

# A Comprehensive Study on All Aircraft Hangar Safety Practices in the Philippine State College of Aeronautics

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**Abstract-** Aircraft hangars play a vital role in aviation training institutions by providing secure environments for aircraft maintenance and storage. At the Philippine State College of Aeronautics (PhilSCA), which operates across four campuses—Basa, Villamor, Fernando, and Mactan—ensuring hangar safety is essential to prevent hazards such as fire risks, equipment damage, and personnel injury. This study investigates the safety management practices in PhilSCA's aircraft hangars by evaluating compliance with aviation safety protocols and the effectiveness of safety leadership. A quantitative descriptive research design was used, employing a purposive sampling technique to gather data from 12 safety managers—both current and former—across PhilSCA's campuses: Basa, Villamor, Fernando, and Mactan. Through the perspectives of both former and current safety managers, the study identifies key safety challenges, assesses management effectiveness in enforcing safety protocols, and provides recommendations for improving risk mitigation strategies. Findings indicate the need for standardized safety training, enhanced risk assessment, and improved management involvement. The results contribute to aviation safety research by providing insights into safety practices in academic aviation settings.

**Indexed Terms - Hangar Safety, Aviation Maintenance, Safety Management, Risk Mitigation**

## I. INTRODUCTION

### A. Background of the Study

Aircraft hangars serve as essential facilities in aviation training institutions, ensuring the maintenance and protection of aircraft. The Philippine State College of Aeronautics (PhilSCA) operates four campuses, each housing Cessna 152

aircraft. However, there is an uneven implementation of safety protocols across campuses due to variations in when aircraft were acquired. Villamor Airbase, the main campus, has had aircraft longer and is expected to have more established safety measures, while other campuses are still in the process of developing their safety protocols.

Another challenge is the disparity in safety training among personnel. While aviation instructors have received Level 3 training for aircraft operation; maintenance personnel, general education instructors, and utility staff have yet to receive formal briefings on proper safety protocols. Furthermore, students are not provided with comprehensive safety or emergency protocol training, leaving only instructors who are well-versed in these critical procedures.

Given these concerns, the need for a standardized and well-structured safety management system is evident. This study aims to assess the current state of safety management in PhilSCA's aircraft hangars, evaluate compliance with aviation safety protocols, and propose improvements to mitigate risks and enhance operational safety.

### B. Objective of the Study

General Objective:

To evaluate the safety management practices in aircraft hangars across all PhilSCA campuses.

Specific Objectives:

1. Assess the current safety compliance and risk management strategies in PhilSCA hangars.
2. Identify the effectiveness of management in enforcing safety protocols.
3. Evaluate the impact of infrastructure limitations on aircraft safety and student learning.

4. Propose improvements to enhance safety management in academic aviation hangars by risk identification and mitigation.

### *C. Significance of the Study*

This research is highly significant for multiple stakeholders. For aviation educators and maintenance personnel, the study provides critical insights into how safety management practices can be enhanced to ensure compliance with industry standards. It will also benefit students by promoting a safer and more conducive learning environment. For regulatory agencies such as Civil Aviation Authority of the Philippines (CAAP), this study highlights areas where policies may need to be reinforced or adjusted to improve aviation safety education. Additionally, for PhilSCA administrators, the findings can serve as a guideline for developing structured and standardized safety training programs that will ensure long-term sustainability and effectiveness in aviation maintenance education.

## **II. METHODOLOGY**

### *A. Research Design*

This study employs a quantitative descriptive method to gather data on hangar safety management practices across all campuses of the Philippine State College of Aeronautics (PhilSCA). This approach allows for a systematic and objective description of safety practices, compliance levels, and challenges from the perspective of key personnel involved in campus safety. Given the study's aim to obtain insights from a specific group of experts — the safety managers — this method ensures clarity, generalizability of findings, and relevance to institutional safety planning.

### *B. Population and Sample of the Study*

The population of this study consists of the twelve (12) safety managers from the four PhilSCA campuses: PhilSCA Basa, PhilSCA Villamor, PhilSCA Fernando, and PhilSCA Mactan. Among them, nine (9) are past safety managers who previously held safety oversight responsibilities in their respective campuses, and three (3) are currently designated as active safety managers.

A purposive sampling technique is employed to deliberately select participants based on their direct

role and experience in managing hangar safety. This technique is appropriate for the study as it targets individuals who possess the most relevant knowledge and firsthand insight into safety practices and challenges. The purposive sampling ensures that the data collected are deeply informed by operational realities and institutional knowledge.

### *C. Research Instruments*

The data gathering tool utilized in this study is a structured questionnaire developed by the safety manager of the main Campus of Philippine State College of Aeronautics, to check the safety compliance of each PhilSCA Campus. The instrument is divided into key sections aligned with the study's objectives: (1) Safety Compliance and Awareness, (2) Effectiveness of Management Practices, (3) Infrastructure Impact on Safety, and (4) Risk Identification and Mitigation. Each item is designed using a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), allowing for quantitative assessment of perceptions and practices. The edited instrument adapted by the researcher was initially validated by the Accountable and Quality manager of PhilSCA Basa, ensuring relevance and clarity for the intended participants.

### *D. Data Collection Procedure*

The researchers employed both printed and digital questionnaires to collect data from safety managers across all four campuses of the Philippine State College of Aeronautics (PhilSCA): Basa, Villamor, Fernando, and Mactan. The data collection period spanned from February 08, 2025, to March 29, 2025. For PhilSCA Basa Campus, where the researcher is currently assigned, questionnaires were printed and administered in person. This approach ensured direct communication, allowed for clarifications if needed, and maintained the reliability of the responses collected.

For PhilSCA Villamor, Fernando, and Mactan campuses, the questionnaires were distributed via Google Forms to accommodate geographic distance and enhance accessibility. Prior to dissemination, the research instrument underwent initial validation by the Accountable and Quality Manager of PhilSCA Basa to ensure the questions were aligned with the

study's objectives and met standards for clarity, relevance, and content accuracy.

Furthermore, formal approvals were obtained from the respective campus directors of all four campuses, ensuring ethical compliance and institutional support. The questionnaire began with a section for basic respondent identification, including their name and role, confirming their eligibility as former or current safety managers. This structured approach enabled efficient organization, classification, and analysis of responses, ultimately supporting the study's goal of assessing safety management in PhilSCA hangars.

#### E. Statistical Treatment

This study employed statistical tools to evaluate and analyze the data gathered from the safety managers of the Philippine State College of Aeronautics (PhilSCA) campuses. Descriptive statistics such as frequency and percentage, mean, median, mode, standard deviation, and rank were used to determine the number and proportion of responses for each Likert-scale item. To assess the general perception of safety managers regarding hangar safety compliance, risk mitigation, management practices, infrastructure, and improvement recommendations, the mean and standard deviation were computed for each item.

Table 1. Likert Scale

Excellent	4.21-5.00
Very Good	3.41-4.20
Satisfactory	2.61-3.40
Fair	1.81-2.60
Poor	1.00-1.80

The weighted mean per indicator was calculated to interpret the safety practices and infrastructure conditions in the aircraft hangars across all PhilSCA campuses. This statistical approach provided a structured analysis of the safety managers' collective evaluation, ensuring objective insights into the effectiveness of hangar safety management practices.

### III. RESULTS

The responses from 12 safety managers across the four PhilSCA campuses were analyzed to assess the current safety management practices in their respective aircraft hangars. Each item on the questionnaire was measured using a five-point Likert scale, with values ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Table 2. Safety Compliance and Awareness

	Weighted Mean	Standard Deviation	Interpretation
Regularly Cleaned	4.08	1.32	Very Good
Fire Safety Protocols	3.08	1.55	Satisfactory
Annual CAAP Audit	4.17	1.14	Very Good
BOSH/CO SH Certification	2.33	1.25	Fair
Safety Protocol Training (Annual)	3.25	1.36	Satisfactory
Safety Management Systems Training (Annual)	3.50	1.44	Very Good

Most respondents indicated that aircraft hangars are regularly cleaned (mean = 4.08), with a relatively consistent agreement among safety managers, reflecting strong adherence to cleanliness standards. Fire safety protocols received a lower mean (3.08) and more varied responses, suggesting inconsistencies such as inadequate fire extinguishers or missing signage. The annual CAAP audit was rated very positively (mean = 4.17), with minimal variation, showing it is a consistently applied safety measure. Meanwhile, the low rating for BOSH/COSH certification requirements (mean = 2.33) suggests a lack of enforcement or awareness of standardized

safety qualifications. Safety protocol training (mean = 3.25) and SMS training (mean = 3.50) were generally rated as satisfactory to very good, though the wider variation in responses points to uneven implementation across campuses. Overall, the differences in response consistency highlight areas where standardization and reinforcement of protocols are necessary.

Table 3. Effectiveness of Management Practices

	Weighted Mean	Standard Deviation	Interpretation
Safety Drills for Both Instructors and Students	3.25	1.36	Satisfactory
Safety Briefings to All Aviation Personnel	2.17	1.14	Fair
Hands-on Training	2.33	1.49	Fair
Metrics for Safety Effectiveness	2.42	1.61	Fair

The findings show that while safety drills for instructors and students are conducted (mean = 3.25), the varied responses suggest inconsistent implementation across campuses. Safety briefings received a low mean (2.17) but had the least variation in responses, indicating a shared perception that briefings are infrequent or insufficient. Hands-on training scored similarly low (mean = 2.33), with wider variation in responses, implying that while some campuses may offer training, many lack it, leading to uneven skill preparedness. The use of metrics to assess safety effectiveness also showed a low average (2.42) and the highest variation, revealing uncertainty or inconsistency in applying performance evaluations. These results highlight the need for more structured and consistent safety communication and training programs across all PhilSCA campuses.

Table 4. Infrastructure Impact on Safety

	Weighted Mean	Standard Deviation	Interpretation
Hangar Layout for Emergency Response and Servicing	4.17	0.99	Very Good
Ventilation of Hangar	4.83	0.55	Excellent
Lighting Sufficiency	3.92	1.61	Very Good
Rating and Placement of Fire Extinguishers	2.42	1.44	Fair
Water Ingress Inside the Hangar	2.08	1.19	Fair

Respondents gave the highest and most consistent rating to hangar ventilation (mean = 4.83), reflecting excellent conditions with strong agreement among them. The layout for emergency response (mean = 4.17) also received very good feedback, and its low variation suggests that most hangars follow a standard, efficient design. Lighting sufficiency (mean = 3.92), while rated very good, showed the widest range of responses, implying inconsistent lighting quality across campuses. Fire extinguisher placement (mean = 2.42) and water ingress (mean = 2.08) received fair ratings, and the higher variation in fire extinguisher scores indicates differences in safety compliance, while the relatively lower variation in water ingress ratings shows consistent concern across locations. These findings highlight strengths in infrastructure planning but also point to recurring issues in fire readiness and water intrusion management.

Table 5. Risk Identification and Mitigation

	Weighted Mean	Standard Deviation	Interpretation
Incident and Accident Documentations	3.67	1.43	Very Good
Environmental Risks	2.42	1.38	Fair
Storing Hazardous Equipment	2.67	1.55	Satisfactory

The data shows that most respondents agree on the presence of incident and accident documentation (mean = 3.67), with fairly consistent responses, indicating that this aspect of safety management is well-acknowledged across campuses. In contrast, environmental risks were rated low (mean = 2.42), suggesting concerns about exposure to weather and poor facility structure; the relatively varied responses imply that some campuses may manage risks better than others. For hazardous equipment storage (mean = 2.67), the mixed ratings indicate that while some areas may have proper protocols, others lack safe practices, which could pose risks of equipment degradation or accidents. The broader variation in these two areas highlights a lack of uniform safety standards, suggesting the need for stronger policy enforcement and facility upgrades. Overall, while documentation practices are viewed positively, environmental controls and hazardous storage require significant improvement.

### CONCLUSION

The study revealed that while foundational safety practices such as regular cleaning of hangars and aircraft are generally upheld, there are significant gaps in critical safety infrastructure and protocols. Most safety managers confirmed that cleaning routines and CAAP audits occur as expected, and safety training is provided at least annually. However, there is a noticeable deficiency in fire safety measures, such as the availability of fire extinguishers and the presence of visual safety reminders. Furthermore, the lack of BOSH/COSH certification requirements for safety managers and the minimal hands-on safety drills raise

concerns about the depth of preparedness and risk mitigation.

Documentation procedures like incident and narrative reports are in place, but storage conditions and hangar designs compromise long-term equipment safety due to environmental exposure. Infrastructure-related issues such as inadequate lighting, lack of fire suppression systems specific to aircraft, and ineffective ventilation contribute to safety risks. The data also points to weak evaluation mechanisms, as there are no clear metrics used to assess the effectiveness of safety protocols. Despite these limitations, the safety managers showed a proactive mindset, expressing a strong desire for improvements and suggesting viable, budget-conscious recommendations.

This study successfully evaluated the safety management practices in the aircraft hangars of all four PhilSCA campuses through the lens of current and past safety managers. The findings highlight a mixed landscape: while routine practices like cleaning and annual training are being followed, significant structural and procedural weaknesses persist. The absence of specific qualifications for safety managers, insufficient fire protection, lack of safety awareness materials, and limited student and staff engagement in real-life drills all contribute to systemic vulnerabilities.

Infrastructure, often overlooked in resource-constrained institutions, emerged as a major factor limiting effective safety management. The open hangar design, inadequate lighting, and insufficient fire suppression tools directly influence the operational safety of both personnel and aircraft. Additionally, the lack of performance metrics and formal evaluation systems hinders continuous safety improvement.

This study accomplished its goal of identifying key safety issues and potential improvements, serving as a foundational reference for future institutional planning. For PhilSCA, these insights are invaluable for prioritizing safety-related enhancements, developing training programs, and establishing robust evaluation frameworks.

## RECOMMENDATIONS

The recommendations on the study:

1. Install Additional Fire Extinguishers: Current fire suppression systems are inadequate and do not meet the standards for aviation-related fire hazards. Upgrading to aviation-rated extinguishers is essential.
2. Implement Visual Safety Reminders: Posting tarpaulins and signage can reinforce safety awareness daily, especially for students and new personnel.
3. Upgrade Hangar Lighting: Poor lighting compromises visibility during maintenance activities. Installing brighter and strategically placed lighting improves both safety and operational efficiency.
4. Provide Aircraft Covers: In the absence of a closed hangar, durable covers can protect aircraft from the elements and reduce wear caused by heat and moisture.
5. Increase Frequency of Hands-on Safety Drills: Involving students and maintenance personnel in practical drills will cultivate a stronger safety culture and ensure better preparedness.
6. Require BOSH/COSH Certification for Safety Managers: Establishing minimum qualifications ensures that designated personnel are equipped with up-to-date knowledge and training.
7. Conduct Regular Infrastructure Audits: Annual assessments of layout, lighting, and fire systems will help identify and fix problems before they escalate.
8. Introduce Safety Performance Metrics: Developing and using KPIs (Key Performance Indicators) will allow safety managers to measure effectiveness and continuously improve.

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