International Journal of Aviation Research

Volume 16 | Issue 01 Peer-Reviewed Article

Investigating Retention Solutions for Women in Aviation Education and Flight Training

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Despite advancements, women remain underrepresented in the aviation industry, particularly in pilot roles. Addressing this disparity, a university initiated the Women's Ambassador Mentoring Program (WAMP) to enhance the recruitment and retention of female aviation students pursuing an aeronautical science degree. Concerns persist about insufficient support systems hindering progress. This study employs a transformative mixed methodology, utilizing both publicly available quantitative data and qualitative insights from program-involved students. The research assesses the growth in female aviation students compared to certified pilots, examining the university's enrollment and retention of female students over time. Emphasizing the necessity of a supportive culture, the study highlights the importance of connectivity and positive relationships for current and aspiring women pilots in sustaining their presence in the aviation industry.

Recommended Citation:

Albelo, J. L. D., Bowyer, S., & Wiggins, M. E. (2024). Investigating retention solutions for women in aviation education and flight training. *International Journal of Aviation Research, 16*(1)

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The aviation industry has historically been male-dominated, with women representing a significantly smaller percentage of professionals in both pilot and aviation-related roles. While efforts have been made to encourage gender diversity and inclusion in the aviation industry (Albelo & O'Toole, 2021; Albelo et al., 2022), there is a pressing need to address the retention challenges faced by women in aviation education and flight training. While there has been a rise in airwomen certificate holders (FAA, 2023), the lack of research in this area indicates that a significant portion faces challenges in advancing through the training pipeline, resulting in a disproportionate low presence within the industry. According to the Federal Aviation Administration (FAA) civil airmen statistics (2023), in 2022, less than 5% of the total Airline Transport Pilot certificates were issued to women. Moreover, in 2022, approximately 15% of the total student pilot certificates were issued to women, yet less than half of the women were able to attain their Private Pilot certificate. Conversely, over 67% of their male counterparts were able to move from student pilot to earning a private pilot certificate in the same time period. Therefore, understanding the factors influencing the retention of women in aviation education and flight training is crucial for fostering a more inclusive and diverse aviation workforce.

The primary purpose of this research is to investigate the retention issues faced by women in collegiate aviation education and flight training and identify effective solutions to improve their persistence and success in the field. The central research questions guiding this study are:

1. How does a women's ambassador mentoring program influence the retention of women in collegiate aviation education and flight training?
2. Does a women ambassador mentoring program positively affect female retention in collegiate aviation education and flight training?

By examining the factors contributing to attrition, such as gender-specific challenges, organizational culture, and educational environments, this study aims to provide actionable insights that can inform policies, practices, and interventions to support the long-term engagement and success of women pursuing careers in aviation.

Literature Review

The historical perspective of the male-dominated aviation industry reflects a trajectory marked by gender disparities and a pervasive culture that has traditionally excluded women. Since the early days of aviation in the late 19th and early 20th centuries, when pioneers like the Wright brothers achieved monumental milestones, women struggled to find their place in this male-dominated field. During World War II, women significantly contributed to aviation as pilots, mechanics, and support staff (Weatherford, 2009). For example, the Women Airforce Service Pilots (WASP) in the United States played a crucial role in ferrying aircraft, testing new planes, and freeing up male pilots for combat duty (US ARMY, n.d.). However, despite their valuable contributions, these women faced discrimination and were largely forgotten after the war.

In the post-war era, as aviation technology advanced and commercial aviation expanded, opportunities for women remained limited. The prevailing societal norms and stereotypes of the time perpetuated the idea that aviation was a male domain (Germain et al., 2012). Female pilots faced challenges in gaining acceptance and respect, and their numbers remained disproportionately low. The image of the "fighter pilot" or "test pilot" was deeply entrenched as a male archetype. The 1970s and 1980s marked a turning point as more women began to break through the gender barrier in aviation. The rise of organizations like the Ninety-Nines, an international group of women pilots, and the advocacy of trailblazers like Amelia Earhart and Jacqueline Cochran paved the way for greater inclusion. However, progress has been slow, and women, such as pilots, engineers, and executives, continue to be underrepresented in key roles within the aviation industry (Germain et al., 2012; Lutte & Morrison, 2022; Stevenson et al., 2021).

In recent decades, there has been a growing recognition of the need for diversity and inclusion in the aviation sector. Efforts to encourage women to pursue careers in aviation, such as mentorship programs and scholarships, have emerged (Morrison, 2021). Nonetheless, challenges persist, including stereotypes, unconscious bias, and systemic barriers (Albelo & O'Toole, 2021; Kim & Albelo, 2020). The industry is gradually evolving, but achieving gender equality in aviation requires sustained efforts to challenge ingrained norms and foster an inclusive environment for all.

Gender-Specific Challenges

Attrition among women in aviation education is influenced by factors, including deeply ingrained stereotypes and biases that permeate the industry (Kim & Albelo, 2020). Gender-specific challenges exacerbate the situation, contributing to a notable gender gap in aviation education. For example, stereotypes and bias are pivotal in shaping perceptions that aviation and technical roles are inherently male-dominated (Kim & Albelo, 2020). These preconceived notions create a hostile environment, deterring women from pursuing careers in aviation (Albelo et al., 2023). The lack of encouragement and support further compounds the issue, making it difficult for female students to navigate an industry that may not readily embrace diversity. Moreover, the dearth of visible female role models within the aviation sector makes the problem more significant (Albelo et al., 2023; Kim & Albelo, 2020). Without relatable figures to look up to, female students may struggle to envision themselves succeeding in the field (Kim & Albelo, 2021). Based on Kim and Albelo's (2020 & 2021) findings, it could be argued that the absence of female mentors and leaders perpetuates a sense of isolation, hindering the development of a robust support system crucial for sustaining women in aviation education.

Inadequate support systems compound the challenges faced by women in aviation education. The lack of tailored mentorship programs and peer networks deprives female students of essential resources designed to address their unique needs and concerns (Kim & Albelo, 2020). This absence of support structures could leave women feeling marginalized and under-supported in their pursuit of aviation careers. Furthermore, the demanding nature of aviation careers introduces another layer of complexity, particularly concerning work-life balance (Douglas & Pittenger, 2020; Stevenson et al., 2021). Stevenson et al. (2021) suggest that females in aviation education may find it challenging to reconcile their aspirations with familial

responsibilities. Striking a balance between the rigorous training demands and personal life becomes a formidable task, contributing to attrition as some women opt for career paths perceived as more accommodating.

Unconscious bias is another gender-specific challenge that further compounds the issue, influencing assessments of women's capabilities and potential. Biased grading, feedback, and limited advancement opportunities create an environment where women perceive their skills as undervalued, fostering a discouraging atmosphere that hampers their progression in aviation education (Albelo et al., 2023). Therefore, addressing attrition among women in aviation education necessitates a multifaceted approach, challenging stereotypes, fostering inclusive environments, and implementing support systems tailored to the unique needs of female students (Albelo et al., 2023; Albelo et al., 2022; Kim & Albelo, 2020; Kim & Albelo, 2021; Lutte & Morrison, 2022). By dismantling these barriers, the aviation industry can cultivate a more equitable and diverse landscape, ensuring that talented individuals, regardless of gender, can thrive in aviation education and beyond.

Organizational Culture Challenges

Attrition among women in aviation education is deeply intertwined with organizational culture, and several factors within this culture contribute to the challenges faced by female students. One significant factor is the prevalence of a male-dominated culture within aviation education institutions. Women may feel marginalized, isolated, or undervalued when the organizational culture is overwhelmingly skewed toward a male perspective (Stevenson et al., 2021). This imbalance is often worsened by a lack of diversity in leadership and faculty positions, creating an environment where women struggle to see themselves reflected in key roles within the educational institution (Kim & Albelo, 2021).

The support, or lack thereof, from faculty and peers plays a pivotal role in shaping women's experiences in aviation education. If faculty members and peers fail to support and encourage women actively, it can foster a negative and discouraging atmosphere (Kim & Albelo, 2021). The absence of mentorship, guidance, and positive role models can profoundly impact a woman's confidence and sense of belonging within the educational community (Dennehy & Dasgupta, 2017; Dasgupta et al., 2015). This lack of support may contribute to a higher attrition rate as female students navigate an environment that does not actively foster their success. Similarly, stereotypes and biases among faculty members represent another formidable barrier for women in aviation education. If faculty members hold and perpetuate gender stereotypes or biases, it can influence their interactions with and evaluations of female students (Kim & Albelo, 2021).

Organizations must actively cultivate an inclusive culture to address attrition among women in aviation education. This involves promoting diversity in leadership and faculty positions, fostering a supportive environment through mentorship programs, and challenging and dismantling gender stereotypes and biases (Laursen & Austin, 2020). Furthermore, recognizing and celebrating the achievements of women in aviation education contributes to a supportive culture (Priest, 2023). This not only boosts confidence but also inspires future generations. Establishing policies that accommodate work-life balance acknowledges female students' unique

challenges in managing familial responsibilities, promoting an environment that accommodates diverse life circumstances (Priest, 2023). By creating a culture that actively values and supports the contributions of women in aviation education, institutions can enhance the retention and success of female students pursuing careers in this traditionally male-dominated field.

Educational Environment Challenge

Among the many challenges women face in aviation education, insufficient support services pose a considerable challenge. Academic advising, counseling, and career guidance are essential for student success (Dennehy & Dasgupta, 2017), but when these services are not tailored to address the unique challenges faced by women in aviation education, it could hinder their ability to navigate academic and career paths effectively. Customized support services are crucial in providing guidance and addressing gender-specific concerns. Limited access to resources further compounds the issue. In aviation education, equipment design and educational materials disparities can create a sense of disadvantage among female students. For example, most flight decks are male dimensions (i.e., flight deck ergonomics). In terms of general educational materials, books like "I'm Grad to be a Boy. I'm Glad to be a Girl" by Darrow (1970) have instilled the notion that only certain genders can achieve specific careers.

The physical and social environment of learning spaces is also a critical factor. Unwelcoming or hostile learning environments can create barriers to participation and engagement for women in aviation education. Fostering inclusive and supportive spaces is essential to promote a sense of belonging and encourage active participation among female students. For example, faculty members and flight instructors could employ critical consciousness (Albelo & O'Toole, 2021) and deliberately utilize FAA-approved gender-neutral terms such as Flight Deck instead of Cockpit.

Lastly, limited networking opportunities further hinder women in aviation education. Building professional networks is crucial for career advancement, and if female students lack opportunities to connect with industry professionals, engage in internships, or participate in networking events, it can impact their ability to explore various career paths and secure employment opportunities (Kim & Albelo, 2020; Brown et al., 2021). Creating avenues for networking and industry engagement could ensure that female students feel connected to the broader aviation community. Similarly, inadequate outreach and recruitment efforts contribute to a smaller pool of female students in aviation education programs (Lutte, 2018). Lutte (2018) suggests that educational institutions should broaden their recruitment strategies and actively reach out to potential female candidates. Proactive efforts to showcase the inclusivity of aviation programs can attract a more diverse student body.

Challenges Faced by Women in Other Disciplines

While research related to women in aviation remains scant, it is important to acknowledge that women have been historically underrepresented in other disciplines. According to the National Science Foundation (NSF, 2023), women represented 35% of people employed in STEM occupations. Furthermore, women remained underrepresented among individuals at all degree levels in engineering, mathematics, physics, and computer sciences

(NSF, 2023). Kenney et al. (2012) stated that the "change resistant STEM workforce has great influence on whether women believe opportunities are available to them" (p. 4). This means that men are typically at the top, while women fill lower positions in the workforce. Bart (2000) pointed out that women find their way into STEM fields primarily through the support of close male acquaintances. However, women entering the conventional male-dominated STEM workforce encounter additional challenges that demand their perseverance and resilience (Kenney et al., 2012).

Women's unique challenges across other disciplines have led them to imposter syndrome (Handforth, 2022). Handforth (2022) points out that despite women's academic achievements, they grapple with feelings of inauthenticity, especially as they navigate STEM disciplines' gendered and hierarchical structures. Therefore, internalized perceptions of being less than men can hinder their development of an academic identity and impact their long-term career aspirations. Similarly, Yantormo (2022) noted that societal expectations and the lack of representation in leadership roles contribute to self-doubt among higher-education women. Consequently, recognizing and addressing these challenges is crucial for fostering a supportive and equitable environment for women in higher education.

Background of the Embry-Riddle Women's Ambassador Mentoring Program (WAMP)

In 2018, the Emrby-Riddle Aeronautical University (ERAU) College of Aviation (COA) prioritized increasing and retaining underrepresented minorities in aviation education. The Women's Ambassador Mentoring Program (WAMP) was one initiative the COA established. WAMP was designed to attract and retain female students in the Aeronautical Science and Aeronautics programs based on research suggesting that mentoring is a significant factor supporting retention. The primary objective of WAMP is to provide support for female flight students, guide them through flight training, networking opportunities, and a peer support atmosphere for women to grow together as they embrace the challenges of aviation education (ERAU, n.d.). Some of the significant tasks WAMP takes on are welcoming every accepted female student to campus prior to arrival, monthly conversations with focused topics (coordinated with peer mentors), and connection to female alums via Zoom calls, campus visits, and social gatherings on and off of campus throughout the year. All first-year women are automatically invited to all events to eliminate the hurdle of "joining" this organization.

Theoretical Framework

White and Massiha's (2016) Retention of Women in the STEM framework of persistence aims to contribute significantly to the knowledge base for women interested in pursuing STEM careers. By investigating the persistence phenomenon among women in STEM, the framework seeks to advance research and education infrastructure. Understanding how women develop a sense of purpose and engagement in the classroom is essential for broadening participation and tapping into a source of talent that may not have been fully realized (White & Massiha, 2016). White and Massiha's (2016) framework also advocates for monitoring students' appreciation of the rigor in STEM fields, particularly during the early college years. While not suggesting a dilution of the curriculum, the framework encourages assessing students' recognition of the difficulty and time commitments required for success. Holistic assessments outside the

classroom, including course participation, completion of assignments, interactions with professors and peers, and engagement in group projects, are proposed to evaluate progress and identify potential challenges. White and Massiha's (2016) framework concludes that these assessments, in conjunction with other approaches, could significantly contribute to improving the retention of women in STEM disciplines.

Moreover, White and Massiha's (2016) framework emphasizes the crucial role of persistence in academic involvement and its impact on the sense of purpose necessary for academic success. It recognizes the linkage between persistence and retention, building upon major retention theories. While previous studies have only provided a cursory inspection of the connection between persistence and women, the framework proposes a more thorough investigation. The conceptual model presented serves as a structured framework for exploring the influence of societal expectations and attitudes on women's decision-making processes (White & Massiha, 2016). It recommends incorporating data collection and evaluation into retention programs and scrutinizing activities that evoke unpleasant feelings while expanding positive ones. Emphasizing time management activities is proposed to help women maintain focus and concentration in STEM courses.

Methodology

The present study utilized a transformative mixed methods approach to comprehensively investigate retention solutions for women in aviation education and flight training. According to Hafsa (2019), transformative mixed methods research incorporates the overarching concept of social justice, encompassing quantitative and qualitative data. Under this design, data can be organized simultaneously or sequentially, allowing for the construction of one data set based on the other (Hafsa, 2019). Combining quantitative and qualitative data methods allows for a more nuanced understanding of the factors influencing women's persistence in aviation education while also providing valuable insights into the effectiveness of potential retention interventions.

This research occurred at Embry-Riddle Aeronautical University (ERAU) in Daytona Beach, Florida. ERAU is a private, not-for-profit institution striving to be the world's aviation and aerospace education leader. The current population of ERAU consists of approximately 7,500 undergraduate students, with a gender distribution of 75% male students and 25% female students. Since 2018, the ERAU College of Aviation has accepted approximately 542 new aviation students into their Aeronautical Science degree program, with an average of 80 of those being female.

The present study leverages datasets from the U.S. Civil Airmen Statistics, published by the Federal Aviation Administration, and internal retention data from Embry-Riddle Aeronautical University. Data collected from ERAU's I.R. was limited to the aeronautical science students; those students are pursuing a bachelor's degree in aeronautical science, which requires flight certificates to be earned within the institution's in-house flight program. The investigation concentrates on the variables of annual enrollment of new male and female aeronautical science students at the beginning of each fall term and the percentage of aeronautical science students who retained from subsequent years up to graduation.

The qualitative data obtained was through a questionnaire distributed to current WAMP members in the Fall of 2023. WAMP membership was not tracked formally or informally until the Fall of 2023, so it is not possible to determine an accurate population. However, WAMP events were open to all freshwomen majoring in aeronautical science from 2018-2022, with about four mentors per year. Based on the data from I.R. addressed previously regarding new students in aeronautical science per year, it can be determined that WAMP consisted of no more than 80 women per year on average.

The researchers procured qualitative data via questionnaires from twelve female students participating in the Women Ambassador Program (see Appendix A). While there are approximately over 150 females participating in the ERAU College of Aviation WAMP, qualitative research often focuses on specific contexts, populations, or phenomena (Patton, 2015). Therefore, a small number of participants who represent the diversity within the target group was deemed sufficient to provide a comprehensive insight (Patton, 2015). The questionnaire was created by developing presupposition questions grounded in literature review. According to Patton (2015), presupposition questions are inquiries that assume certain information or conditions to be true. These questions often embed an assumption within them, and the response is expected to provide additional information or confirm the presupposed details (Patton, 2015). The questionnaire was delivered via e-mail, and students were asked to respond in a written format and reply to the e-mail. Students were encouraged to forward the questionnaire to other peers (snowball sampling) they felt could contribute to the study based on their experience. According to Patton (2015), snowball sampling is appropriate for hard-to-reach populations and facilitates rapport through referrals.

The researchers used thematic analysis to discern common themes, challenges, and insights about female students' experiences in aviation education and flight training. The researchers utilized NVivo® software to arrange and analyze the qualitative data. While both data types are amassed concurrently but analyzed independently, the Retention of Women in STEM framework will enable the findings to be compared and contrasted to derive comprehensive insights. The study aims to develop strategies that are not only empirically supported but also socially just.

Findings

To understand the impact of the Embry-Riddle Aeronautical University's Women Ambassador Mentoring Program within the College of Aviation, one must first understand the trends of female airplane pilots in the U.S. Table 1 highlights the total pilot certificates issued by the FAA between 2013 and 2022. Table 2 shows the rate of increase in female pilot certificates from 2013 through 2022. Figure 1 visually represents the trends in female pilot certificates compared to the total number of certificates issued each year. From 2013 to 2022. The amount of student pilot certificates issued to women averaged an increase of 13.75% each year over the 10 year span, while airline transport pilot certificates increased by less than 5% annually.

Table 1

Total U.S. pilot certificates issued by the FAA from 2013 through 2022.

Category	Year									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Student	14,405	14,369	14,580	15,971	19,219	22,266	27,255	31,687	36,618	42,184
Private	11,909	11,652	11,339	10,009	9,971	10,255	10,683	11,316	11,966	12,831
Commercial	6,911	6,685	6,587	6,081	6,267	6,556	7,038	7,724	8,421	8,925
Airline Transport	6,205	6,408	6,554	6,888	6,994	7,136	7,503	7,549	7,698	8,206
Total	**39,430**	**39,114**	**39,060**	**38,949**	**42,451**	**46,213**	**52,479**	**58,276**	**64,703**	**72,146**

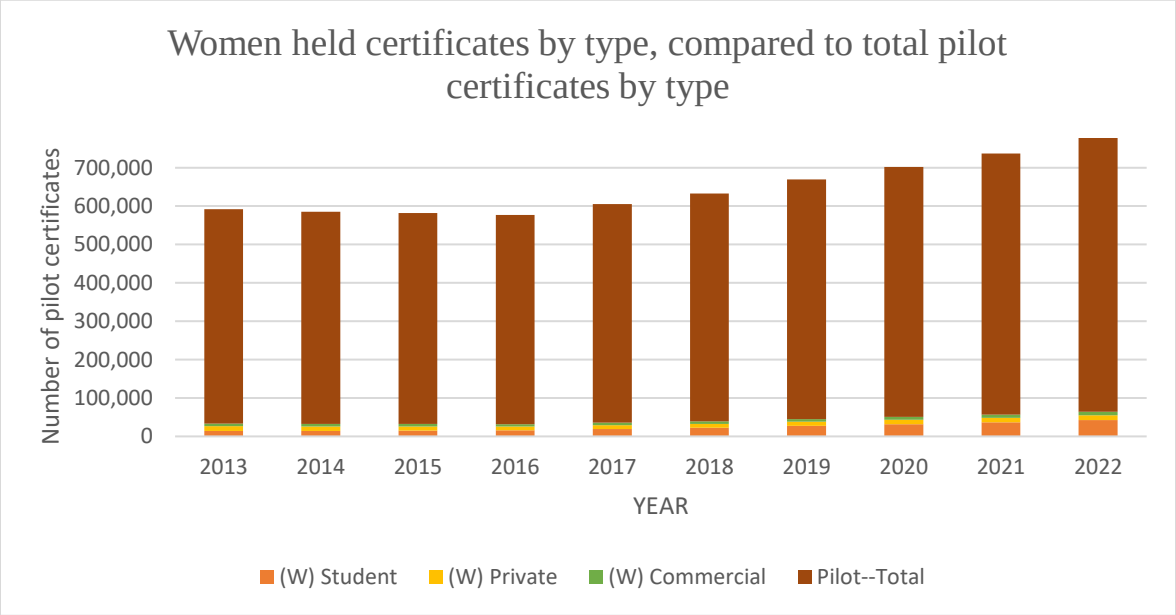
Table 2

Increase rates of pilot certificates issued to women by the FAA from 2013 through 2022.

Category	Year									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Student	12.0%	11.9%	11.9%	12.4%	12.9%	13.3%	13.8%	14.2%	14.6%	15.0%
Private	6.6%	6.7%	6.6%	6.2%	6.1%	6.3%	6.6%	7.0%	7.4%	7.8%
Commercial	6.4%	6.4%	6.5%	6.3%	6.4%	6.6%	7.0%	7.4%	8.0%	8.5%
Airline Transport	4.1%	4.2%	4.2%	4.4%	4.4%	4.4%	4.5%	4.6%	4.7%	4.9%

Figure 1

Women U.S. pilot certificates issued by the FAA between 2013 and 2022 compared to the total U.S. pilot certificates issued.



Since 2018, ERAU has averaged 419 new first-year students per academic year seeking to pursue a degree in aeronautical science to become a professional pilot. Before 2018, the average first-year student admission into ERAU's aeronautical science program was 305, and the average retention rate was 73.4%. To determine the impact of WAMP on the retention of women in aviation, ERAU Institutional Research (I.R.) provided the researchers with an excerpt of data ranging from 2018 through 2021, in which the data was broken down to show retention levels across the College of Aviation. Table 3 shows a gender breakdown of students who joined ERAU to attain a degree in aeronautical science. Table 4 shows the retention of aviation students broken by gender.

Table 3

Total new students pursuing an Aeronautical Science degree at ERAU.

Year	Gender		% of Students
	Women	Men	Women
2018	59	347	14.5%
2019	86	397	17.8%
2020	78	289	21.3%
2021	97	404	19.4%
Average	80	359.25	18.25%

Table 4

Percentage of student retention pursuing an Aeronautical Science degree at ERAU.

Year	Gender		
	Women	Men	Total
2018	85.3%	69.5%	77.4%
2019	84.1%	73.8%	79.0%
2020	75.2%	74.8%	75.0%
2021	79.1%	74.3%	76.7%
Average	81%	73%	77.0%

Three major themes emerged from the qualitative data set and the use of thematic analysis: Peer Support, Empowerment, and Mentorship. Table 5 summarizes the codes and representative statements that lead to each major theme.

Table 5

Themes and Open Codes

Major Themes	Codes	Statements
Peer Support	Camaraderie	"Having fellow female aviation students to talk about coursework and flight training makes a huge difference."
		"Being a part of a women's aviation group has been a life-changing experience for me. I have made life-long friends and learned so much from them."
	Shared Experience	"I have found that our women aviation community has been incredibly supportive and welcoming."
		"We share a common passion for flying and have formed a strong bond that has helped us navigate the unique challenges of being a woman in a male-dominated field."
		"WAMP has given me the opportunity to connect with other female pilots and share our experiences."
	Community	"The Women Ambassador Program has provided me with opportunities to network with other women in aviation, which has made me feel supported."
		"I have been able to attend different event were industry female share their experiences, tips, and advice on how to succeed after graduation."
Empowerment	Resilience	"Through WAMP, I have been able to mentor other female pilots and help them navigate the challenges of flight training."
		"My mentor has enabled me to embrace my strengths and weaknesses."
		"During tough times, the shared commitment to our goals makes facing challenges in aviation education more bearable."
	Celebration	"We've created a support network that celebrates each other's achievements, big or small."
		"I like being able to celebrate the achievement of fellow alumni at different conferences and events."
Mentorship	Confidence Building	"Regular check-ins with my mentor have been instrumental in building my confidence as a female in a male-dominated industry."
		"The biggest takeaway from the women ambassador program has been overcoming initial self-doubts with the encouragement of my mentor."
	Networking Opportunities	"Through mentorship, I've gained access to a broader professional network, opening doors to valuable connections within the aviation community."

Discussion

To summarize the research questions, the primary purpose of this research was to investigate the retention issues women face in collegiate aviation education and flight training and evaluate the effect of a given mentoring program on their persistence and success in the field. By examining the factors contributing to attrition, such as gender-specific challenges, organizational culture, and educational environments, this study aims to provide actionable insights that can inform policies, practices, and interventions to support the long-term engagement and success of women pursuing careers in aviation. An evident solution is the implementation of a Women Ambassador Mentoring Program (WAMP).

Members of WAMP responded to the questionnaire in writing, and the themes of the responses are represented in Table 5. Based on the major themes that emerged from the data, it is evident that WAMP influences the retention of women in collegiate aviation education and flight training by providing them with a peer support system, empowerment, and mentoring. Students engage in camaraderie, share their experiences, and build a sense of community through WAMP and the associated events. At a glance, camaraderie facilitates networking (Kim & Albelo, 2020), which is crucial for future career opportunities. Women who form strong connections during their higher education years are more likely to have access to a broader professional network (Handforth, 2022), increasing their chances of success in collegiate aviation education. The students' responses articulate that programs like WAMP allow its members to share their experiences, creating a sense of solidarity and understanding among women in aviation. Similar to the findings by Kim and Albelo (2020 & 2021), WAMP's peer support helps to empower women to overcome challenges, whether they are related to gender bias, career choices, or training difficulties. Furthermore, findings indicate that a supportive community opens doors to various career development opportunities. Women can access resources, job leads, and guidance on advancing their careers (Lutte, 2018) within aviation higher education through the connections established within the community.

Programs like WAMP also empower women in aviation, contributing to their retention in collegiate aviation education and flight training. The findings show that resilience is a crucial trait for women undergoing collegiate flight training, and its importance is closely tied to empowerment. Resilience contributes to "increased pilot well-being and coping from adversity" (Douglas & Pittenger, 2020, p. 9). As women in aviation encounter various challenges during flight training (Kim & Albelo, 2020), the ability to persevere enhances their self-belief and confidence in their capabilities (Douglas & Pittenger, 2020), leading to greater empowerment. Moreover, the findings indicate that celebrating females in aviation is vital for retaining women in collegiate flight training. Recognizing and highlighting the achievements of the WAMP members contributes to a positive and inclusive culture, potentially encouraging more women to persist in aviation careers.

Finally, WAMP influences the retention of women in collegiate education and flight training through a strong mentorship network. The final theme of mentorship was built upon by confidence and networking. Having a person with a similar perspective on the experience as oneself to share experiences and determine if they are on course is vital in female student

retention. Mentors who can check in with their students and provide insight into what is normal or not can help students reduce imposture syndrome and improve confidence, previously mentioned as a key component to persistence. Additionally, mentors help introduce their mentees to professional organizations and other important people on campus. This can be done by simply being a partner to attend an event hosted by a potential employer, opening doors for their future, otherwise unreachable. Mentors could offer advice on career development, helping women set and achieve their educational and professional goals (Dasgupta et al., 2015). This guidance is instrumental in advancing their careers within the aviation industry, creating a pathway for growth, and enhancing their commitment to long-term retention (White & Massiha, 2016). Connecting with experienced individuals in the aviation industry through mentors introduces women to a broader community. For example, one participant mentioned, "my [WAMP] mentor introduced me to female leaders in the industry, such as the President of the Latino Pilot Association, who has been an instrumental resource in my flight training success." This expanded network can possibly provide additional support, resources, and opportunities, fostering a sense of belonging.

Data from Tables 1 and 2 elucidate a modest increase in female pilot certificate issuance nationally; however, a stark gender disparity remains prevalent. Integrating White and Massiha's (2016) Retention of Women in STEM framework of persistence aims to contribute significantly to the knowledge base for women interested in pursuing STEM careers. The framework accentuates self-efficacy, outcome expectations, interest development, and support as cornerstones for women's persistence in STEM. The Women Ambassador Mentoring Program encapsulates these elements by fostering an environment where female students are aided through peer support, empowerment, and mentorship. ERAU's WAMP stands out as a source of optimism in light of the obstacles encountered by women in aviation education and flight training. Since its inception in 2018, there has been an observable uptick in female enrolment (Table 3), representing an additional 5% of the student population for first-year students, indicating the program's initial success in growing the female pilot population. ERAU Institutional Research (I.R.) data further corroborates the program's impact, showcasing improved retention levels from 2018 through 2021.

Table 4 shows the impressive influence of WAMP in the context of retention for women students pursuing aeronautical science degrees. Initially, the review shows that from 2018-2020, female students' retention rates decreased while their male counterparts increased. In the year following significant retention loss as a result of COVID-19, there was a 5% increase in female retention; conversely, male students remained relatively consistent. Additionally, it should be noted that the female retention rates remained above male retention rates throughout the time frame of WAMP's existence, with the lowest retention rate for women remaining above the highest retention rate for men.

Despite gender-specific obstacles and systematic biases in aviation education and flight training programs, targeted interventions like WAMP show promising prospects for retaining women. Therefore, based on the findings of this research, women ambassador mentoring programs positively affect female retention in aviation education and flight training. By

adhering to White & Massiha's (2016) Retention of Women in STEM—enhancing self-efficacy through mentorship programs, bolstering outcome expectations through real-world exposure, nurturing interest with engaging curricula, and providing robust support networks—we can cultivate an environment where women not only enter but also thrive within the aviation sector. The positive trend in issuing female student pilot certificates could increase with the potential effectiveness of tailored interventions like WAMP over the years. Aligning organizational culture with inclusive practices that address gender-specific barriers can enhance and amplify these efforts.

Limitations and Future Research

This study was accomplished with a few limitations. First, the study only examined female students from a single higher education institution. This means the study's findings may not be generalizable to other institutions or contexts outside the aeronautical science and flight training field. For example, the institution's unique characteristics, such as location, student demographics, and curriculum, may have influenced the results. Future research could benefit from examining multiple institutions to determine whether the findings are consistent across different contexts. Second, the quantitative data given to the researchers was only from 2018-2022. This means that the study may not reflect the current situation or changes since 2022, such as changes in the aviation industry, the institution's policies, or the student population. Future research could benefit from using more recent data to determine whether the findings are still relevant.

Regarding the qualitative aspect of this study, some limitations include subjectivity, small sample size, and difficulty in replication. As Patton (2015) noted, qualitative research is inherently subjective, as it involves interpretation and understanding of meanings. To minimize the exposure to subjectivity, the researchers engaged in epoche. Furthermore, the small sample used in this research limits the generalizability of the findings; however, it was necessary for an intentional, in-depth exploration of female students participating in the Women Ambassador Program. Additionally, replicating mixed methods studies can be challenging due to the context-specific nature of qualitative research. Others may have difficulty reproducing the study with the same results due to variations in context or participants. Lastly, the snowball sampling technique used includes limitations such as potential bias in participant selection, as the sample may become skewed towards individuals who are more connected or outspoken within the community (Patton, 2015).

Moreover, it is crucial to delve into the specific factors that attract women to the aviation field. Therefore, future research should employ qualitative methods to capture the nuanced experiences, motivations, and influences that drive women towards aviation careers. Exploring the impact of role models, educational experiences, and societal perceptions will provide valuable insights into the dynamic interplay of factors that shape women's choices in pursuing aviation as a profession. Moreover, future research should examine how obtaining a private pilot certificate before pursuing higher education affects the retention of women in aviation higher education. This research could involve longitudinal analyses tracking the career trajectories of

women who earned their private pilot certificates before entering formal aviation education programs.

Despite the limitations mentioned and the need for future research, the study provides valuable insights into retention solutions for women in aviation and flight training. Given the underrepresentation of women in the field, the study's focus on women in aviation is critical. The study's findings could inform policies and practices to improve the retention of women and minorities in aviation education and flight training. However, it is essential to consider these limitations when interpreting these results.

Conclusion

The findings of this study reveal that retaining women in aviation education and flight training is a multifaceted challenge requiring a comprehensive understanding of contributing factors. Three key elements affecting women's retention are peer support, empowerment, and mentorship. Peer support is crucial for creating a conducive learning environment, allowing women to navigate shared challenges through mutual experiences. Peer support networks within institutions facilitate connections, knowledge exchange, and collaborative problem-solving, enhancing the aviation education experience and promoting retention. Moreover, empowerment significantly influenced women's retention, focusing on building confidence, self-efficacy, and agency. Initiatives providing skill development, leadership training, and highlighting female accomplishments foster an environment where women feel empowered to overcome challenges and pursue their aspirations. Mentorship programs with mentors who have experienced flight training challenges offer valuable guidance, insights, and personalized support.

The Women's Ambassador Mentoring Program (WAMP) has positively supported women in aviation education and flight training. This specialized initiative addresses retention challenges, fostering community and shared experiences among female aviators. WAMP contributes significantly to an enhanced sense of belonging, which is pivotal in observed retention improvements. As women's retention rates consistently surpass their male peers, increasing the number of women in these programs is expected to enhance overall retention rates. This positively impacts the percentage of female pilots and contributes to the national increase in female pilot certificates. Therefore, ambassadorial programs like WAMP should be implemented in other professional pilot-type degree programs to encourage female enrollment and improve retention rates. These programs must be adjusted to meet individual program and student needs, requiring strong faculty leadership and adequate funding for continued support.

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Appendix A

Questionnaire

1. How would you describe the impact of the Women Ambassador Mentoring Program on the retention of women in aviation higher education?
2. Why do you believe mentoring programs play a crucial role in retaining women in the field of aviation?
3. Describe the specific challenges that women in aviation face, and how do mentoring programs address these challenges?
4. How do Women Ambassador mentoring programs contribute to fostering a supportive and inclusive environment for women in aviation higher education?
5. Why do you think mentorship is essential for the professional development and academic success of women in aviation?
6. Describe any notable success stories or positive outcomes that can be attributed to Women Ambassador mentoring programs in the context of retaining women in aviation higher education.
7. How do mentoring relationships established through Women Ambassador programs differ from other forms of support, and what unique benefits do they offer?
8. Why is it important to tailor mentoring programs to the specific needs and aspirations of women in aviation higher education?
9. How have Women Ambassador mentoring programs evolved over time, and what changes or improvements have been observed in their effectiveness?
10. Describe the key factors that contribute to the success or effectiveness of Women Ambassador mentoring programs in the retention of women in aviation higher education.

11. Why is it crucial to have a diverse pool of mentors in Women Ambassador programs, and how does diversity enhance the overall impact on women in aviation higher education?
12. How do Women Ambassador mentoring programs address potential barriers and biases that may exist in the field, thereby promoting equality and inclusivity?
13. Why do you think participation rates in Women Ambassador mentoring programs vary, and what strategies can be employed to increase engagement and effectiveness?
14. Describe any challenges or limitations associated with Women Ambassador mentoring programs and how these challenges can be mitigated or overcome.
15. How do Women Ambassador mentoring programs complement other initiatives aimed at promoting gender diversity and equality in aviation higher education?