

Enhancing Competency in Aircraft Maintenance Technology Education

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removal and installation of aircraft parts and components. Her industry exposure includes work with Airgurus Ltd. Co., Lufthansa Technik Philippines, and the Philippine National Police – Special Action Force (Air Unit). As an educator, Ms. Andal is recognized for being creative, resourceful, and student-centered, effectively adapting instructional strategies to meet diverse learning needs. She conducts both theoretical and practical classes, develops aviation training curricula, ensures laboratory safety, and mentors students to enhance their technical competence and industry readiness. She is highly organized, capable of multitasking, and able to perform responsibilities with minimal supervision while maintaining full compliance with institutional and regulatory standards.

Introduction

As the aviation industry expands, so does the need for qualified people to perform tasks within aircraft maintenance technology. A competent technician to properly maintain an aircraft will require knowledge, skill, and abilities associated with providing safe and efficient aircraft maintenance. As the number of technological advancements in aircraft and associated systems grows, so does the number of regulations that are established for the safety of passenger aircraft. As such, there is an increased demand for a well-defined educational system in the aircraft maintenance field, which has never been greater than it is today, with the continuously growing demand for aircraft maintenance technicians. The current educational standards associated with aircraft maintenance

technology education specify the technician competency that will be required to meet the demands of the industry as follows:

- Civil Aviation Safety Regulations (CASR).
- International Civil Aviation Organization (ICAO).

In addition to the standards established for the education of technicians, educational institutions face numerous obstacles as they work to align their fleet with current standards. An example of an obstacle that educational institutions face in properly aligning with employer needs is the gap between the skills acquired in the classroom and those employers require of graduates.

Recent studies indicate that many training programs do not include practical elements of aircraft maintenance. Consequently, students enter the workforce unprepared for the realities of aviation maintenance, thereby creating an environment of increased risk and inefficiency within the aviation sector. Puspita et al. (2020).

Acknowledging these obstacles is the first step towards improving aircraft maintenance education. An examination of current trends in aircraft maintenance education indicates that the curriculum must adapt to industry requirements and the latest technology to produce a skilled technician equipped to serve the aviation industry. The current trends in aircraft maintenance education feature the use of technological integration, industry partnerships, and hands-on training to help students become confident and competent in an ever-changing industry. For many aircraft maintenance programs, modern tools and technologies have been integrated throughout the educational program to help students become familiar with the latest systems and equipment and prepare them for "real-world" challenges that will arise once employed in the workforce.

There is an increasing use of hands-on training, with students provided opportunities to experience it through simulators, virtual and/or augmented reality, and practical workshops. Training in

these areas will give students additional experience in an environment that helps them develop a better understanding of complex ideas and build confidence in performing maintenance tasks. Experiencing real-world scenarios in these hands-on training sessions will help students effectively apply the theoretical knowledge they have gained, equipping them with additional skills and abilities to perform effectively once employed as aircraft maintenance technicians.

Collaborating with leaders of the aircraft maintenance and aviation industries supports the integration of technology and hands-on training into educational programs. Educational institutions have established numerous partnerships with airlines and/or aircraft maintenance organizations to ensure that the educational program offered is aligned with industry needs. These partnerships typically offer students opportunities to participate in guest lectures, internships, and job placements within the industry while helping to develop a curriculum that is relevant to becoming an effective aircraft maintenance technician.

As demand for qualified aircraft maintenance technicians grows, developing an informative and effective curriculum will be necessary to prepare the next generation. Educational institutions can provide a strong foundation for future aviation professionals by integrating technology, offering hands-on training, and building industry partnerships.

Enhanced Competency through Curriculum Development

The aircraft maintenance technology education curriculum must adapt to incorporate advanced technologies and develop students' soft skills for the future. Today's student must learn the technical side of aircraft systems and develop skills to work effectively with others, in addition to using the current technology they will be exposed to daily in the aircraft maintenance industry. As technology in the industry continues to advance, the inclusion of new tools and equipment will necessitate adding those items to the

curriculum taught in the technician programs. By gaining hands-on experience with current technologies, students will become familiar with the tools and equipment used in their fields and be able to operate them effectively and safely.

Learning how to communicate clearly, work together with a team, and resolve issues in a positive manner is just as critical as the technical training students need. When students learn to communicate effectively, work together in teams, and solve problems as part of a team or collaborative group, they will have a better chance of finding employment and being successful in the workplace. Educators can facilitate the development of teamwork in a simulated environment that offers a real-world experience by using group projects and collaborative assignments (Ma & Mazlan, 2024).

Regularly reviewing and updating courses to align with current and emerging industry standards and technologies is an important part of developing a curriculum that meets the needs of students and educators. The incorporation of regular course updates, as well as feedback from students and industry professionals on the educational process, helps ensure the curriculum remains relevant and effective.

Another way to prepare students for their future is to use simulation and virtual training technologies to enhance their learning experience. These technologies provide students with realistic experiences that help them understand some of the challenges they will face in the aircraft maintenance field and bridge the gap between theoretical understanding and practical application. Virtual training tools are increasingly regarded as an essential component of educating students in aircraft maintenance technology. The use of simulation provides students with the opportunity to develop their skill sets and problem-solve in an environment as close as possible to real-world conditions; this can be very advantageous, as it reduces many of the risks associated

with hands-on learning, particularly in complex systems and high-risk situations. Simulation allows students in hands-on education/simulation to make mistakes throughout their training and learn from them, without the possible negative consequences that would occur in the actual world.

Many different types of virtual training tools exist, including, but not limited to, flight simulators, maintenance diagnostic tools, and 3-D interactive models. They each provide students with a unique opportunity to engage with the aircraft systems and procedures necessary to maintain the aircraft. A flight simulator allows students to visualize the dynamics of flight and how an aircraft responds and operates under varying conditions. Maintenance software provides students with opportunities to engage in real-world diagnostic challenges that technicians would encounter in the field (LEKEA & STAMATELOS, 2022).

There are several case studies of effective implementation through simulation and virtual training that provide evidence of these programs' effectiveness in preparing students for the aviation industry. Many institutions that have utilized simulation training have reported higher student engagement and retention of the information learned during their academic program. Some institutions have found that students using virtual training tools demonstrate higher levels of competency than those completing a traditional hands-on program.

As the role of technology continues to evolve, it is imperative that technological advancements align with regulatory requirements and/or certifications. By ensuring that training programs comply with the regulations and requirements established by the aviation industry, students will be fully prepared for the challenges they will face. Improving the capabilities of individuals and the safety and effectiveness of the overall aviation industry can be achieved by providing technicians with education and training aligned with regulatory standards.

Importance of Regulatory Standards and Certification

Aircraft maintenance technology, or “the way aircraft are maintained”, has a foundation of regulatory standards and certification. Regulatory standards outline the knowledge and skills technicians need to provide safe and effective aviation operations. A review of the regulations that govern aviation shows that the Federal Aviation Administration (FAA) and the European Union Aviation Safety Agency (EASA), among others, develop regulatory standards to allow technicians to have the necessary skills and knowledge to perform their jobs safely. Failure to meet these regulatory standards jeopardizes the legal ability to operate and the general public's faith in the safety of air travel.

Certification serves to verify that a technician possesses sufficient competence and can positively impact that technician's overall competency level. When a technician is certified, it serves as proof to potential employers that the technician possesses the industry-established level of proficiency in that trade, creating greater opportunities for employment and assuring employers of the technician's competency. However, the process of obtaining and maintaining certification can present challenges for technicians. Technicians must not only remain current with new and changing regulations but also successfully complete stringent testing and practical assessments to demonstrate competency.

The regulations create a structure for the development of education and training programs, but if these programs do not properly address the regulations, competency gaps may result from a lack of information about regulatory standards. Consequently, the education and training programs must be flexible and able to quickly adjust to new regulatory standards. This can sometimes require educational institutions to work with industry leaders to develop an effective education and training program. To enhance students' educational experience in the discipline of aircraft maintenance technology, industry partnerships and internships are



critical. Educational institutions work with industry partners to develop curricula that reflect current industry needs. Student internships provide the opportunity to apply their knowledge in real-world situations and develop hands-on experience that supports their confidence and competence in the technical aspects of their future careers.

For example, a partnership between an airline and an educational institution may allow students to participate in an internship program and work with seasoned technicians through that airline. Such internships help students acquire technical skills and develop soft skills such as interpersonal communication and teamwork. Students learn to manage workplace challenges and collaborate effectively with others as they gain experience through these types of internships (Thakur et al., 2024).

In addition to developing students' skills, successful partnerships can also lead to employment opportunities for graduates. By creating a clear path from school to the workforce, these partnerships enable graduates to meet industry employers' expectations and prepare them for their roles.

There is an increasing recognition of the importance of faculty professional development. Educators need to stay current with industry developments and trends in order to effectively mentor their students through the training process. Investing in faculty professional development will improve the overall educational structure and increase the alignment between educational knowledge and practical skills in aviation.

To provide quality instruction, faculty and professional development must be fundamental aspects of the education system for instructors and students in the field of aircraft maintenance technology. Qualified, trained instructors are essential for providing the technical expertise needed to teach students and prepare them for future careers.

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