Journal of Advanced Studies in Aviation, Aerospace, and Management
2025, ISSN xxxx-xxxx
Volume 1 Issue 2
https://doi.org/10.70838/jasaam.010206
Received: 17 January 2025 Accepted: 10 May 2025

RESEARCH ARTICLE

Determining Human Factors in Aviation among Indiana Aersopace University Pilots

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Abstract

This study aimed to determine the key human factors influencing aviation performance among pilots at Indiana Aerospace University (IAU), focusing on training and flight simulation, safety culture, and workload management. Using a descriptive quantitative research design, the study employed a self-made questionnaire with a 5-point Likert scale to gather data from 50 participants across five pilot groups: student pilots, private pilots, commercial pilots, ground instructors, and flight instructors. Stratified random sampling ensured that all pilot categories were adequately represented. Data were collected through face-to-face distribution of surveys and analyzed using weighted mean and ranking methods. Findings revealed that IAU pilots strongly agreed on the significance of human factors in aviation safety and performance. Regarding safety culture, pilots recognized a well-established system that promotes open communication, mutual respect, and a supportive reporting environment. Workload management, while generally effective, showed areas for improvement, particularly in shift scheduling and institutional support systems to prevent fatigue. Training and simulation programs were also rated highly, especially for their effectiveness in reducing errors and preparing pilots for in-flight emergencies. However, pilots suggested improvements in simulation realism and continuous updates to training standards to match current aviation demands. The study concluded that addressing human factors such as training quality, effective workload distribution, and a robust safety culture is essential for minimizing human error and enhancing overall aviation outcomes. It recommends that IAU adopt more flexible academic policies during flight periods, improve flight scheduling systems, enhance simulator fidelity, and promote a just culture for safety reporting. These strategies will strengthen pilot preparedness, reduce risk, and reinforce IAU's position as a leading institution in aviation education.

Keywords: *human factors, aviation safety, workload management, flight simulation, safety culture*

Introduction

Aviation has made remarkable technological advancements since the Wright brothers' pioneering flight in the early 20th century. However, as the industry evolved, it became increasingly clear that human performance is equally significant in maintaining safety and reliability. Studies by the UK Civil Aviation Authority (CAA) and various organizations in the United States emphasize the impact of pilot training, decision-making, and organizational safety culture on aviation outcomes (Civil Aviation Authority, 2024).

In the Philippines, the Civil Aviation Authority of the Philippines (CAAP) has similarly prioritized human factors in its initiatives, highlighting their role in shaping a progressive and safe aviation sector (Civil Aviation Authority of the Philippines, 2024). This research, titled Determining Human Factors in Aviation Among IAU Pilots, aims to examine key elements such as safety culture, workload management, training quality, and flight simulation, all of which significantly enhance pilot performance and reduce error rates.

The study is grounded in key theoretical frameworks that provide insight into how human factors affect aviation performance. Multiple Resource Theory (MRT), introduced by Wickens (2002), posits that cognitive workload is managed through various mental resources that can be overextended, especially under high-stress or multitasking conditions. For pilots, effective workload management is essential for maintaining situational awareness and making timely decisions. Additionally, Baldwin and Ford's (1988) Transfer of Training theory highlights the importance of high-fidelity, context-specific instruction in aviation, arguing that training must mirror real-world conditions to ensure both near and far skills transfer. This includes realistic flight simulations, continuous instructor feedback, and adaptation to individual learning needs. These theories collectively support the study's focus on improving training environments, managing mental and physical demands, and reinforcing a proactive safety culture.

Ultimately, this study seeks to identify the most influential human factors affecting aviation students at Indiana Aerospace University (IAU), particularly among pilot trainees. By doing so, the research aims to develop an action plan that minimizes human error, promotes a robust safety culture, and enhances both flight and simulation training. Human error remains a leading cause of aviation incidents (Wiegmann & Shappell, 2003), it is crucial to understand and address the specific human factors that influence pilot performance. The researchers—aviation students with foundational knowledge in workload management, training systems, and human factors—aim to provide informed recommendations supporting IAU pilots in developing safer, more effective flight practices.

Research Question/ Objectives

This study sought to determine the Human Factors in Aviation among Pilots at Indiana Aerospace University for 2023-2024 and propose an action plan. Specifically, this study sought to:

1. Determine the human factors in aviation among pilots regarding training and flight simulation, safety culture, and workload management.

Methodology

This study employed a descriptive quantitative research design to determine the key human factors influencing aviation performance among pilots at Indiana Aerospace University (IAU). The research focused on three primary variables: training and flight simulation, safety culture, and workload management. Quantitative methods enabled the researchers to gather objective data revealing patterns and correlations between human factors and aviation-related outcomes such as performance levels, error frequency, and safety practices. A self-made, structured survey questionnaire was used to collect data, which included a 5-point Likert scale to assess perceptions of training effectiveness, workload demands, and safety culture. The survey also featured a checklist of common challenges experienced by pilots during flight operations or simulations. The study was conducted at Indiana Aerospace University in Basak, Lapu-Lapu City, Cebu. It is a well-established institution known for its modern training facilities, including flight simulators and specialized aviation programs. The university served as an ideal research environment due to its accessibility, well-equipped aviation department, and diverse pilot population. The respondents consisted of 50 participants selected through stratified random sampling to ensure balanced representation across five groups: 25 student pilots, 12 private pilots, 7 commercial pilots, 3 ground instructors, and 3 flight instructors. Participants were selected based on specific criteria, such as accumulated flight hours or instructional experience. The data collection was conducted in person; questionnaires were distributed and answered on-site, with researchers present to assist participants and ensure clarity and accuracy in responses.

The survey instrument was divided into three sections: demographic information, human factors (training, simulation, safety culture, and workload), and encountered problems. The data gathered were analyzed using descriptive statistics, specifically the weighted mean and ranking method, to interpret responses and evaluate the prominence of each factor. Ethical standards were upheld throughout the study. Prior to survey administration, participants were informed of the research purpose, assured of confidentiality, and advised that participation was voluntary. By focusing solely on IAU pilots, the study ensured relevance and precision in examining human factors that significantly impact flight safety and pilot performance within an academic aviation setting.

Results

The best practices of on-the-job training in aircraft maintenance are presented and tabulated in terms of training, safety protocols, and human factors.

Safety Culture

The concept of safety culture in aviation closely aligns with James Reason's (1997) theory on managing the risks of organizational accidents. Reason emphasizes that human errors are inevitable, but a strong safety culture can act as a defense mechanism by fostering an environment where mistakes are reported and learned from without the fear of punishment. This is seen in aviation safety culture, where open communication, learning from errors, and continuous improvement are critical components. Through leadership, training, and clear procedures, flight crews collectively work to minimize risks and prevent accidents by creating multiple layers of safety defenses.

Table 1 presents the determining human factors in aviation among IAU pilots in terms of safety culture.

Table 1. *Safety Culture*

Indicators	*Weighted Mean*	*Descriptions*
1. Strong emphasis on maintaining a well-defined safety culture among its pilots.	4.46	Very Strongly Agree
2. Safety training programs are comprehensive and adequately prepare pilots to handle potential safety risks.	4.42	Very Strongly Agree
3. Strong culture of natural respect among IAU pilots that contributes to safety.	4.40	Very Strongly Agree
4. The communication of safety-related information among aviation department are effective.	4.36	Very Strongly Agree
5. Feeling comfortable and supported in reporting safety concerns or incidents without fear of reprisal.	4.12	Strongly Agree
Average Weighted Mean	4.40	Very Strongly Agree

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

Workload Management

Workload Management in aviation aligns closely with the Crew Resource Management (CRM) theory which emphasizes the importance of interpersonal communication, decision making, and teamwork among flight crews. CRM training encourages pilots and crew members to prioritize safety through open communication, allowing them to share critical information and voice concerns without fear of retribution. This collaborative environment fosters a shared responsibility for safety enabling teams to identify potential hazards and mitigate risks effectively (Helmreich et al., 1999). By embedding safety as a core value within the culture of aviation operations CRM enhances the overall effectiveness of teams and reduces the likelihood of human errors ultimately contributing to safer flight operations (Baker et al., 2006).

Table 2 presents the determining human factors in aviation among IAU pilots in terms of workload management.

Table 2. *Workload Management*

Indicators	*Weighted Mean*	*Descriptions*
1. Effective workload management training in identifying and addressing human factors affecting pilot performance.	4.16	Strongly Agree
2. High workload levels among IAU Pilots impacting their decision-making abilities during critical situations.	4.02	Strongly Agree
3. The workload among IAU Pilots is distributed evenly, ensuring that it does not lead to excessive stress during flights.	4.00	Strongly Agree
4. The scheduling of shifts and flight duties by IAU effectively prevents pilot fatigue and ensures optimal performance.	3.96	Strongly Agree
5. IAU provides adequate support systems to help pilots manage their workload efficiently.	3.58	Strongly Agree
Average Weighted Mean	3.90	Strongly Agree

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

Training And Flight Simulation

Baldwin and Ford's (1988) theory of training transfer explains how skills learned during training can be applied in real-life work situations. Their approach highlights the need to ensure that training is both relevant and practical, especially in high-stress environments like aviation. By using tools such as flight simulators, pilots can shift from knowledge-based actions to skill-based behaviors through repetition. Simulations offer a safe space to practice, helping pilots better manage emergencies and stressful conditions, ultimately reducing human error and improving flight safety.

Table 3 presents the determining human factors in aviation among IAU pilots in terms of training and flight simulation.

Table 3. *Training and Flight Simulation*

Indicators	*Weighted Mean*	*Descriptions*
1. The training programs offered by IAU are effective in reducing human errors during flights.	4.26	Very Strongly Agree
2. The training and simulation sessions conducted by IAU effectively ensure that pilots retain critical skills and knowledge.	4.24	Very Strongly Agree
3. Flight simulator training effectively prepares IAU pilots for unexpected inflight emergencies.	4.18	Strongly Agree
4. The flight simulations provided by IAU accurately reflect real-life scenarios, helping pilots prepare for actual flights.	4.16	Strongly Agree
5. IAU continuously updates and improves its training and simulation programs to reflect the latest in aviation safety standards.	3.88	Strongly Agree
Average Weighted Mean	4.10	Strongly Agree

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 findings of the study demonstrated a strong agreement among Indiana Aerospace University (IAU) aviation pilots that human factors significantly influence aviation safety and performance. In particular, safety culture, workload management, training quality, and flight simulation were identified as key elements shaping pilot effectiveness. The results underscore the importance of a well-structured and supportive training environment that emphasizes safety, reduces cognitive overload, and promotes realism in training scenarios. When these factors are properly addressed, pilots are better equipped to handle operational challenges, thereby minimizing human error and improving overall flight safety outcomes.

To enhance pilot performance and reduce training-related stress, it is recommended that IAU adopt more flexible academic policies during flight training periods. Unnecessary school projects and rigid deadlines should be reduced or excused during active flight schedules.

Furthermore, improved scheduling systems should be implemented to minimize pilot fatigue—this includes updating flying schedules in real-time and ensuring pilots receive sufficient rest. Institutions must prioritize both mental health and physical readiness by providing pilots access to counseling services, stress management programs, and fatigue education. Additionally, academic staff should coordinate closely with the aviation department to excuse student pilots from academic requirements during flight training periods to prevent undue

stress and ensure focused learning.

It is equally critical that IAU cultivate a safety-first environment grounded in the principles of a just culture. Pilots must feel safe and supported when reporting safety concerns, without fear of reprisal. Leadership seminars and ongoing training should be introduced to distinguish between human error and reckless behavior, promoting open communication and continuous safety improvement. Moreover, implementing peer mentorship, time management workshops, and clear task delegation for both students and flight instructors can help distribute workload more evenly. These strategic interventions can foster a safer, more efficient, and pilot-centric learning environment, ultimately strengthening the institution's commitment to aviation excellence.

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