The Impact of Safety Management System and Safety Risk Management Towards Aviation Safety Performance at an Airline Company

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ABSTRACT. Since the earliest days of the aviation industry via the invention of the first airplane by the Wright brothers, many risks and perils have consistently arisen to challenge human comprehension of aviation safety. Over time, there has been a concomitant increase in technological advancements aimed at assisting individuals in overcoming this challenge. The respective airline company, an esteemed Indonesian aviation company, now occupies the leading position in the aviation industry inIndonesia. They have just received a 5-star accreditation for aircraft safety during the COVID-19 pandemic. The respective airline company excels in the Indonesian aviation industry, as shown by its many certifications and honors. The respective airline company's ownership of subsidiaries and its own group contributes to its prestigious 5-star airline reputation. The objective of this study is to determine the elements that impact the safety performance indicator, with a special emphasis on safety risk management and safety management system, at this respective airline company. This study used quantitative data in the form of a questionnaire. The questionnaire was submitted to the appropriate department of this respective airline company and all of them were deemed suitable foruse. The use of Structural Equation Modelling (SEM) provided an illustration of the results, regression weights, and model fit for the analysis of the study model.

Keywords: Aviation Safety, Safety Risk Management, Safety Management System, Aviation Safety Performance Indicators

1. INTRODUCTION

For over the past decade, air travel has emerged as a crucial component of everyday existence, exhibiting a growing inclination towards both local and international journeys. The accessibility and comfort of air travel have significantly altered the manner in which individuals engage with distant locations and diverse cultures, hence fostering the processes of globalization and connectivity. As technological advancements continue, airplanes are becoming increasingly efficient, leading to the emergence of new travel routes. Consequently, the globe is becoming more accessible, enabling individuals to explore unfamiliar destinations, reconnect with their dear ones, and engage in global economic activities. (Kin, 2015). The advancement of air travel not only enhances our ability to traverse the world, but also facilitates economic expansion, cultural exchange, and a deeper understanding of our interconnected and diverse global community. In addition, the proliferation of air transportation has led to the establishment of a wide range of supplementary services and enterprises that contribute to and enrich theaviation journey.

The aviation sector has had consistent growth throughout the past decade. Regrettably, the COVID-19 epidemic has impeded the growth of the aviation sector and caused a regression in its progress. During the COVID-19 pandemic, the aviation sector experienced a notable decrease in the volume of flights. In the year 2019, the total volume of flights amounted to around 38.9 million, which saw a notable decrease to approximately 16.9 million flights in the subsequent year of 2020 (Statista Research Department, 2023). Based on the projections provided by Statista, it is anticipated that there will be a gradual rise in the volume of flights over the years 2022 and 2023.

2. LITERATURE REVIEW

Safety Risk Management

Safety Risk Management is term that combines two segments; “safety risk” and “risk management”. According to Müller & Wittmer (2014), the term "safety risk" refers to the persistence of a hazard, which may result in an adverse situation as a consequence of accepting the presence of this danger. The identification of risks and subsequent engagement in a mitigation process is not only significant but also necessitates an evaluation of the severity of the effects. As for risk management, Müller & Wittmer (2014), describe it as the practice of consistently and comprehensively documenting various hazards pertaining to the establishment and growth of a business.

So, combining from those two segments, Safety Risk Management (SRM) refers to a methodical and systematic strategy that is utilized to efficiently and effectively manage safety hazards. The procedure involves several steps, including the identification of possible hazards (hazard identification), the performance of complete safety risk assessments (risk assessment), and the implementation of suitable solutions to minimize these risks (risk mitigation) (ICAO, 2018).

Hazard Identification

The aviation industry recognizes hazard identification as a methodical process used to determine all possible situations, events, and circumstances that might possibly pose a risk to persons by causing harm, sickness, disease, or fatality. Moreover, it includes the potential to result in harm or detriment to machinery, assets, or the natural surroundings (Čokorilo & Dell'Acqua , 2013). Furthermore, the conceptualization of a hazard should not be confined just to a pessimistic meaning or seen merely as a damaging event. Hazards are an intrinsic element of operating environments, and their consequences may be efficiently controlled through various mitigation strategies designed to reduce the harmful (Müller & Wittmer, 2014).

Safety Risk Assessment and Mitigation

The evaluation and quantification of risk, known as risk assessment, is a fundamental concept in which the observable occurrences of risk are analyzed and expressed in terms of probability (Gerba, 2019). Hence, risk assessment can be described as a methodical process that involves the evaluation of the probability of an event taking place and the possible magnitude of its adverse outcomes, including economic, health, and safety aspects, within a certain time frame. Risk mitigation is a methodical process aimed at diminishing risk to a level that is considered reasonably attainable and satisfactory (Müller & Wittmer, 2014). As a result, it has an inherent interconnection between risk assessment and risk mitigation, since the former involves the examination and evaluation of potential dangers, while the latter includes implementing measures to reduce or eradicate these risks.

Safety Management System
A safety management system (SMS) is a system employed for the efficient administration and oversight of safety measures, or a management system specifically developed to meet safety considerations. The concept of an SMS may be seen as the integration of three diverse viewpoints, namely safety, management, and system, as proposed by (Li & Guldenmund, 2018).

There are three pillars for having a good SMS framework which are: safety policy, safety promotion, and safety assurance. Safety policies and goals establish the framework within which the Safety Management System (SMS) operates. Safety assurance is achieved through continuous processes that oversee adherence to global standards and domestic requirements.

Safety Policy
The safety policy represents a strategic approach inside an organization, while the plan serves as the fundamental framework for a Safety Management System (SMS) (Li & Guldenmund, 2018). The safety policy delineates the fundamental ideas, procedures, and approaches of the organization's Safety Management System (SMS) in order to get the intended safety results (ICAO, 2018). The policy of an air operator's management is a formal articulation of the organization's aims, underlying principles, and steadfast dedication to ensuring safety. The statement provides a broad description of the duties and obligations of the individuals concerned. Moreover, the primary emphasis is placed on attaining safety objectives or safety performance benchmarks, accompanied by the requisite strategies to accomplish those aims (Müller & Drax, 2014).

Safety Promotion
Safety promotion is an integral part of the safety management system, as it serves to advance safety and cultivate a heightened sense of safety consciousness (Bedalyte, 2022). This is achieved through various means, such as aviation safety training, the provision of feedback on safety incidents, and the analysis of incident investigation reports (ICAO, 2018). The primary objective of these organizational efforts is to consistently enhance safety measures and procedures. In order to promote the accomplishments of a system, it is essential to properly convey the lessons that have been learnt (Müller & Wittmer, 2014). As a result, the objective of safety promotion is to guarantee that personnel possess comprehensive knowledge of the Safety Management System (SMS), effectively communicate safety-critical information, enhance understanding of corrective measures, and distribute information regarding newly implemented or modified safety protocols.

Safety Assurance
Safety Assurance functions as a system of checks and balances for the Safety Management System (SMS). In order to ensure the highest possible standard level of safety, it is necessary for an operator to prioritize the following procedures by implementing policies, measures, evaluations, and controls (Müller & Wittmer, 2014). Within thefield of safety assurance, it is important for the operator to build a set of systematic processes and procedures that serve the purpose of verifying and monitoring the overall efficacy of the Safety Management System (SMS) (FAA, 2016).

Aviation Safety Performance Indicators
Safety performance indicators (SPI) can undergo further analysis and be combined to generate a safety performance index, which is also known as safety performance. The purpose of this index is to function as a tool that offers a comprehensive perspective on safety data and evaluates the effectiveness of safety management within an organizations or industries and the countries' regulations (Lališ, 2017). The assessment is based on the aggregation of relevant indicators by the respective organizations and countries (ICAO, 2018).

Runway Incursion
A runway incursion (RI) defines as to any event that takes place at an aerodrome where an aircraft, vehicle, or individual is mistakenly present within the protected area of a designated surface intended for the purpose of aircraft landing and take-off (Johnson, Zhao, Faulkner, & Young, 2016). In addition, this phenomenon includes incidents when airplanes collide with other aircraft, collide with buildings, or collide with runway furniture or ground vehicles, regardless of whether the latter are in motion or stationery (Monro & McLean, 2004). As a result, a runway incursion is a safety incident that occurs at an aerodrome and poses substantial safety issues within the aviation industry. It is important to implement effective procedures to avoid and manage these events, hence guaranteeing the overall safety of airfield operations.

Runway Excursion

According to IATA (2014), a runway excursion (RE) is an occurrence in which an aircraft, while in the process of taking off or landing, veers off the designated runway surface, either by departing from its end or deviating from its lateral boundaries. The occurrence consists of two types of events which are: veer-off runway excursions, where an aircraft departs from the side boundaries of a runway, and runway overrun excursions, when an aircraft departs from the end of a runway (Distefano & Leonardi, 2020). Furthermore, ICAO (2013), describe runway excursion as a veer-off or an overrun off the runway surface. Both definitions that are provided by IATA (2014), and ICAO (2013) are limited in their applicability to the take-off and landing stages alone.

Hard Landing

A Hard Landing (HL) refers to a phenomenonwhen an aircraft has an excessive impact uponcontact with the ground during the landing phase. This impact is closely associated with the vertical (or normal) acceleration (Gil, et al., 2021). As a result, hard landings can be characterized as eventswhere the vertical acceleration above the prescribed threshold for the specific aircraft type during the landing phase. The occurrence of this accident has the potential to result in significant consequential harm to the aircraft's structure, henceincreasing the likelihood of a catastrophic incidentduring future flights (Lee, Jeong, Cho, Kim, & Park, 2015). This is due to the possibility of the development and expansion of undetectable micro cracks resulting from a forceful landing, which can ultimately progress into detectable structural damage, particularly in the context of extendedperiods of aircraft operation (Oh, Sim, & Shin, 2011).

3. METHODOLOGY

The research methodology employed in this study is descriptive, utilizing a quantitative research approach. The primary objective of descriptive research is to gather and provide information on specific variables within certain contexts, with the intention of confirming the existence of observed occurrences. (Anantadjaya & Nawangwulan,2018). The objective of this study is to present a comprehensive analysis of the variables Safety Risk Management and Safety ManagementSystem, together with their corresponding indicators. The systematic explanation of the relationship between the two variables will be based on the data acquired.

Table 1. Research Methods

Methods	Description
Type of Research	Quantitative
Data Gathering	Primary (questionnaire) and secondary data
Population	Employees of the respective airline company that are working in the Corporate Quality, Safety & Environment Management unit.
Sample	38
Sampling Method	Cluster Sampling
Method of Analysis	Structural Equation Model
Research Instrument	Validity test. Reliability test, Model fit

Research Instrument

The research instrument employed in this study was a questionnaire survey, specifically conductedusing Google Forms, which proved to be a valuabletool for gathering research data. The Likert scale was comprised of:

1. Strongly Disagree
2. Disagree
3. Quite Agree
4. Agree
5. Strongly Agree

Validity

The purpose of validity testing is to determine if the connection being investigated can be effectively represented using the data collected from the questionnaire. A questionnaire is considered legitimate when there is a meaningful association between the variables being examined(Anantadjaya & Nawangwulan, 2018). The validity of this research was assessed using the KMO and Bartlett's Test, implemented using the SPSS (Statistical Package for Social Science) program. The KMO & Bartlett’s Test’s value must be above
0.5 to be considered as valid (Anantadjaya & Nawangwulan, 2018).

Reliability

The purpose of reliability testing is to determine if the measurements and outcomes obtained via the questionnaire has the consistency and produce minimal levels of mistakes (Anantadjaya & Nawangwulan, 2018). This research will use the

Cronbach Alpha approach as the chosen methodology to evaluate the reliability of the research instrument during the pretesting phase. The Cronbach Alpha of Standard items' value must be greater than 0.7 to be considered as reliable (Sugiarto, 2022).

4. RESULT

The participants in this study were drawn from diverse backgrounds. The respondents are then categorized based on two key attributes: their gender and job title. All respondents are employees from the same unit that is relevant to this research. The questionnaire was delivered to a total of 38 respondents in this research. The respondents meticulously completed the data without any errors during the data-collecting procedure, allowing for seamless data processing.

Table 2. Gender of Respondents

Description		Amount	Percentage
Gender	Male	26	68%
	Female	12	32%
Total	38		100%

Table 3. Job Title of Respondents

Description		Amount	Percentage
Job Title	Group Head (VP)	1	3%
	Division Head (SM)	4	10%
	Dept. Head (Manager)	8	21%
	Senior Associate (Analyst)	19	50%
	Admin (Outsourcing)	6	16%
Total	38		100%

The table above displays the distribution of respondents' gender. The majority of respondents who completed the questionnaire are male, comprising 68% of the total, while the remaining 32% are female. The majority of employees in this specific unit of the respective airline company are male.

According to the table provided, it is evident that the largest portion of respondents, accounting for 50%, have the position of senior associate. Subsequently, 21% of participants with the job title of department head. Admin responses comprise 16% of the total employees. While the division head holds at 10%. The last 3% is the group head. The majority of the employees have the job title as senior associate with a total of 19 employees.

Table 4. Validity and Reliability Pre-test

Description	Result
Validity Pre-test	.590
Reliability Pre-test	.963

A total of thirty questionnaires were issued to potential respondents in order to ensure the reliability and validity of this research. The Keiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's test yielded a value of 0.590. The questionnaire has a predetermined significance level of 0.5. Therefore, the questionnaire is deemed to be legitimate.

The table displays the outcome of the reliability assessment. The Cronbach's Alpha value obtained from the standardized items in SPSS is 0.963, which is above the threshold of 0.7. The reliability test demonstrates the data's dependability, given the substantial number of results. The higher the number, the more correctly it reflects the reliability of the questionnaire.

Table 5. Validity and Reliability Post-test

Description	Result
Validity Pre-test	.714
Reliability Pre-test	.955

Similar to the pre-test, the significance threshold of 0.5 is established for the validity test. The validity test, based on the responses of 38 participants who completed the questionnaire, yielded a result of 0.714, as indicated in the table below. The outcome confirms the validity of the data.

Similar to the pre-test, the significance threshold of 0.7 is established. The reliability test of Cronbach's Alpha, based on the responses of 38 participants who completed the questionnaire, yielded a result of 0.955, as indicated in the table below. The outcome confirms the validity of the data.

Result on Structural Equation Model (SEM)

Following the pre-testing and post-testing of data validity and reliability using IBM SPSS software, the author then proceeds on using the IBM AMOS software for the route analysis with standardized estimates using the structural equation technique (SEM) is depicted in the figure below.

Table 6. Result of SEM

Variable	Estimate	Result
SRM → SPI	.16	No Influence
SMS → SPI	.90	Strong Influence

Source: (IBM AMOS, 2024).

Table 7. List of Abbreviation

Abbreviation	Description
SRM	Safety Risk Management
SMS	Safety Management System
SPI	Safety Performance Indicator

Source: (IBM AMOS, 2024).

Safety Risk Management to Safety Performance Indicator

According to the path analysis by IBM AMOS the relationship between safety risk management to safety performance indicator is 0.16. This number indicates that the influence of safety risk management is 16% to safety performance indicator. Based on the table of coefficient range and strength relationship, the correlation is nonexistent. The Structural Equation Model findings suggest that safety risk management does not exert any influence on safety performance indicator. According Majid, et al., (2022), the safety risk management has a significant indirect influence on flight safety performance. The influence is facilitated by the competence factor of the safety management system. The reason for this is that an efficient safety management system necessitates a shared comprehension of the duties and contributions of both governments and aviation companies. There is a sequential procedure in which safety risk management must be undertaken before it may directly impact safety performance indicator. The variable safety risk management must go through an intervening variable namely safety management system in order to complete the sequential procedure. Whereas in this study the author tried not apply the safety management system variable as an intervening variable between safety risk management system and safety performance indicator for further research according to the journal used by Majid, et al.,2022). According to the result, the respective airline company combines the two independent variable (safety risk management and safety management system) together under the same division.

Safety Management System to Safety Performance Indicator

According to the path analysis by IBM AMOS, the relationship between safety risk management to safety performance indicator is 0.90. This number indicates that the influence of safety risk management is 90% to safety performance indicator. Based on the table of coefficient range and strength relationship, there is a strong correlation between safety management system to safety performance indicator. This result is in line with the study made by Tong (2022), where the researcher stated that the independent variable (safety management system) has the highest influence followed by safety risk management on the dependent variable (safety performance indicator). This result is also in line with Majid, et al., (2022), where the authors stated that to have an effective safety management system, safety risk management must go through an intervening variable in order to complete the sequential procedure. Making safety management system a crucial role on fulfilling the influence to safety performance indicator. Based on the result, the respective airline company utilizes safety management system as vital role since it is regarded to be the bridge between safety risk management and safety performance indicator.

Safety Risk Management

a. **Hazard Identification**
According to the equation model, hazard identification explanatory power is 94%. Based on the table of coefficient range and strength relationship, it showed a strong correlation between hazard identification to safety risk management. Based on the previous study of (Tong, 2022), the author stated that hazard identification is crucial on the safety risk management variable. Hazard identification is part of the safety risk management process and activity that cannot be dismissed and plays an important role on safety risk management. The result of the previous study is aligned with the current result with a high significance value.

b. **Safety Risk Assessment and Mitigation**
According to the equation model, safety risk assessment and mitigation explanatory power is 85%. Based on the table of coefficient range and strength relationship, it showed a strong correlation between safety risk assessment and mitigation to safety risk management. Referring to (Majid, et al., 2022), the risk assessment and mitigation

have a significant impact on safety risk management as they strongly influence the level of flight safety performance. This is achieved by maintaining or lowering the risk of flight accidents in all flight operations, hence creating a sense of security and eliminating danger. The result of the previous study is aligned with the current result with a high significance value suggesting that the respective airline company has a high-power level of its safety risk assessment and mitigation.

Safety Management System

a. Safety Policy

Based on the path analysis, safety policy exploratory score is at 86%. According to (Li & Guldenmund, 2018), the focus of SMS content has consistently revolved around activities, processes, defined procedures, and functional control systems. Safety policy represents a strategic approach inside an organization, while the plan serves as the fundamental framework for a safety management system. The safety policy delineates the fundamental ideas, procedures, and approaches of the organization's Safety Management System (SMS) in order to get the intended safety results. This result suggests that the respective airline company's strategic approach and planning serves as the fundamental framework for a safety management system.

b. Safety Promotion

Safety promotion is significantly impacting the safety management system with 83%. The explanatory of safety promotion is 83% which means it is strongly influencing safety management system. According to the previous study made by (Chen & Chen, 2012), their result showed that safety promotion scored 93% on safety management system. The main goal of safety promotion is to constantly improve safety measures and procedures. To effectively promote the achievements of a system, it is crucial to accurately communicate the knowledge that has been acquired. The aim of safety promotion is to ensure that personnel have a thorough grasp of the safety management system, effectively convey important safety information, improve comprehension of remedial actions, and disseminate information. This result suggests that the respective airline company has a strong sense of safety promotion where it can convey and communicate to all of the employees regarding safety via posters and other forms of communications.

c. Safety Assurance

According on the equation model, safety assurance explanatory power is at 81%. This number showed a significant influence of safety assurance on safety management system. Based on the previous study done by (Teske & Adjekum, 2022), their path analysis showed that safety assurance has the expletory score of 89% to safety management. The result of the previous study is aligned with the current result with a high significance value suggesting that the respective airline company has a high-power level of its safety assurance.

Safety Performance Indicator

a. Runway Incursion

Based on the path analysis, runway incursion explanatory power is at 68%. Even though this score is the lowest amongst all the other indicators, runway incursion has a decent amount of influence on safety performance index. According to (Vittek, Lališ, Stojić, & Plos, 2015), with the existing problem of runway incursion added to safety performance, it allows civil aviation authorities and aviation organizations to exert greater control over the issue. This result is aligned with this research on the respective airline company where it suggests that they are still learning and working around this problem.

b. Runway Excursion

According on the equation model, runway excursion explanatory power is at 92%. This number showed a significant influence of runway excursion on safety performance indicator. Referring to the previous study of (Liu, Cui, & Yan, 2019), the value of runway excursion is at 0.762 which indicates that runway excursion is at high risk level. This results indicates that the respective airline company realizes how dangerous it is about a runway excursion event.

c. Hard Landing

According on the equation model, hard landing explanatory power is significantly impacting the safety performance with 83%. This number showed a significant influence of runway excursion on safety performance indicator. Based on (Liu, Cui, & Yan, 2019), the value of hard landing is at 0.598 which indicates that the hard landing event is at a moderate risk level. This result is aligned with how the respective airline company treats their hazards carefully.

Model Fit

The table below provided includes most of the requirements specified in the explanation of Chapter 3. An exemplary model must satisfy many criteria and successfully pass the Goodness of Fit test. Additional metrics, apart from the CMIN/df value, serve as indicators of the quality of fit result. Consequently, this model exhibits excellent potential and may be effectively utilized in this research.

Table 8. Result of Goodness Fit Model

Criteria Goodness of Fit Model	AMOS Result	Goodness
CMIN/df (Normed Chi-Square)	4.196	Fit
RMSEA (Root mean square error of approximation	0.294	Fit
GFI (Goodness of fit index)	0.781	Fit
AGFI (Adjusted goodness of fit index)	0.562	Fit
TLI (Tucker-lewis index)	0.646	Fit
CFI (Comparative fit index)	0.772	Fit

Hypothesis Testing Result

Influence of Safety Risk Management to Aviation Safety Performance Indicator

H1: Safety risk management significantly influences on safety performance indicator of the respective airline company.

Based on the outcome of hypothesis testing, the correlation between safety risk management, and safety performance indicator is deemed insignificant due to the p-value of 0.155, which above the threshold of 0.05. The correlation between safety risk management and safety performance indicator is deemed to have a little to no impact, with just 16.1% influence. Therefore, the hypothesis of safety risk management, and safety performance indicator is rejected.

Influence of Safety Management System to Aviation Safety Performance Indicator

H2: Safety management system significantly influences on safety performance indicator of the respective airline company

Based on the outcome of hypothesis testing, the correlation between safety management system,and safety performance indicator is deemed significant due to the p-value of ***. The reason being is that the p-value is less than 0.05, indicating statistical significance. The correlation between safety management system and safety performance indicator is deemed to have a strong impact, with 89.7% influence. Therefore, the hypothesis of safety management system, and safety performance indicator is accepted.

5. CONCLUSION

Safety Risk Management to Aviation Safety Performance Indicator

The relationship between safety risk management and safety performance indicator was 16.1%, which was considered to have a negligible correlation. Ultimately, there is no correlation between the management of safety risks and the performance indicators of safety in the respective airline company. The safety risk management system consists of two indicators: hazard identification and safety risk assessment and mitigation. Moreover, safety risk management has a substantial indirect impact on safety performanceindicators. The effect is enhanced by the proficiency factor of the safety managementsystem. The rationale for this is that an effective safety management system requires a mutual understanding of the responsibilities and contributions of both governmental bodies and aviation corporations. Furthermore, there exists a sequential process in which safety risk management must be conducted before its direct influence on safety performance indicators. The variable of safety risk management must pass through an intermediate variable, namely the safety management system, in order to complete the sequential process. The respective airline company integrates the two distinct variables (safety risk management and safety management system) within the same division.

Safety Management System to Aviation Safety Performance Indicator

The correlation between the safety management system and safety performance indicator was 89.7%, indicating a good link. The safety management system comprises safety policy, safety promotion, and safety assurance as its key components. A safety management system is a systematic framework for the governance of safety. This framework comprises fundamental elements such as organizational structures, accountabilities, policies, and processes. Without an effective safety management system, the respective airline company might collapse. The indicator safety policy accounts for 86% of the strategic approach inside the respective airline company, while the plan acts as the foundational structure for a safety management system. On the contrary, safety promotion accounts for 83% of the efforts in safety communication, training, and education development. In addition, safety promotion is also responsible for precisely and efficiently communicating crucial safety information to all employees of the respective airline company. Finally, it is safety assurance. The safety assurance division is accountable for 81% of the functions within the respective airline company serves as a system of checks and balances. To achieve the utmost degree of safety, the respective airline company must prioritize the implementation of policies, measurements, assessments, and controls to adhere to the highest standards.

6. REFERENCES

Statista Research Department. (n.d.).

The respective airline company. (n.d.). *Welcome to Integrated Electronic Safety Database (IESD)*. Retrieved November 1, 2023, from The respective airline company: https://safety.garuda-indonesia.com/

ICAO. (n.d.). *Member States*. Retrieved November 1, 2023, from ICAP: https://www.icao.int/about-icao/pages/member-states.aspx

ICAO. (n.d.). *SARPs - Standards and Recommended Practices*. Retrieved November 1, 2023, from ICAO: https://www.icao.int/safety/SafetyManagement/Pages/SARPs.aspx

Corporate Secretary. (2020, November 1). *The Respective Airline Company Recognized As One Of The Best World Airlines In Health And Safety Protocol Implementation*. Retrieved November 1, 2023, from The Respective Airline Company: https://www.garuda-indonesia.com/id/en/news-and-events/garuda-indonesia-salah-satu-maskapai-penerbangan-standar-protokol-kesehatan-terbaik-didunia#

IBM AMOS. (2024, January 4). Research Model. South Tangerang, Banten, Indonesia.

Raosoft. (2023). *Sample Size Calculator*. Retrieved 2023, from Raosoft: http://www.raosoft.com/samplesize.html

ICAO. (2018). *Doc 9859, Safety Management Manual.* Montreal: ICAO.

ICAO. (2013). *Safety Management Manual Third Edition.* Quebec: International Civil Aviation Organization.

IATA. (2014). *Runway Safety Accident Analysis Report.* Quebec: International Air Transport Association.

FAA. (2016). *Safety Management Systems for Airports, 150/5200-37A – Draft AC 150/5200-37A (AAS-300).* Federal Aviation Administration United States.

ICAO. (2018). *Doc 9859, Safety Management Manual* (Fourth Edition ed.). Montreal, Quebec, Canada: ICAO.

Statista Research Department. (2023, August 29). *Number of Flights Performed by theGlobal Airline Industry from 2004 to 2021, with Forecasts Until 2023*. Retrieved November 1, 2023, from Statista: https://www.statista.com/statistics/564769/airline-industry-number-of-flights/#statisticContainer

Sugiarto. (2022). *Metodologi Penelitian Bisnis.* Yogyakarta: CV Andi Offset.

Tong, K. F. (2022). *Evaluating the Performance of Safety Management System within South African Aviation Industry.* University of Johannesburg, Operations Management. Johannesburg: University of Johannesburg.

Showkat, N., & Parveen, H. (2017). *Non-Probability and Probability Sampling.* Gandhinagar: e-PG Pathshala.

Hult, G. T., Jr., D. J., Cui, A. S., Prud'homme, A. M., Seggie, S. H., Stanko, M. A., . . . Cavusgil, S. T. (2006). An Assessment of the Use of Structural Equation Modeling in International Business Research. *Research Methodology in Strategy and Management, 3*, 385-415.

Vittek, P., Lališ, A., Stojić, S., & Plos, V. (2015). Runway Incursion and Methods for Safety Performance Measurement of this Phenomenon. *International Conference on Engineering Science and Production Management* (pp. 321-326). Prague: CRC Press.

Teske, B. E., & Adjekum, D. K. (2022). Understanding the Relationship Between

High Reliability Theory (HRT) of Mindful Organizing and Safety Management Systems (SMS) within the Aerospace Industry: A Cross-Sectional Quantitative Assessment. *Journal of Safety Science and Resilience, 3*(2), 105-114.

Liu, J., Cui, M., & Yan, H. (2019). Research on Safety Performance Monitoring Method Based on the Analysis of Low Consequence Events. *The 5th International Conference on Transportation Information and Safety*(pp. 646-652). Liverpool: IEEE.

Adjekum, D. K. (2017). An Evaluation of the Relationships between Collegiate Aviation Safety Management System Initiative, Self-Efficacy, Transformational Safety Leadership and Safety Behavior mediated by Safety Motivation. *International Journal of Aviation, Aeronautics, and Aerospace, 4*(2).

Chen, C.-F., & Chen, S.-C. (2012). Scale Development of Safety Management System Evaluation for the Airline Industry. *Accident Analysis and Prevention*, 177-181.

Lee, K. B., Jeong, S. H., Cho, J. Y., Kim, J. H., & Park, C. Y. (2015). Hard-landing Simulation by a Hierarchical Aircraft Landing Model and an Extended Inertia Relief Technique. *International Journal of Aeronautical and Space Sciences, 16*(3), 394–406.

Oh, Y.-K., Sim, S.-K., & Shin, K.-S. (2011). A Study of the Effects of Hard Landing on Aircraft Structure. *Journal of the Korea Institute of Military Science and Technology, 14*(5), 805-811.

Gil, D., Sabaté, A. H., Enconniere, J., Asmayawati, S., Folch, P., Carazo, J. B., & Piera, M. À. (2021). E-Pilots: A System to Predict Hard Landing During the Approach Phase of Commercial Flights. *IEEE Access, 10*, 7489 - 7503.

Distefano, N., & Leonardi, S. (2020). Aircraft Runway Excursion Features: a Multiple Correspondence Analysis. *Aircraft Engineering and Aerospace Technology, 91*(1), 197-203.

Monro, I., & McLean, D. (2004). Runway Incursions and Prevention Systems. *Aircraft Engineering and Aerospace Technology, 76*(5), 472-478.

Johnson, M. E., Zhao, X., Faulkner, B., & Young, J. P. (2016). Statistical Models of Runway Incursions Based on Runway Intersections and Taxiways. *Aviation Technology and Engineering*, 15-26.

Lališ, A. (2017). Time-Series Analysis and Modeling to Predict Aviation Safety Performance Index. *Transport Problems, 12*(3), 51-58.

Müller, R., & Wittmer, A. (2014). *Aviation Risk and Safety Management Methods and Applications in Aviation Organizations.* New York: Springer International Publishing.

Bedalyte, D. (2022). *Safety Promotion and Assurance: Safety Communication Difficulties and Motives in FinnishAviation Organisations.* Helsinki: Haaga- Helia University.

Müller, R., & Drax, C. (2014). Fundamentals and Structure of Safety Management Systems in Aviation. In R. Müller, & A. Wittmer, *Aviation Risk and Safety Management Methods and Applications in Aviation Organizations* (pp. 45-55). New York: Springer International Publishing.

Li, Y., & Guldenmund, F. W. (2018, March). Safety management systems: A broad overview of the literature. *Safety Science, 103*, 94-123.

Gerba, C. P. (2019). Chapter 29 - Risk Assessment. In M. L. Brusseau, I. L. Pepper, & C. P. Gerba, *Environmental and Pollution Science* (pp. 541-563). Cambridge, Massachusetts: Academic Press.

Čokorilo , O., & Dell'Acqua , G. (2013). Aviation hazards identification using safety management system (SMS) techniques. *In Proceedings of the 16th International conference on transport science ICTS*, 66-73.

Anantadjaya, S. P., & Nawangwulan, I. (2018). *Simple Steps for Your Business Research.* Tangerang: Kang Guru Beruang.

Flouris, T., & Yilmaz, K. (2009). Change Management as A Road Map for Safety Management System Implementation in Aviation Operations: Focusing on Risk Management and Operational Effectiveness. *International Journal of Civil Aviation, 1*(1), 1-19.

Majid, S. A., Nugraha, A., Sulistiyono, B., Suryaningsih, L., Widodo, S., Kholdun, A. I., . . . Endri. (2022). The Effect of Safety Risk Management and Airport Personnel Competency on Aviation Safety

Performance. *Uncertain Supply Chain Management*, 1509–1522.

Kaspers, S., Karanikas, N., & Roelen, A. (2019). How does Aviation Industry Measure Safety Performance? Current Practice and Limitations. *Aviation Management, 4*(3), 224-245.

Kin, R. Y. (2015). *The Impact of Safety Management Systems on Safety Performance: Commercial Aviation Operations.* Griffith University, Department of Natural Sciences. Queensland: Griffith University.