

THE INFLUENCE OF FOREIGN OBJECT DEBRIS (FOD) HANDLING ON FLIGHT SAFETY IN THE APRON AREA BY APRON MOVEMENT CONTROL (AMC) OFFICERS

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ABSTRACT

Apron Movement Control (AMC) is a unit found at the airport that has the responsibility to oversee all movements on the apron. Therefore the task of an AMC unit employee is to inspect the airside area to ensure that there is no Foreign Object Debris (FOD) so that flight safety is carried out at Radin Inten II International Airport Lampung. The objective of this study is to investigate whether the management of FOD by AMC officers has an impact or not to flight safety at Radin Inten II International Airport Lampung This is because FOD is still found in the airport apron area which even has an impact on flight delays at the airport. The hypothesis of this study is that the handling of FOD by AMC officers in the Apron area has an influence or not on flight safety at Radin Inten II International Airport Lampung. The research method used is quantitative. Determination of the sample was taken from the total population of 30 people consisting of AMC officers, PKP-PK officers, as well as building and runway officers. The data Approach for collecting data utilized a Likert scale questionnaire which was distributed to the sample and then the data was processed using a regression analysis test and a correlation test which previously carried out analysis prerequisite tests including validity evaluations, reliability tests and normality tests using the Statistical Package for the Social Sciences (SPSS) application. Thus, based on the findings of the several tests above, one can ascertain that FOD handling by AMC officers in the Apron area can have an impact on flight safety at Radin Inten II International Airport, Lampung. Of course by implementing various ways to improve flight safety, for example by rearranging the shifts of AMC officers on the morning and afternoon shifts and providing special FOD bins.

Keywords: Apron Movement Control, Foreign Object Debris, and Safety.

1. INTRODUCTION

Because air transportation is a mode of transportation that is in great demand, it must be in line with the security that is applied to supporting facilities for air transportation modes which are also stipulated in the Minister of Transportation's Regulation of the Republic of Indonesia with Number 80 of 2017. This regulation contains a national aviation security program in which it is explained that an airport is a place or area for intra- and inter-modal transfers of transportation which is equipped with basic facilities as well as supporting aviation safety and security [1]–[4]

The implementation of aviation safety at the airport is due to many factors that follow, for example hijacking, plane skidding, wildlife hazard, and foreign object debris. Of the several threats that have been mentioned, foreign object debris is an object that is still often found in the apron, taxiway, and even runway areas [5]–[8]. Foreign object debris or commonly abbreviated as FOD itself is a dangerous foreign object or material that is found in the apron and runway area and has a potential hazard to safety during aircraft operations [9]–[12].

For example, when FOD debris gets into an airplane engine, it can cause the plane's engine to catch fire. To

keep safe. the aircraft is patrolled 6 times a day, which is divided 3 times during the morning shift and 3 times during the afternoon shift on the airside against FOD [13]. So, this patrol is implemented out by the Apron Movement Control (AMC) unit because basically the job of AMC itself is to oversee all forms of movement on the apron including also in airside patrol activities to ensure whether the apron is sterile from FOD.

The application of the security system carried out by the AMC unit is certainly carried out at every airport throughout Indonesia, including at Radin Inten II International Airport Lampung. Before becoming an international airport, this airport was managed by the Directorate General of Civil Aviation, Ministry of Transportation, which in 2016 carried out major renovations at this airport, for example, such as the construction of taxiways and the expansion of aprons to be able to increase aircraft capacity, after several years later, in 2019 the airport was to be precise. is managed by the company PT. Angkasa Pura II [14]. In addition, Radin Inten II Lampung International Airport is also classified as an airport that has quite busy flight activities. Therefore the supervision carried out by the AMC unit is increasingly being improved.

The activity in question is for example the many movements that occur on the apron such as the movement of aircraft, Ground Support Equipment (GSE) vehicles, employees working in the apron area, even to passengers. Due to the dense activity that occurred during ground time, it did not rule out the possibility of falling debris, whether it was from the GSE vehicle or it could be caused by passengers' luggage. The activity in question is for example the many movements that occur on the apron such as the movement of aircraft, Ground Support Equipment (GSE) vehicles, employees working in the apron area, even to passengers. Due to the dense activity that occurred during ground time, it did not rule out the possibility of falling debris, whether it was from the GSE vehicle or it could be caused by passengers' luggage. Just like what is still commonly found in the apron area at Lampung Radin Inten II Airport, this also happens for a reason. For example, there is a lack of awareness or responsibility for maintaining the cleanliness of the apron area from officers in the area. The impact caused by the existence of FOD is also not trivial, namely causing the cessation of operational activities on the apron. Therefore the task of the AMC unit is responsible for ensuring that the apron region is safe and acceptable for international visitors objects or FOD. And again this is done with the aim of creating flight safety at the Radin Inten II Lampung International Airport [15]-[20].

In connection with the implementation of Apron Movement Control (AMC) performance in handling

Foreign Object Debris (FOD), the AMC unit is fully responsible and must be aware of cleanliness on the air side, especially in the apron area. This is intended to ensure that Foreign Object Debris (FOD) is not found [21], [22].

To fulfill the objectives of this study, the following questions were asked:

- a. How does the handling of Foreign Object Debris (FOD) affect flight safety protection in the apron zone by Apron Movement Control (AMC) officers at Radin Inten II International Airport Lampung?
- b. What method of handling Foreign Object Debris (FOD) in the Apron area should be implemented by Apron Movement Control (AMC) officers to improve flight safety at Radin Inten II International Airport Lampung?

2. METHOD

2.1 Research Design

Investigation is a systematic examination to advance knowledge; it's also a structured and coordinated endeavor to scrutinize particular issues demanding solutions [23]. The research methodology employed in this study is descriptive quantitative with the following investigation design :

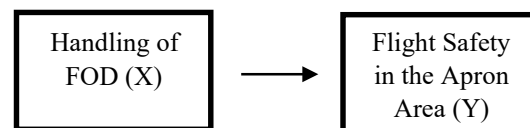


Figure 2.1 Thinking Framework Model.

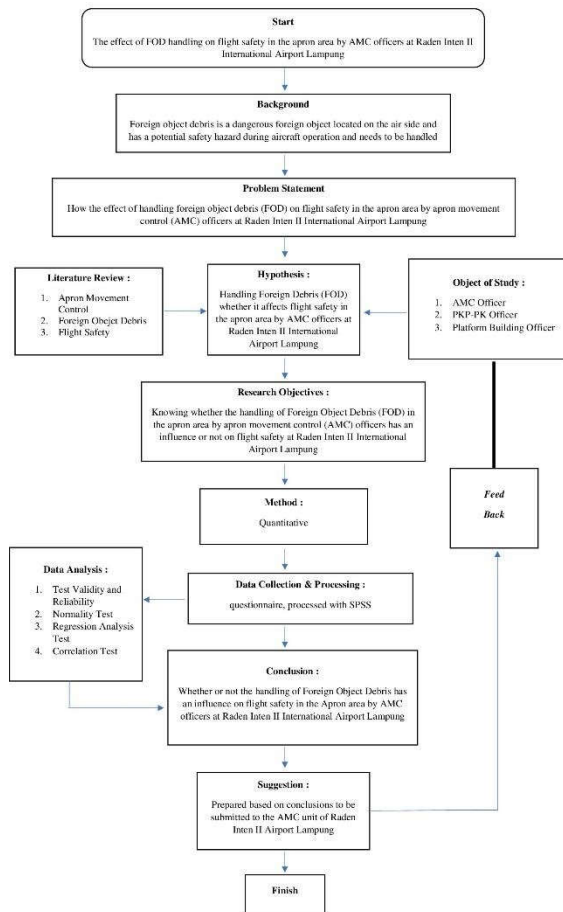


Figure 2.1.2 Research Framework

2.2 Population, Sample, and Research Object

Within the realm of research methods, the concept of “population” holds great importance, popular and is would often describe an assortment of objects that are the target of inquiry. The citizens is the entirety of the research subjects, which may include humans, animals, plants, air, symptoms, event values, disposition to life and so on [24]. Following Sugiyono’s explanation, a population denotes a wide-ranging group comprised of objects/subjects possessing particular characteristics as defined by researchers for examination, culminating in subsequent conclusions. The population under scrutiny within this inquiry were Apron Movement Control (AMC) officers, PKP-PK officers, as well as building and runway officers at Radin Inten II International Airport Lampung, totaling 30 people.

No.	Population	Total
1.	Apron Movement Control Officers	12
2.	PKP-PK Officers	9
3.	Airport Buildings and Grounds Personel	9

Total	30
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Figure 2.2 Number of Respondents

In line with Sugiyono’s perspective, samples extracted from the population should be genuinely representative. For this research, a saturated sampling method was employed, meaning that all population members were included as samples. The sample size for this study consisted of 30 individuals.

In a general sense, the research subject matter typically depicts or outlines the research domain or research objectives comprehensively. This encompasses the distinctive characteristics of the region, its historical development, organizational structure, primary tasks, and other roles in line with the delineation of the research area in question. The objects of this study were Apron Movement Control (AMC) officers, PKP-PK officers, as well as building and runway officers at Radin Inten II International Airport Lampung.

2.3 Data Collection Techniques

The data gathering method employed involved the collection of both primary and secondary data. Primary data was acquired fast by the researchers through the distribution of questionnaires to the sample group, consisting of operational officers and goods. In contrast, secondary data was gathered by researchers from pre-existing sources and associated with the author's research. The inquiry instrument serves as a tool utilized by the author in carrying out his activities so that it is easier and more systematic [25]. The survey apparatus employed in this analysis was a questionnaire or a Likert scale questionnaire to find out how respondents felt about the effect of Foreign Object Debris (FOD) handling on flight safety in the Apron area by Apron Movement Control (AMC) officers at Radin Inten II International Airport Lampung.

2.4 Data Analysis Techniques

Data analysis involves the process of manipulating gathered data into result sets and uncovering new findings or supporting hypotheses. In this research, quantitative data analysis methods were employed, specifically a numerical calculation and statistical formula-based data analysis technique applied to the collected secondary data.

2.4.1 Validity Test

The function of the validity test is to ascertain the suitability of a questionnaire for research. A questionnaire is considered valid when the questions it contains successfully capture the variables intended for

measurement [26]. The validation test criteria on the questionnaire are said to be valid if the significance threshold is less than 0.05.

Coefficient Intervals	Correlation Levels
0,00 – 0,199	Very Low
0,20 – 0,399	Low
0,40 – 0,599	Netral
0,60 – 0,799	High
0,80 – 1,000	Very High

Figure 2.4.1 Pearson Interpretation Guidelines

2.4.2 Reliability Test

A predictable tool is one that, if applied repeatedly to measure the same subject, will yield the same outcomes. It can be said that the variable is reliable when the reliability of the variable is ascertained according to the cronbach alpha value which is greater than 0.6. Reliability level criteria is visible in the table below.

The Magnitude of r	Interpretation
Between 0.80 to 1.00	Very High
Between 0.60 to 0.80	High
Between 0.40 to 0.60	Netral
Between 0.20 to 0.40	Low
Between 0.00 to 0.20	Verry Low

Figure 2.4.2 Cronbach Alpha Interpretation Guidelines

2.4.3 Correlations Test

The coherence test is performed to ascertain the strength of the relationship between variables, as measured by the correlation coefficient (r). the type of variable relationship between X and Y can be positive or negative. According to Sugiyono (2011) the underpinning for making decisions about the magnitude of the relationship or correlation strength is described in the guide table as follows.

3. RESULTS AND DISCUSSION

3.1 Observation

This observation was carried out by researchers at Radin Inten II Lampung International Airport for 3

months starting from January 9 to March 31 2023 in the Apron Movement Control (AMC) unit. Based on the results of the researcher's direct observations in the field, the researcher sees that the problem is that Foreign Object Debris (FOD) is still frequently found, thus disrupting operational activities in the apron area and also the lack of personnel in the Apron Movement Control (AMC) unit, which causes a lack of optimal monitoring of activities operations on Apron [27]. With the number of aircraft movements at Radin Inten II Lampung International Airport, that is, the average flight per day is 16 to 18 scheduled aircraft movements and usually added 4 to 8 unscheduled flights, for example, private jets, military, and flight trainer aircraft from PPI Curug. This number is not comparable to the number of existing personnel for now.



Figure 3.1 The affected GSE Storage areas

For an example of handling cases in the Indonesian aviation world, the authors took samples from the logbook of Radin Inten II Lampung International Airport. At this airport there was once a rainstorm which resulted in some of the existing facilities at Apron being damaged, for example the fence in the GSE area. Which of the damages caused a delay because it was necessary to clean up the area affected by the collapsed fence and scattered glass, this could cause the safety of both passengers and airport staff to have an accident. Therefore, the role and function of AMC officers is very important in air side supervision to create flight safety at airports.

In order to support the creation of aviation safety in the apron area at Radin Inten II Lampung International Airport, the authors prepared a design to provide special FOD bins (FOD Bin) with socialization regarding the use and placement of these bins so that officers in the apron area are more easily understand the function and raise awareness related to maintaining cleanliness in the area.



Figure 3.2 FOD BIN (FOD special Trash)

3.2 Description of Respondents

The results of the analysis of the description of the respondents are divided into several parts, namely descriptions based on profession and gender. This data description is carried out using the Google Form to obtain the appropriate number of frequencies and percentages of data. The results of the descriptive analysis of the respondents areas follows:

No.	Statement	Number of respondents					Total respondents
		SS (5)	S (4)	KS (3)	TS (2)	STS (1)	
A. Variable Effect of FOD Handling							
1	FOD has various types with their respective levels of danger.	22	7	1			30
2	If FOD is found on the airside, it must be sterilized as soon as possible.	21	9				30
3	FOD handling must be adjusted to the type of FOD found.	15	14	1			30
4	FOD can hinder or even endanger flight activities.	17	11	2			30
5	FOD can cause damage and even casualties.	9	17	4			30
6	The need for regular airside inspections to prevent FOD.	19	6	5			30
B. Variable Aviation Safety in the Apron Area by AMC							
1	The AMC must regulate the movement and placement of the aircraft so as not to collide with other aircraft.	22	7	1			30
2	The AMC must regulate the movement and placement of aircraft so that they do not collide or be obstructed by obstacles on the apron and its surroundings.	16	11	3			30
3	The AMC must arrange the placement of aircraft parking stands based on their type and size.	11	17	2			30
4	The AMC must regulate the entry and exit of the aircraft from the apron to the maneuvering area or vice versa in coordination with the Tower Controller unit.	17	12	1			30
5	The AMC must ensure the safety of vehicle movement as well as the regularity of other activities on the apron.	20	10				30
6	The AMC must ensure the smooth movement of vehicles as well as the regularity of other activities on the apron.	14	15	1			30

Figure 3.3 Questionnaire Results

3.3 Questionnaire Results

In this study, the data collection technique used by the author was a questionnaire using a Likert scale. So that the data obtained is in accordance with what is needed so that this statement meets the criteria the statement is prepared based on theoretical concepts, which are adjusted to the dimensions and variable indicators as explained in Chapter III. This questionnaire uses a Likert scale which shows the items stated in several alternative responses.

The author uses a Likert scale questionnaire containing 12 statements. The following are the results of the questionnaire that has been obtained:

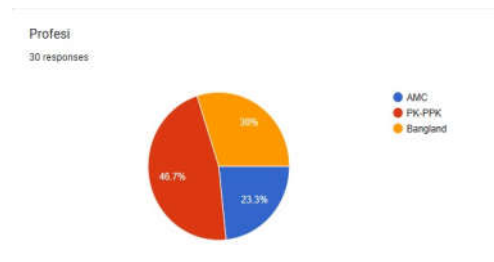


Figure 3.5 Description of Respondents by Profession

3.4 Correlation Test

The primary objective of the goal of the correlation test is to determine the degree of nearness in the relationship between variables, which is expressed through the correlation coefficient (r). The nature of the connection between variables X and Y can be either positive or negative. Here are the outcomes of the SPSS correlation test Statistics 26:

Model	Coefficients ^a					
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
1	(Constant)	8.839	2.955		2.991	.006
	Xtot	.671	.103	.775	6.498	.000

a. Dependent Variable: Ytot

Figure 3.6 Correlation Test Results

Utilizing the information in the table above, the constant value (a) is determined to be 8.839, and the connectivism value (b/regression coefficient) is 0.671, leading to the formulation of the regression equation as follows:

$$Y = a + bX$$

$$Y = 8.839 + 0.671X$$

From this equation it is explained that the regression coefficient X is 8.839 stating that for every 1% addition, the connectivism value increases by 0.671, so it can be concluded that the direction of the influence of variable X (the effect of FOD handling) on variable Y (aviation safety in the apron area by AMC) is positive.

4. CLOSING

In this section, the author briefly explains the conclusions of the development research results that have been carried out.

4.1 Conclusion

a. Monitoring activities carried out by the Apron Movement Control (AMC) unit were deemed to be less effective and optimal due to the lack of personnel from the Apron Movement Control (AMC) unit. The number of personnel in the field is only 2 personnel or 3 personnel per shift with an average number of flights of 18 movements per day. Therefore, there are still many FODs found in the Apron area.

b. Lack of awareness and responsibility of the officers in the apron area in terms of duties and functions in their respective job desks. For example, the airport electrician, after repairing an aerobridge that was experiencing undermaintenance, immediately handed over the cleanliness of the apron to AMC officers. Then there are ground handling officers who are still negligent in their work, such as not wearing safety vests in the airside area.

c. Lack of awareness and responsibility of the officers on duty in the apron area to maintain cleanliness in the area. This is evidenced by the fact that there are still many FOD findings during daily inspections. Therefore it is necessary to develop related to the application of handling methods for FOD in the apron area.

d. That the influence of FOD handling has an influence on flight safety in the apron area by AMC at Radin Inten II International Airport Lampung. For the correlation level, it is explained that the regression coefficient X is 8.839 stating that for every 1% addition, the connectivism value increases by 0.671, so that the handling of FOD with flight safety in the apron area by AMC at Radin Inten II International Airport Lampung is strong and with a positive direction of influence.

4.2 Suggestions

1. Continuous and routine application of inspection and handling of FOD in the apron area by AMC. As well as changing the shift system where the morning shift is even more condensed for the number of personnel to maintain and improve flight safety during peak hours at Radin Inten II Lampung International Airport.

2. It is necessary to re-socialize all airport officers regarding the duties, principals and functions of each unit in terms of workload or what tasks and responsibilities must be carried out. This is intended so that the main duties and functions can be in accordance with each work unit and are not simply handed over to other units.

3. Designing a special FOD bin called the FOD Bin, but in its implementation later socialization is needed regarding the use and placement of the special trash bin. This is done so that this design can be implemented appropriately for all officers on duty in the apron area, from this design it is also hoped that it will increase flight safety at Radin Inten II International Airport Lampung.

4. For continuity and the creation of flight safety in this study further research can be carried out on the effect of FOD handling on flight safety by other units and in areas other than the apron at Radin Inten II International Airport Lampung because the author only examined the apron area which only involved AMC officers at Radin Inten II International Airport in Lampung.

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