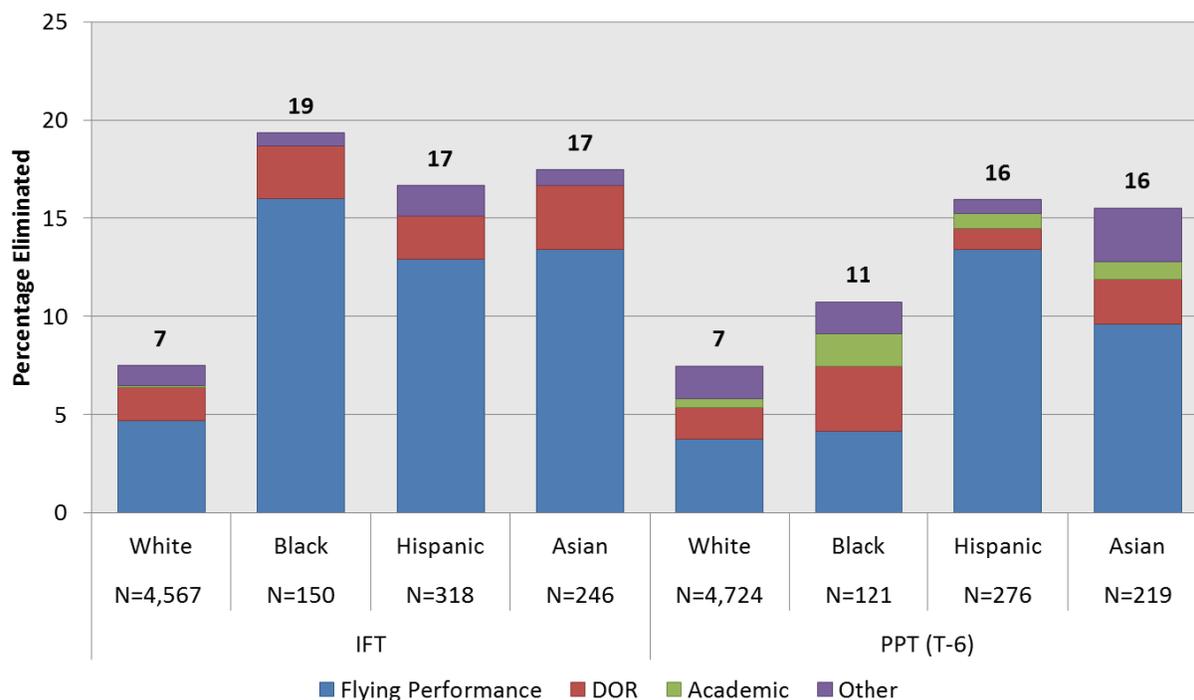
Although candidates from ROTC have the highest attrition rates, this factor does not correlate with demographics in a way that would disadvantage minority and female candidates. In our sample, minority and female candidates are actually more likely to have attended USAFA than their white or male counterparts. Forty percent of the white candidates in the sample

commissioned through USAFA, compared with 49 percent, 52 percent, and 56 percent of the black, Hispanic, and Asian candidates, respectively. Additionally, 53 percent of the female candidates in the sample attended USAFA, compared with 41 percent of the male candidates.

Demographic Differences in Attrition

In both IFT and PPT, the likelihood of attrition is highly correlated with race, ethnicity, and gender. Specifically, minority and female candidates tend to be eliminated at higher rates than their white and male counterparts. Figure 4.4 illustrates this pattern by showing attrition rates for IFT and PPT by race and ethnicity, while Figure 4.5 shows attrition rates by gender. The figures depict the rates in the same fashion as before, in which the colored sections of the stacked bars represent different reasons for attrition.

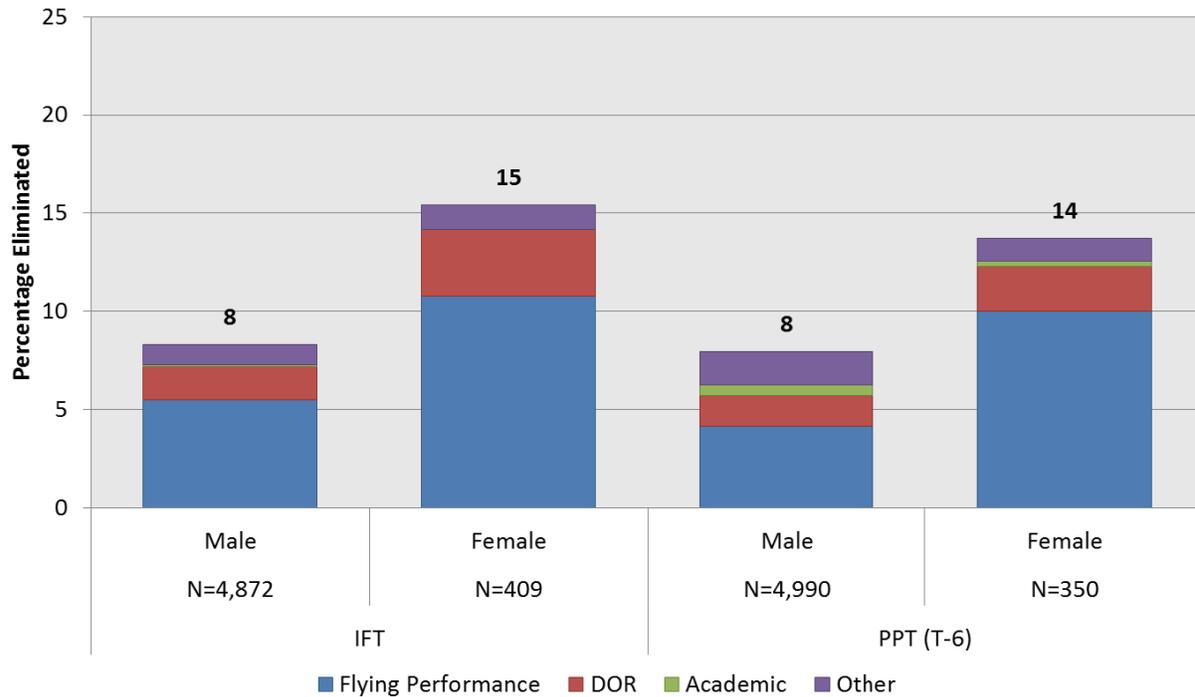
Figure 4.4. Initial Flight Training and Primary Pilot Training Attrition, by Elimination Reason and Race or Ethnicity



SOURCE: Authors' calculations from AETC data.

NOTE: For IFT, the difference in the overall rate between each minority group and the white group is statistically significant at the 0.05 level. For PPT, only the differences for Hispanic and Asian candidates are statistically significant. When conducting significance testing separately by attrition reason, only differences in attrition due to flying performance were statistically significant.

Figure 4.5. Initial Flight Training and Primary Pilot Training Attrition, by Elimination Reason and Gender



SOURCE: Authors' calculations from AETC data.

NOTE: Both gender differences in the proportion eliminated due to flying performance are statistically significant. The IFT difference in the proportion eliminated due to DOR was also statistically significant at the 0.05 level.

First, Figure 4.4 demonstrates that minority candidates tend to be eliminated from training at higher rates than white candidates. In IFT, the attrition rate for black, Hispanic, and Asian candidates was more than double the rate for white candidates for the time period captured in the data. The reasons for attrition show that these gaps stem mainly from group differences in flying performance. Group differences in attrition due to DOR and other factors were minimal and statistically insignificant for IFT.

In PPT, rates of attrition for white and black candidates were much more similar. Both groups were eliminated for flying performance at nearly the same rate. Other differences that are visually apparent in Figure 4.4, such as the white-versus-black candidate difference in overall attrition, were statistically insignificant.¹⁴ The pattern for other racial and ethnic groups is similar

¹⁴ However, the reader should note that the black candidates make up the smallest demographic group, and this small sample size reduces the possibility of detecting a statistically significant difference. A back-of-the-envelope calculation shows that, if two additional black PPT candidates had been eliminated, this would have rendered a statistically significant finding at the 5-percent level, which demonstrates that a larger sample size is needed to draw firm conclusions about any real differences we observe.

to the pattern in IFT—Hispanic and Asian candidates were eliminated at roughly double the rate of white candidates because of differences in flying performance.

Gender differences in reasons for attrition show a similar pattern, in which majority-group candidates (men, in this case) have much lower attrition rates (Figure 4.5). In both IFT and PPT, female candidates were eliminated at higher rates than male candidates, although these differences are slightly smaller than some of the racial and ethnic differences depicted in Figure 4.4. The reasons for training attrition also show that these gaps mainly arise because of differences in eliminations due to flying performance.

Attrition's Impact on Graduate Demographic Representation

Another aspect that is somewhat hidden when comparing group-specific attrition rates is the reality that the white and male groups are much larger than the minority and female groups. This means that changes in the attrition rates for small groups will have less of an impact on the demographic composition of the population that graduates from each phase of training. Table 4.1 illustrates this relationship with a back-of-the-envelope calculation of how the demographic composition of the graduate population would be different if all groups had the same attrition rate. The left pane of Table 4.1 shows the actual number of minority and female graduates from IFT and PPT over the five-year period covered in the data, as well as minority and female representation in the graduate population (i.e., the percentage of all graduates from each racial or ethnic group). The right pane shows the hypothetical change that would have occurred if each group had the same overall attrition rate as the white or male candidates. For example, the first row shows that there were 121 black graduates of IFT in the data, which made up 2.5 percent of the population of IFT graduates. However, if the attrition rate for black candidates had been the same as that for white candidates (7.5 percent instead of 19 percent), this would have produced 18 additional black IFT graduates and increased black representation in the graduate population by 0.4 percentage points.

Table 4.1. The Effect of Higher Attrition on the Demographic Composition of Graduates

Phase	Group	Actual Graduates		At the White or Male Attrition Rate	
		Number	Representation (%)	Additional Graduates	Change in Representation (%)
IFT	Black	121	2.5	18	0.4
	Hispanic	265	5.5	29	0.6
	Asian	204	4.2	24	0.5
	Female	346	7.2	29	0.6
PPT	Black	108	2.2	4	0.1
	Hispanic	232	4.7	23	0.4
	Asian	185	3.8	18	0.4
	Female	304	6.2	20	0.4

SOURCE: Authors' calculations from AETC data.

Despite large demographic differences in rates of attrition, the results show that erasing those differences fails to change representation by more than 0.6 percentage points. The number of minority or female graduates increases in each case, reflecting the relatively high attrition rates discussed previously. However, these large changes in attrition do not translate into large changes in demographic representation because relatively few minority and female candidates enter the pipeline compared with the number of white and male candidates. Therefore, although minority and female candidate levels remain so low, reducing minority and female attrition might not have a large impact on the demographic composition of the pilot community.

Summary

In general, minority and female candidates have higher attrition rates, and these higher rates are attributable primarily to group differences in the likelihood of being eliminated for flying performance. Although the focus groups with current students and instructors suggested many challenges that could contribute to relatively high attrition rates for minority and female candidates (such as added pressure to fit in with the dominant culture), the differences presented in this chapter do not attempt to account for individual factors known to influence UPT attrition, such as aviation knowledge or flying aptitude. Chapter Five explores the extent to which these differences in attrition are attributable to individual characteristics independent of unique difficulties that minority and female candidates face in UPT.

It is also important to keep in mind that, in addition to the success rate, the size of the population entering training determines representation in the career field. A hypothetical calculation shows that, even if there were no attrition differences in the 2009–2014 time period, the demographics of the graduate pool in the two main phases of training would not have changed by more than 0.6 percentage points for any single group. Thus, policy interventions that

increase the flow of minority and female candidates into the pipeline might have a larger impact than interventions that target the training pipeline itself.

Chapter Five. Can Other Characteristics Account for Demographic Differences in Undergraduate Pilot Training Attrition?

According to a comparison of group-specific rates, minority and female pilot candidates are more likely than white and male candidates to be eliminated from Air Force pilot training. This finding indicates that an obstacle to increasing minority and female representation in operational Air Force career fields has been ensuring that candidates from all groups have equal success in training. In order to know whether potential policies can reduce or eliminate these gaps, it is first necessary to determine whether demographic differences in other characteristics that relate to training success could contribute to the group differences in attrition rates. Group differences in background characteristics, such as flying aptitude or experience, could result in relatively high attrition among minority and female candidates that do not directly relate to race or ethnicity or gender. If the underlying cause is rooted in pretraining differences between groups, reducing minority and female attrition rates would call for a different prescription from the one needed if the attrition differences were the result of negative attitudes or discrimination in the training environment.

This chapter explores this question by comparing the attrition rates of minority and female candidates with those of white and male candidates with similar pretraining background characteristics using regression analysis. Further, to identify which characteristics are most important in explaining the gaps, the analysis employs a decomposition technique to calculate the proportion of the attrition gaps that are attributable to each individual characteristic, conditional on the others.

In modeling the likelihood that candidates are eliminated from training, we utilize a limited, yet powerful, set of predictors that were available in the AETC data on pilot training. In addition to candidate demographics and their respective training outcomes for all candidates from 2009 to 2014, the data include test results from the AFOQT and the TBAS, the number of hours of flight experience the candidate had prior to training, the candidate's overall PCSM score, source of commission, and whether the candidate was a distinguished graduate (DG) at his or her commissioning source. One limitation of the approach is that PCSM did not apply to candidates who commissioned through USAFA. During this time period, USAFA used other criteria to select pilots that are not available in our data. Thus, the following analyses use only candidates from commissioning sources other than USAFA with complete test records. As Chapter Four describes, minority and female representation tends to be slightly higher among USAFA graduates for all groups, and USAFA graduates have lower attrition rates in IFT. Other research has suggested that there are systematic differences between pilot training students who

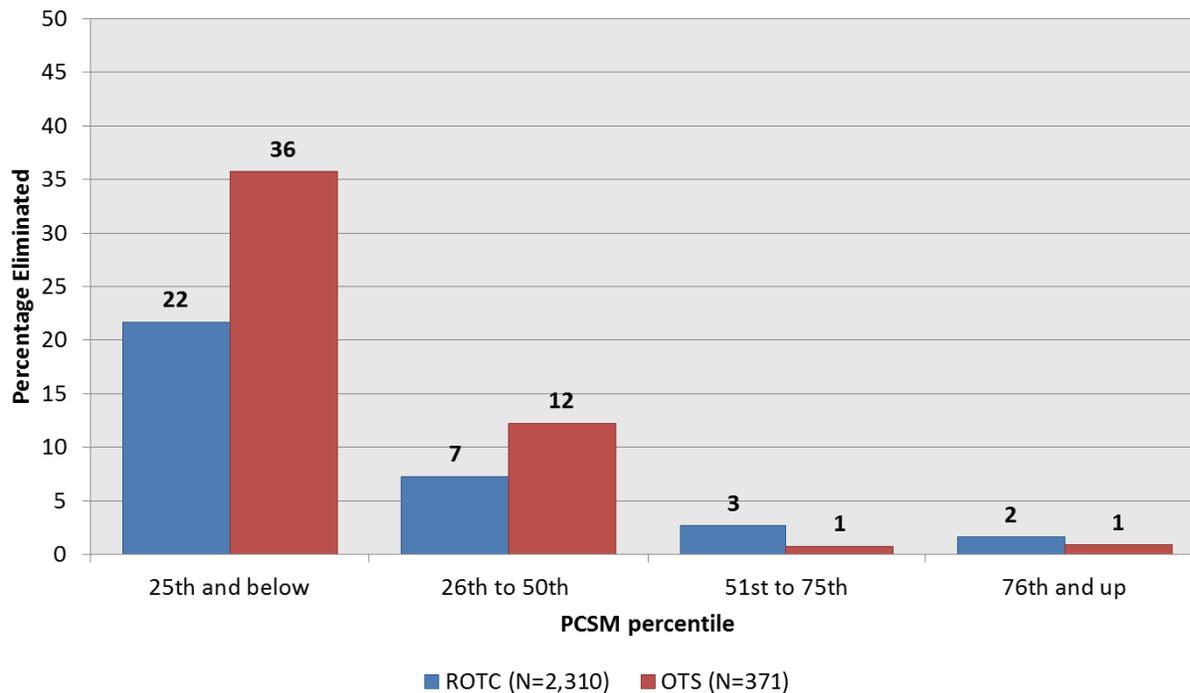
commissioned through USAFA and those from other commissioning sources (Barto, King, and Retzlaff, 2012). Therefore, the patterns summarized in this chapter might not generalize to the population of USAFA graduates, which we discuss further in Chapter Six.

Pilot Candidate Selection Method Scores and Attrition

Although Chapter Four notes large demographic differences in training attrition, it is important to fully investigate the relationship between all available characteristics and training attrition before concluding that the patterns are driven by demographics alone. Otherwise, the comparisons in Chapter Four could lead to faulty conclusions.

As an illustration, recall that the previous chapter showed that a higher percentage of candidates from ROTC (11 percent) were eliminated from IFT than candidates from OTS (6 percent). This pattern appears to indicate that candidates from ROTC are less likely than candidates from OTS to be successful. But, when calculating rates separately for candidates who have different levels of pretraining aptitude, as measured by PCSM scores (see Figure 5.1), we find that ROTC graduates are generally *more* likely than OTS graduates to be successful. The reason for this reversal is that ROTC graduates are much more likely than OTS graduates to be in the bottom half of the PCSM distribution, which leads to a higher overall attrition rate for ROTC graduates. Conditional on PCSM scores, though, ROTC candidates have a higher likelihood of being successful. Just as accounting for PCSM scores reversed the initial conclusion in this illustration, doing so could affect conclusions about female and minority attrition rates.

Figure 5.1. Initial Flight Training Attrition Rates for Candidates from Reserve Officer Training Corps Versus Officer Training School, by Pilot Candidate Selection Method Quartile



SOURCE: Authors' calculations from AETC data.

Relationships Between Pilot Candidate Selection Method Scores and Attrition

Before we describe demographic differences in PCSM scores, Tables 5.1 and 5.2 describe the relationship between the three components of the PCSM score and attrition in IFT and PPT. Table 5.1 presents attrition rates by quartile for AFOQT and TBAS scores (relative to others in the data) and by 50-hour increments in the case of flight experience. Table 5.2 presents pairwise correlation values that show the relationships among the components, as well as the relationships between each component and IFT or PPT attrition. The correlation coefficient is a measure of association between two variables, which is on a scale from 0 to 1 (or -1).

Table 5.1. Initial Flight Training and Primary Pilot Training Attrition Rates Versus Pilot Candidate Selection Method Component Categories

PCSM Component	Percentage Eliminated	
	IFT	PPT
AFOQT pilot percentile		
25th and below	20.1	15.0
26th to 50th	9.1	8.8
51st to 75th	4.9	5.8
76th and up	1.9	4.5
TBAS percentile		
25th and below	23.2	16.3
26th to 50th	9.0	9.6
51st to 75th	3.1	5.1
76th and up	1.0	4.5
Flight hours		
0	15.6	10.3
1 to 50	5.3	9.3
51 to 100	1.5	7.0
101 to 150	0.0	9.2
151 or more	0.8	1.7
Overall PCSM percentile		
25th and below	21.8	16.9
26th to 50th	7.6	9.2
51st to 75th	2.0	6.8
76th and up	1.1	3.0

NOTE: We calculated percentile cutoffs for AFOQT and TBAS scores relative to all candidates in the sample.

Table 5.2. Correlation Matrix of Pilot Candidate Selection Method Component Scores and Initial Flight Training and Primary Pilot Training Attrition Indicator Variables

PCSM Component	AFOQT Pilot Score	TBAS Score	Flight Hours
AFOQT pilot score	1.00		
TBAS score	0.71	1.00	
Flight hours	0.18	0.31	1.00
Attrition in IFT	-0.27	-0.30	-0.08
Attrition in PPT	-0.17	-0.17	-0.07

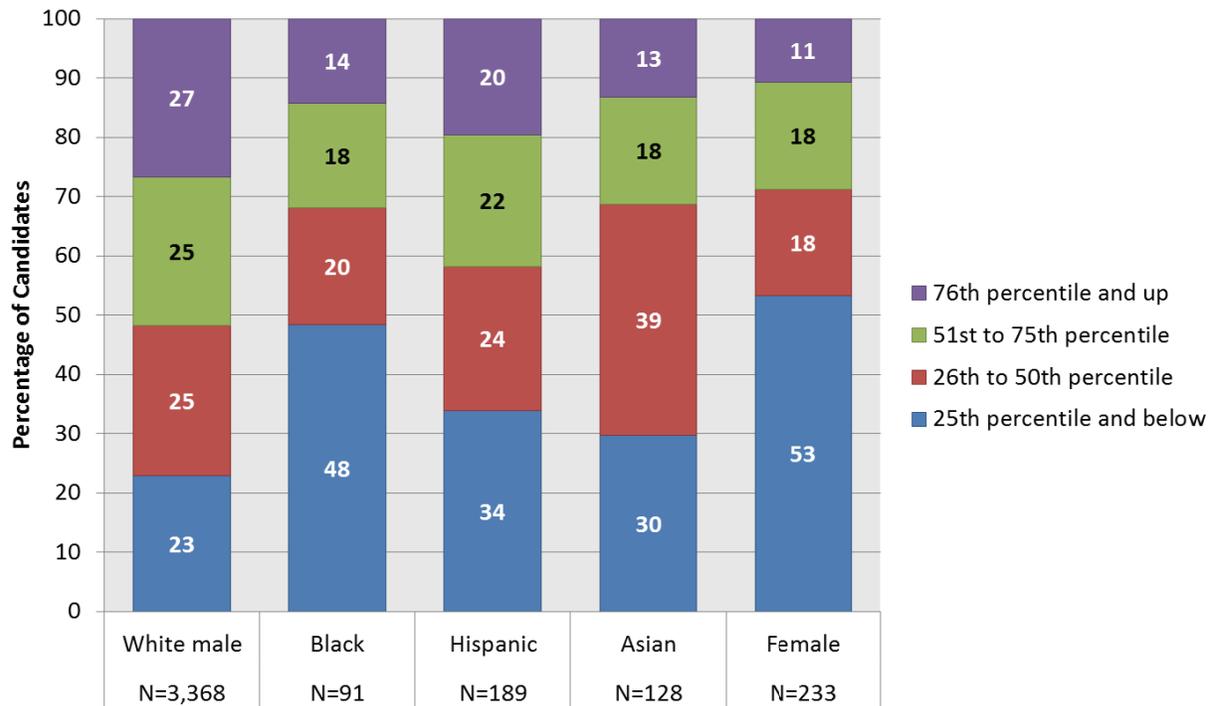
NOTE: All correlations are statistically significant at the 0.05 level.

The first fact apparent in Tables 5.1 and 5.2 is that all PCSM components relate strongly to attrition; candidates with higher values in each area are generally eliminated at lower rates. For example, Table 5.1 shows that more than 20 percent of candidates in the bottom quartiles of AFOQT and TBAS scores were eliminated from IFT, while attrition rates were only 1.9 percent and 1.0 percent for candidates in the top quartile of the AFOQT and TBAS distribution, respectively. Candidates with more hours of flying experience were also less likely to be eliminated from IFT and PPT; attrition rates in both phases were below 2 percent for those who had more than 150 hours of flying experience prior to the start of training. By contrast, 15.6 percent and 10.3 percent of candidates with no flying experience were eliminated from IFT and PPT, respectively. Table 5.2 also shows that AFOQT and TBAS scores are closely related (the correlation between them is 0.71) and that both tests show a stronger association with attrition than flying experience does.

Demographic Differences in Overall Pilot Candidate Selection Method Scores

Demographic group differences in candidate characteristics that relate to training success could play some role in the relatively high attrition among minority and female candidates. Figure 5.2 shows how the percentage of candidates in each quartile of the PCSM distribution varies by demographic category. The colored sections of the stacked bars represent the percentage of candidates in each group that fall in the respective portions of the PCSM distribution. The results show that the minority and female candidates in the sample are much more likely than white male candidates to have PCSM scores in the bottom half of the distribution. The black and female candidates, in particular, have vastly different PCSM scores from those of the white male candidates. Although 23 percent of white male candidates score in the bottom quartile, 48 percent of black candidates have scores on the bottom 25 percent and more than 50 percent of the female candidates have similarly low PCSM scores. Combining this information with that in Table 5.1 suggests that more than 50 percent of the 233 female candidates in the sample (who did not commission through USAFA) faced a 21.8-percent chance of being eliminated from IFT and a 16.9-percent chance of being eliminated from PPT, compared with less than 25 percent of the white male candidates who faced a similar risk of attrition.

Figure 5.2. Percentage of Candidates in Each Pilot Candidate Selection Method Quartile, by Demographic Group



SOURCE: Authors' calculations from AETC data.

NOTE: The colored sections of the stacked bars represent the percentage of candidates in each group that fall in the respective portions of the PCSM distribution.

These patterns could produce differential attrition rates along racial or ethnic or gender lines, even if candidates from all groups had similar experiences in training. Further, they are relevant to the patterns that emerged in the qualitative findings. For example, instructors in the focus groups identified a perception that female students seemed more likely to struggle, and both female groups and instructor groups suggested that female students lacked confidence compared with men. This pattern is borne out in Figure 5.2: The female candidates in our sample had lower scores on the PCSM metrics, suggesting that they might have faced more of a headwind in UPT than the male candidates did, on average.

Demographic Differences in Overall Attrition from Training

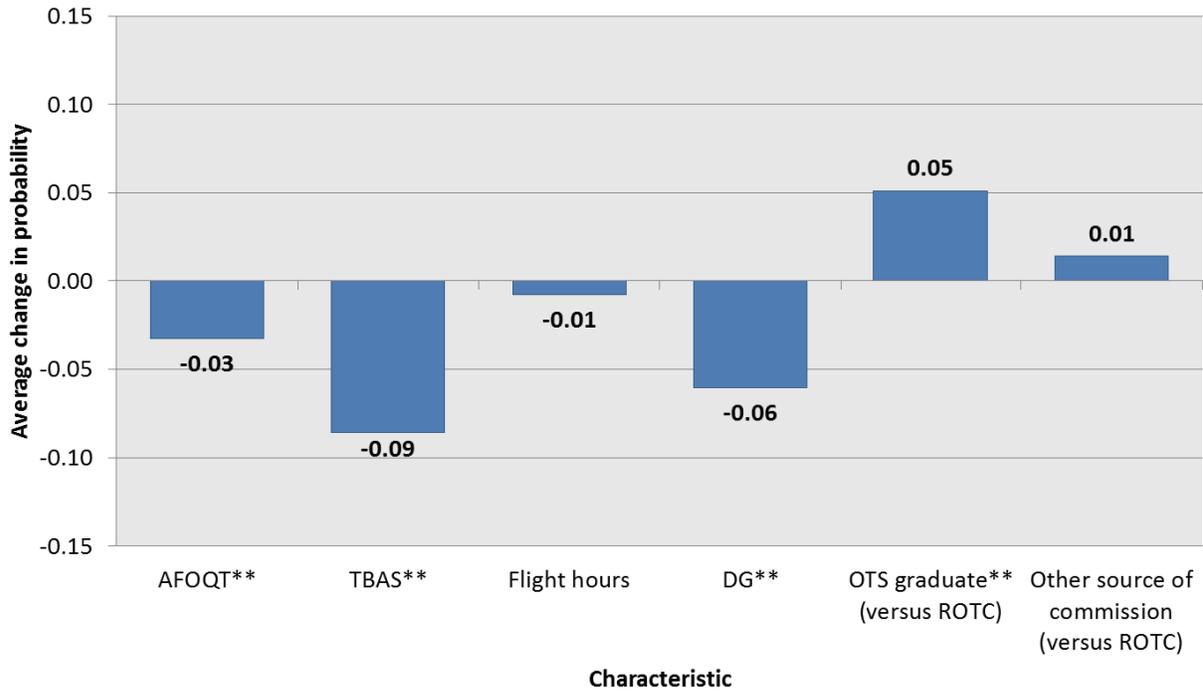
This section seeks to determine the portion of the demographic differences in attrition that is attributable to characteristics other than race, ethnicity, or gender. The ideal way to answer this question would be to compare the attrition patterns of minority and female candidates with those of a group of white or male candidates who were identical in every respect, other than their race or gender. Because that comparison group does not actually exist, the best substitute is a

comparison group of white and male candidates in the data who have the same observable characteristics as the minority and female candidates, such as test scores and sources of commission. Calculating attrition differences between minority and female candidates and their white and male “look-alikes,” who have similar characteristics, creates a clean comparison that isolates the impact of race, ethnicity, or gender. Although this comparison does not capture the causal relationship between demographics and training success, it at least serves to measure whether the differences in characteristics (such as those in Figure 5.2) are large enough to plausibly account for the differential attrition rates.

In order to construct these comparisons, we use a regression technique to model the relationship between all characteristics, including demographics, and the likelihood that a candidate is eliminated from training at any point. To maximize the minority and female sample size, the model includes all candidates who were involved in any portion of the training pipeline from 2009 to 2014, even those who have only partially completed training. Because it is impossible to determine whether the partially complete observations will be eliminated later on in the pipeline, including these observations could bias the results. To combat this problem, we designed the regression technique to correct the observations that are observed for only part of the pipeline (see Appendix A for more details on the regression methodology). We then use the model to predict the attrition rate for a hypothetical look-alike group of white or male candidates with the same observable characteristics as each minority or female cohort.

Figure 5.3 captures the relationships between the characteristics other than race or ethnicity and gender and the likelihood that a candidate was eliminated from training. The figure displays each relationship as a marginal effect, which is the average change in the probability of attrition associated with a one-unit change in the variable, holding all the other variables constant. For example, the first bar shows that a 1–standard deviation increase in AFOQT score decreases the likelihood of attrition by about 3 percentage points, on average, conditional on TBAS scores, flying experience, DG status, and source of commission.

Figure 5.3. Average Marginal Effects of Characteristics on the Probability of Attrition



NOTE: We use the nonparametric bootstrap to calculate standard errors used for significance testing. Statistically significant variables are marked on the horizontal axis with a **. The model also included indicator variables for each candidate's race or ethnicity and gender, of which only the Hispanic and Asian indicator variables were statistically significant. The AFOQT and the TBAS are standardized. Flight hours are scaled so that one unit is equal to 50 additional hours. DG is an indicator for whether the candidate was a distinguished graduate at his or her commissioning source.

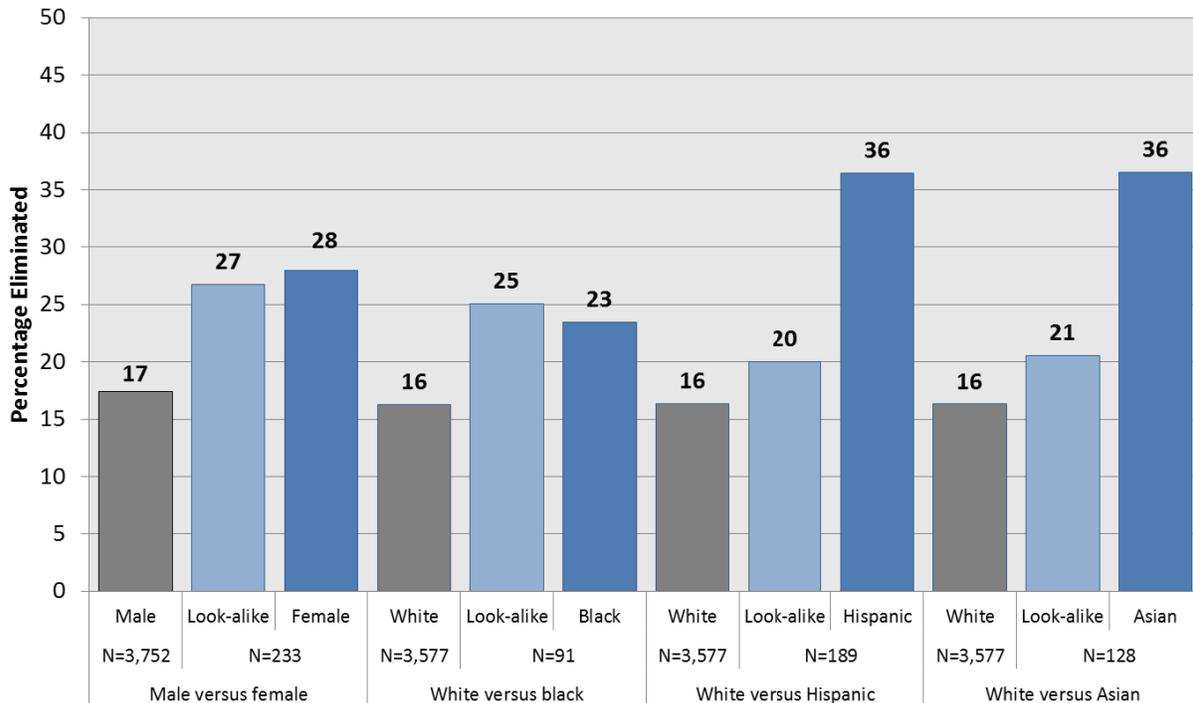
The factors associated with the largest decreases in the likelihood of attrition are having higher TBAS scores, being a DG, and being an ROTC graduate (rather than an OTS graduate). It might appear odd that flying experience does not significantly correlate with attrition from UPT. The proper interpretation for this result is that small changes in flying experience do not significantly affect the probability of attrition, conditional on all of the other characteristics in the model. In other words, for a given level of measured aptitude and background characteristics, an additional 50 hours of experience does not significantly change the likelihood of attrition, on average.¹⁵

Figure 5.4 uses the regression method to create the comparisons described earlier for each minority group and for female candidates. The gray bars represent the predicted attrition rate for the base group (either male or white candidates), while the dark blue bars show the predicted

¹⁵ We investigated several alternative specifications of the number of flight hours. When specified as a categorical variable, there are discrete points at which significant differences in attrition exist. For instance, candidates with 51 to 100 hours of experience were 5.2 percentage points less likely to be eliminated than candidates with no experience, all else being equal. However, the particular way in which flight hours were specified did not have a strong impact on the estimated look-alike attrition rates, which were of primary interest.

attrition rates for female candidates and for each minority group.¹⁶ The light blue bar in the center of each set represents the look-alike group—that is, a group of candidates from the base group with the same observable characteristics as those for the female or minority group.

Figure 5.4. Estimated Overall Attrition Rates, by Demographic Group, Versus Look-Alike Comparison Groups



NOTE: We use the nonparametric bootstrap to calculate standard errors used for significance testing. The only groups that are significantly different from the look-alike group are Hispanic and Asian candidates. The gray bars represent the predicted attrition rate for the base group (either male or white candidates), while the dark blue bars show the predicted attrition rate for female candidates and for each minority group. The light blue bar in the center of each set represents the look-alike group.

The male-versus-female and white-versus-black comparisons show similar patterns. In both cases, the base group is eliminated at a significantly lower rate than the minority group. However, hypothetical base-group candidates with the same characteristics as female and black candidates have predicted attrition rates that are very similar to the rates for actual female and black candidates. In other words, the regression model predicts that a hypothetical group of male or white candidates with flying-aptitude scores, levels of experience, and backgrounds similar to the female or black candidates in the sample would be eliminated from UPT at similarly high rates. The differences in the pretraining characteristics are large enough to plausibly account for

¹⁶ We use predicted elimination rates rather than actual rates to take advantage of the model’s correction for partially completed observations.

the higher attrition rates present in these two groups, and the fact that these groups had relatively high attrition rates is not necessarily related to their race or ethnicity or gender. When combined with the qualitative findings from Chapter Three, this result could mean that the challenges that students and instructors identified do not affect graduation rates for these groups or that support mechanisms (such as affiliation groups) can partly mitigate the impact of such challenges.

The results of the white-versus-Hispanic and white-versus-Asian comparisons point in a different direction. Hispanic and Asian candidates had the highest predicted attrition rates of any group (36 percent), and there is still a substantial gap between both groups and their base-group look-alikes. Thus, the relatively high attrition rates for candidates from these groups are not attributable to the characteristics included in the regression, so some other factors particular to these groups must be driving the differences in rates.

In summary, the degree to which pretraining characteristics can explain demographic differences in attrition varies across demographic groups. For black and female candidates, attrition rates are no higher than would be expected after taking into account ability measures (i.e., PCSM components), commissioning sources, and DG status. For Hispanic and Asian candidates, a significant gap remains that is not easily attributable to the other characteristics included in the model. Given that these variables explain the majority of the gap for some groups, it would also be useful to know which of them are most important. The next section addresses this question by further examining the differences in attrition in the initial and primary phases of pilot training.

The Most-Important Characteristics in Explaining Attrition Gaps

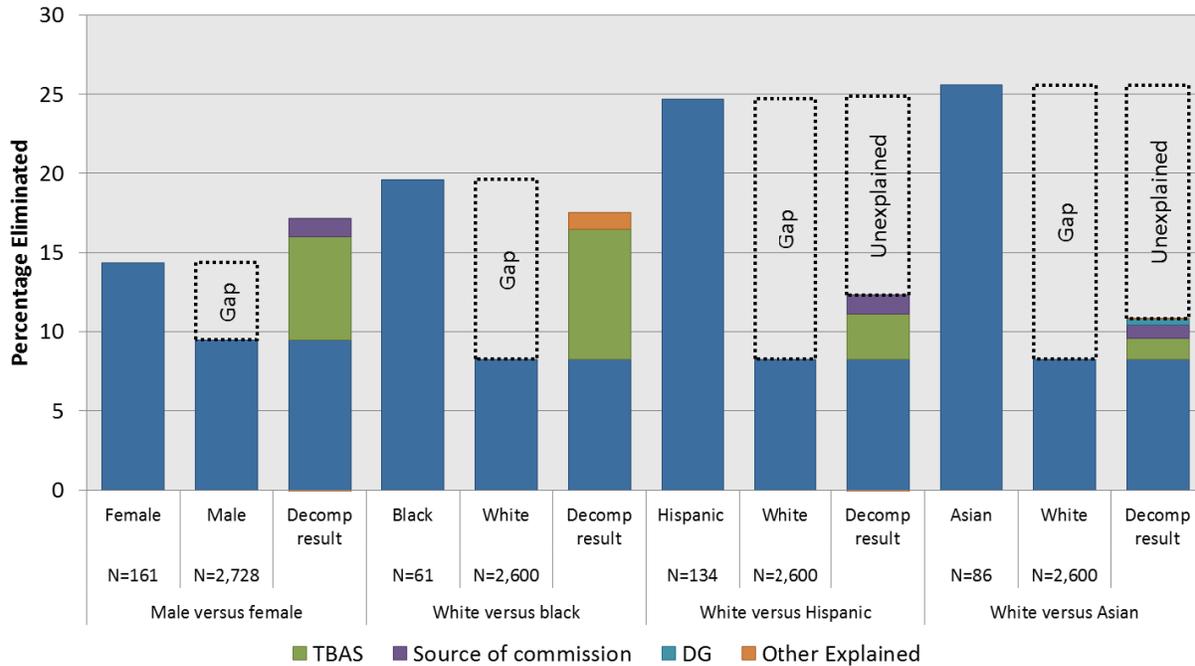
The previous analysis examined how all characteristics, together, relate to patterns of attrition at any of the three major stages of the pilot training pipeline. Although this overview is helpful, it would also be informative to have greater fidelity on the particular phases of training, as well as which characteristics are most important in explaining the demographic differences in attrition. The following results separately examine the first two major phases of the pipeline,¹⁷ the initial and primary phases. To determine which characteristics are most important, we use the Blinder–Oaxaca decomposition method. Appendix B provides more details on the actual calculations behind the methodology. Broadly, the decomposition takes the portion of the gap attributable to differences in the characteristics (known as the *explained component*) and determines how much each individual characteristic contributes to this portion.

Beginning with IFT, Figure 5.5 shows the results of the decomposition analysis. For each set of three bars, the first two bars represent the minority and base-group attrition rates, respectively, with the initial gap represented above the base group's bar with a dashed outline. The third bar

¹⁷ As shown in the previous chapter, elimination rates in the advanced phase tend to be very low, so examining demographic differences in elimination is uninformative.

adds colored sections that represent the portion of the gap attributable to the individual characteristics, for all characteristics that were statistically significant. To ensure that the height of the third bar represents the size of the explained component, we added a colored section that is denoted “Other explained” to represent the remaining portion of the explained component after all statistically significant characteristics were represented. For example, in the white-versus-black comparison in Figure 5.5, differences in TBAS scores account for 8.2 percentage points of the original gap (represented by the green portion of the third bar), but all other variables were insignificant. Thus, the orange portion of the third bar, with a height of 1 percentage point, represents the net impact of the insignificant variables so that the entire explained component is visible on the figure. In cases in which a significant gap remains after accounting for characteristics, the remaining portion (labeled as “unexplained”) is shown above the decomposition results with a dashed outline.

Figure 5.5. Decomposition of Initial Flight Training Attrition Rates, by Demographic Group



NOTE: We use the nonparametric bootstrap to calculate standard errors used for significance testing. Only statistically significant results at the 0.10 level are shown. In cases in which the overall explained component was significant but individual characteristics were insignificant, the remainder of the explained component is represented by the “other explained” category. Results for the male-versus-female and white-versus-Hispanic comparisons also included a small negative “other explained” portion of less than 0.5 percentage points that is omitted for readability. For each set of three bars, the first two bars represent the minority and base-group attrition rates, respectively, with the initial gap represented above the base group’s bar with a dashed outline. The third bar adds colored sections that represent the portion of the gap attributable to the individual characteristics, for all characteristics that were statistically significant. To ensure that the height of the third bar represents the size of the explained component, we added a colored section that is denoted “Other explained” to represent the remaining portion of the explained component after all statistically significant characteristics were represented. For example, in the white-versus-black comparison, differences in TBAS scores account for 8.2 percentage points of the original gap (represented by the green portion of the third bar), but all other variables were insignificant. Thus, the orange portion of the third bar, with a height of 1 percentage point, represents the net impact of the insignificant variables so that the entire explained component is visible on the figure. In cases in which a significant gap remains after accounting for characteristics, the remaining portion (labeled as “unexplained”) is shown above the decomposition results with a dashed outline.

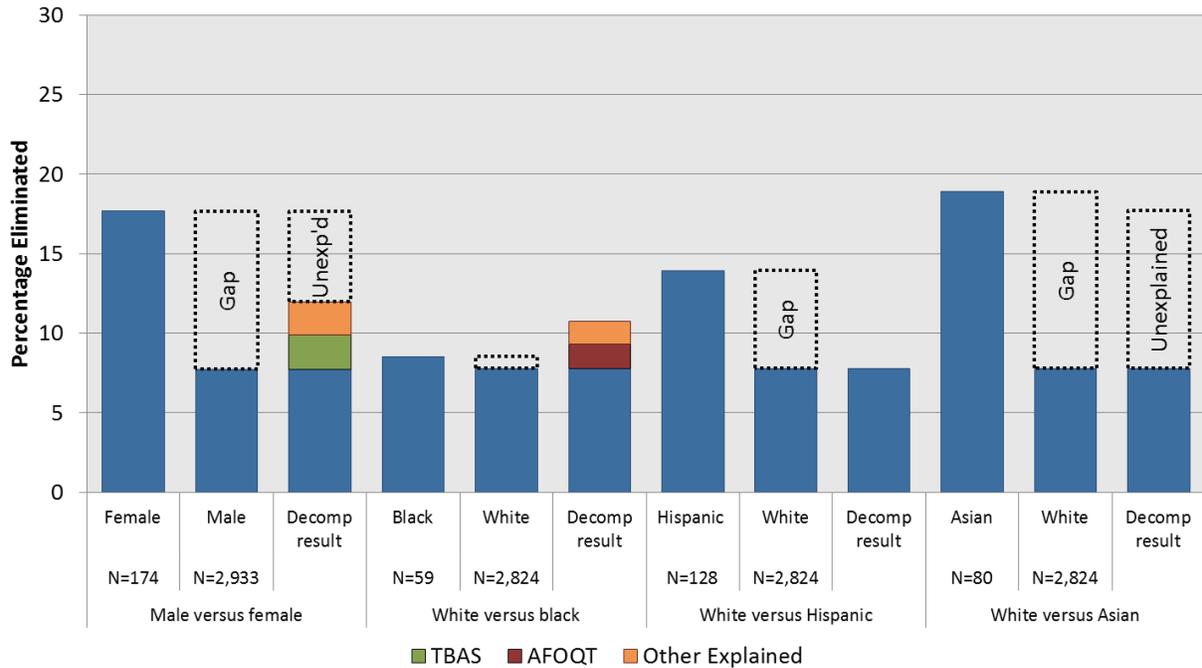
Finally, the decomposition figures use the 10-percent significance threshold for the colored sections of the bars. Because the goal of this section is to explore the gaps (in contrast to the previous section, in which the goal was to determine whether the gaps could be explained), we thought it more appropriate to display more information, including borderline values. Still, there was no case in which the entire explained component failed to meet the traditional 5-percent threshold (see Appendix B for more details on the decomposition methodology).

Across the demographic groups, the analysis reveals that TBAS scores tend to be the most important characteristic in explaining the differences in attrition rates. For the male–female comparison, TBAS alone accounts for more than the original gap, which suggests that female candidates would have a lower attrition rate than male candidates if average TBAS scores were

the same across groups. For the white–black comparison, results show that TBAS alone accounts for 72 percent of the gap in IFT attrition rates. With the Hispanic and Asian comparisons, these results replicate the pattern in Figure 5.4, in which large portions of the gap are not attributable to group differences in other characteristics. However, of the small portions of the gaps that can be explained, TBAS scores play a primary role.

Figure 5.6 shows the same results for the primary phase of pilot training. Figure 5.6 displays fewer results than Figure 5.5 because most variables were not statistically significant in the decomposition. This lack of significance is likely due to a combination of limited sample size and the fact that the relationships between the characteristics and attrition in the primary phase are not as strong as those in the initial phase. Regardless, the results show that TBAS continues to be a factor in explaining higher attrition for female candidates, while AFOQT score significantly relates to differences in attrition between black and white candidates. In the primary phase, no characteristics explain the differences between white and Asian candidates, and a statistically significant gap remains.

Figure 5.6. Decomposition of Primary Pilot Training Attrition Rates, by Demographic Group



NOTE: We use the nonparametric bootstrap to calculate standard errors used for significance testing. Only statistically significant results at the 0.10 level are shown. In cases in which the overall explained component was significant but individual characteristics were insignificant, the remainder of the explained component is represented by the “other explained” category. For the Hispanic comparison, all variables, including the overall explained and unexplained components, were statistically insignificant. For each set of three bars, the first two bars represent the minority and base-group attrition rates, respectively, with the initial gap represented above the base group’s bar with a dashed outline. The third bar adds colored sections that represent the portion of the gap attributable to the individual characteristics, for all characteristics that were statistically significant. To ensure that the height of the third bar represents the size of the explained component, we added a colored section that is denoted “Other explained” to represent the remaining portion of the explained component after all statistically significant characteristics were represented. In cases in which a significant gap remains after accounting for characteristics, the remaining portion (labeled as “unexplained”) is shown above the decomposition results with a dashed outline.

Summary

Minority and female pilot candidates have significantly higher attrition rates than white and male candidates at key points in pilot training, but group differences in other characteristics, such as pretraining measures of flying aptitude, muddy these comparisons. Although qualitative information suggested that female and minority candidates face many unique challenges to completing UPT, analyses that account for test scores, flying experience, and commissioning source find that white–black differences and male–female differences can be explained by group differences in other characteristics. Among these characteristics, the fact that black candidates and female candidates have lower TBAS scores is the most important factor in explaining higher attrition rates in these groups. At the same time, Hispanic and Asian candidates have the highest attrition rates of any demographic group, and their characteristics are closer to those of white

candidates. Results show, therefore, that the majority of the difference in attrition rates for these groups cannot be explained by their characteristics.

Chapter Six presents a synthesis of the focus group findings and recent patterns in the UPT data, with concrete recommendations for next steps in achieving policy goals for increased diversity in the pilot career fields.

Chapter Six. Conclusions and Recommendations

Becoming a pilot in the Air Force requires an officer to persevere through a lengthy and challenging training process with a narrow path to success. If current career progression trends continue, an officer's ability to obtain a pilot slot and navigate the pipeline will greatly affect his or her long-term career trajectory. Thus, the only way to boost the number of officers from underrepresented demographic groups available to serve at the highest ranks is to address potential barriers to minority and female officers in becoming pilots and, in turn, increase demographic diversity in the pilot career field. This study sought to collect as much information as possible on the potential barriers that minority and female officers face in becoming Air Force pilots, with the goal of understanding recent demographic patterns in UPT in view of potential barriers. This chapter characterizes the state of knowledge on this policy problem and recommends several next steps to policymakers.

Key Findings

We examined potential barriers to female and minority candidates becoming pilots by conducting focus groups with recent students and instructors and analyzing patterns in recent UPT data. The patterns we identified point to several key findings, outlined in this section.

Women and Minorities Appear to Face Unique Challenges to Becoming Pilots

Focus group discussions with UPT students and instructors raised some factors that might present race- and gender-specific challenges to entering and completing UPT. Focus group participants suggested that women and minorities might have fewer external influences encouraging them to become pilots in the first place. Participants also suggested that women and minorities might face certain unique challenges, such as being marginalized in a white male-dominated culture, some instructors being "generationally unaware" of what could be construed as offensive and condescending language toward women and minorities, and perceptions that women and minorities are unqualified or receive special treatment. Although participants saw peer relationships and mentoring opportunities as crucial sources of support, they perceived access to these resources to be uneven. As a result, female and minority UPT students might seek out other means of support, such as from same-race or same-gender peers or from affiliation groups (e.g., Supergirls, SUFR).

Minority and Female Candidates Have Relatively High Attrition Due to Flying Performance

Examining the reasons for attrition by phase and demographic group showed few differences in rates of DOR (i.e., self-elimination) across groups. Relatively high minority and female attrition rates stem primarily from differences in elimination due to flying performance. This finding implies that efforts to reduce attrition gaps should focus on improving the flying performance of minority and female candidates in training, whether through recruiting different candidates, improving the preparation of candidates who are at risk of early attrition, or adjusting the policies for struggling students.

Minority and Female Representation Among Undergraduate Pilot Training Graduates Would Be Low Even If All Groups Had Similar Attrition Levels

The analyses of attrition data in this report focused on demographic differences in rates of attrition, but, at current levels of minority and female representation in the cohorts entering training, higher attrition rates for these candidates would not affect representation as much as the rate comparisons might imply. If all groups had the same rates of attrition in recent years, this would have not have raised any disadvantaged group's representation by more than 1 percentage point in the population of either IFT or PPT (i.e., T-6A) graduates. Therefore, there are unlikely to be any long-term gains in minority and female representation among Air Force pilots (let alone among those promoted to senior levels) without a change in the demographic composition of pools of candidates entering training.

Pretraining Characteristics Could Account for Higher Attrition Among Female and Black Candidates

Analysis of UPT attrition data showed that characteristics that are known about candidates before they enter pilot training could account for the relatively high attrition among female and black candidates. In other words, pilot candidates from the base demographic group (male for gender comparisons, white for race and ethnicity comparisons) who had similar test scores, sources of commission, flying experience, and levels of DG attainment were eliminated from UPT at similarly high rates. This finding implies that race and ethnicity or gender do not, in themselves, drive these differences in attrition rates. Rather, members of these groups are less likely to possess the preparation or experience necessary to be successful.

We further investigated which of the pretraining characteristics played the largest role in explaining these differences in attrition rates. The analysis showed that group differences in scores on the TBAS, alone, could account for the entire male–female difference and 72 percent of the white–black difference IFT attrition. Analyses of later phases in training were less informative because characteristics are less correlated with attrition in later phases and because of limited statistical power.

More Information Is Needed in Several Areas

Although gaps in attrition for female and black candidates could plausibly be attributed to group differences in candidate flying aptitude and experience, the patterns for Hispanic and Asian candidates could not be attributed to differences in the basic pretraining characteristics that factor into pilot selection. These groups had the highest overall attrition rates, and their actual attrition rates significantly exceeded the attrition rates of look-alike candidates from the base group who matched their characteristics other than race and ethnicity. Therefore, an explanation of the elevated attrition in these groups requires more information about what actually occurs in UPT.

Additionally, many of the findings in the analysis of attrition data apply only to candidates from commissioning sources other than USAFA because USAFA used different selection procedures for awarding pilot slots to graduates during the time period covered in our data. There is no a priori reason to assume that the same relationships observed in the non-USAFA candidate population will hold with the candidates who came from USAFA. In the focus groups, we asked students and instructors to comment on any differences in student performance related to commissioning source. Although we heard some anecdotal perspectives, there was not sufficient information to draw definitive conclusions. For the Air Force to obtain findings that generalize to all UPT candidates, there needs to be an analysis of additional data on USAFA graduates linking candidate flying aptitude or experience to training completion.

Recommendations

When considered together, these findings point to the following recommendations, which we explore in more detail below:

- Improve pilot training experiences for women and minorities.
- Continue to increase the number of minority and female candidates entering pilot training. Consider ways to raise the TBAS scores of incoming minority and female candidates.
- Review training progress–management policies to determine whether less prepared candidates with potential have the opportunity to succeed.
- Conduct research to identify the causes of higher attrition rates among Hispanic and Asian candidates and to further assess differences among USAFA graduates.

Improve Pilot Training Experience for Women and Minorities

The qualitative portion of this study raised many specific challenges that female and minority students might face that are likely of interest to policymakers independently of their impact on attrition. In light of these results, several possible actions could help improve pilot training experiences for these students. The first such action is to provide opportunities to connect sim instructors with flight instructors and to increase accountability for their behaviors. This could

involve coordinating teaching techniques or topics, which would minimize discrepancies and inefficiencies when students are forced to relearn new techniques. This might also help indirectly affect the ways in which sim instructors interact with students, reducing offensive behaviors. Senior leaders might also need to increase instructor accountability, making clear that such behaviors will not be tolerated.

A second action would leverage existing networks and informal mentoring to increase opportunities for peer and mentor support. Because participants described fraternization concerns as a deterrent for mentoring, clarifying and raising awareness of appropriate student and instructor mentoring strategies might encourage greater mentorship. Focus group participants reported that affiliation groups were valuable but that access to them was not universal. For instance, Supergirls exists mainly at Vance AFB, and SUFR consists mainly of black students and pilots. Further, some students reported that lack of time prevented them from participating in Supergirl groups as much as they would have liked. Expanding opportunities for other female and minority students and those at other bases to participate in these groups would increase their access to valuable support. This might be particularly important when considering the attrition rates of Asian and Hispanic candidates, neither of which appeared to participate broadly in these affiliation groups, potentially because few opportunities were available.

Our focus groups also highlighted the possibility of intentionally grouping candidates to prevent people from feeling isolated in the training environment. In our focus groups, for instance, one instructor reported basing his grouping decisions in part on his knowledge of peer relationships, such as study groups. He attempted to group students who he already knew worked well together.

Policymakers could also explore ways to take advantage of “casual” time (when students are waiting on base to begin training) to provide flying experience or to study academics. Many students described the initial academic portion of training as the most difficult and time-consuming. They suggested that sending incoming students to other bases or elsewhere to get flying experience would help students with less flying experience catch up to some of their classmates. Instructors also suggested that a simple action would be to provide publications or other materials so that students could begin studying before beginning pilot training.

Continue to Increase the Number of Minority and Female Candidates Entering Pilot Training

Because minority and female candidates represent a small fraction of the population of UPT trainees, changes in attrition levels do not affect representation in the graduate pool in the same way as an equivalent percentage shift among white or male candidates. Our hypothetical calculations show that reducing attrition among minority and female candidates alone will not dramatically change diversity in the pool of graduates. An increase in the number from each group entering training is also necessary to increase representation levels among UPT graduates.

The AFSC assignment systems award pilot slots based on a combination of merit criteria and individual preferences, which differ by commissioning source, so the degree to which policies can alter the demographic composition of incoming candidates depends on many factors. Although a full evaluation of the most efficient way to change the demographics of candidates entering training is beyond the scope of this study, prior research on USAFA cadets indicates that there would be room for increases in diversity if the AFSC preferences of minority and female candidates were more similar to those of white male candidates (Schulker, 2010). However, as in the current study, the prior findings could not assess candidates from all commissioning sources, so they do not necessarily generalize to the broader population of Air Force officer candidates.

Increasing minority and female representation in UPT might also have important implications for minority and female experiences during pilot training. First, one of the most prevalent themes in the qualitative findings, when we asked about specific challenges for female and minority students, was difficulties navigating the predominant white male–majority culture. Second, increasing the number of female and minority students would allow the Air Force to try out potential ways to improve minority and female networking and support. This could include, for example, achieving a “critical mass” of women or minorities that would overcome the effects of a majority culture to mitigate a “spotlight” that singles out nonconforming people. In both ways, introducing more female and minority students into pilot training could theoretically affect the culture in a positive way and reduce the impact of such adjustment difficulties.

At the same time, the findings illustrate potential unintended consequences that could result if minority and female numbers increase, but these increases are drawn from samples of candidates who are less likely to succeed. For example, the quantitative analysis showed that female and minority candidates had disproportionately low PCSM scores, which coincides with negative perceptions about minority and female candidate performance. According to student responses, such negative perceptions could adversely affect all female or minority candidates, including highly prepared candidates, if they create additional stress for the candidates or if instructors have different expectations for them. This dynamic illustrates a potential pitfall in which negative generalizations or perceptions of favoritism could undermine the positive cultural impact of increasing diversity. These patterns also echo findings in other contexts, in which the positive impact of diversity in terms of perceived organizational performance has been found to be contingent on effective diversity management (Choi and Rainey, 2010).

Consider Ways to Raise the Test of Basic Aviation Skills Scores of Incoming Minority and Female Candidates

Although policies aiming to reduce minority and female attrition are unlikely to significantly increase representation on their own, such policies could help to maximize the effectiveness of increasing the number of minority and female candidates entering training. The findings of the current study indicate that some attrition gaps could be addressed if minority and female

candidates entering training had similar levels of TBAS-related skill to those of their white and male counterparts. Older research shows that selection boards might not weight measures of pilot aptitude very heavily in their decisions (Carretta, 2000), so there might be adjustments to selection procedures that reduce the demographic differences in pilot aptitude among selected candidates. Additionally, the Air Force could attempt to build TBAS-related skills by offering additional preparation to candidates with a higher likelihood of early attrition (see Carretta, 2005, for a description of the TBAS subtests and skills they measure). However, the literature describes the TBAS as a measure of pilot “aptitude,” and the degree to which potential interventions could raise the ability of students who score lower on the TBAS is unknown. Thus, we recommend that the Air Force conduct additional groundwork for understanding which skills the TBAS measures and identifying the best method to increase such skills.¹⁸

Regardless of the approach, designing an effective course will likely require careful planning. Although creating additional “familiarization” training is often the first option to come to mind, our results indicate that improving a candidate’s likelihood of success requires more than increasing his or her general familiarity with flying. The regression analysis showed that small changes in flying experience did not significantly relate to attrition, conditional on other factors.

Review Training Progress–Management Policies to Determine Whether Less Prepared Candidates with Potential Have the Opportunity to Succeed

An alternative to attempting to affect candidate success prior to training is to adjust the policies governing how candidate progress is managed. The current policies emphasize quickly eliminating candidates who cannot keep up with the rapid pace of training. Although this process might be efficient, it also might eliminate some candidates (from all demographic groups) who had the potential to succeed. An alternative process could offer less prepared candidates who have the requisite desire and potential to succeed additional opportunities to practice areas of difficulty before they are eliminated. Alternatively, the curriculum could instead group students according to ability or experience and deliver training content that is better designed to match the background of each trainee. Such a curriculum could improve the performance of all trainees, if the types of training events that would benefit students at risk of attrition are different from the events that benefit highly prepared students (Bink and Cage, 2012), and the literature on adaptive training generally supports the idea that the military would benefit from incorporating adaptive techniques into training (Spain, Priest, and Murphy, 2012). Determining the optimal strategy for doing this, however, is beyond the scope of this study and therefore would require deliberate examination before any policy changes are considered. But the demographic differences in pretraining aptitude and experience suggest that changes designed to benefit at-risk candidates would disproportionately help minority and female students.

¹⁸ At the time of this research, the Air Force Personnel Center was conducting an experimental study on whether providing candidates with an online aviation course increases candidate test scores and pilot training performance.

Conduct Research to Identify the Causes of Higher Attrition Rates Among Hispanic and Asian Candidates and to Further Assess Differences Among U.S. Air Force Academy Graduates

Finally, current options are constrained by a lack of information. Without understanding the attrition gaps for all demographic groups (especially the gaps for Hispanic and Asian candidates), we cannot identify candidates with the best chance of success or improve the prospects of less prepared candidates.

Limitations on the information available—both on candidate background characteristics and on the events that unfolded as they completed training—constrain the current study. Although focus groups discussed training experiences, the research design focused on group-level themes and did not provide representative information about Hispanic or Asian students in particular. One way to determine the causes of higher attrition rates among Hispanic and Asian candidates would be to conduct a longitudinal study that collects detailed information on a representative sample of candidates over time. Another research approach would be to conduct a randomized study across bases, using the high tempo of student cohorts to test interventions to improve student experiences, as we have described above. Such information could help to pinpoint the precise causes of the higher attrition and identify policy remedies to improve the prospects of these fast-growing minority groups.

Appendix A. Regression Methodology for Predicting Attrition

Air Force pilot training is a multistage process that takes place over the course of roughly two years. Thus, it is necessary to use only cohorts that have results for the entire pipeline when calculating rates of attrition for different demographic groups, or group comparisons will be biased by the nonrandom nature of the incomplete observations. Because of the length of pilot training and the fact that data were available for only a five-year period, simply dropping incomplete observations would have resulted in a costly reduction in sample size for the minority groups of interest in the research. As an alternative solution, we treated completion of the successive stages of pilot training as an ordered outcome and applied a modified ordered regression technique that corrects for the bias from incompletely observed candidates. This appendix describes the details of this regression technique and how it is applied to the pilot training data.

Data Description and Potential Reasons for Incomplete Observations

AETC began collecting the data that this report uses in 2009, and the data include the results of all stages of Air Force pilot training completed until the point when the data were requested, near the end of 2014. Certain stages that other services oversee (such as T-6A training at Naval Air Station Pensacola, Florida, and TH-1H training at Fort Rucker, Alabama) do not appear in the data. The time cutoffs and missing bases produce a situation in which any combination of the three training phases could be missing, and only a slight majority of candidates are fully observed through all phases of the pipeline (see Table A.1).

Table A.1. Number and Percentage of Candidates with Unobserved Phases of Training

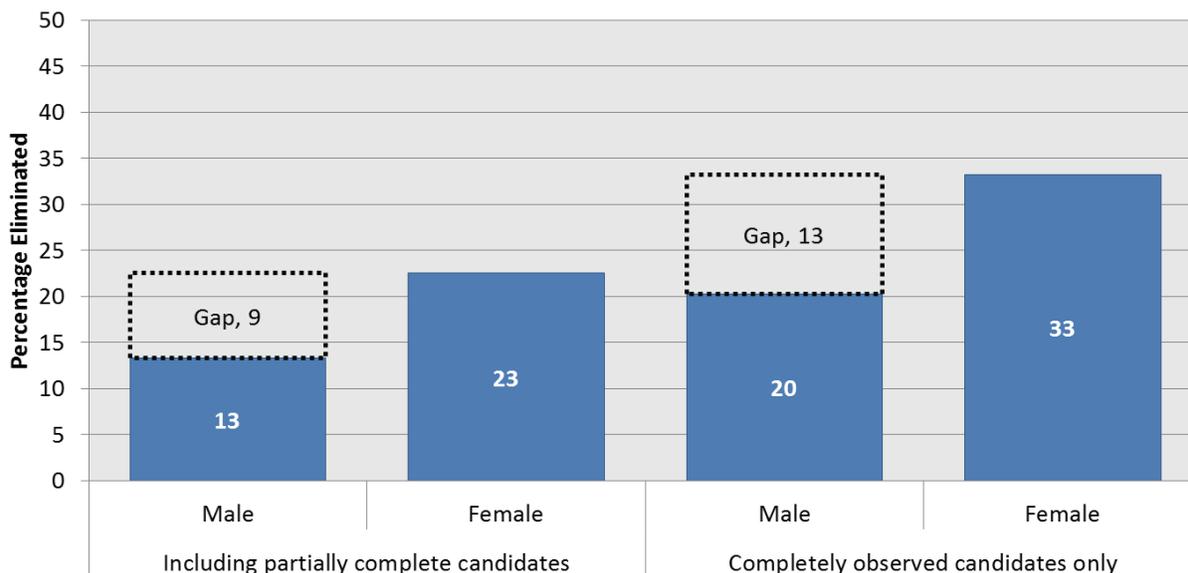
Missing Course	Number of Candidates	Percentage of Candidates
None	3,885	55.37
IFT only	1,365	19.45
PPT only	168	2.39
APT only	324	4.62
IFT and PPT	145	2.07
PPT and APT	904	12.88
IFT and APT	226	3.22

NOTE: APT = Advanced Pilot Training. Candidates who were eliminated from earlier phases are not considered to be missing follow-on courses. The three phases of training are IFT, PPT, and APT. These numbers include the whole data set, while the analysis included only candidates from commissioning sources other than USAFA.

In the presence of group differences in attrition, these missing values can bias group comparisons of the overall likelihood of attrition in ways that make racial and ethnic or gender gaps appear smaller than they are. Intuitively, consider the case in which some candidates have completed only IFT and are undergoing PPT at the time of the data cutoff in 2014 (the research literature refers to this situation as *censoring from above*). Including these candidates in a model of overall attrition would hide potential demographic differences in PPT and APT for part of the population, shrinking the estimated gaps. Alternatively, incompleteness is also a problem for candidates who completed earlier phases prior to when the data collection began in 2009: Their classmates who were eliminated during the unobserved period do not appear in the data at all (in the literature, this is called *truncation*). If there are demographic differences in attrition in the early phases, more minority and female candidates had already been eliminated during the unobserved period, which again would make overall differences in attrition appear smaller than they really are.

Figure A.1 illustrates this tendency by showing two sets of attrition comparisons by gender. The first comparison is the overall percentage of male and female candidates in the data who were eliminated at any stage, which fails to deal with the partially completed observations. The second comparison includes only candidates with results for every stage in the pipeline. Because female candidates are more likely to be eliminated in each phase, the gender difference is larger among the completely observed candidates.

Figure A.1. Percentage Eliminated in Any Phase of Training, by Gender



SOURCE: Authors' calculations from AETC data.

NOTE: Candidates who were eliminated from earlier phases are not considered to be incomplete when they do not appear in follow-on courses. These numbers include the whole data set, while the analysis included only candidates from commissioning sources other than USAFA.

Regression Model Correcting for Censoring and Truncation

With the usual case of censoring or truncation, the mechanism that determines the missing information relates to the value of the outcome variable, for which all outcomes above or below a threshold (e.g., a certain duration or income category) are cut off. For these cases, maximum likelihood estimators (MLEs) exist to combat both censoring and truncation. Censored MLEs model the probability that incomplete observations fall above or below the threshold while incorporating complete observations into a standard regression model. Truncated MLEs model the likelihood contribution of each observation, conditional on it being above the truncation threshold. In either case, the goal is for all observations to contribute only what is known about them to the estimation so that incompleteness does not bias the model parameters.

The current case does not fit the standard mold: The overall outcome of whether someone completed pilot training is dichotomous, and no known cutoff values generate the censoring or truncation. In addition, the fact that training includes multiple stages creates a situation in which multiple censoring and truncation cutoff values are necessary. Our solution to this problem is to consider training completion as an ordered outcome, in which each higher level is the completion of the next stage of training. The possible levels become (1) failing IFT, (2) completing IFT and failing PPT, (3) completing IFT and PPT but failing APT, and (4) completing all three phases of training. Ordered models can estimate each predictor's effect on the likelihood of moving up to

higher levels while determining the cutoff thresholds at which trainees cross into each new level. Because an ordered model captures the thresholds relevant to the censoring or truncation, we can modify the likelihood function of an ordered model to get back to the original goal: that each observation should contribute only what is known about it to the likelihood.

Model Specification

We begin with the general specification of the ordered model used in this report, before incorporating the modifications for censoring and truncation. We drew on the treatment of these topics in Cameron and Trivedi, 2005, in the subsequent formulations.

A general ordered model begins with an unobserved, continuous index that captures the candidate's capacity for success, denoted y_i^* . This report takes the ordered probit approach and models y_i^* as a linear function of the candidate's characteristics ($x_i' \beta$) and a normally distributed error term. The probability that candidate i makes it as far as level j (i.e., the probability that $y_i = j$) is the probability that y_i^* is greater than the threshold for the next-lowest level (denoted c_{j-1}) and less than the threshold for the next-highest level (denoted c_j). In the ordered probit model, this probability is the following, where Φ represents the standard normal cumulative distribution function:

$$\Pr(y_i = j) = \Pr(c_{j-1} < y_i^* < c_j) = \Phi(c_j - x_i' \beta) - \Phi(c_{j-1} - x_i' \beta). \quad (\text{A.1})$$

The probability that a candidate completes all phases is the probability that y_i^* is greater than the highest cutoff point, c_3 :

$$\Pr(y_i^* > c_3) = 1 - \Phi(c_3 - x_i' \beta). \quad (\text{A.2})$$

Then, the probability of attrition (at any point) is the probability that y_i^* is less than the highest cutoff point, which is 1 – Equation A.2, or

$$\Pr(y_i^* < c_3) = \Phi(c_3 - x_i' \beta). \quad (\text{A.3})$$

Censored observations enter the likelihood function according to what is known about how much training the observed people have successfully completed. For example, for candidates who completed IFT but for whom we lack information on subsequent courses, all that we know about them is that their value of the unobserved index (i.e., of y_i^*) is greater than the first threshold. The density for these observations would then be the following:

$$\Pr(y_i^* > c_1) = 1 - \Phi(c_1 - x_i' \beta). \quad (\text{A.4})$$

Truncated observations must be adjusted for the fact that they would not be in the data if they had not passed previous phases. For example, the density of a candidate who made it to the end of training but was not observed in IFT is the probability that he or she completed training, conditional on making it past the first stage:

$$\Pr(y_i^* > c_3 | y_i^* > c_1) = \frac{1 - \Phi(c_3 - x_i' \beta)}{1 - \Phi(c_1 - x_i' \beta)}. \quad (\text{A.5})$$

As Table A.1 suggests, candidates who complete IFT can be censored in any of the subsequent phases, and there are reasons for groups of candidates to be truncated in IFT (if completed prior to 2009) and in PPT (if completed prior to 2009 or at Naval Air Station Pensacola). The final likelihood function for the ordered probit model includes censoring and truncation adjustments for every possible gap in training.

Once the necessary corrections are applied, the resulting parameter estimates, β , will approximate the index function correctly. Those parameters can then be used to predict the probability of success using Equation A.2 or failure using Equation A.3 or to calculate the marginal effect of each variable, x_i , using standard formulas. This report focuses primarily on attrition, so we calculate each regressor's marginal effect on the probability of failure in the following way:

$$\frac{\partial \Pr(y_i < c_3)}{\partial x_i} = \phi(c_3 - x_i' \beta) \beta, \quad (\text{A.6})$$

where ϕ is the standard normal density.

In addition to marginal effects, we report the attrition rate for a group of look-alike candidates who are members of the base group but match the characteristics of members of each minority candidate group. This look-alike attrition rate is the average predicted probability of attrition for the minority group after setting its members' race, ethnicity, or gender to the value of the base group's members.

Model Impact

As an illustration of how the different modeling strategies affect the results, Table A.2 compares the average effect of demographics across three potential modeling strategies. The first pane shows the marginal effects and standard errors from a binary probit regression predicting attrition without making any adjustments for the incomplete observations. The second pane shows the same results but for a model estimated only on observations that are completely observed. The final pane shows the marginal effects and standard errors from the ordered probit regression that this report employs. All models also include the other covariates from the previous analyses (test scores, flying experience, distinguished graduate status, and source of commission).

Table A.2. Race, Ethnicity, and Gender Marginal Effects from Potential Models of Attrition

Characteristic	Uncorrected Model (N = 3,985)		Complete Observations Only (N = 2,191)		Corrected Model (N = 3,985)	
	Marginal Effect	Standard Error	Marginal Effect	Standard Error	Marginal Effect	Standard Error
Gender (base category: male)						
Female	0.022	0.022	0.037	0.032	0.010	0.022
Race or ethnicity (base category: white)						
Black	-0.019	0.030	-0.026	0.045	-0.013	0.035
Hispanic	0.125	0.030	0.195	0.046	0.155	0.034
Asian	0.118	0.035	0.125	0.043	0.144	0.043

NOTE: As before, we used the nonparametric bootstrap method to calculate the standard errors included in the table.

The adjustments for censoring and truncation generally alter the results in the expected direction, but the impact is small. In all three models, only Hispanic and Asian candidates are significantly different from the base group. Both the binary probit model using completed observations and the corrected ordered probit model record larger effects than the uncorrected model. Additionally, the ordered probit estimates have smaller variance than the binary probit on completed observations in that they have more observations on which to draw. In this case, the substantive conclusions of the analysis do not happen to change as a result of the correction.

Summary

Correctly understanding patterns of attrition in protracted training pipelines requires many years of data. This report has demonstrated a way to include partially completed observations by considering stages of training completion as successively higher levels of an ordered outcome and correcting for censoring and truncation. This approach is flexible in that it would easily generalize to training pipelines with more stages. Additionally, this method could be applied to other areas with successive stages, such as career progression, provided that there is a natural ordering to completing the stages.

Appendix B. Decomposition Methodology for Understanding Group Differences in Attrition

A common problem in studies of racial and ethnic and gender diversity or discrimination is accounting for group differences in other characteristics (besides race or gender) that relate to key outcomes, such as training completion or promotion. The question of how to compare members of a base group (e.g., male candidates) with members of a minority group (e.g., female candidates) while accounting for other characteristics has been extensively studied, and there are many available empirical strategies on which to draw (Imbens, 2004; Angrist and Krueger, 1999; Heckman, Lalonde, and Smith, 1999). However, simply knowing that a demographic difference in outcomes is driven by innocuous characteristics is often not relevant enough for policymakers who seek the best way to mitigate demographic gaps. For example, some of the characteristics might be amenable to policy while others are not, and the question for policy is whether there is evidence that changing a subset of characteristics is likely to have an impact, conditional on the other factors.

An alternative approach to estimating an adjusted treatment effect that meets this need for policy relevance is the Blinder–Oaxaca decomposition method (Blinder, 1973; Oaxaca, 1973). The fundamental insight of Blinder and Oaxaca is that an average difference between two demographic groups in an outcome of interest can be split into two components: (1) the portion that arises from group differences in key characteristics (sometimes referred to as the *explained* component) and (2) the portion potentially attributable to discrimination (or the *unexplained* component). If the outcome is linear, the two components easily break down into the sum of the contributions of the individual characteristics. For a dichotomous outcome variable, such as training attrition, methods deriving the contributions of the individual characteristics came more recently. Yun, 2004, proposes the methodology pertinent to the current research for applying the detailed decomposition to nonlinear outcomes.

This appendix provides an overview of how we applied the methodology to the current problem, with some additional detail about the calculations involved and the presentation of results. We used the *oaxaca* command in Stata for all calculations, which was originally developed in Jann, 2008, for the linear case. *Oaxaca* in Stata also supports the nonlinear decomposition developed in Yun, 2004.

Overview of Nonlinear Decomposition Method

Portions of this report focused on understanding the difference in attrition between a potentially disadvantaged minority group and members of a base demographic group. The decomposition method begins by assuming that the probability of attrition in each group

(denoted Y_g) is a nonlinear function of a linear combination of characteristics (denoted by the matrix X , where each row is a set of covariate values for an individual pilot candidate):¹⁹

$$Y_g = F(X_g \beta_g). \quad (\text{B.1})$$

The predicted attrition rate in each group (hereafter denoted \bar{Y}_g) is the same as the group-specific average predicted probability of attrition:²⁰

$$\bar{Y}_{base} = \overline{F(X_{base} \beta_{base})}. \quad (\text{B.2})$$

$$\bar{Y}_{minority} = \overline{F(X_{minority} \beta_{minority})}. \quad (\text{B.3})$$

The classic aggregate decomposition separates the difference between \bar{Y}_{base} and $\bar{Y}_{minority}$ into the portion that is due to differences in the characteristics (i.e., X) and the portion that stems from differences in the way the characteristics relate to attrition (i.e., β):

$$\bar{Y}_{base} - \bar{Y}_{minority} = \left[\overline{F(X_{base} \beta_{base})} - \overline{F(X_{minority} \beta_{base})} \right] + \left[\overline{F(X_{minority} \beta_{base})} - \overline{F(X_{minority} \beta_{minority})} \right]. \quad (\text{B.4})$$

Note how the first bracketed term compares the predicted attrition rate of the base group with the predicted rate of the minority group using the relationships from the base-group model (β_{base}).

By holding the relationships constant, the component isolates the impact of the different characteristics and thus is commonly referred to as the *explained* component. The second bracketed term compares the predicted attrition rate for the minority candidates with the base candidate relationships (β_{base}) and the predicted attrition rate from the minority model. This term, then, holds characteristics constant and isolates the impact of the differences in the relationships (β_g). Because there is no reason to assume that characteristics should relate differently to success in different groups, this portion is the *unexplained* component. In the literature on wage differentials, the unexplained component is the portion attributed to discrimination or other unobserved factors that differentially affect minority groups (Oaxaca, 1973).

Before moving on to the impact of the individual characteristics, it might help to fill in the values in Equation B.4 with an example from the IFT attrition comparison of white versus black candidates. The IFT attrition rate for black candidates was 19.6 percent, compared with 8.3 percent for white candidates, yielding a difference ($\bar{Y}_{base} - \bar{Y}_{minority}$) of 11.3 percentage points.

The decomposition shows that the explained component ($\overline{F(X_{base} \beta_{base})} - \overline{F(X_{minority} \beta_{base})}$) is

¹⁹ In this report, we use the probit model to predict attrition for each group in each phase. For this model, $F()$ corresponds to the standard normal cumulative distribution function.

²⁰ The bar over each quantity represents the sample average.

about 9.3 percent, while the unexplained component $\left(\overline{F(X_{minority}\beta_{base})} - \overline{F(X_{minority}\beta_{minority})}\right)$ is 2.1 percent (and is statistically insignificant). The fact that the explained component makes up the majority of the overall gap indicates that differences in the characteristics can account for higher attrition among black candidates.

Beyond the aggregate decomposition, Yun, 2004, shows how the explained component can be broken down into the sum of the portions attributable to the individual characteristics:

$$\text{explained component} = \sum_{i=1}^k \frac{\left(\overline{X_{base}^i} - \overline{X_{minority}^i}\right) \beta_{base}^i}{\left(\overline{X_{base}} - \overline{X_{minority}}\right) \beta_{base}} \left[\overline{F(X_{base}\beta_{base})} - \overline{F(X_{minority}\beta_{base})} \right]. \quad (\text{B.5})$$

The intuitive interpretation of this equation considers the first term as a sort of weight that applies to each characteristic, X^i . The weight for a characteristic depends on the size of the average difference between the two groups $\left(\overline{X_{base}^i} - \overline{X_{minority}^i}\right)$ and the strength of the relationship between the characteristic and attrition (which is measured by the size of β_{base}^i), relative to the other characteristics and relationships $\left(\left(\overline{X_{base}} - \overline{X_{minority}}\right) \beta_{base}\right)$. This weight parses out the portion of the explained component (the second term) that can be attributed to each characteristic. The weights sum to 1, which ensures that the individual portions add up to the overall explained component.

Prevailing Relationships in the Absence of Discrimination

Variations of the aggregate decomposition in Equation B.4 arise from different assumptions about the relationships that would prevail in the minority groups if there were no unobserved factors differentially affecting them (such as discrimination). The explained component in Equation B.4 compares the base-group attrition rate with what the base-group rate would be if it had the same characteristics of the minority group (in this way, the decomposition mirrors the look-alike comparisons constructed in Chapter Four). The assumption underlying this comparison is that characteristics would relate to success in the same way in minority groups as they currently do in the base group in the absence of discrimination. This is equivalent to assuming that discrimination goes only against minorities (rather than in favor of the base group). The opposite assumption that the relationships observed in the minority groups would prevail in the barrier-free environment would lead to an explained component that substituted $\beta_{minority}$ for β_{base} in the first term of Equation B.4. This assumption would mean that all discrimination favors the base group, so ridding the environment of discrimination would bring base-group attrition up to minority levels, rather than lowering minority attrition to base-group levels. There is also the potential for a middle ground, in which the barrier-free environment is

assumed to be somewhere in between $\beta_{minority}$ and β_{base} , achieved through calculating a weighted average of the two sets of parameters or using parameters from a pooled regression model (Neumark, 1988; Oaxaca, 1994; Jann, 2008).

Ideally, the analyst could examine different options to test how sensitive the results are to this assumption. In the current application, practical considerations make such sensitivity analysis difficult to perform. The minority-group sample size tends to be so small that the group-specific coefficients are often poorly estimated, which adds noise to the explained component and its detailed decomposition. In the current case, using the base-group relationships to approximate the barrier-free environment is the best of limited options. However, because minority candidates make up such a small proportion of the candidate population, it is probably reasonable to assume that the patterns in the base group are close to what would prevail in the absence of barriers or discrimination.

Displaying Results

Because the results of this decomposition analysis summarize how different factors affect the *difference* in attrition, finding an intuitive way to display results can be challenging. This report depicts decomposition results as colored portions of a bar chart stacked above group-specific attrition rates. The group-specific rates convey the size of the original gap, and the stacked bars convey the impact of the characteristics. An obstacle to this approach to displaying results involved how to handle the contributions of individual characteristics that were statistically insignificant. The impacts of all individual characteristics add up to the explained component, by construction, because the weights in Equation B.5 sum to 1, so omitting them would mean that the chart does not correctly depict the size of the explained component. However, including statistically insignificant portions could be distracting or misleading. The tactic we use to circumvent this obstacle is to show an additional section (denoted “other explained”) to capture the impact of these characteristics. This decision required some additional explanation in the chapter, but it permits a figure that focuses the reader’s attention on the significant characteristics while faithfully displaying the size of the overall explained component.

Conclusion

The detailed decomposition in Equation B.5 arrives at the desired gain in policy relevance that we see as a key advantage of the methodology. Instead of stopping at the result that differences in characteristics could account for some of the relatively high minority-group attrition rates, the detailed decomposition provides the additional information that the traits that the TBAS measures (rather than the AFOQT or flying experience) appear to play a primary role in explaining the gaps. As a result of these gains in specificity, future research and potential policy interventions can target the most-promising areas for mitigating demographic differences

and ensuring that training contains no unnecessary barriers to success for underrepresented minority groups.

Appendix C. Focus Group Methodology

We conducted focus groups to better understand student pilots' experiences during UPT and potential barriers women and minorities might face in completing UPT. Focus groups can provide rich information about participants' concerns and that can then be used to inform policy decisions. Further, group discussions efficiently surface multiple points of view and allow opportunities to probe for more detail. Thus, to provide a comprehensive picture of the pilot training experience, the study team incorporated qualitative research with the quantitative analysis explored in the initial phase of the research. This qualitative component consisted of focus groups with student pilots and IPs.

Focus Group Design

As discussed in the report, UPT has undergone recent changes in the structure of IFT, which is no longer designed to screen out students like it has done in the past. The result of this change is that most UPT attrition takes place when students are in the primary (T-6A) phase of instruction. We therefore sought to investigate experiences during this part of training. We used two criteria to select participants for the student focus groups. First, we selected students in the latter part of the primary (T-6A) phase, so they would have had sufficient experience, and those who had recently completed the T-6A phase and were now in an advanced phase (T-1A and T-38C), so that these students could provide insight and reflection from a relative distance. Second, in an effort to ensure that participants felt comfortable speaking freely about issues related to race or gender, we grouped focus group participants with people from similar demographic backgrounds. Using this approach, the student participant sessions consisted of six types of groups: three groups of students in the primary (T-6A) phase (white male, minority male, and female) and three groups of students in the advanced (T-1A and T-38C) phase (white male, minority male, and all female). We also conducted focus groups with white male, minority male, and all female instructors.²¹

We conducted focus groups with students and instructors at three of the four main UPT bases assigned to AETC: Laughlin AFB, Texas; Vance AFB, Oklahoma; and Columbus AFB, Mississippi.²² Across these three bases, we conducted a total of 43 focus group sessions, each

²¹ Due to the relatively small number of female students and IP participants, we did not further divide these groups by race and ethnicity.

²² We did not conduct focus groups at the fourth main training base (Sheppard AFB, Texas) in large part because of the presence of the elite ENJJPT program, which enjoys relatively low attrition rates. Also, the population includes students and instructors from NATO member countries who might not experience diversity-related issues similar to those that U.S. students and instructors experience.

consisting of six to ten participants and lasting approximately 90 minutes. One facilitator led each group while another team member transcribed the discussion. As much as possible, we had a male team facilitate focus groups with white male students and instructors, while female study team members conducted focus groups with all the women and many of the minority participant groups. Again, the purpose of this was to maximize the likelihood that participants felt that they could speak freely.

In total, 214 students and instructors (144 men and 70 women) participated across the three locations.

Focus Group Procedures

We designed the focus group procedures to add nuance to our quantitative findings regarding attrition characteristics, by identifying specific factors that initially draw students to the pilot field and what challenges student pilots face during the training experience. To open each session, the study team distributed information sheets to focus group participants that described the parameters of the study and emphasized that participation was voluntary and confidential. Before beginning group discussion, we gave focus group participants the opportunity to provide written comments that they might not feel comfortable discussing in a group setting. We added these comments to the discussion notes. As an introduction, facilitators briefly discussed participants' backgrounds, including why they decided to pursue a career as Air Force pilots, influences on their decisions, and any flying experience or information about pilot training prior to UPT. We then focused on identifying specific factors that initially draw students to the pilot field and what challenges student pilots face during the training experience. We designed our research questions to be open-ended, which would avoid leading participants to answer questions in particular ways. This was important to see whether participants would volunteer certain answers of their own accord—specific challenges for women and minorities, for instance. See Appendix D for the full focus group protocol.

Qualitative Coding and Analysis

After completing the focus groups, the study team compiled, analyzed, and coded the transcribed notes along with any additional written comments, extracting key themes and the frequency with which they were mentioned. First, two researchers on the study team generated an initial list of salient themes for each research question, drawing from their experiences facilitating the focus groups. This list formed the basis of a numerical coding scheme of topics that were discussed. Next, the two researchers individually coded a sample (around 10 percent) of the focus group notes to check the coding scheme. The researchers met to discuss the individual coding, reconciled discrepancies by agreeing on a more specific coding definition, and modified the coding scheme accordingly. At this stage, other team members vetted the coding scheme and added suggested changes. After these multiple rounds of group discussion and

refinement, the coding scheme was finalized. The two researchers then divided up and individually coded the entire set of focus group notes (including recoding the initially coded sample). We further coded the data according to demographic characteristics to highlight possible diversity-centric trends associated with participant comments. Insights gleaned from these discussions, along with frequencies with which the coded themes appeared, formed the basis of the findings and recommendations reported here.

Limitations

There are important limitations to this focus group methodology. First, by asking open-ended questions, we intended to provide opportunities for participants to organically raise topics they found important. Accordingly, not all topics were raised in all groups, and not all members of a focus group answered every question. Therefore, to give an overall sense of how frequently a theme was discussed, we describe the focus group findings as percentages of groups in which a topic was mentioned. These percentages do not provide precise statistical estimates with which to directly compare the relative frequency of topics and themes. They do, however, suggest general insights regarding key UPT completion factors. Another important limitation is that there are small numbers of women and minorities in any one class at UPT. Our findings therefore represent a snapshot of current student experiences at the time of the study. We could not follow a cohort of students or conduct groups with multiple cohorts given the length of the training pipeline and the study timeline.

Appendix D. Focus Group Protocols

Undergraduate Pilot Training Students

Provide Study Overview and Administer Consent

[Read the following statement to T-1/T-38 students only.] *In the following set of questions, we plan to ask you a little bit about your background and would then like to know about your experiences in the primary phase of pilot training flying the T-6s, including your thoughts on why others may not have been successful in completing that phase of training.*

Icebreakers (Go Around the Room)

1. What was your commissioning source?
2. How long have you been in this phase of training?
3. What type of pilot (fighter, bomber, helo [helicopter], heavies [tanker and airlift], etc.) would you like to become? Why?

Motivations and Influences

1. Why do you want to become an Air Force pilot?
 - a. Who, either inside or outside the Air Force, influenced your decision to become a pilot? How did they influence your decision?
2. What flying experience, if any, did you have prior to IFT? (e.g., Academy airmanship programs, incentive flights)
3. What information did you receive about pilot training before you arrived at initial flight training?
 - a. How and when did you get that information?

Pilot Training Experience

1. What do you enjoy most about pilot training and what do you enjoy least?
2. What factors do you think contribute to success in completing the primary phase in pilot training thus far?
3. What are the most challenging aspects of pilot training?
4. Do you feel like you have access to the tools and instructors to be successful in pilot training?
 - a. Probe: Do you think that you have the same access as that of your peers?
5. How sure are you that you will complete pilot training? If you have doubts about completing pilot training, why is that?

Mentors and Peer Relationships

1. What support system, if any, do you rely on to help you succeed during pilot training (e.g., peers, instructors, family, etc.)?
2. Do you have a mentor or someone with influence who you rely on to help you get through pilot training? If yes, please describe that relationship.
3. Do peers support one another during training? If so, how? If not, why not?
 - a. Probe: Would you say the training environment is collaborative or competitive? How does that affect support from your peers?

Diversity Questions

1. Do you see many racial or ethnic minorities or women in your cohort at squadron? Is that important to you?
2. Do you see many racial/ethnic minorities or women in leadership positions during pilot training and at your training base? Is that important to you?

Challenges in Completing Training

1. For students that you've been in training with who have not met training requirements or have requested to drop out of training, what challenges do you think contributed to them leaving?
 - a. What do you think the Air Force can do to support trainees in remaining in and successfully completing pilot training?
2. Are there specific challenges that [racial and ethnic minorities or women] face during pilot training? If so, do you think these challenges are a factor in whether or not [racial and ethnic minorities and women] complete pilot training?
 - a. If so, how can the Air Force better address those challenges?

Closing Question

1. Is there anything important for us to know about pilot training that we haven't asked you about or any key take-aways we should have for how the Air Force could help better support students in completing pilot training?

Undergraduate Pilot Training Instructors

Provide Study Overview and Administer Consent

Icebreakers (Go Around the Room)

1. What is your current paygrade?
2. How long have you been a UPT instructor?
3. Briefly describe your flying experience in the Air Force prior to becoming an instructor.

Student Experiences

1. What factors do you think make a student successful during pilot training?
2. What challenges do students most often face during pilot training?
 - a. Probes:
 - i. Do you see different trends in challenges faced based on:
 1. Student source of commission?
 2. Type of pilot the student would like to become?
3. What specific challenges do racial/ethnic minorities or females face during pilot training? Do you think these challenges are a factor in whether or not racial/ethnic minorities/females complete pilot training?

Remediation

1. What happens when a student begins to struggle with a particular area of pilot training?
 - a. If students are struggling, are they usually successful in turning things around? How does that process tend to work?
2. Have you placed a student on a Commander's Awareness Program (CAP)? If so, what has been your experience with the CAP process?
 - a. Probes:
 - i. Do students more often improve once being put on a CAP and catch up with their peers or do they more often end up not completing pilot training after being placed on a CAP?
 - ii. Do you believe that CAP is more of a prelude to elimination or an assistance mechanism?
 - iii. How can CAP be adjusted to be more effective in helping students improve and become more successful in pilot training?

Retention

1. During which phases or tasks in pilot training are students more likely to drop out or fail to be successful?
2. What factors do you think influence a student's decision to drop out of pilot training?
 - a. Probes:
 - i. Do students seek guidance from you or other instructors when making the decision to drop out of pilot training?
 - ii. Have there been instances where you were successful in persuading a student either to self-eliminate, or to not to drop out of pilot training? Can you describe how you influenced that decision?
3. When you have had students fail to complete pilot training, what do you think the Air Force could have done to keep those students and help them successfully complete pilot training?

Mentors and Peer Relationships

1. Do you serve as a mentor to any of your students? If so, how do you mentor these students?
 - a. Probes:
 - i. How frequently do you interact with your mentee and in what type of activities?
 - ii. How do those relationships typically come about? For example, do students approach you about mentorship? Are these relationships in any way formalized?
2. How important do you think peer group relationships are to student success in pilot training?
 - a. Probes:
 - i. Do you think students seek support from their peers?
 - ii. Do peer groups tend to be supportive or competitive in pilot training?
3. Where do you think students most often seek support? (Instructors/mentors, peers, mental health professionals, other?)

Closing Questions

1. How can the Air Force help make pilot trainees more successful in completing the program?
2. *[If the group earlier identified challenges specific to racial and ethnic minorities or women]* For those challenges specific to racial/ethnic [minorities] or females, how can the Air Force better address those challenges?

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