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RESEARCH ARTICLE

Evaluating the Engine Run-Ups on Student Performance in Aircraft Maintenance Technology at Indiana Aerospace University

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Abstract

This study investigates the impact of engine run-ups on student performance in the Aircraft Maintenance Technology (AMT) program at Indiana Aerospace University (IAU) for the academic year 2023–2024. Engine run-ups, which simulate real-world aircraft maintenance procedures, are integral to aviation training programs. While these activities aim to strengthen technical competencies, their effect on students' skill development, knowledge acquisition, and assessment performance has not been widely examined in the Philippine context. Using a descriptive quantitative research design, the study gathered data from 50 second-year AMT students through a self-constructed survey. The instrument measured the impact of engine run-ups across three key areas: skills, knowledge, and assessment, supported by the theoretical frameworks of Environmental Stress Theory and Cognitive Load Theory. The findings revealed that students strongly agreed engine run-ups significantly enhance their practical skills and problem-solving abilities. Additionally, the experience contributed to a deeper understanding of aircraft engine systems, confirming that hands-on learning complements theoretical instruction. Regarding assessments, students agreed that engine run-up exercises are reflected in their evaluation methods, although further alignment between practical activities and academic assessments is recommended. The study also identified the need to diversify instructional strategies and implement more comprehensive evaluation methods to fully capture student competence. In conclusion, engine run-ups are a valuable component of AMT education, bridging classroom knowledge with industry-relevant skills. However, to optimize learning outcomes, training programs must include complementary activities such as simulations, troubleshooting workshops, and formative assessments. The study's recommendations advocate for aligning practical experience with evaluation methods and enhancing student confidence through mentorship and peer-based support. These improvements are essential to producing well-rounded aviation maintenance professionals prepared for the demands of the global aviation industry.

Keywords: *engine run-up, student performance, aircraft maintenance, aviation education, practical assessment*

Introduction

Engine run-up procedures are a critical aspect of aviation training across global regions such as the United States, Europe, and Asia. These procedures play a key role in ensuring aircraft safety and operational readiness, in accordance with regulatory standards set by the International Civil Aviation Organization (ICAO, 2022) and the Federal Aviation Administration (FAA, 2020). While engine run-ups offer valuable real-world learning experiences—exposing students to realistic maintenance environments involving noise, vibration, and high operational demands—they may also introduce stressors that influence student focus, learning outcomes, and performance in practical assessments (Alasim & Almalki, 2021).

In the Philippine aviation training landscape, institutions have increasingly incorporated engine run-ups as core elements of Aircraft Maintenance Technology (AMT) programs, reflecting the country's growing aviation industry (Civil Aviation Authority of the Philippines [CAAP], 2024). However, limited empirical research has explored the specific effects of these procedures on student development and academic performance. Cebu, a regional hub for aviation education, presents a dynamic context where schools like Indiana Aerospace University (IAU) in Lapu-Lapu City must balance practical exposure with the creation of supportive learning environments that foster student well-being and skill mastery.

This study draws on Environmental Stress Theory and Cognitive Load Theory to investigate how engine run-ups affect AMT students' knowledge retention, skill acquisition, and assessment performance. Environmental Stress Theory posits that stressors in the training environment—such as engine noise and mechanical vibration—can disrupt concentration and reduce learning efficiency (Lazarus & Folkman, 1984). Meanwhile, Cognitive Load Theory suggests that when students are exposed to high sensory demands without

sufficient cognitive support, their working memory may become overwhelmed, limiting their ability to absorb and apply new information effectively (Sweller, 1988). By examining these frameworks in the context of simulator-supported and hands-on run-up training at IAU, this study aims to generate actionable insights for improving aviation maintenance education in the Philippines.

Research Question/ Objectives

This study aims to evaluate the impact of engine run-ups on student performance in the Aircraft Maintenance Technology (AMT) program for the school year 2023-2024 at Indiana Aerospace University and to propose an action plan. Specifically, the study sought to:

1. Assess the influence of engine run-ups on student performance in AMT in terms of skills, knowledge, and assessment.

Methodology

This study employs a descriptive quantitative research design to evaluate the effects of engine run-ups on the performance of Aircraft Maintenance Technology (AMT) students. Descriptive research allows for systematic observation, measurement, and analysis of specific variables—such as student knowledge, skills, and assessment outcomes—related to practical engine run-up activities. Quantitative methods are particularly effective in generating objective, replicable data that can identify trends and relationships. Through this approach, the study aims to understand how engine run-ups influence student performance, offering evidence-based insights that can enhance teaching strategies and strengthen the AMT training curriculum.

The research will be conducted at Indiana Aerospace University (IAU) in Lapu-Lapu City, Cebu, a leading institution in aviation education in the Philippines. Known for producing competent aviation professionals since its establishment in 1992, IAU provides a learning environment that fosters both technical excellence and personal growth. The study's respondents will consist of 50 second-year AMT students (15 female and 35 male), who were selected through purposive sampling based on their experience with engine run-up procedures. Student lists were obtained from course instructors to ensure a relevant and representative sample of participants directly involved in these training activities.

Data will be collected through self-constructed survey questionnaires designed to assess the impact of engine run-ups on students' knowledge, skill development, and assessment performance. The instrument is divided into three parts: respondent demographics, impact on performance using a 5-point Likert scale, and challenges encountered during training. Prior to distribution, instructors will verify participants' involvement in engine run-ups to ensure alignment with the study's objectives. The data gathered will be statistically treated using descriptive methods, particularly weighted means, to determine patterns and levels of effectiveness across key performance indicators.

Results

Skills

Skills refer to the abilities and competencies a person develops through training, education, or experience, allowing them to complete tasks efficiently and effectively. In aircraft maintenance, these skills involve technical tasks like handling tools, operating machinery, and performing maintenance procedures.

Relating to Experiential Learning Theory, the hands-on nature of engine run-ups allows students to apply theoretical knowledge in real-world settings, solidifying their technical skills and ensuring they are prepared for the demands of aviation maintenance.

Table 1 presents the impact of the engine run-up on student performance in aircraft maintenance technology students at Indiana Aerospace University in terms of skills.

Table 1. *Skills*

Indicators	*Weighted Mean*	*Description*
1. Students' practical abilities in Aircraft Maintenance Technology are greatly enhanced by engine run-ups.	4.82	Strongly Agree (SA)
2. Regular engine run-up sessions boost students' confidence in their technical skills.	4.62	Strongly Agree (SA)
3. The hands-on experience gained from engine run-ups is crucial to students' success in the program.	4.56	Strongly Agree (SA)
4. The development of students' maintenance abilities is strongly influenced by the frequency of engine run-ups.	4.36	Strongly Agree (SA)
5. Participation in engine run-ups has led to significant improvements in students' problem-solving skills.	4.32	Strongly Agree (SA)
Average Weighted Mean	4.54	Strongly Agree (SA)

Legend: 4.21–5.00, Very Strongly Agree; 3.41–4.20, Strongly Agree; 2.60–3.40, Neutral; 1.81–2.59, Disagree; 1.00–1.80, Strongly Disagree

Knowledge

Knowledge refers to the information, facts, and theoretical understanding gained through education and training. In aircraft maintenance, knowledge involves understanding the principles of aerodynamics, systems engineering, and maintenance protocols.

Constructivist Learning Theory relates to how students build knowledge through experience. By applying a combination of theory and practice ensures that they not only memorize information but also understand how to apply it in the field.

Table 2 presents the impact of the engine run-up on student performance in aircraft maintenance technology students at Indiana Aerospace University in terms of knowledge.

Table 2. *Knowledge*

Indicators	*Weighted Mean*	*Description*
1. Engine run-ups contribute to a deeper understanding of aircraft engine systems among students.	4.52	Strongly Agree (SA)
2. Engine run-ups enhance students' grasp of aircraft maintenance techniques and procedures.	4.50	Strongly Agree (SA)
3. Students' theoretical knowledge is solidified through the practical experiences of engine run-ups.	4.48	Strongly Agree (SA)
4. The knowledge acquired from engine run-ups is effectively connected to the material covered in students' courses.	4.44	Strongly Agree (SA)
5. The insights gained from engine run-ups are directly relevant to students' academic learning.	4.4	Strongly Agree (SA)
Average Weighted Mean	4.47	Strongly Agree (SA)

Legend: 4.21–5.00, Very Strongly Agree; 3.41–4.20, Strongly Agree; 2.60–3.40, Neutral; 1.81–2.59, Disagree; 1.00–1.80, Strongly Disagree

Assessment

Assessment is the process of evaluating a student's learning, progress, and competence. In aviation, assessments can involve theoretical exams, practical evaluations, and on-the-job performance to measure both knowledge and skills.

Evaluating students through real-world tasks, such as engine run-ups, aligns with the principles of Authentic Assessment Theory. By emphasizing practical tasks that mirror real job requirements, this ensures assessments are relevant and effectively measure students' true competence and preparedness for professional aviation careers.

Table 3 presents the impact of the engine run-up on student performance in aircraft maintenance technology students at Indiana Aerospace University in terms of assessment.

Table 3. *Assessment*

Indicators	*Weighted Mean*	*Description*
1.The skills students gain from engine run-ups are effectively evaluated in their coursework.	4.50	Strongly Agree (SA)
2. The assessment methods used for engine run-ups accurately represent students' practical understanding and abilities.	4.42	Strongly Agree (SA)
3. Students believe that engine run-ups should have a greater influence on the assessment of their technical skills.	4.34	Strongly Agree (SA)
4. Students feel that the knowledge acquired from engine run-ups is accurately reflected in their exam assessments.	4.30	Strongly Agree (SA)
5. Students' performance during engine run-ups serves as a reliable measure of their overall competence in Aircraft Maintenance Technology.	4.06	Agree (A)
Average Weighted Mean	4.32	Strongly Agree (SA)

Legend: 4.21–5.00, Very Strongly Agree; 3.41–4.20, Strongly Agree; 2.60–3.40, Neutral; 1.81–2.59, Disagree; 1.00–1.80, Strongly Disagree

Conclusion

The study concludes that engine run-ups play a significant and positive role in enhancing student performance in Aircraft Maintenance Technology, particularly in the areas of skill development, knowledge acquisition, and practical assessment. Students overwhelmingly agreed that these hands-on experiences improved their technical competencies and deepened their understanding of aircraft engine systems. Furthermore, the alignment between training and assessment was seen as effective, ensuring that students' capabilities are accurately measured. These findings underscore the value of integrating real-world applications into the training process, reinforcing the practical relevance of academic learning.

However, while the impact of engine run-ups is clearly beneficial, the research also highlights the need for a more comprehensive and diversified approach to training and evaluation. Sole reliance on engine run-ups as a performance indicator may not fully capture a student's overall competence. Therefore, expanding assessment strategies to include simulations, project-based tasks, and formative evaluations can provide a more complete picture of student readiness. Likewise, enhancing instructional support—through mentorship, feedback mechanisms, and integrated learning opportunities—can help students build confidence, bridge theoretical and practical gaps, and perform more effectively in real-world scenarios.

Based on the findings, the study recommends revising and expanding the current training framework. This includes incorporating varied practical activities such as troubleshooting workshops and simulation-based assessments, aligning exam content with hands-on tasks, and providing consistent, constructive feedback throughout the training process. Additionally, integrating mentorship programs and peer

learning systems can offer students guidance and improve technical confidence during engine run-ups. These initiatives will not only strengthen students' practical abilities but also ensure they are better prepared for the challenges and expectations of the aviation maintenance industry.

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