ENHANCING EMERGENCY RESPONSE CAPABILITIES OF MANILA INTERNATIONAL AIRPORT AUTHORITY RESCUE AND FIREFIGHTING DIVISION

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Abstract: **The emergency response capabilities of Airport Rescue and Firefighting Services are of paramount importance in times of emergency at the airport. These capabilities are essential to safeguard the well-being of passengers, employees, stakeholders, and other airport users. The rapid and coordinated response during emergencies is imperative to mitigate potential risks, minimize damage, and ensure the overall safety of the airport complex. This study aimed to enhance the emergency response capabilities of the Manila International Airport Authority-Rescue and Firefighting Division by finding the gaps in response protocols and level of preparedness. The comprehensive review of the Literature and Studies, which were carefully selected for their relevance and applicability to this study, has provided the researcher with an extensive amount of relevant information.**

A survey questionnaire was distributed to a sample of sixty (60) MIAA-RFD personnel to identify the deficiencies in response protocol and evaluate the level of preparedness among key personnel. This study utilized a descriptive quantitative research design using random sampling techniques. The survey questionnaire was validated by experts in the field of emergency response to ensure the relevance of the data collected and the answers was analyzed employing qualitative approach. Various statistical tools were used including frequency and percentage to describe the demographic profile, mean distribution to determine the response protocol and level of preparedness of the participants, and the Kruskal-Wallis H test to determine significant differences.

The study identified several areas that required enhancement and recommended that a regular training and preparedness exercises be conducted in order to adapt to evolving emergency scenarios, prioritize equipment maintenance and upgrades, improve communication systems, collaborate with relevant agencies, assess response protocols, provide tailored communication training programs, create a unified communication system, and conduct realistic emergency response drills and simulation exercises to enhance teamwork and coordination among emergency responders.

Keywords: **emergency response capabilities, Airport Rescue, Firefighting Services, emergency, airport.**

1. INTRODUCTION

Airport rescue and emergency responders play a crucial role in safeguarding lives and minimizing damages during various airport-related incidents like fires, aircraft accidents, and natural disasters. The effectiveness depends on their preparedness, skills, knowledge, training, and resources to safeguard the well-being and security of passengers, stakeholders, employees, infrastructure, as well as vital facilities.

The International Civil Aviation Organization (ICAO) has set forth global standards and guidelines governing airport safety and emergency preparedness. This includes the establishment of rescue and firefighting services, equipment requirements, training protocols, and response time objectives. The Airport Council International (ACI), a global trade association representing airports worldwide, emphasizes the development of comprehensive emergency plans and effective coordination with stakeholders.

The oversight and management of airports including their emergency response capabilities, fall under the purview of the Civil Aviation Authority of the Philippines (CAAP). This regulatory body is responsible for ensuring compliance with standards and protocols to enhance the safety and efficiency of airport operations nationwide. CAAP's Aerodrome Manual establishes specific requirements for rescue and firefighting services operating within the country's airports. This manual includes guidelines on personnel requirements, firefighting equipment, training programs, response times, and equipment maintenance. Compliance with the standards set by the Civil Aviation Authority of the Philippines (CAAP) is of paramount importance for the Manila International Airport Authority (MIAA). Upholding these standards is essential not only for maintaining certification but also for ensuring the airport's preparedness to respond effectively to emergencies.

The Manila International Airport Authority (MIAA) manages Ninoy Aquino International Airport (NAIA), which serves millions of passengers annually. Given the airport's significant role in both domestic and international travel, it is imperative to continually assess and improve the emergency response capabilities of MIAA's Rescue and Firefighting Division (RFD). By conducting this assessment, the study will provide a specific perspective into the RFD's strengths, weaknesses, and areas requiring immediate improvement. The findings will not only benefit the MIAA and NAIA but will also make a significant contribution to the overall domain of aviation safety and emergency management within the country.

This research proposal aims to comprehensively evaluate the emergency response capabilities of the Manila International Airport Authority Rescue and Firefighting Division. By assessing the division's preparedness, current operational capabilities, and existing response program, this study will identify areas in need of improvement and propose recommendations to enhance MIAA's emergency response for critical incidents.

Background of the Study

The Manila International Airport Authority (MIAA) plays a critical role in safeguarding the safety and security of both air travelers and personnel operating within the Ninoy Aquino International Airport (NAIA). As air traffic continues to grow, the demand for effective emergency response capabilities has become increasingly important.

The MIAA has established a dedicated Rescue and Firefighting Division (RFD) responsible for handling emergencies and providing rescue firefighting services within the airport. However, the effectiveness of the RFD emergency response capabilities necessitates thorough evaluation to identify potential areas for improvement.

Enhancements are imperative to adapt to the current trends in technology. The emergence of new aircraft, advancements in cargo and passenger handling technologies, and constantly evolving aviation environment necessitate that emergency response protocols be updated and made more sophisticated to effectively address potential challenges.

This research aims to conduct a comprehensive assessment of the MIAA Rescue and Firefighting Division, focusing on its operational procedures, equipment, communication protocols, and coordination with other emergency response agencies. Employing a mixed-methods approach that includes qualitative interviews and quantitative data analysis, this study seeks to provide recommendations to enhance the MIAA-RFD's performance during emergency situations.

The expected outcomes of this research endeavor will offer valuable insights to strengthen its emergency response capabilities to ensure that the airport is better prepared to handle various emergency scenarios efficiently and safeguard the well-being of passengers, stakeholders, personnel, and other airport users. Additionally, it will help identify the gaps in the current capabilities and level of preparedness of MIAA-RFD to further enhance their emergency response.

Statement of the Problem

This research aims to evaluate the effectiveness of the emergency response capabilities within the Manila International Airport Authority (MIAA) Rescue and Firefighting Division and identify areas for enhancement to address the gaps in emergency response protocols, equipment and resources, and communication and coordination at the Ninoy Aquino International Airport (NAIA).

1. What is the demographic profile of the participants in terms of:

    1.1. Age;

    1.2. Civil status;

    1.3. Educational attainment;

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1.4. Length of service;

1.5. Employment status;

1.6. Designation; and

1.7. Position?

2. What are the current operational capabilities of MIAA-RFD in responding to emergency situations in terms of:

2.1. Response protocols;

2.2. Equipment and resources; and

2.3. Communication and coordination?

3. What is the level of preparedness of the MIAA-RFD personnel in responding to emergency situations in terms of:

3.1. Skills:

3.2. Knowledge; and

3.3. Trainings?

4. What significant difference exists in the current operational capabilities of MIAA-RFD in responding to emergency situations when grouped according to profile?

5. What significant difference exists in the preparedness levels of the MIAA-RFD personnel in responding to emergency situations when grouped based on their profile?

6. What suggestions and recommendations may be proposed for the enhancement of the emergency response capabilities of the MIAA-RFD?

2. METHODS OF RESEARCH

The efficient and effective management of emergency situations at an airport is of paramount importance for ensuring the safety of passengers, crew, and airport personnel. This study aims to identify potential areas for improvement, develop evidence-based recommendations, and contribute to the overall enhancement of the MIAA Rescue and Firefighting Division's response capabilities combining both qualitative and quantitative approaches. This will enable a holistic understanding of the division's operations and performance and incorporate various perspectives to draw meaningful conclusions.

The quantitative method involved the collection of numerical data and performance metrics related to the RFD's response times, equipment inventory, training hours, and incident reports. This data was obtained from official records and reports, like incident response times, equipment maintenance records, training, and other relevant data sources within the MIAA. To assess the effectiveness of the division's response capabilities, various performance metrics were analyzed using statistical tools. The research aimed to identify trends and patterns in the division's performance and quantify its response capabilities based on measurable factors.

The qualitative method was employed to gain a deeper understanding of the factors influencing the division's response capabilities. In this phase, interviews were conducted with key personnel within the Rescue and Firefighting Division, including firefighters, supervisors, managers, and other relevant stakeholders. The qualitative data collected through these interviews provided valuable insights into the RFD's organizational structure, operational challenges, resource limitations, training programs, equipment, response protocol, challenges faced, opportunities for improvement, and other subjective factors that may affect the RFD's ability to respond effectively to emergencies.

For data analysis, thematic analysis was used to analyze qualitative data from documents and interviews. This involved identifying patterns and themes within the data. Descriptive statistics were applied to analyze the quantitative data obtained from the survey, providing a summary of participants' responses.

Participants of the Study

The study participants consist of members from the Manila International Airport Authority Rescue and Firefighting Division. The research included firefighters, supervisors, and managers responsible for managing emergency response operations.

Participation in the study was voluntary and confidentiality will be maintained throughout the research process to encourage open and honest responses during interviews. The selection of participants will be based on their roles, expertise, and involvement in the MIAA-RFD emergency response.

Validation of the Instrument

The research was conducted at the Manila International Airport Authority Rescue and Firefighting Division premises. To ensure the instrument's relevance and suitability for the specific setting of the MIAA, the researcher consulted the expertise of subject matter experts specialized in aviation safety and emergency response. These experts were selected to review the research instrument and provide critical feedback.

To further validate the instrument, a modified academic test and survey questionnaire were submitted to three key experts within the MIAA-RFD for content validation: Mr. Simeon G. Valleser, Manager, Airport Emergency Services Department; Mr. Noel F. Butingan, Manager, Rescue and Firefighting Division; and Mr. Alvin M. Manabat, Chief, Emergency Response Section.

The above-mentioned individuals were selected as validators to thoroughly assess the questionnaires and ensure they align with the study's purpose and objectives. This meticulous validation process is essential to accurately measure the instrument's content and can effectively gather reliable data within the specific operational context of MIAA-RFD.

Data Gathering Instrument

Semi-structured interviews were conducted with key personnel from the Rescue and Firefighting Division. These interviews allowed for flexibility, enabling the researchers to explore relevant topics in-depth and gain insights into the RFD's response capabilities, challenges, and potential areas for improvement. Interview questions were formulated which covers a wide range of topics, including response times, training effectiveness, equipment availability, teamwork, and coordination with other airport emergency units.

Various documents, including incident reports, training records, and equipment inventories, were analyzed to collect quantitative data related to the division's performance. These official records provided valuable information on the frequency and types of emergencies encountered, response times, and the utilization of resources during emergencies.

Statistical Treatment of Data

The data collected for the study were subjected to comprehensive statistical analysis, employing both descriptive and inferential statistics. The main goal was to attain a deeper comprehension of the current capabilities of the Rescue and Firefighting Division and identify areas for improvement.

1. **Frequency and Percentage**. A frequency distribution serves as a representation of the number of observations within a specific interval presented either graphically or in a tabular format. The distribution delineates the pattern of the variable's frequency, with frequency denoting how often a particular value occurs within a given period (Young, J., 2022). The information obtained from the questionnaire will be compiled, totaled, and tabulated to show how many people responded to a certain question or topic.

To show the number of respondents who responded to specific questions or questionnaire components, the survey data will be reduced, tallied, and grouped into tables.

$$P = \frac{f}{n} \times 100$$

Where:

P = Percentage

f = Frequency

n = Sample Size

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2. Weighted Mean. The weighted mean was employed to calculate the average score for the participants' ratings regarding the current capabilities of MIAA-RFD in responding to emergency situations and the preparedness of the MIAA-RFD personnel in responding to emergency.

According to Taylor, S. (2023). A weighted mean is a type of mean calculated by averaging the products obtained by multiplying the weight (or probability) associated with a particular event or result by its corresponding quantitative outcome.

The weighted arithmetic mean is calculated by multiplying each value in the dataset by its weight or relevance factor and then summing the resulting products. The total is then adjusted using the dataset's weighted average of all the values.

$$\overline{X} = \frac{\sum fx}{n}$$

Where:

$\overline{X}$ = Weighted mean

$\sum fx$ = Sum of the frequency

n = Sample Size

The Likert Scale was utilized to interpret the outcomes. An arbitrary threshold for numerical boundaries is provided below.

Table 1: FOUR POINT LIKERT SCALE INTERPRETATION

Unit Weight	Equivalent Weighted Mean	Interpretation/ Scale Responses
4	3.25-4.00	Strongly Agree
3	2.50-3.24	Agree
2	1.75-2.49	Disagree
1	1.00-1.74	Strongly Disagree

The collected data through document analysis, interviews, and survey questionnaires were analyzed using appropriate statistical treatment. The specific methods employed in the analysis may have included.

3. Thematic Analysis. Is a qualitative method for analyzing data that aims to identify and examine patterns, themes, and insights present within the data set. It involves coding the data, categorizing it into themes, and interpreting the meaning behind these themes. Thematic analysis was likely used to analyze the qualitative data obtained from document analysis and interviews.

4. Kruskal-Wallis H Test. Is a statistical test used to assess the degree of significant difference that exists among the variables in responding to emergency situations.

$$H = \frac{12}{N(N + 1)} \sum_{i=1}^{k} \frac{Ri^2}{ni} - 3(n + 1)$$

Where:

N = total sample size

Ri = sum of ranks for group i

ni = sample size of the groups k

The p-value represents the likelihood of obtaining observed results or more extreme outcomes when the null hypothesis of a specific statistical test is accurate. It serves as a fundamental metric to quantify the statistical significance of hypothesis test outcomes. A lower p-value, typically set at alpha (commonly 0.05), indicates stronger evidence to refute the null hypothesis, suggesting a notable distinction among the groups being compared.

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When the p-value is equal to or below 0.05, it signifies statistical significance, indicating that the observed outcomes are unlikely to occur by chance under the null hypothesis. However, a p-value greater than 0.05 suggests inadequate evidence to reject the null hypothesis, implying that the observed results could be explained by random variability.

3. CONCLUSIONS

The conclusions drawn from this comprehensive study provide invaluable insights into the demographic profile, operational capabilities, and perceptions of the MIAA-RFD personnel, shedding light on critical aspects of their emergency response preparedness. These findings serve as a foundation for targeted interventions and improvements in training, career development, and organizational management within the MIAA-RFD.

The study reveals that the predominant age group within the MIAA-RFD is 46 years and older, with a significant proportion being married and possessing a college-level education. The majority of participants have served for 16 years or more, predominantly in LServ contractual employment. The prevalence of airport firefighters, coupled with a significant number of positions held by firefighters, offers valuable insights for tailoring interventions and support structures. Understanding these demographic variations allows for the implementation of targeted strategies in training and career development programs, ensuring they are relevant to the specific needs of the personnel.

Important aspects of emergency response readiness were evaluated through participant responses. The MIAA-RFD received high praise in the Response Protocols category, indicating a strong agreement among participants about the division's effective adherence to established procedures. Similarly, the positive assessments in the Equipment and Resources category highlight the well-equipped nature of the division. The Communication and Coordination aspect further showcases the MIAA-RFD's proficiency in managing information and collaboration during emergencies. These commendable scores affirm the division's strong operational capabilities and highlight areas of strength that can be used for continuous improvement.

The mean distribution for skills, knowledge, and training among participants demonstrates a strong agreement, emphasizing a collective confidence in their capabilities. The overall average score of 3.40, indicating a "Strongly Agree" stance, affirms that MIAA-RFD personnel feel well-prepared for various emergencies. The absence of significant differences in response protocols and equipment/resources based on profiles suggests a uniform level of operational readiness across different demographic groups. However, the observed difference in communication and coordination necessitates tailored approaches to enhance effectiveness in this crucial aspect of emergency response.

A noteworthy aspect of the study is the absence of significant differences in skills and knowledge across profile groups, indicating consistent levels of preparedness. While training programs exhibit no statistically significant differences, the proximity of the p-value to significance suggests a potential trend or inclination that warrants further exploration. This insight into training programs could guide the development of tailored interventions to enhance preparedness among different profile groups within the MIAA-RFD, ensuring a more targeted and effective approach to training initiatives.

Lastly, the recommendations provided by the 60 participants demonstrate the importance of public awareness campaigns, emphasizing the need to inform the community, including passengers, airport employees, and airline personnel, about emergency procedures and evacuation routes. The commitment to after-action reviews and continuous learning reflects a proactive approach to refining and optimizing emergency response protocols. The call for regular evaluation and learning from drills and real-world incidents reinforces the participants' dedication to operational excellence. Furthermore, the unanimous agreement on the necessity for frequent and realistic training exercises for rescue and firefighting personnel highlights the significance of practical scenario-based training in ensuring preparedness for diverse emergencies.

REFERENCES

[1] Almansoori MK (2018). Factors Impacting Crisis Preparedness at Airports

[2] Civil Aviation Authority of the Philippines https://www.caap.gov.ph

[3] Civil Aviation Authority of the Philippines Advisory Circular 139AN-01 (CAAP 2022)

[4] Chan et al. (2020). Assessing the economic impact of the closure of Ninoy Aquino International Airport caused by Xiamen Air Flight 8667: A Dynamic Inoperability Input-Output Approach

[5] Chen, L., & Wong, M. (2019). Optimizing Emergency Response Training for Airport Firefighters: A Comparative Study of Global Standards

[6] De Leon, L., Joson, A (2023). Standard Disruption Management Policy at Mactan-Cebu International Airport

[7] Delos Santos, M. L. C., Dasalla, J. B., Feliciano, J. C., & Cabatay, D. R. B. (2023). ICARUS: An Android-Based Unmanned Aerial Vehicle (UAV) Search and Rescue Eye in the Sky

[8] European Union Aviation Safety Agency (EASA 2018)

[9] Federal Aviation Administration (FAA) Federal Administration Regulation/Aeronautical Information Manual (FAR/AIM) 2018

[10] Google Scholar https://scholar.google.com

[11] International Civil Aviation Organization Manual (ICAO 2018)

[12] Manila International Airport Authority https://www.miaa.gov.ph

[13] Manila International Airport Authority Crash and Rescue Exercise (MIAA 2022)

[14] Marchetti, L., & Brown, R. (2018). Airport Emergency Preparedness: Lessons from International Best Practices

[15] Meng, B., Lu, N., Guo, X., Si, Q., Bai, O. (2020). Scenario Analysis of Emergency in Civil Aviation Airports Based on the Pressure State-Response Model and Bayesian Network

[16] Mumbai Chhatrapati Shivaji Maharaj International Airport's (CSMIA), Aerodrome Rescue & Fire Fighting Services (ARFF) (International Airport Review 2023)

[17] National Fire Protection Association (NFPA 2018)

[18] Natividad, LR (2021). Initial Response Intelligent Fire Extinguisher Robot: A Prototype

[19] Ninoy Aquino International Airport-Airport Emergency Plan (NAIA-AEP 2022 8th edition)

[20] Republic Act No. 11589 or an Act Strengthening and Modernizing the Bureau of Fire Protection (BFP) and Appropriating Funds (BFP 2021)

[21] Rescue and Firefighting Services (RFFS) Manual (MIAA-RFD 2017)

[22] Sheairs, J., Canter, G., Kreckie, J. (2022). Evaluation of Unmanned Aircraft Systems for Live Monitoring to Enhance Situational Awareness during an Aircraft Rescue and Firefighting Response

[23] Tobisova, A et. al. (2018). The Simulation of Fire and Rescue Services Operations by Airplane Accidents

[24] Wankmüller C., Kunovjanek M., Mayrgündter S. (2021). Drones in emergency response – evidence from cross-border, multi-disciplinary usability tests

[25] Yongli Z., Qinfang J., Wenfei Y. (2019). An aircraft fire emergency rescue system based on visual simulation

[26] Zhang, Y., & Cao, L. (2019). Training and Education for Airport Emergency Responders: A Comparative Analysis