

RETHINKING PILOT RETENTION IN THE UNITED STATES: AN ANALYSIS OF KEY
FACTORS

by

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ABSTRACT

This thesis examined pilot retention challenges in U.S. regional and low-cost carriers (LCCs), focusing on nonfinancial incentives such as quality of life, career stability, and work-life balance, which may have a greater influence on retention than traditional financial incentives. This quantitative, survey-based approach assesses how pilots rank the factors that influence their retention. Using a sample of U.S.-based pilots, the study examines six key areas adapted from a European pilot retention framework. Statistical analyses, including the Friedman test, the Mann-Whitney U test, and the Kruskal-Wallis test, identified correlations between demographic variables and retention priorities.

The inherent financial constraints of regional airline business models often mean that offered salaries cannot compete with the compensation packages provided by mainline carriers. However, the findings suggest that nonfinancial quality of life factors, such as desirable pilot bases, work-life balance, and predictable schedules, may counterbalance the financial incentives offered by mainline carriers, especially for the younger generation of pilots entering the workforce. Addressing the methodological limitations identified within the study and conducting comprehensive mixed-methods research in the future, will further clarify pilot retention dynamics, offering practical guidance to airline management, policymakers, and labor organizations.

Chapter 1: Introduction

Regional airlines and low-cost carriers face pilot retention issues due to unprecedented hiring rates at mainline and legacy airlines, such as Delta, American, and United (US GAO, 2023). The Regional Airline Association 2022 Annual Report stated that the retention of qualified Pilots-in-Command (PICs) is one of the top concerns in the industry. Several sources have indicated that over 500 regional airline aircraft were parked in 2022 due to PIC retention, resulting in degraded service to numerous smaller markets throughout the United States (Regional Airline Association, 2023; Skores, 2023). Despite short-term relief from hiring rates at the mainline carriers in 2024, forecasts have reaffirmed that there will be a substantial demand for airline pilots over the next decade, which will continue to stress the current pool of qualified pilots.

The foundational work by Efthymiou et al. (2021) on pilot retention at Ryanair (a Low-Cost Carrier in Europe) provided an analytical framework that may be tailored to the U.S. aviation market. Their study employed a mixed-methods approach, providing insights into retention factors such as quality of life (QOL), career progression, and compensation. Other studies conducted in Asia found that robust compensation packages, supportive organizational cultures, and career growth opportunities were common themes to counter competitive hiring practices and enhance pilots' QOL (Amornpipat, 2019; Shanker, 2019). In Australia, Lambeth et al. (2022) explored structural shifts in pilot compensation trends, finding that productivity-based pay and seniority-based scheduling systems positively impacted pilots' decisions to stay, particularly within a highly unionized workforce. Together, these studies outline the known factors influencing pilot retention globally.

Despite insights from international studies, research on pilot retention in the United States remains limited. Additionally, many recent studies primarily focus on the effects of the COVID-19 pandemic (Kim & Choi, 2024; Kioulepoglou & Blundell, 2022; Mizzi et al., 2022; Sobieralski, 2020; Vulturius et al., 2024). Although voluminous research exists on general employee turnover and retention across various business sectors, few directly address U.S. regional airlines. Regional airlines operate low-cost business models that may not allocate the financial resources to offer lucrative compensation packages compared to the mainline airlines, limiting their ability to compete for talent solely on monetary terms (Higgins et al., 2016; Lutte, 2018).

While the analytical and quantitative model for this thesis was executed at an LCC in Europe, a gap exists in understanding if regional airlines in the United States can leverage nonfinancial retention factors, such as culture, QOL, and work-life balance, to competitively retain pilots (Efthymiou et al., 2021). Although similarities in attitudes and perceptions exist between employee groups from varying cultures, Zhang et al. (2012) demonstrated that there are significant cultural differences in retention factors and their order of importance in decisions to stay or leave an employer. This project aims to address the gap by providing a quantitative analysis of pilot retention in the U.S. through the lens of employee motivation and job embeddedness theory, considering both financial and nonfinancial aspects of pilot retention (Burrows et al., 2022; Mitchell et al., 2001; Porter et al., 2019). This examination considers six key areas adapted from a European pilot retention framework using a sample of U.S.-based airline transport pilots. The data collection has been conducted using a quantitative survey to inquire how pilots rank retention factors in order of importance. Statistical analyses, including the Friedman Test, Mann-Whitney U, and Kruskal-Wallis, identified differences between

demographic variables and retention priorities, providing empirical insights into pilot career choices.

This analysis builds upon previous research by emphasizing the importance of nonfinancial retention factors for various pilot subgroups. The practical implications of this work are to offer insights that will help airline management, unions, and policymakers craft effective retention strategies that focus on nonfinancial incentives, rather than relying solely on wage increases, which may become financially impractical for regional airline business models.

Review of the Literature

Airline pilots must undergo extensive training and stringent certification standards, which require years of flight training and experience (Fraher, 2019). Depending on age, airline pilots also maintain medical certification and undergo annual or semiannual exams. Their skills and knowledge are continually evaluated through their airline's training program. Aircraft-type ratings often take several weeks to months of training and cost tens of thousands of dollars. These extensive training, experience, and certification requirements make replacing airline pilots difficult and costly.

Kiernan examined a Part 135 business jet charter company and attempted to calculate the cost of pilot turnover (2018). Turnover costs include recruiting, hiring, onboarding, training, and equipping a pilot. The total cost ranges from 50% to 250% of a pilot's yearly salary. Additionally, ongoing training and investment in the pilot increase the expenses of initial hiring. This calculation is highly variable depending on the specific business model and type of air carrier. Despite the varying costs of turnover, the important takeaway is that the longer pilots are retained, the lower the impact of the costs on the employer (Kiernan, 2018).

The pilot workforce possesses significant bargaining power in negotiations due to the difficulty of replacing them. This bargaining power is compounded by an increasing demand for pilots and a shortage of qualified applicants entering the workforce (Gittell et al., 2004; Harvey & Turnbull, 2006). While airline pilot strikes are rare in the U.S. (the last strike occurred in 2010), labor unions can employ a variety of work actions to disrupt airline operations and garner media support (Fraher, 2019). In the U.S., the Railway Labor Act (RLA) is designed to prevent disruptions to critical services such as airlines. However, settling collective bargaining agreements (CBAs) may take months or even years (von Nordenflycht & Kochan, 2003).

In contrast, Harvey and Turnbull (2006) explained several reasons airline pilots have a disincentive to leave their current employers. First, the advantages gained through accumulated seniority include better schedules and higher pay. Next, if a pilot leaves their employer for another airline, they typically start at the bottom of the seniority list and are generally not given credit for experience at their previous airline. Additionally, pilots' core skills are not easily transferable to other industries (Efthymiou et al., 2021).

Increasing seniority also provides a protective measure to pilots in the case of system shocks or other conditions that may lead to furloughs and/or job loss. Furloughs and job loss may occur for a variety of reasons, including economic – (decline in economic conditions creating furloughs or airline collapse), medical – (medical conditions creating a loss of medical certification), disciplinary – (incidents leading to negative pilot records or media attention), regulatory – (the reduction of pilot workforce through the allowance of single pilot operations), and/or technological – (growth of reliance on automation leading to unmanned flight) (Simon, 2016, p. 112). If these conditions occur, furloughs and job loss typically affect junior pilots first, and the most senior pilots are less susceptible to the effects. This is also true in the case of

mergers and acquisitions, where senior pilots may be able to retain their date of hire during the union merger negotiation process (Fraher, 2013).

Complicating matters even further are the business models employed by regional airlines and LCCs in the post-deregulation period. Deregulation has encouraged an environment of unfettered competition, driving airlines to lower fares, thereby reducing costs while increasing efficiency at the expense of other initiatives (Simon, 2016, p. 63). Michael O'Leary, the controversial leader of European LCC Ryanair, explains why high workforce and asset productivity are essential: "Everything is geared toward efficiency, and we have to be more aggressive than our competitors [to survive]" (Bennett, 2003). These carriers are organized to withstand price wars and system shocks, and because of that model, they exhibit broadly similar behaviors toward their employment practices (Hunter, 2006; Wild, 2022).

In the book *Sociology of Commercial Flight Crew*, author Bennett Simon (Simon, 2016) conducted a thorough qualitative study of pilot groups at many airlines across Europe. He captured how high-efficiency employment practices may affect the pilot workforce at some carriers, stating that some LCC pilots felt that efforts to maximize the efficiency of equipment and personnel are impacting safety, specifically in the areas of pilot fatigue and aircraft maintenance. For example, some pilots felt that airlines treat flight duty limitations as productivity goals rather than the maximum limits of safe operation regarding pilot performance and fatigue management (Simon, 2016, p. 112). However, despite airlines' claims that their crew utilization falls within legal limits, scheduling and pilot utilization practices are an area that directly affects pilots' decisions to stay or leave (Efthymiou et al., 2021).

Foundational Theories of Motivation

Numerous well-known theoretical frameworks have been developed to describe employee motivation. In relation to work and employment, motivation is defined as the urge for an individual to satisfy unmet needs and desires (Ryan & Deci, 2000). Although there are numerous theories of motivation, Acquah et al. (2021) specified four overlapping content theories of motivation that are the foundation for understanding the organizational management of human capital.

Maslow's Hierarchy of Needs, developed in the mid-20th century, outlined five categories of human needs arranged in a hierarchy, beginning with physiological and safety needs at the base and progressing to social, esteem, and self-actualization needs (Maslow, 1943). These needs must generally be met sequentially, with lower-order needs requiring satisfaction before higher-order needs become motivational drivers. Alderfer's ERG Theory builds on Maslow's work but condenses the hierarchy into three overlapping categories: existence, relatedness, and growth (Alderfer, 1969). Unlike Maslow's strict progression, ERG Theory allows for movement between levels based on individual circumstances.

Herzberg's Two-Factor Theory differentiates between hygiene factors, such as salary and working conditions, which prevent dissatisfaction, and motivators, such as achievement and recognition, which foster job satisfaction (Herzberg et al., 1959). Finally, McClelland's Need Theory emphasized three primary motivators: achievement, affiliation, and power. Unlike the others, McClelland's model focused on how cultural and life experiences shape an individual's dominant motivators (Johnson & McClelland, 1984). Together, these theories provide foundational insights into how organizations can address intrinsic and extrinsic motivators to enhance employee retention. The integration of these content theories establishes a basis for

exploring process theories, which emphasize the dynamic mechanisms behind motivation and behavior in the workplace.

Building on content theories that identify motivational variables, process theories examine the cognitive and behavioral mechanisms that influence the enactment of motivation in organizational contexts. These theories focus on the dynamic relationships between effort, outcomes, and perceived fairness, offering actionable strategies for leaders to guide employee behavior. Process theories, including equity, expectancy, goal-setting, and reinforcement theories, provide critical insights into the motivational dynamics within organizational structures (Oban, 2018). In the context of airline management, process theories offer valuable tools for aligning employment practices with pilots' motivational drivers.

Equity theory, proposed by John Stacy Adams (1963), emphasizes fairness, suggesting that individuals compare their input-output ratios to those of others and adjust their efforts based on perceived equity (Oban, 2018). Expectancy theory, developed by Victor Vroom (1964), argues that motivation depends on the expected outcome of an action and the value assigned to that outcome. Goal-setting theory, popularized by Edwin Locke (1968), highlights the power of clear, challenging, and attainable goals to drive performance. Reinforcement theory, derived from B.F. Skinner's (1958) work, examines how behavior is influenced by its consequences. Positive reinforcements, such as recognition for exceeding productivity targets, encourage desired behaviors, while the removal of rewards can decrease unwanted actions. Together, these theories enable airline leaders to not only identify what motivates pilots but also design strategies to enhance retention by fostering fairness, aligning rewards with effort, setting clear objectives, and applying targeted reinforcements.

History of Turnover Research and Contemporary Job Embeddedness Theory

Employee turnover research began at the turn of the 20th century when journalists reported that pay raises stymied quitting within the postal service, which prompted scholars to observe why employees leave their jobs (Hom & Griffeth, 1995). Over the ensuing 100 years, several hundred articles appeared in applied psychology journals, providing numerous theories, models, and research methods that focused on why employees leave their jobs (Hom et al., 2017). The study of turnover began to shift in the 21st century with the introduction of job embeddedness theory, which focused on why employees choose to stay (Mitchell et al., 2001).

Mitchell et al. (2001) presented the construct of job embeddedness not only to examine organizational factors and job satisfaction but also to introduce “off-the-job” considerations that motivate people to stay with their current employers. The three critical aspects that contribute to job embeddedness are links (workplace and community relationships), fit (comfort and appropriateness for the role and organization), and sacrifice (what is given to move to an alternative job). These aspects are intertwined with an employee’s organization, community, and family. While turnover research examined many organizational aspects, job embeddedness provided a quantitative analysis of turnover deterrents (now labeled as retention considerations) that were not considered in the past century (P. W. Hom et al., 2017).

Throughout the next two and a half decades, the job embeddedness literature expanded into a substantial field of study that explored embeddedness concepts through the lenses of job performance effects, organizational citizenship, and various contexts, including different types of jobs and cultures (P. W. Hom & Kiazad, 2024). The research confirmed that embeddedness forces drove employees to perform at higher levels and weather the effects of job shocks (Lee et al., 2021). Ng and Feldman (2012) further examined factors outside of the workplace that

explain why employees who may otherwise be unsatisfied with their roles may remain in their current jobs.

Feldman et al. (2012) introduced the concept that community, family, and nonwork embeddedness work together to tether employees to their current roles and locations. The combination of concerns regarding other people in the employee's life extends to the employee's embeddedness by proxy. Examples of these concerns are continuity in children's education, proximity to relatives, spousal employment, and community involvement. The most recent findings further demonstrate employees' increasing emphasis on considerations regarding their community and family embeddedness (Burrows et al., 2022; Peltokorpi & Allen, 2024; Porter et al., 2019).

The inherent financial constraints of regional airline business models often mean that offered salaries cannot compete with the compensation packages provided by mainline carriers (Higgins et al., 2016; Lutte, 2018). However, theories of motivation and job embeddedness suggest that by focusing on QOL initiatives, airlines can create a work environment that makes leaving for higher pay at a mainline carrier a more complex decision for pilots (Harvey & Turnbull, 2006). In other words, if management and unions can find a path to enhance QOL and nonfinancial incentives, pilots may find it challenging to leave their current positions and forfeit the seniority and stability they have built.

Analytical Framework

Efthymiou et al.'s (2021) study on pilot retention provides a methodological foundation for exploring the factors influencing pilot retention within the airline industry. Their exploratory mixed-methods approach, which utilized both qualitative interviews and a quantitative survey, identified key drivers of retention, including being based at home, predictable rosters,

competitive salaries, and job security. This research demonstrated how these factors shape pilots' decisions to stay or leave their employer, and it has provided valuable insights into retention strategies for low-cost carriers. However, research suggests that employee perceptions and attitudes toward retention vary significantly across cultural contexts (Majumdarr & Dasgupta, 2024; Zhang et al., 2012). While Efthymiou et al. focused on a European airline, applying their findings to the U.S. market requires adaptations to account for differing use of terms to describe the factors of pilot retention. A deeper discussion of the adaptations is presented in Chapter 2.

Research Questions (RQs)

This study aims to answer the following research questions:

1. What retention elements do pilots perceive as most important at low-cost carriers and regional airlines in the United States?
2. To what extent do perceived retention elements differ among pilots based on demographic factors (age, gender, position, experience, and military background)?
 - a. To what extent do retention elements differ based on pilots' age?
 - b. To what extent do retention elements differ between male and female pilots?
 - c. To what extent do retention elements differ between Captains and First Officers?
 - d. To what extent do retention elements differ based on pilots' years of experience?
 - e. To what extent do retention elements differ between pilots with and without military backgrounds?

Chapter 2: Methodology

The purpose of this study is to explore the factors that influence airline pilot retention in the United States and determine how age, gender, experience, position, and military background influence these retention factors.

Research Design

This study employs a quantitative cross-sectional design that collects rank-ordered data on the factors most important to airline pilots in the United States when deciding whether to remain with an airline. Given the lack of recent research on airline pilot retention in the United States, a survey instrument that was utilized in a previous European study was deployed (Efthymiou et al., 2021). The lead researcher, Professor Marina Efthymiou, provided the instrument utilized in that study. The survey was revised to incorporate language familiar to the U.S. aviation sector. The final survey instrument underwent several revisions following a review by a team of subject matter experts in pilot retention. Since this survey method had been successfully used in a prior peer-reviewed article, it was concluded that conducting a pilot survey test would be neither necessary nor feasible due to the extra time and Institutional Review Board approvals required.

The survey collected demographic information and employed the analytical framework outlined in the literature review of the European study conducted at Ryanair (Efthymiou et al., 2021b). The demographic factors of age, gender, commercial flying experience, position, and military background were selected as the independent variables in the statistical analysis. Age, position, and flying experience were chosen based on previous findings indicating that airline pilots prioritize different retention factors at various stages of their careers (Lambeth et al., 2022;

Nikle & Bjerke, 2018; Shanker, 2019). Gender and military background were included to evaluate whether these variables significantly influence retention factors.

The dependent variable constructs included Financial, Lifestyle, Professional Opportunity, Recognition, Schedule, and Operational Experience aspects of retention. The dependent variables were chosen based on the study by Ethymiou et al. (2021) and refined with the input of subject matter experts on pilot retention. The survey instrument is available in the appendix.

The Mann-Whitney U and Kruskal Wallis tests were conducted to determine whether there were statistically significant differences between demographic subgroups' ranking of retention factors. Nonparametric tests were selected due to the reliance on ranked ordered data in the dependent variables (Frey, 2016). Multiple iterations of the Mann-Whitney U and Kruskal-Wallis tests were applied using the R Studio (version 2024.12.1 Build 563) statistical software. The complete statistical reporting of the tests is available in the appendix.

Participants

This study targeted participants currently employed as airline transport or commercial pilots with certificated air carriers in the United States. Participants who did not finish the survey were excluded from the analysis. The survey gathered 113 responses; however, only 76 responses were included in the study ($n = 76$). Only 78 participants completed the survey to the end, and two were further excluded because they were not currently employed as pilots by a U.S. air carrier. The participation rate will be further discussed in the limitations.

Demographic items included gender, age, years of experience, total flying hours, air carrier type, flight deck position, military experience, and nationality. Age was grouped into "35 and Under" and "Over 35" due to the limited number of data points from older participants.

Nationality was grouped into “U.S. Pilot” and “Foreign Pilot” due to the limited data points available for each foreign nationality. The largest demographic group was American males under 35, regional first officers without prior military experience. Table 1 provides a summary of participant demographics.

Table 1

Participant Demographics

Demographics	N	%
Age		
35 and Under	58	76.3
Over 35	18	23.7
Gender		
Male	67	88.2
Female	8	10.5
Prefer Not to Say	1	1.3
Air Carrier Type		
Regional Airlines	57	75
Low-Cost Carrier	5	6.6
Legacy/Mainline	11	14.5
Other	3	3.9
Position		
First Officer	50	65.8
Captain	26	34.2
Military Exp		
No	69	90.8
Yes	7	9.2
Nationality		
United States	70	92.1
Foreign	6	7.9

As regional airlines and low-cost carriers face more challenges with retention than mainline/legacy airlines, the study could have excluded other types of carriers. However, due to the low survey participant rate, it was decided to include all types of carriers, despite the potential for outliers.

This study used convenience and snowball sampling methods to recruit participants. The Qualtrics survey link was posted to social media groups of current and former regional airline pilots and sent to the author's personal and professional networks of pilots via text messages and email. The posts and messages requested that participants share the survey link with other pilots. This method was selected because it was easier and less expensive than other sampling methods. Additionally, attempting to gain access to a single pilot group at a single airline posed numerous legal, management, and labor organization approvals that did not meet the timelines for completing this project.

Survey Instrument and Data Collection

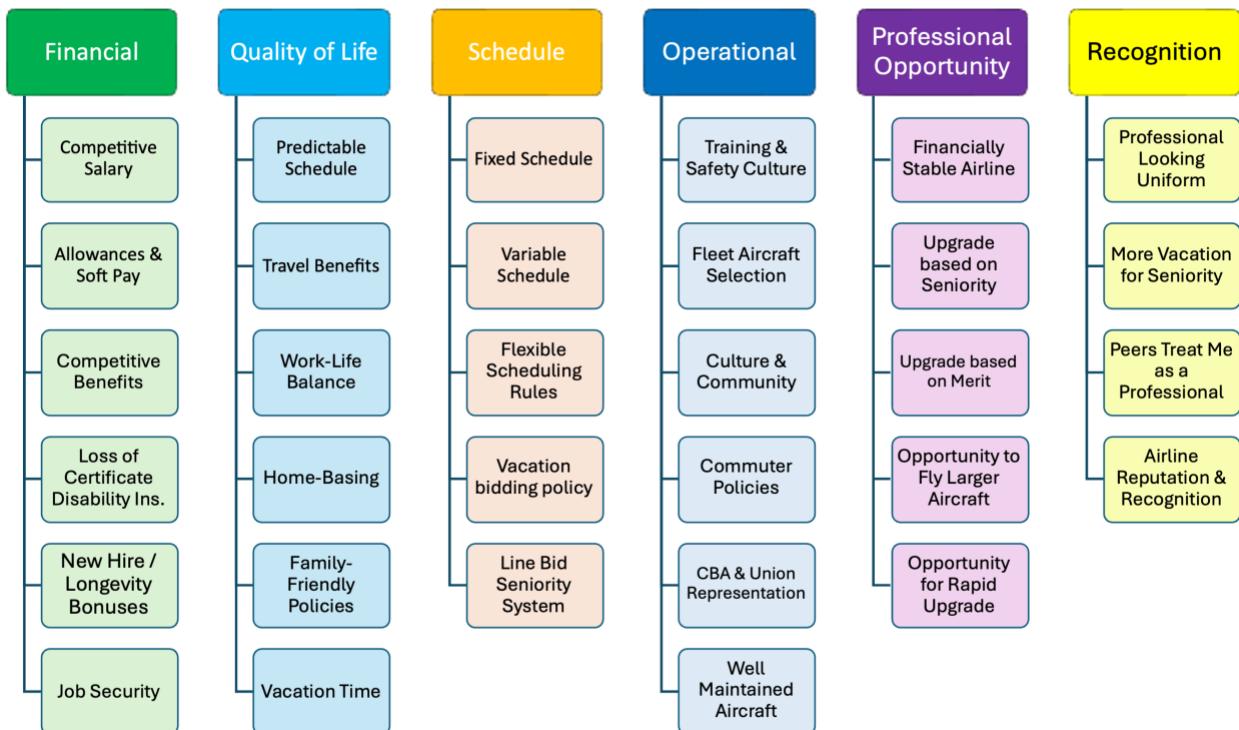
The survey instrument used in this study was based on a previously validated instrument developed by Efthymiou et al. (2021) to examine pilot retention factors at Ryanair, a European low-cost carrier. With permission from the original author, the instrument was adapted to reflect the terminology, structure, and operational context of the United States airline industry. The survey retained the core framework of rank-ordering retention categories—such as schedule, financial, and lifestyle factors—but was revised to align with U.S. labor contract structures, crew scheduling practices, and other cultural differences.

Figure 1, Factors of Pilot Retention in U.S. Regional Airlines, presents the factors of pilot retention adapted to the context of a U.S.-based airline pilot. The original study's qualitative phase identified six primary retention factors—economic, lifestyle, professional opportunity,

recognition, rosters, and operational—which were subsequently quantified through a structured survey. Those factors form the basis of the analytical framework but were slightly modified to align with the language and considerations specific to U.S. pilots. For instance, items such as commuting policies, union representation, and the impact of seniority systems were added as they are particularly important to U.S. pilots. Several terms were changed for American English, such as changing the “Rosters” to “Schedule,” and “Lifestyle” to “Quality of Life.”

Figure 1

Factors of Pilot Retention in U.S. Airlines



To ensure content and face validity, a panel of four subject matter experts (SMEs) with deep experience in aviation employment and airline pilot retention collaboratively revised and approved the survey. The panel included Dr. Marina Efthymiou (lead author of the original

Ryanair study), Dr. Jim Higgins (a U.S. airline labor researcher and professor at the University of North Dakota), and Embry-Riddle Aeronautical University professors Dr. Aman Gupta and Dr. Robert Walton, who specialize in aviation workforce research and survey design. These experts reviewed the instrument for clarity, relevance, and completeness, ensuring that the categories accurately represented the spectrum of retention considerations faced by U.S. airline pilots. A series of five meetings was conducted over Zoom over several months from October 2024 to March 2025 to improve the survey instrument iteratively.

The final instrument included demographic questions (age, gender, position, years of experience, military background), and rank-order questions across six key retention domains: Financial, Schedule, Operational, Lifestyle, Professional Opportunity, and Recognition. Within each domain, participants ranked subelements in order of importance (e.g., fixed schedule, vacation bidding, bid system under “Schedule”).

The survey was administered, and responses were collected using Qualtrics, a secure online platform provided by the University of North Dakota at no cost to students. A snowball sampling method was used to reach a broad range of U.S. airline pilots. The survey link was disseminated via social media platforms, including Facebook, LinkedIn, and Reddit, through posts in aviation-focused groups. In addition, the research team shared the survey link via email and text message with contacts in their personal and professional networks, requesting participation and further distribution. This approach allowed the study to reach pilots across various airline types, positions, and experience levels while accommodating the decentralized nature of the U.S. airline pilot workforce. Participation was entirely voluntary, anonymous, and designed to take fewer than 15 minutes to complete.

Reliability

This study did not employ scale-based reliability measures such as Cronbach's Alpha, as the survey design used a rank-order format rather than Likert-type scales. Since each retention domain captured distinct, nonoverlapping constructs (e.g., financial vs. lifestyle considerations), internal consistency metrics were not appropriate. Despite the lack of formal reliability measures, the instrument was modeled after a peer-reviewed, previously published design that demonstrated success in a similar population (Efthymiou et al., 2021). Although a formal pilot survey was not conducted due to time and IRB constraints, the iterative revision process involving four subject matter experts (SMEs) ensured that the survey items were unambiguous and understandable to the target population.

Institutional Review Board (IRB)

In March 2025, the study received approval from the University of North Dakota IRB. Further approvals were secured from Dublin City University and Embry-Riddle Aeronautical University in March 2025 so the dataset may be used for future article development and publishing with the panel of experts mentioned above.

Participants accessed the survey via a link from social media, email, or one of the other participants via the snowball method. The link was placed in several Facebook groups with members who were current or former regional airline pilots. Additionally, the link was posted on LinkedIn as a general post from each of the subject matter experts who assisted with the survey development. Several participants were contacted directly via email and direct messaging from the author's professional network.

Upon clicking the link, participants were notified of the study's purpose, data confidentiality measures, and the investigative team's contact information. Participants were then asked for informed consent to participate in the research. The informed consent document is

contained in the Appendix. No personally identifiable information was collected from participants. Further measures were taken during statistical analysis to view demographic data collectively (not individually) to safeguard participants' identities further. Questions were designed to be clear, readable, noncoercive, and did not include sensitive or triggering issues.

Timeline

The concept for this study was developed from June 2024 to December 2024 with the assistance of the research team named above. The survey instrument was developed from October 2024 to March 2025. Survey data was collected between April 1 and May 15, 2025. Expected graduation date is August 8, 2025.

Chapter 3: Results

The survey aimed to assess the relative importance of various factors pilots consider when deciding whether to stay with or leave an airline. Participants provided demographic information and ranked the six retention constructs from 1 to 6 based on importance. Nonparametric statistical tests were used for analysis because the dependent variables are ranked data (Friedman, 1937; Okoye & Hosseini, 2024). Additionally, since the collected data are not normally distributed, the assumptions of parametric tests are violated, which necessitates the use of nonparametric tests (Frey, 2016). The outcomes of the tests for each research question are presented with minimal interpretation in this chapter.

Research Question 1

Research Question 1 asks, “What retention factors do pilots perceive as most important at low-cost carriers and regional airlines in the United States?” The Friedman test was used to assess the differences in the ranked importance of the six general pilot retention factors established in the literature review: lifestyle, financial, schedule, professional opportunity, operational, and recognition. The Friedman test was selected because it is a nonparametric test designed for comparing more than two related samples within the same group of participants, where the dependent variable is ordinal (rank-ordered data) (Frey, 2016; Friedman, 1937). The results indicated a statistically significant difference in how these factors were ranked, $\chi^2(5) = 234.00$, $p < .001$.

Table 2

Ranking of Each Retention Factor as Most Important

Factor	n	%
Lifestyle	34	44.7
Financial	25	32.9
Schedule	13	17.1
Professional	3	3.9
Operational	1	1.3
Recognition	0	0.0

Table 2 displays the factors that received the highest rankings from the participants.

Lifestyle was ranked as the top factor in retention considerations by 44.7% of participants.

Financial considerations followed at 32.9%, and schedule came in third at 17.1%. Fewer than 5% of participants ranked each of the remaining three categories as their top concern.

The Friedman Test is used to determine whether there is a significant difference in the rankings of the retention constructs; however, further post-hoc testing is necessary to establish if the specific rankings in Table 2 are statistically significant or if they could have occurred by chance. Post-hoc testing was performed using the Wilcoxon signed-rank tests with Bonferroni-adjusted p-values to assess differences in pilot preferences among the six retention factors (Zimmerman & Zumbo, 1993). The test was conducted pairwise, and the results are presented in Table 3. Most comparisons revealed statistically significant differences ($p < .001$), indicating that pilots clearly distinguished the relative importance of most factors. For example, Lifestyle was ranked significantly higher than Operational and Recognition (both $p < .001$), as was Financial when compared with those same categories.

Table 3*Wilcoxon Signed-Rank Test Results for Retention Factors*

	Lifestyle	Financial	Schedule	Opportunity	Operational	Recognition
Lifestyle	—					
Financial	.144	—				
Schedule	.232	.185	—			
Opportunity	<.001***	<.001***	<.001***	—		
Operational	<.001***	<.001***	<.001***	1.000	—	
Recognition	<.001***	<.001***	<.001***	<.001***	<.001***	—

Note. Bonferroni-adjusted Wilcoxon signed-rank test p-values are reported. Only the lower triangle is shown to avoid redundancy. Asterisks indicate levels of statistical significance: p < .05*, p < .01**, p < .001***.

Several pairs in the analysis did not reach statistical significance. The difference between Lifestyle and Financial factors was not statistically significant ($p = .144$), indicating that pilots ranked these two factors similarly. Schedule also did not differ significantly from Lifestyle ($p = .232$) or Financial ($p = .185$), suggesting that these three were perceived as relatively close in priority. In contrast, Professional Opportunity and Operational Excellence produced a p-value of 1.000, indicating that there was no difference in how pilots valued these two categories. This finding suggests that in a larger sample size or the population at large, these factors may be ranked with equal frequency.

Research Question 2

Research Question 2 asks, “To what extent do retention factors differ among pilots based on demographic factors (age, gender, position, experience, and military background)?”

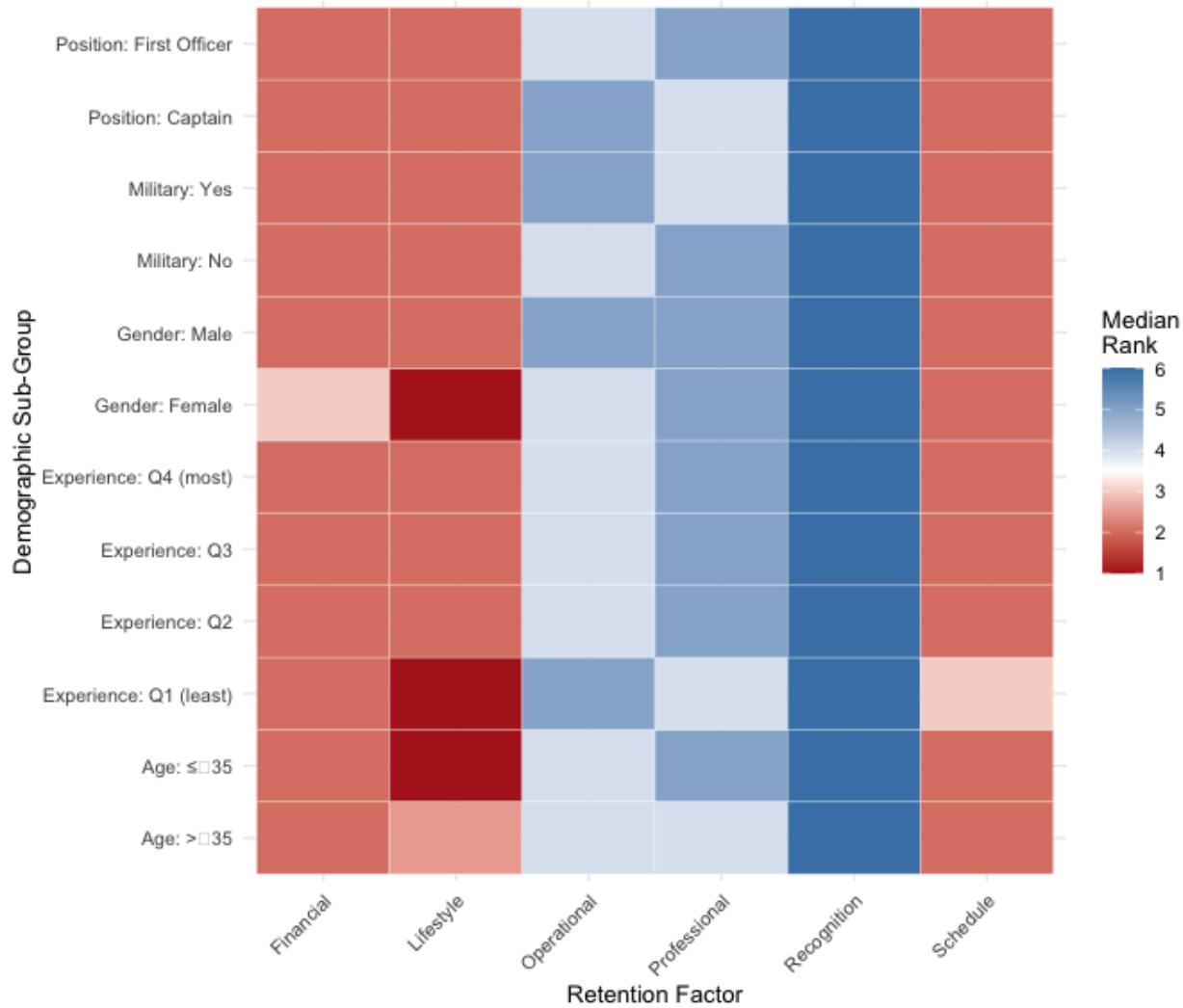
Subquestions 2a through 2e address each of these variables individually, using nonparametric statistical tests to evaluate whether differences in ranked retention priorities exist across pilot subgroups. The analysis included comparisons by gender (2a), age group (2b), position (2c), experience quartile (2d), and military background (2e).

The findings for RQ2 indicate that retention priorities are stable across demographic subgroups, with few exceptions. Gender-based differences were observed in the ranking of Schedule, with female pilots placing greater emphasis on this factor than their male counterparts. Age-related differences also emerged, particularly among pilots aged 35 and younger, who ranked Lifestyle higher than older pilots. No statistically significant differences were identified based on position, experience level, or military background. Across all groups, Lifestyle, Financial, and Schedule consistently appeared among the top-ranked factors.

Figure 3 provides a heat map of the median rank of each retention factor across the analyzed demographic subgroups. The x-axis lists the retention constructs. The y-axis shows each demographic subgroup. The scale indicates the highest-ranked factors in red and the least important factors in blue. The specific color signifies the median rank in that subgroup. For example, the median rank of the Lifestyle factor for female pilots is 1.

Figure 3

Median Retention Factor Ranking by Sub-Group



Research Question 2a

The statistical test used for RQ 2a was the Mann-Whitney U test, the nonparametric equivalent to the independent samples t-test (Frey, 2016). RQ 2a investigates differences in the ranked importance of retention factors based on pilots' age, with the independent variable (IV) being the age group (≤ 35 years, $n = 58$; > 35 years, $n = 18$). Two age groups were selected to

simplify the analysis. The specific age groups were chosen because the average age of a new first officer at a major/legacy airline is 34 years old (ALPA, 2023). This provided a break point that included two groups of pilots who are likely at different stages of life with differing priorities and generational values.

The dependent variable (DV) is the ordinal rank assigned to each retention factor. The Mann-Whitney U test was chosen because it is a nonparametric test suitable for comparing two independent groups (the two age groups) on an ordinal DV. The test accommodates the ordinal nature of the ranked data and does not assume normality, which is appropriate given the nonparametric approach noted in the document. The R statistical analysis provided Bonferroni-adjusted p-values to account for multiple comparisons across the six factors and reduce Type I errors (Emerson, 2020).

A statistically significant difference was found in the ranking of the lifestyle factor ($p = .05$), with younger pilots placing greater emphasis on lifestyle considerations. Table 4 provides a summary of the descriptive statistics for the sample based on age. Table 5 presents the summary of the Mann-Whitney U results with Bonferroni corrected values.

Table 4

Descriptive Statistics for Age

N	Min	Q1	Median	Mean	Q3	Max	SD	Skew	Kurtosis
76	21	26	29	32.41	35	63	9.91	1.46	1.48

Note. SD = standard deviation; Q1 = first quartile; Q3 = third quartile.

Table 5*Comparison of Retention Factors by Age Group*

Factor	Median ≤35	Median >35	P (Bonferroni)
Lifestyle	1	2.5	0.05*
Financial Considerations	2	2	1
Operational Excellence	4	4	1
Professional Opportunity	5	4	1
Recognition	6	6	1
Schedule	2	2	1

Note. Lower median values indicate higher importance. p-values adjusted using Bonferroni correction for multiple comparisons. Asterisks indicate levels of statistical significance: p < .05*.

Research Question 2b

Research Question 2b asks, “To what extent do retention factors differ between male and female pilots?” The statistical test used for RQ 2b was the Mann-Whitney U test. RQ 2b explores differences in the ranked importance of retention factors between male and female pilots, with the independent variable (IV) being gender. The dependent variable (DV) is the ordinal rank assigned to each retention factor. Bonferroni-adjusted p-values were applied to control for multiple comparisons across the six retention factors.

The results indicated no statistically significant differences in the ranking of general retention factors between male and female pilots. A simple analysis of the rankings revealed that female pilots gave a slightly higher priority to Lifestyle (median = 1) and a somewhat lower priority to Financial (median = 3) than male pilots. However, the difference was not statistically significant across any of the six factors. Table 7 displays median rankings by gender and the results of the Mann-Whitney U tests.

Table 7

Median Rank of Factors by Gender and Mann-Whitney U Results

Factor	Male Median	Female Median	P (adjusted)
Financial Considerations	2	3	0.504
Lifestyle	2	1	1.000
Operational Excellence	5	4	0.280
Professional			
Opportunity	5	5	1.000
Recognition	6	6	0.364
Schedule	2	2	1.000

Note: Mann-Whitney U Test with Bonferroni adjusted p shown.

Research Question 2c

Research Question 2c asks, “To what extent do retention factors differ between Captains and First Officers?” The statistical test used for RQ 2c was the Mann-Whitney U test. RQ 2c assesses differences in the ranked importance of retention factors between Captains and First Officers, with the independent variable (IV) being position (Captains, n = 26; First Officers, n = 50). The dependent variable (DV) is the ordinal rank assigned to each retention factor.

No statistically significant differences were found between the two groups across any of the six general retention factors. The highest-ranked categories for both Captains and First Officers were Lifestyle, Financial, and Schedule, with identical median scores. Operational Excellence and Professional Opportunity were ranked slightly differently between the two groups, but these differences were not statistically significant. Table 8 provides a breakdown of the median values and associated p-values.

Table 8

Median Rank of Factors by Position and Mann-Whitney U Results

Factor	Captain Median	First Officer Median	P (adjusted)
Financial Considerations	2	2	0.400
Lifestyle	2	2	1.000
Operational Excellence	5	4	0.082
Professional			
Opportunity	4	5	1.000
Recognition	6	6	1.000
Schedule	2	2	1.000

Note: Mann-Whitney U Test with Bonferroni adjusted p shown.

Research Question 2d

Research Question 2d asks, “To what extent do retention factors differ based on pilots’ years of experience?” The statistical test used for RQ 2d was the Kruskal-Wallis H test. The independent variable (IV) is the pilot’s level of experience. Years of experience were divided into quartiles, with 19 pilots in each group. Quartiles were chosen to simplify the analysis and results. The dependent variable (DV) is the ordinal rank assigned to each retention factor. The Kruskal-Wallis H test was selected because it is a nonparametric test designed for comparing more than two independent groups (the four experience quartiles) on an ordinal DV (Frey, 2016; Kruskal & and Wallis, 1952).

No statistically significant differences were identified in any of the factors. Median ranks for Financial, Schedule, and Lifestyle considerations remained consistent across experience levels. Table 9 summarizes the median ranks by quartile and the outcomes of statistical tests.

Table 9

Median Rank of General Factors by Experience Quartile and Kruskal Wallis Results

Factor	Q1	Q2	Q3	Q4	Test Statistic	df	P (adjusted)
Financial Considerations	2	2	2	2	0.551	3	1.000
Lifestyle	1	2	2	2	3.854	3	1.000
Operational Excellence	5	4	4	4	1.364	3	1.000
Professional Opportunity	4	5	5	5	1.015	3	1.000
Recognition	6	6	6	6	4.639	3	1.000
Schedule	3	2	2	2	2.619	3	1.000

Note: Kruskal Wallis Test shown with test statistic, degrees of freedom (df), and Bonferroni adjusted p.

Research Question 2e

Research Question 2e asks, “To what extent do retention elements differ between pilots with and without military backgrounds?” The statistical test used for RQ 2e was the Mann-Whitney U test. RQ 2e investigates differences in the ranked importance of retention factors between pilots with and without military backgrounds, with the independent variable (IV) being military background (two levels: prior military, n = 7; no military service, n = 69). The dependent variable (DV) is the ordinal rank assigned to each retention factor.

Both groups shared similar median scores across all six constructs, as shown in Table 10. Bonferroni-adjusted p-values were used to account for multiple comparisons across the six retention factors.

Table 10

Median Rank of Factors by Military Background and Mann-Whitney U Results

Factor	Prior Military	No Military Service	p (adjusted)
Financial Considerations	2	2	1.000
Lifestyle	2	2	1.000
Operational Excellence	5	4	1.000
Professional Opportunity	4	5	1.000
Recognition	6	6	1.000
Schedule	2	2	1.000

Note: Mann-Whitney U Test with Bonferroni adjusted p shown.

Chapter 4: Discussion

This study examined the factors influencing airline pilot retention at regional airlines and low-cost carriers in the United States. Pilots ranked lifestyle, financial considerations, and scheduling as the most important retention factors. Lifestyle emerged as the highest priority factor, identified by approximately 45% of participants, closely followed by financial considerations at around 33%, and schedule at about 17%.

Demographic analysis indicates a notably younger sample, with a mean age of approximately 32 years, significantly younger than the average age of Airline Transport Pilot certificate holders, which is 50.3 (Federal Aviation Administration, 2025). The study primarily captured data from regional airline pilots, who comprised around 75% of respondents, while major airlines, low-cost carriers, and other carriers accounted for the remainder. Table 11 shows the overall composition of the sample by carrier type. The heavy regional pilot composition of the sample explains the younger age demographic and provides context for the findings discussed below. The findings will be presented by research question, followed by a discussion of the practical implications, limitations, and conclusions.

Table 11

Sample Composition by Carrier Type

Air Carrier Type	n	Percentage
Regional Airline	57	75.0%
Low-Cost Carrier	5	6.6%
Legacy/Mainline (Part 121)	11	14.5%
Charter/Fractional (Part 135/91K)	2	2.6%
Freight/Cargo Carrier	1	1.3%
Total	76	100.0%

Note: This table presents the sample composition by air carrier type, as defined in the Literature Review in Chapter 1.

Research Question 1

Research Question 1 examined which retention factors pilots at regional airlines and LCCs considered most important. The results, as determined by the Friedman test ($\chi^2(5) = 234.00$, $p < .001$), demonstrated a clear prioritization of lifestyle and financial factors, which were significantly higher than operational, professional opportunity, and recognition factors, as shown in Table 2. Schedule factors were also rated highly, though slightly less consistently than lifestyle and financial factors. The results indicate that while financial considerations are important to all pilots, initiatives that improve quality of life and help pilots achieve a better work-life balance may improve retention rates (Harvey & Turnbull, 2006).

Research Question 2

Research Question 2a

Statistical analysis of this sample reveals that age has a significant influence on retention factor rankings. Mann–Whitney U test results ($p = .05$) indicated that pilots 35 years and younger prioritized lifestyle factors more heavily compared to older pilots (Table 5). This finding suggests that younger pilots may be undergoing a generational mindset shift where quality-of-life considerations are valued more than financial incentives alone (Tanoto & Go Tami, 2024). These results are in alignment with recent literature concerning work-life balance, job satisfaction of airline pilots, and Gen Z workers recently entering the workforce (Arseven & Yurdakul, 2024; Hom & Kiazad, 2024; Tanoto & Go Tami, 2024)

The primary concern with this result is that younger pilots were significantly over-represented in this sample, with the mean age of airline transport pilots in the U.S. in 2024 as

50.3 years (Federal Aviation Administration, 2025). The Statistica website (2024) shows the median age for airline pilots from 2002 to 2020 as 45.3 years. Younger pilots, particularly those working for regional airlines, may have different career priorities, values, and expectations compared to older, more experienced pilots employed at major airlines or in other areas of aviation. As a result, the findings provide valuable insights into the retention factors most relevant to younger regional pilots.

Research Question 2b

Gender did not yield statistically significant differences in retention factor rankings, as indicated by the Mann-Whitney U test results shown in Table 7. These results suggest that both male and female pilots placed similar importance on lifestyle, financial, and scheduling factors, demonstrating gender neutrality in retention considerations. However, Figure 3 and Table 7 show that female pilots ranked schedule and lifestyle ahead of financial considerations. Given the small sample size of female respondents ($n = 8$), further research with a larger sample may be warranted to understand the initiatives airlines can implement to increase the number of females hired and retained within their workforce.

Research Question 2c, 2d, and 2e

No statistically significant differences emerged between Captains and First Officers (Table 8). Both groups ranked lifestyle, financial, and schedule factors similarly high, suggesting uniformity across positions in retention priorities. Pilot experience, measured in quartiles, showed no statistically significant influence on retention rankings (Table 9). All experience groups similarly prioritized lifestyle, financial, and schedule factors, indicating consistent values across experience levels. No statistically significant differences were found between pilots with military backgrounds and those without (Table 10). Both groups consistently ranked lifestyle,

financial, and schedule factors highest, reflecting similar priorities regardless of military experience.

Limitations

The study faced several limitations affecting the interpretation and generalizability of its findings. The survey design and format contributed to a relatively low completion rate of 69% (76 usable responses out of 113 initiated). The complexity of rank-ordering questions might have resulted in cognitive fatigue or confusion, negatively impacting response rates. Future studies should adopt simpler survey formats, such as Likert scales, to encourage better completion rates and facilitate parametric statistical analysis.

The sample size of 76 responses was well below the ≈ 380 responses needed to adequately represent the 31,400 pilots at U.S. regional and LCCs at the 95% confidence level with a margin of error of $\pm 5\%$, as determined using Cochran's formula. Additionally, a power analysis for the non-parametric tests indicated that with this sample size, the study was powered to detect only medium effect sizes (approximately $r = 0.31$) with 80% power. The inclusion of pilots from major airlines, cargo carriers, and other operators was necessary due to the limited responses and may have introduced variability that is not fully representative of regional and LCC pilots.

The quantitative method used limited the applicability of the adapted analytical framework to the retention and turnover context in U.S. regional airlines. The inclusion of a qualitative component may have significantly enhanced the analytical framework by providing a deeper understanding of the subfactors influencing retention. Additionally, transitioning to a mixed-methods study utilizing Likert scales would enable factor analysis that may better explain the relationships of the factors affecting retention.

Implications for Practice

Airline management and unions should carefully consider these findings when negotiating collective bargaining agreements (CBAs). The high priority younger pilots place on lifestyle factors indicates that enhancing quality-of-life provisions, such as flexible scheduling, commuting policies, and improved home-basing options, may significantly benefit pilot retention. A nuanced understanding of individual pilot groups, achieved through internal surveys similar to the approach described by Vulturius (2024), will enable tailored bargaining strategies that address specific pilot preferences and concerns, potentially lowering the overall labor costs to the airline.

A thorough cost-benefit analysis of nonfinancial retention strategies could also identify opportunities for airlines to improve pilot satisfaction and retention more effectively and efficiently than purely financial incentives. The findings align with Efthymiou et al. (2021), emphasizing the importance of considering nonfinancial factors in pilot retention, particularly in competitive hiring environments faced by regional and low-cost carriers.

Future Research

Future studies should incorporate both qualitative methodologies and quantitative measures to deepen the understanding of pilots' motivations for retention. Incorporating structured interviews or focus groups could provide richer insights into the specific lifestyle and quality-of-life factors pilots value most, complementing quantitative survey data.

Investigating generational shifts in pilot expectations, particularly among younger cohorts (e.g., Gen Z pilots aged 21–30), could reveal emerging trends and help industry stakeholders better anticipate future workforce needs. Additional studies into female-specific recruiting and retention strategies may also help increase the number of female pilots within regional airlines and low-cost carriers (Casebolt, 2023; Ferla & Graham, 2019; Germain et al., 2012).

Longitudinal studies could further explore how pilot retention priorities evolve throughout career stages, providing insights for strategic planning by airline management and labor organizations. A focus of these studies should examine the relationship between recruiting and retention strategies to better understand pilot expectations during the hiring process versus the realities they face throughout different stages of their career (Rad & De Moraes, 2009; Shanker, 2019).

Conclusion

This study highlights the critical role of lifestyle, financial, and scheduling factors in pilot retention at U.S. regional and low-cost carriers, echoing concerns identified in the opening chapter regarding competitive pressures from mainline and legacy airlines (US GAO, 2023; Regional Airline Association, 2023). The prioritization of lifestyle factors, particularly among younger pilots, highlights the shifting dynamics in pilot expectations, suggesting that regional airlines and LCCs can benefit by addressing nonfinancial retention factors. This finding aligns closely with earlier literature emphasizing the strategic importance of nonfinancial considerations in retention, such as quality of life and work-life balance. Consequently, airlines and unions should proactively incorporate these insights into their collective bargaining strategies, prioritizing pilot lifestyle enhancements alongside traditional financial compensation. Addressing the methodological limitations identified and conducting comprehensive mixed-methods research in the future will further clarify pilot retention dynamics, offering practical guidance to airline management, policymakers, and labor organizations.

REFERENCES

- Acquah, A., Nsiah, T. K., Antie, A. E. N., & Otoo, B. (2021). Literature review on theories of motivation. *EPRA International Journal of Economic and Business Review*, 25–29. <https://doi.org/10.36713/epra6848>
- Adams, J. S. (1963). Towards an understanding of inequity. *The Journal of Abnormal and Social Psychology*, 67(5), 422–436. <https://doi.org/10.1037/h0040968>
- Alderfer, C. P. (1969). An empirical test of a new theory of human needs. *Organizational Behavior and Human Performance*, 4(2), 142–175. [https://doi.org/10.1016/0030-5073\(69\)90004-X](https://doi.org/10.1016/0030-5073(69)90004-X)
- ALPA. (2023). *More than enough pilots to meet U.S. airline demand*. Air Line Pilots Association, Int'l. <https://www.alpa.org/advocacy/pilot-supply>
- Amornpipat, I. (2019). An exploratory factor analysis of quality of work life of pilots. *Journal of Psychology Research*, 9(7). <https://doi.org/10.17265/2159-5542/2019.07.003>
- Arseven, G. K., & Yurdakul, E. (2024). Commercial airline pilots' psychosocial risk factors: Evaluating the mechanisms influencing job satisfaction. *Human Factors in Aviation and Aerospace*, 1(1), Article 1. <https://doi.org/10.26650/hfaa.1471279>
- Bennett, S. A. (2003). Flight crew stress and fatigue in low-cost commercial air operations—An appraisal. *International Journal of Risk Management*, 4(2/3), 207–239. <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=5b0d94474dd86476f9ae2c7c21da5f3ff4f3fc65>
- Burrows, D. N., Porter, C. O. L. H., & Amber, B. (2022). Beyond choosing to leave: The interactive effects of on- and off-the-job embeddedness on involuntary turnover. *Journal of Applied Psychology*, 107(1), 130–141. <https://doi.org/10.1037/apl0000881>

- Casebolt, M. K. (2023). Gender diversity in aviation: What is it like to be in the female minority? *The Journal of Aviation/Aerospace Education & Research*, 32(1).
<https://doi.org/10.15394/jaaer.2023.1943>
- Efthymiou, M., Usher, D., O'Connell, J. F., Warnock-Smith, D., & Conyngham, G. (2021). The factors influencing entry level airline pilot retention: An empirical study of Ryanair. *Journal of Air Transport Management*, 91, 101997.
<https://doi.org/10.1016/j.jairtraman.2020.101997>
- Emerson, R. W. (2020). Bonferroni Correction and Type I Error. *Journal of Visual Impairment & Blindness*, 114(1), 77–78. <https://doi.org/10.1177/0145482X20901378>
- Federal Aviation Administration. (2025). *Table 13: Average age of active pilots by category as of December 31, 2024 [Data set]*. U.S. Civil Airmen Statistics.
https://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics?utm_source=chatgpt.com
- Ferla, M., & Graham, A. (2019). Women slowly taking off: An investigation into female underrepresentation in commercial aviation. *Research in Transportation Business & Management*, 31, 100378. <https://doi.org/10.1016/j.rtbm.2019.100378>
- Fraher, A. L. (2013). Airline downsizing and its impact on team performance. *Team Performance Management: An International Journal*, 19(1/2), 109–126.
<https://doi.org/10.1108/13527591311312123>
- Fraher, A. L. (2019). The vulnerability of quasi-professional experts: A study of the changing character of US airline pilots' work. *Economic and Industrial Democracy*, 40(4), 867–889. <https://doi.org/10.1177/0143831X16668580>
- Frey, B. B. (2016). *There's a stat for that! What to do & when to do it*. SAGE Publications, Inc.

- Friedman, M. (1937). The use of ranks to avoid the assumption of normality implicit in the analysis of variance. *Journal of the American Statistical Association*, 32(200), 675–701.
<https://doi.org/10.1080/01621459.1937.10503522>
- Germain, M.-L., Herzog, M. J. R., & Hamilton, P. R. (2012). Women employed in male-dominated industries: Lessons learned from female aircraft pilots, pilots-in-training and mixed-gender flight instructors. *Human Resource Development International*, 15(4), 435–453. <https://doi.org/10.1080/13678868.2012.707528>
- Gittell, J. H., Nordenflycht, A. V., & Kochan, T. A. (2004). Mutual gains or zero sum? Labor relations and firm performance in the airline industry. *Industrial and Labor Relations Review*, 57(2), 163–180. <https://doi.org/10.2307/4126615>
- Harvey, G., & Turnbull, P. (2006). Employment relations, management style and flight crew attitudes at low cost airline subsidiaries. *European Management Journal*, 24(5), 330–337.
<https://doi.org/10.1016/j.emj.2006.07.002>
- Herzberg, F., Mausner, B., & Snyderman, B. B. (1959). *The motivation to work*. Transaction Publishers.
- Higgins, J., Bjerke, E., Lovelace, K., & Leonard, A. (2016). *US airline pilot supply forecast 2016*.
- Hom, P., & Griffeth, R. W. (1995). *Employee turnover*.
- Hom, P. W., & Kiazed, K. (2024). *New directions for theories for why employees stay or leave*.
<https://doi.org/10.1146/annurev-orgpsych-110622-033733>
- Hom, P. W., Lee, T. W., Shaw, J. D., & Hausknecht, J. P. (2017). One hundred years of employee turnover theory and research. *Journal of Applied Psychology*, 102(3), 530–545.
<https://doi.org/10.1037/apl0000103>

- Hunter, L. (2006). Low cost airlines: Business model and employment relations. *European Management Journal*, 24(5), 315–321. <https://doi.org/10.1016/j.emj.2006.08.001>
- Johnson, E. W., & McClelland, D. C. (1984). *Learning to achieve*. Scott, Foresman.
- Kiernan, K. (2018). Calculating the cost of pilot turnover. *Journal of Aviation/Aerospace Education & Research*. <https://doi.org/10.15394/jaaer.2018.1737>
- Kim, J.-H., & Choi, S. (2024). Effects of Post-COVID-19 Syndrome on quality of life among airline crew. *Workplace Health & Safety*, 72(9), 374–383.
<https://doi.org/10.1177/21650799241253870>
- Kioulepoglou, P., & Blundell, J. (2022). Impact of COVID-19 on job satisfaction: The case of military and airline pilots. *The International Journal of Aerospace Psychology*, 32(4), 183–202. <https://doi.org/10.1080/24721840.2022.2071714>
- Kruskal, W. H., & and Wallis, W. A. (1952). Use of ranks in one-criterion variance analysis. *Journal of the American Statistical Association*, 47(260), 583–621.
<https://doi.org/10.1080/01621459.1952.10483441>
- Lambeth, D., Lei, Z., & Cheung, T. (2022). Airline pilot remuneration: A conceptual framework and empirical analysis of airlines in Australia. *Transport Policy*, 126, 34–42.
<https://doi.org/10.1016/j.tranpol.2022.07.002>
- Lee, J., Huang, Y.-H., Dainoff, M. J., & He, Y. (2021). Where to focus? Insights from safety personnel and external safety consultants on lessons learned about safety climate interventions – A qualitative approach. *Journal of Safety Research*, 79, 51–67.
<https://doi.org/10.1016/j.jsr.2021.08.005>
- Locke, E. A. (1968). Toward a theory of task motivation and incentives. *Organizational Behavior & Human Performance*, 3(2), 157–189. [https://doi.org/10.1016/0030-5073\(68\)90004-4](https://doi.org/10.1016/0030-5073(68)90004-4)

Lutte, B. (2018). *Pilot supply at the regional airlines: Airline response to the changing environment and the impact on pilot hiring*. National Pilot Source Forum. Embry-Riddle Aeronautical University.

<https://commons.erau.edu/cgi/viewcontent.cgi?article=1749&context=jaaer#page13>

Majumdarr, S., & Dasgupta, S. A. (2024). Understanding why do we stay in our jobs? A bibliometric and content analysis of job embeddedness in the past two decades (2001–2021). *Employee Relations: The International Journal*, 46(2), 309–339.

<https://doi.org/10.1108/ER-12-2022-0549>

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, 50(4), 370–396.
<https://doi.org/10.1037/h0054346>

McGee, M. (n.d.). *Air transport pilot supply and demand current state and effects of recent legislation* [Ph.D., The Pardee RAND Graduate School]. Retrieved August 30, 2023, from

<https://www.proquest.com/docview/1680014670/abstract/DCFCD331F6674142PQ/1>

Mitchell, T. R., Holtom, B. C., Lee, T. W., & Sablinski, C. J. (2001). Why people stay: Using job embeddedness to predict voluntary turnover. *The Academy of Management Journal*, 44(6), 1102–1121. <https://www.jstor.org/stable/3069391>

Mizzi, A., Lohmann, G., & Carim Junior, G. (2022). Clipped wings: The impact of the COVID-19 pandemic on airline pilots and influence on safety climate. In D. Harris & W.-C. Li (Eds.), *Engineering Psychology and Cognitive Ergonomics* (pp. 384–396). Springer International Publishing. https://doi.org/10.1007/978-3-031-06086-1_30

- Ng, T. W. H., & Feldman, D. C. (2012). The effects of organizational and community embeddedness on work-to-family and family-to-work conflict. *Journal of Applied Psychology*, 97(6), 1233–1251. <https://doi.org/10.1037/a0029089>
- Nikle, A., & Bjerke, E. (2018). US regional airline pay scale changes. *International Journal of Aviation, Aeronautics, and Aerospace*, 5(2). <https://doi.org/10.15394/ijaaa.2018.1233>
- Oban, C. (2018). Part 3: Process theories of motivation. *Motivation 101: A Guide for Public Servants*. <https://stars.library.ucf.edu/motivationforpublicservants/3>
- Okoye, K., & Hosseini, S. (2024). Mann–Whitney U test and Kruskal–Wallis H test statistics in R. In K. Okoye & S. Hosseini, *R Programming* (pp. 225–246). Springer Nature Singapore. https://doi.org/10.1007/978-981-97-3385-9_11
- Peltokorpi, V., & Allen, D. G. (2024). Job embeddedness and voluntary turnover in the face of job insecurity. *Journal of Organizational Behavior*, 45(3), 416–433. <https://doi.org/10.1002/job.2728>
- Porter, C. M., Posthuma, R. A., Maertz Jr., C. P., Joplin, J. R. W., Rigby, J., Gordon, M., & Graves, K. (2019). On-the-job and off-the-job embeddedness differentially influence relationships between informal job search and turnover. *Journal of Applied Psychology*, 104(5), 678–689. <https://doi.org/10.1037/apl0000375>
- Rad, A. M. M., & De Moraes, A. (2009). Factors affecting employees' job satisfaction in public hospitals: Implications for recruitment and retention. *Journal of General Management*, 34(4), 51–66. <https://doi.org/10.1177/030630700903400404>
- Regional Airline Association. (2022). *RAA 2022 annual report*. <https://www.raa.org/content-hub/raa-annual-reports/raa-2022-annual-report/>

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25(1), 54–67.

<https://doi.org/10.1006/ceps.1999.1020>

Shanker, M. (2019). Recruitment process and its impact on retention of commercial pilots in Indian aviation industry. *Business Process Management Journal*, 26(3), 736–751.

<https://doi.org/10.1108/BPMJ-12-2018-0376>

Simon, B. (2016). *A sociology of commercial flight crew*. Routledge.

<https://doi.org/10.4324/9781315263595>

Skinner, B. F. (1958). Reinforcement today. *American Psychologist*, 13(3), 94–99.

<https://doi.org/10.1037/h0049039>

Skores, A. (2023, June 1). *American Airlines CEO says it can't deploy 150 regional jets because of pilot shortage*. Dallas News.

<https://www.dallasnews.com/business/airlines/2023/06/01/american-airlines-ceo-says-it-can-t-deploy-150-regional-jets-because-of-pilot-shortage/>

Sobieralski, J. B. (2020). COVID-19 and airline employment: Insights from historical uncertainty shocks to the industry. *Transportation Research Interdisciplinary Perspectives*, 5, 100123. <https://doi.org/10.1016/j.trip.2020.100123>

Tanoto, S. R., & Go Tami, E. (2024). Understanding Generation Z: Work-life balance and job embeddedness in retention dynamics. *Binus Business Review*, 15(3), 225–238.

<https://doi.org/10.21512/bbr.v15i3.11277>

US GAO. (2023). *Aviation workforce: Current and future availability of airline pilots and aircraft mechanics*. <https://www.gao.gov/products/gao-23-105571>

von Nordenflycht, A., & Kochan, T. (2003). Labor contract negotiations in the airline industry.

Monthly Labor Review. <https://www.bls.gov/opub/mlr/2003/07/art3full.pdf>

Vroom, V. H. (1964). *Work and motivation*. Wiley.

Vulturius, S., Budd, L., Ison, S., & Quddus, M. (2024). Commercial airline pilots' job satisfaction before and during the COVID-19 pandemic: A comparative study. *Research in Transportation Business & Management*, 53, 101108.

<https://doi.org/10.1016/j.rtbm.2024.101108>

Wild, P. (2022). How airline business models impact working conditions of flight crew members.

Aeronautics and Aerospace Open Access Journal, 6(3), 101–106.

<https://doi.org/10.15406/aaoj.2022.06.00147>

Zhang, M., Fried, D. D., & Griffeth, R. W. (2012). A review of job embeddedness: Conceptual, measurement issues, and directions for future research. *Human Resource Management Review*, 22(3), 220–231. <https://doi.org/10.1016/j.hrmr.2012.02.004>

Zimmerman, D. W., & Zumbo, B. D. (1993). Relative power of the Wilcoxon Test, the Friedman Test, and Repeated-Measures ANOVA on ranks. *The Journal of Experimental Education*, 62(1), 75–86. <https://doi.org/10.1080/00220973.1993.9943832>

APPENDIX
U.S. Airline Pilot Retention Survey

Start of Block: IC

IRB_notification

UNIVERSITY OF NORTH DAKOTA

Institutional Review Board - Study Information Sheet

Title of Project: Factors influencing U.S. airline pilot retention

Principal Investigator:

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Purpose of the Study: The purpose of this research study is to understand the key factors that influence pilot retention and investigate whether these factors differ based on pilots' gender, nationality, age, military background, and level of commercial flying experience.

Procedures to be followed: You will be asked to answer 19 questions in an online survey.

Risks: There are no risks in participating in this research beyond those experienced in everyday life.

Benefits: This research may provide a better understanding of the factors that influence airline pilot retention in the United States. The information provided by this research could help change policies and incentives to increase airline pilots' quality of life & well-being and/or enhance airline operational effectiveness and safety.

Duration: It will take about 10 minutes to complete the questions.

Statement of Confidentiality: The survey does not ask for any information that would identify who the responses belong to. Therefore, your responses are recorded anonymously. If this research is published, no information that would identify you will be included since your name is in no way linked to your responses. All survey responses that we receive will be treated confidentially and stored on a secure server. However, given that the surveys can be completed from any computer (e.g., personal, work, school), we are unable to guarantee the

security of the computer on which you choose to enter your responses. As a participant in our study, we want you to be aware that certain "key logging" software programs exist that can be used to track or capture data that you enter and/or websites that you visit.

Right to Ask Questions: The researchers conducting this study are Michael Hickey, Marina Efthymiou, Aman Gupta, and Robert Walton. You may ask any questions you have now. If you have questions, concerns, or complaints about the research at a later time, please contact James Higgins at (701)777-6793 during the day. If you have questions regarding your rights as a research subject, you may contact The University of North Dakota Institutional Review Board at (701) 777-4279 or UND.irb@UND.edu. You may contact the UND IRB with problems, complaints, or concerns about the research. Please contact the UND IRB if you cannot reach the research staff or if you wish to talk with someone who is an informed individual who is independent of the research team. General information about being a research subject can be found on the Institutional Review Board website "Information for Research Participants" <http://und.edu/research/resources/human-subjects/research-participants.html>

Compensation: You will not receive compensation for your participation.

Voluntary Participation: You do not have to participate in this research. You can stop your participation at any time. You may refuse to participate or choose to discontinue participation at any time without losing any benefits to which you are otherwise entitled. You do not have to answer any questions you do not want to answer. You must be 18 years of age or older to participate in this research study. Completion and return of the survey implies that you have read the information in this form and consent to participate in the research. Please keep this form for your records or future reference.

informed_consent

By selecting "Yes" you acknowledge that you have read the above statements and consent to your participation in this research.

- Yes (1)
- No (2)

Skip To: End of Survey If By selecting "Yes" you acknowledge that you have read the above statements and consent to your pa... = No

End of Block: IC

Start of Block: demographics

*

age

What is your age?

gender

What is you gender?

- Male (1)
 - Female (2)
 - Other (3)
 - Prefer not to say (4)
-

nationality

What is your nationality?

birth

What is your Country of Birth (if different from nationality)?

position

What position do you currently hold?

- Captain (1)
 - First Officer (2)
-

air_carrier_type

What type of air carrier do you currently work for?

- Legacy/Mainline Part 121 Airline (1)
 - Low Cost Carrier (2)
 - Regional Airline (3)
 - Charter/Fractional (Part 135/91K) (4)
 - Other (5)
-

*

experience

How many years of airline flying experience do you have (round up to nearest year)?

Total_flying_hours

How many total flying hours do you have

military_experience

Have you or do you currently serve in the military?

- Currently serve in the military (Active Duty/National Guard/Reserve) (1)
- Previously served in the military (2)
- Never served in the military (3)

End of Block: demographics

Start of Block: rank_order

general

The most important factor I look for in a job as a pilot is:

Please rank these factors in order of importance to you, with 1 being the most important, 2 being the 2nd most important, and on down to 6 for the 6th most important.

Financial factors include a competitive salary, allowances, soft pay, benefits package, and job security. (Allowances and soft pay are pays you receive above your minimum monthly guarantee

and include per diem, uniform/luggage pays, productivity pay, availability of overtime pay, bonuses, etc.)

Lifestyle factors include a predictable schedule, vacation time, family-friendly policies, the possibility of being based at home, and travel benefits.

Professional Opportunity factors include a financially stable airline, the opportunity for rapid upgrade, the opportunity to fly larger aircraft, promotion based on merit, and an upgrade based on length of service.

Recognition factors include an airline that offers professional-looking uniforms, recognition as a professional, additional vacation time for long service, bonuses for long service, and long service awards.

Schedule factors include a fixed schedule, a variable schedule, flexible work rules, a bid line seniority system, and vacation bidding rules.

Operational factors include unambiguous SOPs, a proactive training environment, well-maintained and well-equipped aircraft, and highly skilled pilots.

- Financial (1)
 - Lifestyle (2)
 - Professional Opportunity (3)
 - Recognition (4)
 - Schedule (5)
 - Operational Excellence (6)
-

financial

It is most important to me that my employer offers:

Please rank these factors in order of importance to you, with 1 being the most important, 2 being the 2nd most important, and on down to 5 for the 5th most important.

- A competitive salary (1)
 - Allowances and soft pay (2)
 - A competitive benefits package (3)
 - Loss of certificate disability insurance (4)
 - Job security (5)
-

lifestyle

It is most important to me that my employer offers:

Please rank these factors in order of importance to you, with 1 being the most important, 2 being the 2nd most important, and on down to 5 for the 5th most important.

- A predictable schedule (1)
 - Vacation time (2)
 - Family friendly policies (3)
 - Possibility to be based at home (4)
 - Travel benefits (5)
-

professional

It is most important to me as a pilot that my employer offers:

Please rank these factors in order of importance to you, with 1 being the most important, 2 being the 2nd most important, and on down to 5 for the 5th most important.

- Financially stable airline (1)
 - Opportunity for rapid upgrade (2)
 - Opportunity to fly larger aircraft (3)
 - Upgrade opportunity based on merit (4)
 - Upgrade opportunity based on length of service (5)
-

recognition

It is most important to me as a pilot that my employer:

Please rank these factors in order of importance to you, with 1 being the most important, 2 being the 2nd most important, and on down to 5 for the 5th most important.

- Provides a professional looking uniform (1)
 - Recognizes me as a professional (2)
 - Offers additional vacation time for higher seniority (3)
 - Offers retention bonuses (4)
 - Offers long service awards (5)
-

schedule

It is most important thing to me about my schedule is:

Please rank these factors in order of importance to you, with 1 being the most important, 2 being the 2nd most important, and on down to 5 for the 5th most important.

- A fixed schedule (1)
 - A variable schedule (2)
 - Flexible scheduling rules (3)
 - Bid line seniority system (4)
 - Vacation bidding policy (5)
-

operational

It is most important to me as a pilot that my employer has:

Please rank these factors in order of importance to you, with 1 being the most important, 2 being the 2nd most important, and on down to 5 for the 5th most important.

- Unambiguous Standard Operating Procedures (1)
- A proactive training environment (2)
- Well-maintained aircraft (3)
- Well-equipped aircraft (4)
- Highly skilled pilots (5)

End of Block: rank_order

Start of Block: turnover

leaving

Do you intend on leaving your current airline?

- No (1)
 - Maybe (2)
 - Yes (3)
-

Display This Question:

If Do you intend on leaving your current airline? != No

when

If you do leave your airline, when do you plan on leaving from now?

- Within 1 year (1)
 - 1-2 years (2)
 - 3-4 years (3)
 - over 4 years (4)
-

Display This Question:

If Do you intend on leaving your current airline? != No

why

If you were to leave your airline, describe why you want to leave?

End of Block: turnover

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