UAA UNIVERSITY AVIATION ASSOCIATION

Collegiate Aviation Review International

Volume 42 | Issue 2 Proceedings of the 2024 UAA Annual Conference, Article #11

12-31-2024

Pathways to Retention for Women in Aviation Education

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Although there have been strides in aviation, women continue to be underrepresented, especially in pilot roles. To address this gap, Embry-Riddle Aeronautical University launched the Women's Ambassador Mentoring Program (WAMP) to improve female students' recruitment and retention in aeronautical science programs. However, there are ongoing concerns that limited support structures may hinder progress. Our line of research uses a transformative mixed-method approach, integrating quantitative data and qualitative feedback from students involved in the program. It evaluates trends in female aviation student enrollment alongside the growth of certified female pilots, focusing on the university's female enrollment and retention rates over time. The findings underscore the critical role of a supportive environment, highlighting how connection and positive mentorship can help current and future women pilots thrive in the aviation field.

Recommended Citation:
Bowyer, S., Albelo, J., & Wiggins, M. (2024). Pathways to retention for women in aviation education. *Collegiate Aviation Review International, 42*(2), 267-275. Retrieved from http://ojs.library.okstate.edu/osu/index.php/CARI/article/view/10030/8916

Introduction

The historical underrepresentation of women in aviation underscores the need for strategies that actively promote retention and diversity. While there has been notable progress in increasing gender diversity through initiatives such as scholarships and mentorship programs, retention remains a significant challenge due to persistent stereotypes, biases, and insufficient support structures (Albelo & O'Toole, 2021; Kim & Albelo, 2020). Our research investigates retention obstacles for women in collegiate aviation education and training, focusing on how targeted interventions can promote a more inclusive aviation workforce.

Gender-Specific Challenges

The retention of women in aviation education and flight training is impacted by numerous gender-specific challenges, which include entrenched stereotypes, a shortage of support structures, limited visibility of role models, and the complexities associated with balancing work and life responsibilities. Together, these factors create an environment where women face disproportionate obstacles compared to their male counterparts, contributing to higher rates of attrition among female students pursuing careers in aviation. One of the foundational gender-specific challenges that women encounter in aviation is the prevalence of ingrained stereotypes and biases, which continue to shape the industry's culture and expectations. Historically, aviation has been regarded as a male-dominated field, with the perception of technical and piloting roles as predominantly masculine. These stereotypes often reinforce the notion that aviation is "unsuitable" for women, subtly or overtly questioning their capabilities in these roles. This results in an environment where female students may feel unwelcome or judged more critically than their male peers. A study by Kim and Albelo (2020) highlighted that such biases can profoundly affect female students, diminishing their confidence and sense of belonging within their programs. These biases, often held by both faculty and male peers, can manifest in discouraging comments, reduced expectations, or unequal access to learning opportunities, ultimately impacting female students' motivation and perseverance.

In addition to stereotypes, the lack of support systems tailored to address the unique needs of women in aviation poses a significant retention barrier. In many aviation programs, there is a scarcity of mentorship opportunities specifically designed for women, which leaves female students without essential guidance and support as they navigate their education and training. Female students in aviation often express that they lack access to mentors who can empathize with their experiences and provide relevant advice. Research by Kim and Albelo (2021) indicates that the absence of these critical support structures leads many women to feel isolated and unprepared for the challenges they encounter, which could be alleviated by mentorship from women who have succeeded in similar paths. The establishment of mentoring networks has shown the potential to mitigate feelings of isolation and discouragement, creating a sense of community that can significantly impact female retention in aviation education (Albelo et al., 2023; Kim & Albelo, 2021; Lutte & Morrison, 2022).

Another critical challenge is the limited visibility of successful female role models in aviation, which exacerbates the feeling of isolation and affects women's self-efficacy in the field. Women in aviation programs often struggle to envision themselves in leadership or advanced

technical roles due to the scarcity of women in these positions. As Albelo et al. (2023) found, the lack of relatable role models hinders female students' ability to see a clear and achievable career path in aviation. While organizations like the Ninety-Nines and Women in Aviation International have made strides in promoting female accomplishments, visibility remains limited within educational institutions and flight schools. Greater representation of women in faculty and leadership roles within aviation programs could counteract this effect, providing female students with tangible examples of success and encouraging them to persist in their training.

Balancing work-life responsibilities presents an additional gender-specific challenge, as many women face societal expectations regarding family obligations that may conflict with the demanding nature of aviation training. Unlike many other professions, aviation training often requires long hours and a significant commitment of time and energy, which can be difficult to reconcile with family or personal obligations. According to research by Stevenson et al. (2021), work-life balance is a significant factor in female students' decision-making, with many women perceiving aviation careers as incompatible with their long-term personal or family goals. Women in aviation education often feel compelled to choose between their aspirations in aviation and potential family responsibilities, a choice not as commonly faced by their male peers. Addressing this barrier requires institutional flexibility, such as accommodating schedules or promoting career options that allow for a balanced work-life structure, to ensure that women feel empowered to pursue their aviation goals without compromising their personal lives.

Finally, unconscious bias presents a persistent challenge for women in aviation education and flight training, where assessments of women's performance are sometimes unfairly influenced by gendered perceptions. This can take the form of biased grading, unequal feedback, or the tendency to overlook women for advanced training opportunities, which further discourages their participation. As highlighted by Dennehy and Dasgupta (2017), unconscious bias is often subtle but can lead to a perception among female students that their skills are undervalued, affecting their motivation to persist. This bias is particularly problematic in aviation, where performance evaluations are crucial to progression and career opportunities. By implementing diversity and sensitivity training, educational institutions can reduce unconscious bias, ensuring that assessments are objective and based solely on performance.

In sum, the gender-specific challenges faced by women in aviation education and flight training contribute significantly to attrition rates. Addressing these issues necessitates a multifaceted approach, including challenging stereotypes, providing support systems, increasing the visibility of role models, accommodating work-life balance, and mitigating unconscious bias. Implementing these changes can foster an inclusive and supportive environment where women feel empowered to pursue and succeed in aviation, ultimately strengthening the diversity and capability of the future aviation workforce.

Organizational Culture and Support Structures

The culture and support structures within educational institutions and aviation organizations play a crucial role in shaping female students' experiences and retention rates in aviation education. An inclusive and supportive organizational culture is essential for creating an environment where all students, regardless of gender, feel welcomed, valued, and empowered

to succeed. Yet, many aviation programs and organizations continue to operate within a framework that unintentionally marginalizes women, impacting their sense of belonging and long-term commitment to the field. Organizational culture in aviation education is often rooted in traditional, male-dominated norms that have historically defined the industry. This cultural legacy can create an unwelcoming or even hostile environment for female students, who may feel as though they must constantly prove their competence to be taken seriously. As highlighted by Kim and Albelo (2020), the dominant culture within aviation education can often lead to an implicit "prove-it-again" bias, where women are frequently asked to demonstrate their skills or knowledge more than their male counterparts. This culture of skepticism toward female competence can be exhausting, causing women to feel alienated and frustrated, ultimately contributing to higher attrition rates. Institutions committed to diversifying their student body must acknowledge these implicit biases and take concrete steps toward fostering an inclusive environment where all students are supported equitably.

Mentorship and networking opportunities are also essential to support structures that play a significant role in retaining female students in aviation education. Access to mentors who can offer guidance, encouragement, and industry insights is invaluable, especially for women who may lack role models in their immediate academic environment. Albelo et al. (2021) have shown that women with access to mentors, particularly female mentors, demonstrate higher retention and completion rates in aviation programs. This is partly because mentorship provides emotional support and practical advice that help female students navigate their unique challenges. However, aviation programs often lack formal mentorship structures, leaving many female students to rely solely on informal connections or external organizations for support. Establishing formal mentorship programs within aviation institutions can bridge this gap, providing female students with access to consistent support and encouragement throughout their educational journey.

In addition to mentorship, creating supportive networks that foster a sense of community among female students and faculty can enhance retention rates significantly. Many women in aviation education report feeling isolated or disconnected due to the small number of female peers and faculty members within their programs (Albelo et al., 2024). This isolation can be mitigated by institutional initiatives that encourage peer networking, collaboration, and community building. Examples include women-focused student organizations, professional development workshops, and events that promote networking among female students and industry professionals. These support networks allow female students to connect with others facing similar challenges, creating a collective sense of belonging and resilience. When students feel that they are part of a community that understands and supports them, they are more likely to persist in their studies and enter the aviation workforce.

Access to resources and equitable opportunities is another critical aspect of organizational support that affects female retention in aviation. Resource disparities—whether in access to flight training, funding, or career counseling—can disadvantage female students, impeding their progress and diminishing their motivation to continue. Research has shown that male students often receive more informal support from faculty or peers, while female students may struggle to access the same resources or guidance. Providing equitable resources, including financial support and access to necessary training tools, is essential to leveling the playing field

and ensuring that female students can succeed on equal footing. Institutions should assess their resource distribution policies and practices to identify and eliminate disparities that hinder female students' progress. Therefore, organizational culture and support structures are fundamental to creating an environment where women can thrive in aviation education. Inclusive culture, formal mentorship programs, supportive networking, and equitable access to resources all play crucial roles in retaining female students in aviation. By addressing these areas, aviation institutions can foster a positive and supportive atmosphere that encourages women to persist in their studies, ultimately contributing to a more diverse and skilled aviation workforce.

Educational Environment

The educational environment in aviation education plays a fundamental role in shaping the experiences and outcomes of female students. One of the key issues affecting female students is the implicit and sometimes explicit gender bias present in classroom dynamics and educational practices. Female students feel marginalized during theoretical and practical (flight) lessons. They may experience differential treatment from instructors, such as assumptions about their capabilities based on gender rather than merit (Kim & Albelo, 2020). These experiences can undermine self-confidence and hinder participation, making it challenging for women to engage fully in their studies. Addressing these biases requires a proactive approach, including sensitivity training for faculty and promoting gender-neutral interactions to ensure that all students, regardless of gender, feel equally valued and supported.

The availability and design of learning resources, including textbooks, instructional materials, and equipment, also play a critical role in shaping the educational environment for women in aviation. Many of these materials and resources have traditionally been tailored to male-dominated industries, which can inadvertently alienate female students. For example, training materials and aircraft simulators are often designed around male physical attributes, creating ergonomic challenges for women and reinforcing the perception that they are "outsiders" in the field.

The physical and social environment within aviation learning spaces further impacts retention. Learning spaces where women feel uncomfortable, isolated, or underrepresented can amplify their challenges, reinforcing a sense of exclusion. Creating inclusive learning environments fosters supportive classroom cultures and offers opportunities for female students to engage in peer networking and collaborative projects. For instance, aviation programs could develop women-focused study groups, project teams, or lab partnerships to build community among female students and allow them to support each other in overcoming shared obstacles. Lastly, fostering inclusivity within the educational environment is essential for building a strong, diverse aviation workforce. Institutions that prioritize inclusivity through open discussions on gender equity, inclusive policies, and diversity-oriented curricula help create a supportive environment that enables all students to thrive. By actively cultivating a learning environment that values diversity, aviation programs can empower female students to overcome traditional barriers, persist in their education, and contribute meaningfully to the aviation industry.

Case Study: The Women's Ambassador Mentoring Program (WAMP)

The Embry-Riddle Aeronautical University Women's Ambassador Mentoring Program (WAMP) was launched to address the gender disparity in aviation and provide essential support structures to improve retention for female students pursuing careers in aeronautical sciences. The program was designed as a targeted intervention, aiming to mitigate the isolation, bias, and structural barriers that women often encounter in a male-dominated field. By focusing on mentorship, peer support, and empowerment, WAMP offers a case study of how structured programs can foster inclusivity and significantly influence retention rates among female aviation students.

One of the key components of WAMP is its mentorship network, which pairs incoming female students with mentors who are further along in their academic journey or are experienced professionals in the aviation industry. This mentor-mentee relationship is designed to provide female students with guidance, support, and a role model they can relate to, helping them navigate academic challenges and adjust to the demands of flight training. Mentors help their mentees with everything from understanding course material to coping with the pressures of flight training, creating a continuous support system that often extends beyond academics. This close-knit mentorship community addresses the lack of representation that can make female students feel disconnected, reinforcing a sense of belonging and community that is essential for their retention and long-term success.

Another core element of WAMP is its emphasis on professional development, offering workshops, guest speakers, and networking opportunities specifically for women in aviation. These events expose participants to industry leaders and potential career pathways, enabling female students to envision themselves in various aviation roles and set clear career goals. Additionally, by bringing in guest speakers who share insights on overcoming gender-specific challenges in the industry, WAMP normalizes conversations around inclusivity and resilience, reinforcing female students' confidence and commitment to their chosen field.

The program also fosters a culture of collaboration and peer support, encouraging participants to work together on projects, share experiences, and celebrate each other's successes. This environment creates bonds between female students, which can be crucial in sustaining morale and motivation during challenging periods. WAMP's focus on peer relationships means that female students are building their network within the university and are more likely to find allies and collaborators in the industry post-graduation. This sense of community serves as a buffer against the biases and isolation that female students may face, allowing them to maintain focus on their education and career goals despite external pressures.

Since its inception, WAMP has demonstrated a measurable impact on female retention rates within the university's aviation programs. Institutional data shows an increase in the enrollment and retention of female students, with higher graduation rates among those participating in WAMP compared to those who do not (Albelo et al., 2024). These outcomes underscore the importance of specialized programs in bridging the gender gap in aviation, highlighting WAMP as a replicable model that other institutions can adapt to promote diversity and inclusivity within their aviation education programs. By addressing the specific needs of women in aviation, WAMP offers a sustainable solution to fostering gender equity in this field,

illustrating how targeted support structures can empower female students to succeed and thrive in aviation.

Conclusion and Implications

This research highlights the urgent need for targeted interventions to address gender disparities in aviation education and training, specifically through initiatives like the Women's Ambassador Mentoring Program (WAMP). The challenges faced by women in aviation are multifaceted, encompassing gender-specific stereotypes, organizational culture constraints, and a lack of tailored educational support structures. These barriers not only hinder the recruitment of women into aviation but also contribute to high attrition rates among female students. Additionally, WAMP's policy of simply inviting all freshwomen into the program without the barrier to "join" appeared to have a positive impact on participation. WAMP's case study demonstrates how structured mentorship, peer support, and empowerment-focused initiatives can counteract these challenges, creating an inclusive environment that significantly enhances retention rates for women in aviation programs.

The findings of this research have far-reaching implications for both educational institutions and the aviation industry. Institutions that incorporate mentorship and support networks tailored to women's unique challenges are more likely to retain female students, thereby increasing the pipeline of qualified women entering the aviation workforce. Furthermore, programs like WAMP offer a replicable model that other aviation and STEM fields can adopt to foster diversity and inclusivity within male-dominated sectors. Such programs benefit individual students and contribute to an industry-wide shift toward a more equitable and supportive culture for all aspiring aviation professionals.

At an industry level, improving the retention and success of women in aviation education has long-term implications for workforce diversity, innovation, and productivity. Companies that prioritize gender diversity benefit from a wider range of perspectives, skills, and ideas, which ultimately drive operational and competitive advantage. Addressing gender equity in aviation education also enhances the industry's reputation, attracting more women to consider careers in this field and gradually closing the gender gap. As this study demonstrates, implementing targeted programs to support women in aviation is not only an educational imperative but also a strategic industry investment that promises to strengthen the aviation sector's growth and resilience in an increasingly diverse global market.

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