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About **the Council**

ATEC was founded in 1961. Its mission is to promote and support aviation maintenance technical education.

The council actively engages with regulatory and legislative bodies to advocate on behalf of the community, and provides resources, continuing education, and networking opportunities for our members.

Our membership is made up of employers, vendors, and educational institutions with aviation technical programs. The vast majority of member schools are certificated by the FAA to provide aviation mechanic programs.

Membership supports the following activities and initiatives—

- Advocating for sound regulatory policy, the development of clear and concise guidance, and consistent enforcement and application
- Participating on industry and agency committees to further aviation technical education and workforce development
- Fostering and supporting career pipeline partnerships between industry and educational institutions
- Facilitating networking opportunities through the annual conference, Washington fly-in, regional outreach meetings, and virtual webinars
- Enhancing aviation technical career awareness through support of ATEC's sister organization, Choose Aerospace

About **the Journal**

The *ATEC Journal* (ISSN 1068-5901) is a peer-reviewed, biannual electronic publication. The publication provides an opportunity for educators, administrators, students and industry personnel to share teaching techniques and research. Authors are encouraged to submit their articles for publication consideration, whether scholarly, research, application, or opinion, by using the submission form below. Papers supporting the council's regulatory and legislative agenda may be considered for presentation via online webinar and at the annual conference. Suggested topics include:

- Technical and soft-skills curriculum integration
- A history of legislative actions affecting aviation maintenance workforce development
- A study on implementing employer-education partnerships
- Funding implications stemming from Bureau of Labor Statistics occupational outlooks
- Highlighted innovations in the aviation maintenance industry
- A look at successful online teaching methods and subject matter in other technical fields
- Surveying currently used computer-based teaching across aviation maintenance training schools

SUBMISSION DEADLINES

Fall Issue Closing Date: October 1 • Spring Issue Closing Date: May 1

SUBMIT AN ARTICLE FOR REVIEW AT ATEC-AMT.ORG/THE-JOURNAL.HTML

Cover photo courtesy of
Spartan College of Aeronautics

from the EDITOR

This issue of the ATEC Journal brings you two academic pieces from our fellow AMT instructors. James Barker from Southern Illinois University discusses results from conducting focus groups in which students provided insights to what drew them to studying for a career in aviation maintenance and what they perceive might be driving potential students away from the field. His article should prove to be quite useful to programs in both its findings and as an example for conducting similar meetings to help recruitment efforts.

Richard Johnson from Liberty University provides a review of literature on the necessity and benefits of adapting teaching methods and styles to meet the change in the dominant learning styles of students. Implications include not only further academic success of students but the advancement of the aviation maintenance industry's technologies.

We also are pleased to present to the reader an opinion piece from a collaboration between the Experimental Aircraft Association and Appalachian State University. Kevin Sutton, EdD, Dominick Manusos, EdD, and Paul Maloy introduce the AeroEducate curriculum from EAA that promotes careers in aviation to a younger K-12 audience and how AMTS can use this curriculum to create potential opportunities for future students.

Thank you all for your continued support of this Journal and of ATEC. And as always, many thanks to the Editorial Board members for their efforts that sustain the Journal.

Best,

Karen Jo Johnson, Ph.D.

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Committee Updates

Committee membership is open to all individuals employed at ATEC member organizations. Explore initiatives below and get involved! Email atec@atec-amt.org to join a committee.

Click here to view full committee rosters

MEETING PLANNING COMMITTEE

We're thrilled to reflect on the tremendous success of our 2024 conference, boasting record-breaking attendance, the largest exhibitor hall to date, and unprecedented sponsor support. A heartfelt thank you to our gracious host, Pima Community College, and our esteemed presenting sponsor, Bombardier. We extend our gratitude to all attendees whose contributions made this event truly remarkable.

The wheels are already in motion for next year's conference in Norfolk, Virginia! Aviation Institute of Maintenance is excited to welcome you to our flagship campus' city, alongside our presenting sponsor, Piedmont Airlines.

Next year's conference will feature informative sessions, amazing food, open waters, and the return of our beloved beer plane—designed, manufactured, and maintained by one of our own.

Agenda development is underway. Have a topic you're eager to share with the community? Respond to our call for presentations; details can be found on page 4.

Mark your calendars for March 16-19, and be on the lookout for registration, which will open in the fall. Meanwhile, exhibitor and sponsorship opportunities abound. Learn more at https://www.atec-amt.org/events/2025-annual-conference.

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LEGISLATIVE COMMITTEE

After numerous extensions and months of anticipation, Congress stands on the brink of finalizing a deal to advance comprehensive legislation reauthorizing the Federal Aviation Administration (at the time of drafting this article, the Senate had passed the bicameral legislation, with the House aiming for a final vote by May 17).

This groundbreaking bill is poised to address each of ATEC's legislative priorities, spanning from expanding the FAA workforce development grant to enhancing the airman certification standard system and establishing dedicated pathways for transitioning military personnel. The committee eagerly anticipates the implementation of these initiatives and their passage to our colleagues in the regulatory committee.

Join us in Washington! The 2024 Fly-in will convene in our nation's capital from September 17-20. The committee is diligently crafting a purposeful and pertinent agenda, featuring open discussions with regulators, industry stakeholders, and congressional leaders. For further details and registration, please visit https://www.atec-amt.org/events/2024-flyin.

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CHOOSE AEROSPACE

ATEC's flagship initiative, Choose Aerospace, aimed at bolstering new talent pipelines into the industry and part 147 programs, is gearing up for its third academic year.

The Choose Aerospace general aviation maintenance curriculum is currently deployed in 31 schools and 574 students across 15 states. With fourteen new applicants and over 300 expected new students for the upcoming school year, enrollment is projected to exceed 1000 students in the coming academic year.

In readiness for both new and returning educators, ATEC Academy is facilitating the annual teacher training, slated for June 11-13 at Tulsa Technology Center. We sincerely thank the master A&P instructors who will support the "train the trainer" three-day session, imparting invaluable knowledge to teachers and bolstering our secondary and community-based aviation programs. Further details about the training, which is offered free to Choose Aerospace teachers, can be found at https://www.chooseaerospace.org/teacher-training.html.

This year's teacher training will once again feature an opportunity for employers to network with Choose Aerospace program educators through the Industry Showcase. We acknowledge the vital role of industry support in providing this training at no cost and express our appreciation to participating organizations in advance. To reserve a table, please visit https://www.chooseaerospace.org/exhibit.html.

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ATEC ACADEMY

ATEC Academy, a board-led initiative, addresses the pressing challenge of recruiting and retaining skilled aviation instructors amidst the growing demand for technical expertise. Spearheaded by a seasoned educator with extensive experience in teacher training and supported by a team of expert A&P master teachers providing mentorship, this exclusive course launched its inaugural cohort in the days leading up to the annual conference in March.

The program commenced with a two-day in-person training and subsequently transitioned to a virtual format, scheduled to conclude next month. Over the course of three months, participants receive comprehensive training in active teaching strategies, student behavior management, assessment methods, lesson planning, and current trends in education, with a specific focus on technical training. While initially designed for new educators in the secondary and post-secondary classroom, it has proven a valuable resource for industry training personnel and seasoned instructors seeking skill enhancement.

Amidst ongoing sessions, the course has garnered enthusiastic reviews, prompting the scheduling of the next offering. Registration is now open for our second cohort, set to commence at Moore Norman Technology Center on August 10-11, 2024. Responding to initial feedback, the course has been enhanced and is limited to 20 students. Secure your spot now at [registration link].

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REGULATORY COMMITTEE

The committee has spent some time contemplating its next move in the regulatory arena, following the seemingly smooth transition to the new part 147 and mechanic airman certification standards (ACS). The next advocacy phase will focus on testing system enhancements, ACS revisions, and increased testing accessibility.

Eager to delve into these initiatives, the committee looks forward to discussing them with our FAA counterparts at the upcoming ATEC Fly-in (mentioned and linked above in the Legislative Committee report). We encourage you to seize the opportunity for face-to-face engagement with officials tasked with shaping national policies that influence aviation education.

Learn more about ATEC's regulatory priorities for the coming year at https://www.atec-amt.org/regulatory-priorities.

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ATEC 2024 WASHINGTON FLY-IN

SEPTEMBER 17-20

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SPONSORSHIP OPPORTUNITIES

ATEC CALL FOR PRESENTATIONS

The Council is currently accepting scholarly, research, application, or opinion articles for the ATEC Journal. Published authors are offered the opportunity to present the topic at the annual conference in Tucson. Submissions are due October 1.

SUBMIT YOUR ENTRY TODAY!

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Photo courtesy of
Southern Illinois University Carbondale

Deficiencies In Recruitment Contributing To The Aviation Maintenance Tech Shortage

By **James Barker**

James Barker is an Assistant Professor of Aviation at Southern Illinois University Carbondale. Originally an auto and farm mechanic, James expanded to aviation in 2017. He holds both a Bachelor's and Master's degree in the field of aviation as well as an Airframe and Powerplant certifications with specializations in both the Avionics and Advanced Propulsion. The owner of an automotive restoration shop, and faculty advisor of two separate aircraft maintenance RSO's, Mr. Barker is interested in all things' maintenance.

ABSTRACT

The shortage of aircraft maintenance technicians in the aviation industry is well documented. However, the reasoning behind this shortage is less explored. This study focused on aviation maintenance students, their plans, and reasons for pursuing a career in maintenance. Twenty-six students enrolled in an aviation maintenance program were interviewed. Only 3% were found to have been recruited via recruitment events such as career fairs while 30% discovered aviation maintenance purely by chance. Additionally, 11% discovered the career field during their military service and 23% were recruited by family or friends. Students reported being drawn to the program by low math requirements compared to similar careers (30%), while the ability to receive A&P (Airframe & Powerplant) certifications was cited by 92%. The ability to earn a college degree was reported by 80% of participants. Preferring a hands-on career versus a desk job was reported by nearly all at 92% of participants. Less than 25% entered the program with any aircraft-related experience. Over 50% listed high school wood shop as their only real encounter with tools. Most participants (75%) plan to either work as an AMT for a limited time or not at all. Of that group, 57% plan to transition away from maintenance and into flight. A mere 25% plan to be mechanic's long term. Participant feedback points to a deficiency in exposure and recruitment within the aviation maintenance industry. Low levels of mechanical experience upon program entry coupled with complaints of misinformation or no information surrounding the aviation maintenance field may be contributing to low enrollment and high turnover rates.

The aviation industry is best described as having a turbulent history with periods of advance and growth followed by setbacks and disruption. The Covid-19 pandemic illustrates that point. Commercial flight was experiencing steady growth, finally recovering from the negative effects of September 11th, 2001, and the great recession of 2008 (ICAO, 2022). Progress that took years was undone overnight as travel bans went into effect in early 2020. Airline revenue dropped from 248 billion dollars in 2019 to just over 130 billion in 2020 (Flynn, 2023). They had lost nearly half of their revenue in less than a year.

As a result, technicians nearing the end of their career were offered early retirement options, and new job postings were postponed (Wildes, 2022). If this did not produce sufficient results, employees would be laid off and maintenance contracts suspended. The industry took these measures to survive the pandemic. However, it put them in a poor position for the return to normalcy. No one was prepared for the overnight growth of the industry following the end of travel restrictions (Wildes, 2022). As quickly as consumers had stopped flying, they were back and eager to make up for lost time. Only now, there were not enough staff to support those flights. Many of the most seasoned aircraft technicians had taken the early retirement option presented to them during the pandemic (Wildes, 2022) and the availability of new recruits was limited.

The goal of this research is to explore alternative causes of this shortage, specifically at an educational level. There is existing research on the projected growth of the industry, its needs, and the probable outcome of the shortage of technicians. However, there is little research aimed at why the industry cannot recruit enough aviation maintenance technicians (AMT's), an issue that existed prior to the pandemic.

We must identify why a new generation is not pursuing open positions within the industry. By interviewing students training to become AMTs, we gain a better understanding of why they chose this career field over other options. Are there any trends to be discovered that could improve recruitment numbers? For example, if responses show a high percentage of students learned of the trade by word of mouth, that will point to deficiencies in the way organizations advertise.

Statement of the Problem

The aviation industry has a problem on its hands: the shortage of aircraft maintenance technicians. Boeing projects that between 2022 and 2041, the industry needs to train and employ some 610,000 new technicians to meet projected growth (Boeing, 2023). Some, such as Raytheon's CEO Greg Hayes, say the only solution to this problem is a slowdown in the economy (Wildes, 2022). This is a troubling thought.

This research began by interviewing 26 students currently training to become maintenance technicians. Five questions were asked: What was their mechanical background before their training? How did they discover aviation maintenance as a career option? Why did they choose aviation maintenance over other opportunities? How long do they intend to remain in aviation maintenance? And finally, what do they think could be done to improve recruitment?

Less than 25% of subjects entered the program with any type of aircraft-related experience. Half of those with prior experience had gained it during their military service. The average level of mechanical experience held by students at the time of enrollment was considered minimal. A majority cited high school wood shop as being the extent of their tool use and knowledge.

Only 3% of participants were recruited through career fairs or recruitment events while 30% discovered aviation maintenance accidentally. It was discovered that 23% were recruited by family or friends, and 11% discovered the career field during their military service. Additionally, 3% were recruited by AMT's (Aircraft Maintenance Technicians) posting their work on social media.

Thirty percent of the student participants indicated they were drawn to the program by its low math requirements compared to similar careers such as engineering, as well as the ability to receive Airframe & Powerplant (A&P) certifications (92%) and a college degree (80%). The preference of a hands-on career versus. a desk job was cited by 92% of participants as being a contributing factor in their decision to enroll as well.

Many who enroll in aviation maintenance training programs are not interested in a long-term career as an AMT. Seventy-five percent plan to either work as an AMT for a limited time or not at all. Out of that group, 57% of participants plan to transition out of maintenance and into flight. A mere 25% wish to remain maintenance technicians for the duration of their careers.

When asked why they believed more people were not pursuing a career in aviation maintenance, the overwhelming response was a lack of exposure. Aviation maintenance was never presented to many of them as an option. On several occasions, participants felt confused about what the career entailed. These students did not understand what an aircraft mechanic was required to do until they were in training to become one.

To summarize, participant feedback points to a deficiency in both the levels of exposure and recruitment within the aviation maintenance industry. Low levels of mechanical experience upon program entry coupled with complaints of misinformation or no information surrounding the aviation maintenance field may be contributing to low enrollment and high turnover rates. Possible solutions are improving recruitment, advertising efforts, and emphasizing the participants' positive responses. This includes lower math requirements comparative to similar careers, the ability to earn a college degree, FAA-issued A&P certificates that are valid for life, and a hands-on career. Improving outreach and better informing students may not only increase the number of recruits, but also who is recruited. By recruiting individuals who

are informed and mechanically inclined, there is a better chance of retaining them in the industry and lowering turnover rates.

Literature Review

According to data collected by Oliver Wyman's Annual Maintenance, Repair, and Overhaul (MRO) survey, the lack of technical staff was cited as the number one disruption to the MRO industry over the next five years (Wyman, 2022a). A study of MROs around the world revealed that 80% of North American respondents, and 65% of respondents in European countries, felt that sourcing technicians had become difficult (Wyman, 2022a). This shows a worldwide struggle for qualified mechanics, not just domestic. An article posted by the International Civil Aviation Organization (ICAO), an agency within the UN states, "Demand for air transport will increase by an average of 4.3% per annum over the next 20 years" (ICAO, 2022). An increase in future demand will only compound the issue.

A separate 2022 article by Oliver Wyman addresses the shortage of aircraft mechanics directly. The article states, "The imbalance between supply and demand will persist and even worsen over the next ten years. It is likely to result in fewer flights, delays, cancellations, or airlines having to compensate by keeping additional spare aircraft and parts on hand" (Wyman, 2022b). The year 2027 is likely to be the worst year for the shortage, predicting a shortfall of 24% (Wyman, 2022b). Not only are the negative effects being felt now, but they are likely to worsen.

A fourth article conveys the same sentiment. Bryan Shaw of the STS Aviation News Group states, "The shortage of these skilled workers is a global problem that is affecting the aviation industry in many regions, most notably the United States, Europe, and Asia." (Shaw, 2023).

One reason for the materialization of this shortage is the COVID-19 pandemic. According to a report published in 2022 by the Aviation Technician Education Council (ATEC), the Pandemic resulted in the loss of at least 5,000 new mechanics (Banglesdorf, 2023). This sped up the formation of any shortage that may have been forming prior to the pandemic. The average age of a technician before the pandemic was 57 years old according to Stacey Rudser, President of the Association for Women in Aviation Maintenance. "Airlines offered early retirement options to their aging workforce during the pandemic" (Banglesdorf, 2023). This was done to combat the sudden loss of revenue caused by the pandemic. According to Jack Flynn of Zippia, a career analysis company, the airline industry alone saw a decrease in revenue from 248 billion dollars in 2019 to 130.85 billion in 2020 (Flynn, 2023). This loss of an older workforce also meant the loss of their expertise. Some, such as Stacey Rudser, believe this knowledge is irreplaceable. The average age of a maintenance technician in 2022 is 40 years old (Flynn, 2023). That is a 17-year age drop in two years. This loss of expertise creates a new level of complexity to the shortage. Not only must enough workers be hired to cover the job's physical requirements, but they must be adequately trained as well. Failure to do so could have dire consequences.

Much data exists covering the existence of a mechanic shortage in the industry. However, little is known about how we correct it. Only a few articles covering this topic present strategies or practical options. One strategy looked at how employers have taken steps to reduce the number of open positions they have. Employers have tried raising pay, decreasing healthcare costs, and enhancing 401k plans to appear more attractive to the small pool of available technicians. FEAM Aero is one such example. In an article published on the line maintenance firm's website in October of 2021, the company completely overhauled its employee benefits. FEAM Aero reduced their health insurance premiums by 50%. They enhanced their 401k plans to include contribution matching. Vacation time was increased by 3.5 hours a month plus an added week of paid vacation for most of its current employees. New technicians now qualify for a sign-on bonus of up to $2,000 (FEAM Aero, 2021). All of this, plus an average starting salary of $75,000 a year and referral bonuses prove how desperate this family-owned business is for workers. This shows that the lack of technicians is proving costlier than the incentives being offered.

Methodology

This study's purpose is to identify shortcomings regarding the recruitment and preparedness of AMT's, which may be contributing to the worldwide shortage. Boeing believes that some 610,000 new technicians will be needed by the year 2041 (Hughes, 2023). With the worst of the shortage predicted to take place within the next several years and, according to Southern Utah University, an average training program taking two years to complete, the industry is in trouble (Crookston, 2020). This may be a case of being too little too late when presenting any solution in the short term. However, there is still plenty of time to begin researching a long-term solution for what is set to be a long-term problem.

A qualitative approach was chosen, so that insight could be gained into the minds and lives of current aviation maintenance recruits. Since this research was conducted at an aviation maintenance training school, the opportunity to interview students who had not only traveled from other states, but other countries were available and created a diverse group of subjects. This group is not only diverse in a geographical sense but in age and experience.

A focus group format was chosen to encourage open discussion. By asking a group of subjects to share their unique stories and opinions, a "safety in numbers" mindset revealed information that subjects may not have been comfortable sharing in a one-on-one setting. In other words, there was a fear that a one-on-one interview process may not only take much longer to complete but also achieve indirect responses that were lacking in criticism and elaboration. By using a focus group, most subjects felt comfort-

able surrounded by their peers and were willing to elaborate on their responses to each research question. This was particularly true of the final question, which asked their opinion on why more students were not pursuing the same career.

The setting for this research was a classroom within a Part 147 aviation maintenance program located in the midwestern United States. This setting was specifically chosen due to its size, availability, and the subjects' familiarity with it. The setting was ensured to be at room temperature (72 degrees Fahrenheit) and with lighting at a moderate level. This was done according to CCSU's (Central Connecticut State University) suggested parameters (CSU, 2024). Subjects were seated with equal spacing around a table facing the interviewer. This arrangement was chosen to ensure each subject could be equally heard, seen, and involved in the discussion. By choosing this layout, a welcoming environment free of discrimination and promotion of equal participation was created.

Recruitment was carried out by a third party employed by the University. An email informed students over 18 years of age in the Aviation Technology program of an opportunity to take part in this research project. Interested parties were asked to email the address provided. Once contacted, a meeting time was provided where all interested parties met and learned more about the project and what was expected of them. Interested subjects were then asked to read and sign a consent form. Twenty-six subjects were recruited for this study. Twenty-five being male, one being female. Ages ranged from 18 to 50 years old, with roles within the program ranging from first-year students to seniors. Out of the 26 participants, four focus groups were created, each with varying numbers of participants; Group one contained ten students, Group two contained eight, Group three contained three and Group four contained five. Attempts were made to keep the numbers within the recommended size of 8-10 subjects (CSU, 2024), however, scheduling conflicts experienced by the participants prevented more uniform group sizes from taking place. Subjects were assigned to one of the four groups based on participant availability. Every effort to randomize the participants within a given group was made. This was done to ensure that a group of friends, for example, could not influence the direction of focus group discussion by way of their familiarity with each other. In other words, friends may share similar ideas and backgrounds or feel pressured to answer questions a certain way in front of each other.

Subjects were asked not to discuss the research questions or their answers with any of the other groups after the completion of their session. This was done to maintain a level playing field and not give any one group or subject more time to plan a response than the next. This was also done to prevent biasing or pressure from being applied on a subject to answer in a particular way. Each of the four focus groups met once for a 30-minute session. This time was long enough to allow each participant to answer each question yet short enough that subjects remained motivated and willing to participate fully in the discussions as time went on. During that 30-minute session, five questions were asked with 6 minutes being spent answering each one. Participants were not required to answer all questions and could answer to the extent they felt comfortable.

The first question asked was: "What was your mechanical background before enrolling in aviation tech?" This question created a baseline and determined the average level of mechanical experience an aviation technology student has. A lack of mechanical experience or knowledge before entering a heavily mechanical field could reveal deficiencies in recruitment in terms of targeting the right audience, portraying the career field accurately, or preparing students for vocational careers.

The second question: "Where did you first learn about a career in aviation maintenance?" This question works to identify how students were recruited. Was it from family, friends, a career fair, or some other source? The answers to this question help us determine which methods are effective or ineffective, and what methods we may not be using to their full potential.

The third question: "What ultimately made you decide to choose a career in aircraft maintenance over other opportunities?" By better understanding what characteristics of aircraft maintenance are appealing to recruits, can we then leverage them to improve future recruitment? For example, if participants indicated they were attracted by the prospect of having a hands-on career, we could push that as a selling point when interacting with future students.

The fourth question: "Do you intend to make aviation maintenance a lifelong career? If not, why? If so, why." This question is critical as not all students enrolled in aviation maintenance programs are interested in working on aircraft. Students may enroll solely for a college degree and not for the licenses required to work on aircraft. Some students may be pilots who just want a little extra knowledge of how an aircraft works mechanically. This data will help us better understand what percentage of maintenance trainees are planning to enter the workforce and contribute to the shortage. We may also learn what factors are influencing viable candidates to either choose not to get their aircraft maintenance licenses or choose not to continue to use them.

The fifth and final question is: In your opinion, what could be done to recruit and retain more students like yourself within the aviation maintenance industry?" Although this question is not helpful in terms of retaining technicians already in the field, it does speak to the state of mind of the subjects. Their perception of the industry is critical in keeping them on board. By better understanding their expectations, grievances, and opinions we may be able to make changes that will lead to better retention in the future, not just at a college level but at an industry level as well.

Results

Question#1

Participants were asked about their mechanical background if they had any, and if so, how did they obtain it?

Fourteen out of 26 (53%) indicated having prior woodworking experience, whether it be from previous employment, working at home, or in a classroom setting. All agreed that their experience with woodworking had increased their general knowledge of tools and equipment. This was an unexpected point of commonality between each of the five groups as participants recounted their experiences with the craft without being prompted. Furthermore, their experiences were overwhelmingly positive.

Fifteen out of 26 (57%) reported taking courses during high school that introduced them to tools or equipment. These classes consisted of wood shop and welding. Wood shops were the most popular accounting for 14 of 26 (53%), while welding classes were taken by only one out of 26 students. Automotive or aviation-specific courses were not mentioned.

Twenty-five out of 26 participants (96%) indicated having gained some level of mechanical experience before enrolling, some from cars, motorcycles, lawn equipment, or woodworking. The level of experience varied from zero to decades as a mechanic for another student. However, when averaged, the typical student enters the aviation program with minimal mechanical skills and experience. Only 6 of the 26 participants (23%) had experience of any kind relating to aircraft. Three of those participants were either military veterans or active-duty military who could connect their military service to the aircraft experience they obtained. Based on our sample size of 26 students, less than 25 percent of them are entering the program with any formal knowledge of aircraft systems, maintenance, or operation.

Question #2

Following the assessment of their mechanical background participants were asked to share how they first became aware of the aviation tech industry and the opportunity to become an aircraft mechanic.

Only one out of 26 participants indicated they learned of the career field through a career fair or recruitment event. Eight out of 26 had found out about the career field purely by chance. Half of those had intended to go into either flight or management career paths but stumbled upon the Aviation Maintenance program while learning more about their chosen career. One participant admitted the only reason they were in the program was because it was the only one that offered them a scholarship with free tuition. They indicated having no genuine interest in the program itself, instead attending because it was free for them to do so. Six out of 26 were introduced to the idea of aviation maintenance by family members or friends. In all cases, the friend or relative who referred the student had been in the aviation industry. Three of the 26 participants had learned of aircraft maintenance during their service in the military. These participants completed the same kind of work either on or around aircraft and wished to continue once discharged. One student found out about the career field on a social media platform after seeing an aircraft mechanic record and post their work online. Another Student worked at an airport completing line service tasks and after the arrival of their newborn child, decided to find a way to further their education to earn more money. After an online search for aviation-related fields, they stumbled across the aviation maintenance program. One student remarked that they always knew someone had to work on airplanes, but it never occurred to them that it was a real occupation or what exactly would be involved.

Question #3

After establishing how participants learned of a career in aviation maintenance, they were then asked to reveal what factors pushed them to choose this career field over other alternatives. What incentives or factors in general had driven them to enroll?

Eight participants (30%) indicated that less advanced math requirements pushed them to choose aircraft maintenance over alternatives such as engineering or aviation management. When comparing career choices, these eight students agreed that not having to take advanced math courses had been a determining factor for them. One student went as far as to enroll in engineering courses, showing up on the first day of his math class and then deciding to never go back. He knew it was not for him, so the search for a different program ensued.

Twenty-four participants (92%) want their A&P certificate and cite it as one of the top reasons for choosing aviation maintenance over other careers. Participants noted that having a certificate that does not expire was a big plus when deciding between programs. This was especially true when deciding between aviation tech and aviation management. Similarly, 21 participants (80%) agreed that the bachelor's degree the aviation technology program offers was a factor that pushed them toward choosing this career over others. The remaining five did not believe the degree itself swayed them in any way when considering career paths. Either because they already had a degree or because the alternatives they considered had a similar degree.

Twenty-four participants (92%) also agreed that aircraft maintenance, being a hands-on career, pushed them toward this field. The most common response was, "I just didn't want to be stuck behind a desk all day." They noted that the variation in day-to-day activities and ability to work on different aircraft was exciting and promised a more fulfilling career than sitting in an office.

Half of the participants, 13 out of 26, indicated that a career as an aviation mechanic was just a backup to a different career

they were pursuing. Many are pursuing a career as a pilot with the maintenance program serving as a backup in the event they ever lose their medical certification and thus their ability to fly. Furthermore, those planning to be pilots felt going through the maintenance program would help increase their understanding of aircraft systems and benefit their flying careers. For one participant, however, it was just to earn money for a few years so they could quit and open their own business unrelated to aviation.

Question #4

A follow-up question asked participants if they planned to use their A&P certification and privileges for the entirety of their careers.

Seven participants (26%) planned to utilize their A&P license for their entire career. Eighteen participants (69%) stated they would use their A&P certificate at some point but did not intend to use it the entire time. Fifteen out of 26 or 57% planned to transition out of maintenance and into flight at some point, while 20 out of 26 or 76% either already had or wished to obtain a pilot's certificate. Again, many referenced their perceived importance of mechanics knowing how to fly and pilots knowing how an aircraft works.

Question #5

The final question is: In your opinion, what do you believe is preventing more students like you from pursuing the same career?

This question sparked the most discussion and interaction among students and therefore also revealed the greatest amount of feedback.

Twenty-five participants (96%) agreed that aviation maintenance is perceived as inferior to careers in aviation flight and aviation management. It was cited as one of the top reasons they believe more students are not joining the career field. Ninety-six percent also agreed that the quality of aviation maintenance training programs themselves was a large reason more students are not enrolling. The lack of program funding, support and the poor condition of training aircraft were all top answers. Additionally, each of the focus groups mentioned the lack of recruitment, advertising, and scholarship opportunities at least once.

Participants also mentioned misleading information being spread by student pilots to discourage aviation technology enrollment. Three out of four focus groups mentioned hearing flight students speak poorly about being an aircraft mechanic. Several participants followed this up by stating how upset they were with the lack of teamwork between different areas of aviation and the difficulty they experienced when trying to be a member of more than one simultaneously.

A female participant voiced her frustrations on how she felt staff and students alike routinely discouraged her from joining the male-dominated maintenance field. She believes this behavior is not welcoming of female students and is deterring a larger female presence within the industry from taking place.

Eleven subjects (42%) believe becoming an aircraft mechanic is often looked down upon and not respected. Discussion around this point was highly conflicted. Many participants felt pride when telling someone what career field they had chosen. Others felt the public thinks of them as "just a mechanic." When asked how they felt about their career when compared exclusively to other roles within aviation, the answers were unanimous. All participants shared the feeling that they were underappreciated, underpaid, and treated with less respect than pilots.

Discussion

Question #1

Research revealed less than 25% of aviation maintenance students enrolled in the program had any kind of aircraft experience. Those who do are primarily military. The other 75%, on average, have an extremely limited amount of mechanical experience. Although 57% took high school courses that introduced them to tools, only a limited amount of knowledge was directly relatable to aircraft maintenance. None of the participants noted taking classes that introduced them to aviation-related subjects. Participants who reported higher levels of mechanical experience gained it through their employment or hobby. One subject reported learning to work with tools while restoring their truck, another reported gaining experience while working on a farm, and another a tire shop. Entering the program with a low level of mechanical experience is concerning.

The ability to learn is not the concerning part. When students sign up for a hands-on, technical career with little to no exposure to that type of work, it can increase the likelihood they will change their mind either while enrolled or shortly after. An article explaining the importance of vocational classes made the following statement. "If students aren't exposed to skilled trades in high school, then how are they going to know if it's a viable career path for them after graduation?" (Robinson, 2015). By increasing awareness around vocational courses and promoting hands-on hobbies and skills at a pre-college level perhaps we can give students a better idea of what to expect and increase the number who complete the program and become full-time mechanics. Vocational courses are designed to give students a head start in technical careers.

Question #2

The results of question 2 revealed a significant deficiency in recruitment and advertising for aircraft maintenance. Only one out of 26 participants were actively recruited into the A&P program. That is only 3% who learned about aviation maintenance as a career possibility through professional means. The highest response to this question, 30%, learned about this career purely by chance. Imagine having 10 times more students find out about a program accidentally than were able to be reached directly through advertisements, career fairs, exhibitions, social media posts, and other means.

This is counterproductive to the issue at hand. As discussed earlier, aviation maintenance is competing against other career opportunities that often promise a less stressful or higher-paying job. With most participants indicating they did not learn of aviation maintenance until post-high school, we are losing a large group of candidates who are setting their career path before graduation. The other issue we create here is many of the students who accidentally found out about this program did so while researching another area of aviation they were more passionate about. As shown earlier in the statistics, half of the participants' intent behind going through this program was to create a backup or safety net for them while they pursue a separate career.

Question #3

With over 30% of participants citing math requirements as a factor when considering career options, an opportunity emerges. When discussing why math requirements were a factor, several students said they felt a degree in aviation maintenance was much more obtainable when compared to similar fields that require a higher level of math, such as engineering. This, coupled with the fact that the program offers an A&P certificate and a bachelor's degree, made it desirable to participants. Future recruitment efforts should consider emphasizing these points in addition to promoting a hands-on career.

Question #4

With only seven participants (26%) planning on being an A&P for their entire career, we are left with nearly 75% who plan to either work as an A&P for a limited time or not at all. Fifty-seven percent plan to transition out of maintenance and into flight at some point. This again points to very few new aircraft mechanics entering the workforce and failing to put a long-term dent into the A&P shortage. For this program specifically, it implies that only 27 out of every 100 graduating students will enter the field and help reduce the AMT shortage in the long term.

Question #5

When asking participants why they believe more students are not enrolling in aircraft maintenance, I had expected to hear the same concerns mentioned in prior publications. Those concerns being job security, harsh working conditions, stress, and poor pay. Although the research did support prior publication's claims of poor recruitment and exposure for aviation maintenance, the rest of the feedback pointed the finger directly at the aviation training program itself and not at the industry.

Were participants so focused on sharing their current and past experiences that they forgot to share any concerns they have for their future? The more likely answer is that they are unaware of the current issues within the industry. If 30% discovered aircraft maintenance by accident, what percentage is unfamiliar with industry expectations, pay, or benefits? What implications might this have for graduates as they enter the workforce? These questions arose while collecting data from the four focus groups.

Interestingly, little mention was made regarding pay or benefits associated with this career field. One participant mentioned enrolling to earn more money than they currently had been, but no comment was made referring to aviation maintenance as being a high-paying or low-paying career. Further research should focus on interviewing current A&P mechanics in the field post-graduation, ideally after several years on the job.

Conclusion

To summarize the findings of this research, recruitment must begin earlier and with a higher degree of intensity. From the responses of participants, there is limited outreach from A&P programs and businesses within the industry to potential recruits. Thirty percent of A&P students should not be learning about their career by accident. If the industry wishes to reduce the shortage, it needs to focus on more than just recruiting current A&P mechanics in the workforce. The solution to this problem may start with K-12 education. This is not only true in terms of increasing industry exposure but changing who we recruit. We must also realize that the number of students graduating from A&P programs is in no way an accurate representation of the number contributing to the reduction of the shortage. As we have discussed, this program's current population of A&P recruits are only 25% likely to be an A&P for their entire career. Over 50% want to transition to flight and leave maintenance altogether. By increasing career exposure to students at a younger age they may be more likely to develop an interest in aircraft maintenance. This may also spark interest in vocational classes, which could lead to an increase in the average mechanical ability of A&P recruits.

Addressing the complaints of current students who are training to become technicians is also a key part of the solution. The negative experiences participants shared regarding their time in an A&P training program presents itself as a deterrent toward future recruitment, retention, and growth. We have a long way to go, but with knowledge of these issues comes the hope we can address them before it is too late.

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Aviation Maintenance Technician (AMT) Learning Styles and Technology Integration in Title 14 Code of Federal Regulations (CFR) Part 147 Maintenance School Classrooms

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ABSTRACT

This paper aims to demonstrate a framework for the dominant learning styles of aviation maintenance technicians (AMT) while also integrating advanced technology within the classroom. The topic is critical to the advancement of the 14 Code of Federal Regulations (CFR) Part 147 operating maintenance schools; the dominant learning styles of AMTs remain largely unexplored. Additionally, technology continues to advance; artificial intelligence, augmented reality, and composite materials repair and integration are but a few examples. Being ahead of the curve may help the success of future maintenance programs and mitigate further transitional issues. Additional generational gaps and a departure from traditional teaching methods to best meet the learning styles of future AMT students are paramount. The aviation industry still faces significant manning concerns on many levels, and its future success rests squarely on addressing some of these issues.

A significant shift in teaching standards must occur from traditional delivery methods and focus on the dominant learning styles of AMTs. Data shows a difference between AMT dominant learning styles and non-maintenance students. The need to shift toward addressing the learning styles of AMT students is paramount to the future success of the aviation industry. Last, technological advancements and generational gaps further compound the issue; many students are often more adept with technology than the instructors. The paper sets out to address these issues.

This paper aims to demonstrate a framework for the dominant learning styles of aviation maintenance technicians (AMT) while also integrating advanced technology within the classroom. The topic is critical to the advancement of the 14 Code of Federal Regulations (CFR) Part 147 operating maintenance schools; the dominant learning styles of AMTs remain largely unexplored. Additionally, technology continues to advance; artificial intelligence, augmented reality, and composite materials repair and integration are but a few examples. Being ahead of the curve may help the success of future maintenance programs and mitigate further transitional issues. Additional generational gaps and a departure from traditional teaching methods to best meet the learning styles of future AMT students are paramount. The aviation industry still faces significant manning concerns on many levels, and its future success rests squarely on addressing some of these issues.

A significant shift in teaching standards must occur from traditional delivery methods and focus on the dominant learning styles of AMTs. Data shows a difference between AMT dominant learning styles and non-maintenance students. The need to shift toward addressing the learning styles of AMT students is paramount to the future success of the aviation industry. Last, technological advancements and generational gaps further compound the issue; many students are often more adept with technology than the instructors. The paper sets out to address these issues.

This paper addresses how Aviation maintenance Technician (AMT) programs that operate within title 14 of the Code of Federal Regulations (CFR) Part 147 regulatory environment further build on the competency-based training (CBT) framework with the integration of advanced technology to better meet the dominant learning styles of future AMT students. CBT is an educational teaching and learning assessment framework.

Furthermore, instructors working in the teaching framework for AMT students must aim to be as immersive and realistic as possible, as safe as possible, and as practical as possible. The Law of Primacy is an essential factor in primary aviation maintenance training. One's initial learning is most likely to become your first response. "Experts in learning theory call the importance of learning a procedure or technique correctly the first time the law of primacy" (Olcott, 2022). The Law of Primacy is a learning theory that stresses the importance of a good first impression, as the initial influence leaves the students with the strongest impression.

The Law of Primacy, which is content that is learned first holds the strongest impression, identifies the need for instructors to teach concepts correctly the first time (Jones, 2021). This concept is paramount in teaching AMT students the correct way, the first time, as the first impressions are often the most lasting. In this framework, scenario-based training, similar to that of pilot training, may yield significantly effective results with similar benefits. An effort to integrate state-of-the-art realistic trainers, aimed at teaching at the application level of learning geared toward the dominant learning style of AMTs more fully equips the future AMT to enter the industry. Additionally, CBT in this current framework may increase aviation safety, aeronautical decision making (ADM), sound logical and critical thinking skills, risk management fundamentals, identification of personal hazards, and making risk decisions (Jones, 2023).

An Aviation Maintenance Technician Program (AMTP) is an institution approved by the Federal Aviation Administration (FAA) to train and certify future AMTs. Prospective students must attend instruction covering 40 technical subjects. Each subject must meet a completion standard of 70 percent and pass oral, written, and practical exams to obtain their Airframe and Powerplant (A&P) certificates. The new FAA regulations removed the previous 1900-hour time component and allowed each 14 CFR Part 147 maintenance program to decide how to instruct future students. A CBT curriculum is the new standard (Johnson, 2023).

A disparity could now exist between the curriculum, current teaching practices, and learning styles of AMT students. Regarding the present need within the aviation industry, this paper is not emergent in the sense of preventing possible loss of life or equipment damage. However, the condition is urgent as the demand for qualified AMTs increases. The industry must find ways to continue to integrate advancing technologies and meet the generational gaps in learning styles.

Identify the Problem

For years, the aviation industry has been experiencing a labor shortage in all career fields. The growing need for qualified AMTs is only compounded by generational and learning gaps while advancements in technology outpace the teaching approaches in the classrooms. Schools must prepare for significant curriculum revisions to best meet the primary learning styles of future AMT students to best equip the technicians for success. A gap exists in current curriculum teaching, learning styles of AMT students, which is made worse by generational differences and technological advancements. A transition in teaching must occur to meet the real-world operations of systems the AMTs will one day work on. This paper directly helps AMT programs by shedding additional light on these areas.

Learning Styles and Technology Integration

A case for educational reform can be made from various vantage points. However, the predominant learning style of AMTs is an application-level, competency-based, hands-on approach, and the educational reforms and curriculum are aimed toward this dominant learning style (Baghdasarin, 2020). Many studies speak to the realm of aviation concerning pilot training and learning styles. However, there is little research on the relationship of learning styles to test performance for AMTs or any other workplace population (Haines, 2008). A large pool of talent in the future of AMT professionals has yet to be studied. The career field of the AMT is an applied level of understanding, logically a case might be made that AMTs learn at the applied level of education. The applied level of knowledge is a hands-on trade, CBT is the curriculum framework in action, CBT curriculum is the new standard (Johnson, 2023). Baghdasarin (2020) defines applied knowledge as being acquired through "practical experience" with either power plants, airframes, or both. AMT students can typically struggle in the traditional classroom setting but most often thrive in the hands-on, application-level shop environment. It is possible that traditional ways of teaching can affect the performance of trainees if diversified needs among the students exist (Kang et al., 2018). Additionally, students further excel once they see the correlation between what they have learned and how the concepts apply to their career field. A heightened sense of learning and cognitive growth occurs, and a positive correlation to course grade is achieved (Niemczyk & Ulrich, 2009).

New Technology

New technologies should be incorporated into the "practical experience" modules, and schools might find it easier to do this by partnering with industry and providing students opportunities to see the exciting work they will be doing first-hand (Baghdasarin, 2020). By effectively incorporating new modes of lecture and new technology, students are in a better position to meet the demands of the workforce, being adept with software and technology ahead of their potential employment.

In many cases, students are more digitally literate than their instructor counterparts. Digital literacy and willingness to implement new technology in new ways mean Generation-Z cohort individuals will be ready to help integrate new technologies, such as virtual reality and augmented reality, into the traditional world of aviation maintenance (Baghdasarin, 2020).

New Approaches

With the advancements in technologies and experiential training, new approaches to teaching methodologies and modes of delivery are soon to follow suit as well. New approaches to teaching methods, such as the course of instruction and mode of delivery, can be beneficial to meet the new age of technology and promote further student engagement. Taking an unconventional approach to teaching, the instructor can break traditional learning methods of classroom lectures and redirect them toward an applied learning methodology (Santonino, 2016). An often-overlooked method of immersive training is that of scenario-based training. Scenario-based training is used heavily in the pilot training to great effect, and this same approach yields significant benefits within the 14 CFR Part 147 realm as well. Likewise, an immersive environment with a high degree of realism has been employed for aspiring remote pilots and sensor operators to a resounding success (Macchiarella & Mirot, 2018).

Generation Gaps

With the advancement of new technologies on the horizon, the new cohort of students must also be brought into consideration. Many factors come into play when considering the obstacles of the new aviation frontier. The hurdles can be overcome with a positive and proactive mindset for change. Specific areas of focus could help to ease the anticipated manning shortages as well as training and experience deficiencies. The aviation industry and higher education alike must address the following areas of concern: Generation Z and Characteristic Changes.

While considering future generations, a great deal of information can be gleaned from analyzing the cohort of Generation Z Baghdasarin, (2020) expresses praise of the Generation Z cohort of students and their ability to engage in digital media and delivery methods and excel at gathering data extremely quickly and proficiently. However, because of the lack of interface, interaction, and modality of application, the cohort lacks the skills to analyze and comprehend the data collected (Baghdasarin, 2020). Additional comments ranged from poor analytical and problem-solving skills to poor skills in self-regulation, stating a low tolerance for ambiguity and a desire for strong leadership and clear instructions (Baghdasarin, 2020).

A further look into Generation Z might prove beneficial as a look at the demographics and characteristics of AMTs within the digitally saturated modern world becomes more pronounced. The digital age has significantly affected the characteristics of students now entering training programs with exposure to technology, virtual reality devices, and cell phones (Kang et al., 2018). Traditional means of communication and interaction, as well as interpersonal skills, are also affected. Students with high self-efficacy are more confident in their abilities and more likely to succeed in various learning activities (Niemczyk & Ulrich, 2009). Generation Z individuals tend to accept challenging tasks and exhibit perseverance and determination in achieving their learning goals (Niemczyk & Ulrich, 2009). Investigation of possible intertwining learning styles, Universal Design for Learning, and advanced technologies in the context of technical training could be instrumental in creating frameworks that can be applied to the training solution for the aviation industry (Kang et al., 2018).

Throughout the discussion of learning styles, competency-based educational and evaluation assessments, the need to change traditional theories of higher education, and modalities of delivery are present, especially concerning learning styles. The change in approach from the standard classroom environment to interactive environments, advancements in technologies, and immersive training have higher levels of effectively demonstrating course learning outcomes. The tailoring of curriculum approaches to the upcoming cohort of students' dominant learning styles is a pressing matter that must be addressed. Additionally, the simultaneous assessment of addressing experience and technology disparities is paramount.

Conclusion

With a professional mindset, a positive attitude, and an approach of willingness to be taught, the resistance to change to new tech-

nologies can be mitigated. The educational realm might be able to keep pace with technological advancements if certain technologies and software were made available to students.

The research presents a gap between higher education curricula and learning styles with the integration of technology in the classroom. The direction in which higher education must focus change in teaching methodologies toward learning styles is significant. A departure from traditional teaching methods, assessments, and modes of delivery is paramount to successfully matching the learning styles of students and the integration of technology. Generational and learning style gaps makeup but a small portion of this growing disparity between current and future-state education and curriculum. Implementing cutting-edge technology within the classroom aimed toward the dominant learning styles of AMT students will pay huge dividends toward the success of the students.

A change in teaching styles to an application level and a shift toward CBT meet the AMT students where they operate most effectively. Furthermore, this change in traditional approaches also aims to submerse the students in realistic environments. This scenario-based training has proven to be highly successful in the pilot realm of operation, and logic that follows the same would apply to the AMT realm as well. Additional research is needed to assess the gender and minority talent pools while focusing on the dominant learning styles of each talent pool.

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Promoting careers in aviation to a wider audience with EAA AeroEducate™

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The aviation industry, a crucial part of the science, technology, engineering, and mathematics (STEM) workforce pipeline, is grappling with a significant shortage of skilled professionals (Krause, 2023 and Aviation Technician Education Council, 2023). This current and growing shortage is widespread and not limited to a specific sector. Various entities are diligently developing sustainable solutions to enhance access to aviation careers. National Academies of Sciences, Engineering, and Medicine (2019) emphasizes the need for collaborative efforts to address these challenges in aviation awareness and participation. This piece discusses resources and approaches to provide awareness of aviation careers to K-12 students.

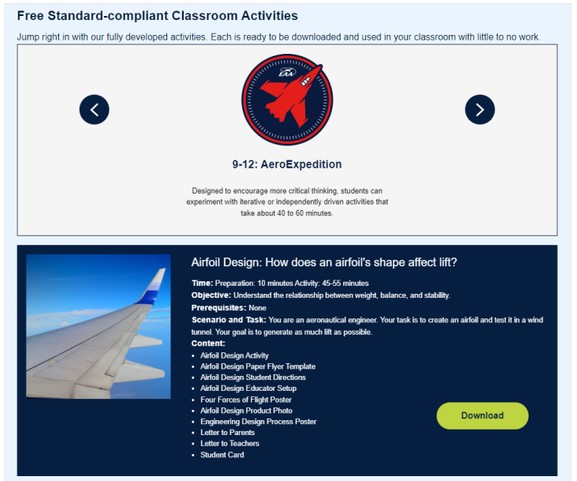
In secondary education (middle school and high school), curricula and programs exist to help students already interested in aviation begin to meet FAA requirements. Choose Aerospace (https://www.chooseaerospace.org), TangoFlight (https://www.tangoflight.org/), AOPA You Can Fly (https://youcanfly.aopa.org/high-school/high-school-curriculum), and Civil Air Patrol (https://www.gocivilairpatrol.com) present pathways for students in high school and beyond. Multiple examples of aviation and aerospace courses are taught in several states and schools near the aviation industry. These local education course offerings exemplify how Career and Technical Education (CTE) courses can assist in meeting local industry needs. Post-secondary education opportunities through aviation maintenance technician schools, community colleges, and universities provide further opportunities for students pursuing an aviation career. These pathways are critical in assisting aviation career-committed students, but how do we engage students outside the aviation community who might not have access to such programs or curricula? How do we create career awareness before high school so students can pursue an education in aviation during high school and beyond?

One solution comes from The Experimental Aircraft Association's (EAA) Young Eagles program, which provides free flights to youth and other connections and directions for aviation career exploration. EAA offers another solution and worked with industry and educational partners to develop AeroEducate. This online platform is designed to demystify entrance to the aviation industry for students in grades K-12. AeroEducate prefaces and builds on the Young Eagles program, encouraging students to create free accounts where they can engage in more than 200 online activities, earn badges from online and in-person experiences, learn about different types of aviation careers, and learn the steps to get to that career.

AeroEducate is for more than just activities for students. Teachers know STEM interactions increase student interest in STEM-related careers, as supported by the research of Li et al. (2019) and Zuo et al. (2020). As such, AeroEducate provides free aviation-themed integrative STEM enrichment activities for K-12 grades for use in classrooms or other youth group settings. These fully developed, hands-on experiments explore aviation concepts through design and build pedagogy. The activities are fully aligned with national STEM standards for classroom use, or they can be used in less formal settings such as after-school clubs, summer camps, enrichment programs, libraries, museums, and the like. This versatility makes

these lessons available to all educators without the need to purchase or implement an entire curriculum or have special licenses or endorsements to teach them. The foundational knowledge and well-designed educator guides remove the requirement for educators to be aviation experts to implement the activities.

The Web-based AeroEducate resource hub has seen significant traction. As of April 2024, more than 40,000 students had enrolled, and more than 1,500 educators had enrolled. Participants have completed over 34,000 activities and earned over 1,200 badges. AeroEducate can reach students at multiple levels; 38 percent of enrolled student users are in high school, 35 percent are in middle school, and 25 percent are in 3rd through 5th grade. Many students access AeroEducate content via the Internet, reducing some of the barriers with traditional in-person activities.



Beyond the exciting aviation exploration activities available for youth at AeroEducate.org, the AeroEducate program encourages partners to participate, creating opportunities for students and educators to learn about aviation careers earlier than most existing aviation career-focused programming. Sharing information about AeroEducate with educators in your area and events such as open houses, factory tours, or even offering to share your knowledge as a guest speaker for a class will help reach additional students. Please consider sharing AeroEducate resources with students and educators, thus spreading opportunities to raise awareness of aviation careers further. Finally, working with local CTE teachers and directors can provide insight and opportunities to build partnerships and connections, further helping students find their way into the rewarding career opportunities of aviation and aerospace.

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