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RESEARCH ARTICLE

Ensuring Aircraft Safety: A Case Study on Maintenance Operations at an Aerospace University in Lapu-Lapu City, Cebu

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Abstract

This study examines safety and maintenance practices related to aircraft inspection at an aerospace university in Lapu-Lapu City, Cebu, Philippines, using Wong's methodology as a guide. Eight instructors from the Bachelor of Science in Aircraft Maintenance Technology program participated. Data were collected through a semi-structured interview guide created by the researchers, with in-person interviews held at Indiana Aerospace University. Interview recordings were made with permission, and additional notes were taken throughout. Key themes identified during data analysis include: 1) Contributions to Safety, 2) Resource Challenges, Diverse Student Perspectives, and Limited Instructor Authority, 3) Improvements through Equipment Modernization, Partnerships with Philippine Aviation Industry. These insights reveal distinct aspects of aviation education, emphasizing the role of industry partnerships, equipment modernization, and the need for ongoing training program improvements. Highlighted challenges, such as resource constraints and varied student attitudes, point to a need for adaptable strategies in aviation education. This study contributes specific insights on enhancing aviation education and maintenance practices. Recommendations focus on strengthening industry partnerships, modernizing equipment, and refining training programs to support a safer, more efficient future for aviation. Further research is encouraged to deepen understanding in this area.

Keywords: *aircraft safety and maintenance, inspection practices, aviation technology education*

Introduction

Safety and Maintenance are fundamental aspects of aircraft operations, requiring routine inspections to ensure smooth functionality. Aircraft inspection, integral to aviation operations, emphasizes systematic and thorough checks to maintain airworthiness and protect passengers and crew. As a key element of aviation maintenance, these inspections are mandated globally by aviation regulatory bodies (ICAO, 2019). They involve comprehensive assessments of an aircraft's components, systems, and structures to identify potential defects, damage, or failures that could compromise safety or performance.

Safety encompasses preventive measures and procedures aimed at avoiding accidents and safeguarding passengers, crew, and aircraft. Maintenance focuses on regular inspections, repairs, and aircraft upkeep to ensure reliability and airworthiness. In Lapu-Lapu City, Cebu, Philippines, an aerospace university offers specialized aviation programs, providing students with hands-on training in aircraft inspection and maintenance (Indiana Aerospace University Website, n.d.). Regulatory authorities, like the International Civil Aviation Organization (ICAO) and local aviation bodies, enforce routine inspections to meet safety standards (ICAO, 2019). Such inspections follow established guidelines to uphold the aircraft's operational integrity. It is assumed that institutions preparing future aviation professionals will maintain a strong inspection program to promote sound maintenance practices and a robust safety culture (FAA, 2020).

Although existing research covers aircraft maintenance, safety protocols, and aviation education, there is limited focus on detailed safety and maintenance practices within aerospace universities, particularly at Indiana Aerospace University in Lapu-Lapu City, Cebu, Philippines. Much of the current literature addresses broad industry practices, regulatory measures, and commercial aviation, overlooking the unique educational and operational nuances within aviation training institutions (Smith & Johnson, 2020; Brown et al., 2019). This highlights a need for an in-depth study into safety and maintenance operations, regulatory compliance, and educational approaches specific to aerospace universities, especially within the evolving context of Indiana Aerospace University. Insights gained could benefit aviation education and maintenance standards both locally and globally (CAAP, 2020; Serdar Dalkilic, 2017).

Given the importance of aircraft maintenance and the necessity for ongoing improvements in safety practices, this study aims to examine aircraft inspection and maintenance practices at the aerospace university in Lapu-Lapu City, motivating the researcher to explore these issues and propose an actionable plan as an outcome.

Research Question/ Objectives

This study sought to address the following questions:

1. What are the experiences of Aircraft Maintenance Technology (AMT) instructors at Indiana Aerospace University regarding aircraft safety and maintenance?
2. What challenges do AMT instructors encounter in the area of aircraft safety and maintenance?
3. What opportunities exist to address the challenges faced by instructors in aircraft safety and maintenance?
4. What plan of action can be proposed as an outcome of this study?

Methodology

This study adopted a qualitative approach, suitable for capturing participants' perspectives and gaining a deep understanding of the subject matter (Creswell, 2013). Below is an outline of the research design, sampling, data collection, analysis, and trustworthiness considerations.

Research Design

The researchers applied a single case study design, aligning with Yin's (2003) guidelines. Yin suggested that a case study design is appropriate when: (a) the research aims to answer "how" and "why" questions; (b) the behavior of participants cannot be influenced by the researcher; (c) contextual conditions are relevant to the phenomenon; or (d) the boundaries between the phenomenon and the context are unclear.

Participants/Respondents

The study involved eight Aircraft Maintenance Technology instructors from Indiana Aerospace University. Purposive sampling was used to select participants based on specific criteria. The selection process included collaboration with the AMT Department Head, who recommended instructors meeting the criteria: (a) active instructor in the BSAMT program, and (b) significant experience in aircraft inspection to ensure practical knowledge in safety and maintenance.

Instruments

Data were collected primarily through semi-structured interviews using an interview guide developed by the researchers. These interviews were conducted in person at Indiana Aerospace University. With participants' permission, some interviews were recorded; additional notes were taken throughout. Eight AMT instructors from Indiana Aerospace University participated in the interviews.

Procedure

Data collection followed Creswell's (2012) seven-phase approach: 1) identifying cases meeting the criteria, 2) obtaining study permission, 3) informing participants of confidentiality and anonymity, 4) beginning data collection promptly, 5) documenting interview records, 6) discussing field notes with participants, and 7) coding and securely storing data. Semi-structured interviews were conducted face-to-face within Indiana Aerospace University. Participants provided consent for recording, and notes were taken during each session. This study adhered to the legal and ethical requirements of the Philippine Republic Act 10173 and the Data Privacy Act, ensuring data confidentiality and respect for participants' privacy.

Data Analysis

Following Wong's (2008) guidance, the researchers analyzed qualitative data through a systematic process. They: (1) transcribed the interviews and read them multiple times, (2) highlighted key phrases and sentences, (3) assigned codes to highlighted text, (4) grouped codes into themes, (5) identified recurring themes and patterns, and (6) selected significant phrases to illustrate key themes.

Results

Upon analyzing the transcript from the in-depth interview regarding Safety and Maintenance Operations: A Case Study of Aircraft Inspection Maintenance at an aerospace university in Lapu-Lapu City, Cebu, Philippines, the following themes emerged: 1) Contributions to Safety, 2) Resource Challenges, Diverse Student Mindsets and Mentalities, and Lack of Authority in Instructors, and 3) Enhancements through Modernization of Equipment and Partnerships with Aviation Industry Stakeholders. Below are their significant findings:

Theme 1: Contributions to Safety

Sub-theme 1: Regular Inspection and Monitoring

Routine inspections play a crucial role in maintaining safety and reliability within the aviation sector. By identifying and mitigating

potential risks proactively, these measures ensure aircraft remain airworthy, safeguard passengers and crew, and uphold the industry's high standards (Bellot, 2023). The theme of "Contributions to Safety through Inspection" showcases the dedication of aviation maintenance technology (AMT) instructors to comprehensive inspections, fostering a safe learning atmosphere. Participants highlighted their pivotal roles, underscoring the importance of inspections in averting hazards and upholding safety protocols.

The participants were asked about Contributions to Safety through Inspection. Participant 3 mentioned:

"There's an area that needs improvement regarding safety. Each lab should have two fire extinguishers, and they must be current and not expired. We should carry out visual inspections every three months."

Similarly, Participant 5 stated:

"During audits, I assist the administration, ensuring support is available when engaging with CAAP auditors who come yearly to evaluate the university. My role in promoting safety is notable during these audits, as I request reviews of previous findings, which inform the basis for future evaluations."

The same inquiry was made to Participant 6, who shared:

"Implementing safety protocols in the workplace or labs enhances student awareness and knowledge. Wearing proper personal protective equipment (PPE) during lab sessions is required for safety."

Finally, Participant 7 commented:

"It is common knowledge that all aviation institutions undergo inspections by CAAP. These inspections have shown that our school needs better safety practices, especially in the AMT department. For instance, we haven't enforced the use of coveralls, a requirement identified as an issue by CAAP. The department is now working to address this."

These responses collectively highlight how AMT instructors contribute to safety through structured inspections, demonstrating a vigilant approach to maintaining a secure educational and operational setting (Smith & Johnson, 2021).

Sub-Theme 2: Implementation

Contributions to safety through implementation reflect the proactive efforts of AMT instructors in nurturing a secure learning environment.

The participants were asked about Contributions to Safety through Implementation. Participant 1 noted:

"As an instructor, I incorporate real-life examples and case studies into courses on Aviation Safety and Aircraft Accident Investigation. Drawing on my experiences as an AMS and safety officer, I share practical scenarios illustrating the significance of PPE and hazard identification. This practical insight enriches student learning and bolsters safety and maintenance standards."

Participant 2 responded:

"During lab sessions, it's essential to teach students various practices, like navigating a ramp. Whether working in the field or outside the hangar, risks are high. Basic practices such as wearing a reflectorized vest are safety measures we enforce."

Participant 3 explained:

"To maintain student safety, we must clear any debris, such as safety wires, before conducting lab work to avoid accidents."

Participant 4 stated:

"I require students to review specific safety protocols before beginning any task, ensuring they understand potential risks. General safety guidelines are introduced and expected to be followed. Sometimes students lack the skills to handle tools and equipment safely, so regular checks on the condition of tools and equipment are necessary."

Participant 5 echoed:

"During audits, I assist the administration, providing support when interacting with CAAP auditors who conduct annual inspections. Reviewing previous findings plays a significant role in promoting safety."

Participant 6 shared:

"Safety guidelines for the workplace and labs enhance awareness among students. The use of prescribed PPE during lab sessions is mandatory for their safety."

Participant 7 pointed out:

"It is widely known that CAAP inspects all aviation schools. These inspections reveal gaps in safety implementation, especially in the AMT department. For example, coveralls are not currently in use, an issue identified by CAAP. The department is actively working on this."

Lastly, Participant 8 noted:

"Being explicit and clear about potential outcomes is crucial. Practicing foresight is essential daily. Demonstrating the right approach and possessing operational knowledge greatly enhances safety."

These varied responses underscore the proactive measures taken to ensure safety, such as practical teaching, focus on safety during hands-on activities, and involvement in safety audits. According to Smith and Johnson (2021), incorporating practical knowledge into lessons enhances the overall effectiveness of safety training.

Theme 2: Resource Challenges, Diverse Student Mindsets and Mentalities, and Lack of Authority in Instructors

Sub-Theme 1: Resource Limitations

Resource constraints emerged as a significant challenge shared by multiple participants during the AMT instructor interviews. One recurring issue was the difficulty of providing real-world scenarios and experiences due to limited resources.

Participant 2 shared:

"One major challenge is that some students find it difficult to visualize real-life scenarios in the field. This limitation impacts the ability to conduct realistic simulations at the university."

Participant 4 noted:

"While there have been no incidents recently, instructors should not only have the technical knowledge but also be well-informed about safety protocols."

Participant 7 stated:

"A significant challenge I face is accessing updated resources, particularly for our subjects. The main difficulty stems from relying on outdated reference materials."

This constraint extends beyond physical resources to outdated teaching materials, as Participant 7 highlighted the difficulty of obtaining updated references.

Participant 7 added:

"Resource limitations restrict what we can cover, given the facility's capabilities."

These resource constraints impact teaching effectiveness and preparedness, posing challenges that instructors address through adaptation and persistent advocacy for improvements (Brown & White, 2018).

Sub-Theme 2: Diverse Student Mindsets and Mentalities

A recurring challenge faced by AMT instructors revolves around the diverse mindsets and mentalities of their students. Participants were asked about these challenges. Participant 3 noted:

"My concern lies in how to handle the students. Let's take, for example, a class with a maximum of 50 students. We all know that every student has a different mindset and mentality, right?"

This statement highlights the inherent challenge of managing a large class with diverse perspectives. Participant 5 echoed this concern, emphasizing the difficulty of instilling the importance of safety in large classes:

"Teaching safety is a crucial aspect of my class. Yet, with a large class, it becomes challenging to drive home the importance of safety when faced with the limited attention spans of some students."

This response underscores the specific issue of maintaining attention and engagement. Additionally, Participant 6 reflected on the impact of diverse mindsets on discipline:

"My main concern revolves around student management. Failure to instill discipline and training in students during their school years can negatively impact their attitudes in future employment."

This response points to the long-term consequences of managing diverse mindsets, stressing the need for proactive measures in student management. Instructors must continuously adapt their teaching strategies to handle such diversity, emphasizing the importance of flexibility and continuous learning.

Sub-Theme 3: Lack of Authority in the Instructors

Another notable challenge is the perceived lack of authority among instructors, which affects their ability to manage students effectively. Participant 7 stated:

"I believe it all comes down to proper implementation because, as instructors, it seems like we lack the essence of authority."

This perspective highlights the difficulty of enforcing discipline and ensuring adherence to safety protocols when instructors feel their

authority is insufficient. The challenge is compounded by the need for additional training, as noted by Participant 7:

"I think we need more training and a stronger sense of authority to guide students in practicing what we want them to and help them realize this early on."

Participant 5 also pointed out the challenge of maintaining discipline in large classes:

"Teaching safety is a crucial aspect of my class. Yet, with a large class, it becomes challenging to drive home the importance of safety when faced with the limited attention spans of some students."

These observations emphasize the need for a stronger sense of authority and additional training for instructors to effectively guide students and maintain discipline, thus fostering a secure learning environment (Johnson & Williams, 2019).

Theme 3: Improvements through Modernization of Equipment and Collaboration with Aviation Partners in the Philippines

Sub-Theme 1: Modernization of Equipment

The modernization of equipment in aviation maintenance training is essential for meeting industry standards. Participant 8 highlighted:

"The use of modernized equipment, continuous identification of procedures and equipment, and the determination of risk factors are essential for addressing safety concerns."

This statement underscores the importance of current tools and technologies in ensuring effective training. The adoption of industry standards, such as the SS methodology, was also recommended to align with best practices.

Sub-Theme 2: Collaboration with Aviation Partners in the Philippines

Collaboration with industry partners, such as Aviation Partnership Philippines, has been recognized for its positive impact on education. Participant 2 noted:

"Yes, this is already in progress at A+."

This confirms that partnerships are being pursued. Participant 7 emphasized the potential benefits:

"Such partnerships can greatly contribute to the future careers of our students."

This statement underscores the value of industry collaborations in enriching education and preparing students for careers in aviation. The importance of such partnerships is supported by research showing their role in creating a comprehensive, industry-relevant curriculum (Johnson & Davis, 2020).

Conclusion

This study underscores the critical role of routine inspection, safety protocols, and resource management in aviation training. Key findings highlight the dedication of instructors to uphold safety through rigorous inspection processes and practical implementation strategies. However, challenges remain in resource constraints, diverse student mindsets, and limited instructor authority, which collectively impact the effectiveness of training programs. The study suggests that enhancing aviation education through partnerships, equipment modernization, and more structured authority for instructors could address these challenges, fostering a safer and more effective learning environment. These insights are valuable not only for aviation education but also for broader improvements in industry safety standards, with recommendations calling for further research to deepen understanding and refine safety practices..

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