THE IMPACT OF THE NUMBER OF PASSENGERS ON FLIGHT TIME SLOTS

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ABSTRACT
The increase in flight activity at Minangkabau International Airport after COVID-19 in 2023 will increase due to economic growth and tourism starting to improve in the region. Although this increase has a positive impact on the aviation industry, it also raises challenges related to flight time slot management. The aim of this research is to determine the effect of the number of passengers on flight time slots at Minangkabau International Airport. The method in this research is a quantitative method with the aim of collecting the information or data needed in this research. The data used in this research is secondary data in the form of the number of passengers during busy times and the use of time slots used in daily units in hours in 2023. Then the data will be analyzed using the Pearson correlation test, simple linear regression test, and T test and the results will be used as the basis decision making to add time slots. The correlation results between variable X and Y have a high and positive value, namely 0.842. The results of hypothesis testing or testing the influence of variable x on y have a calculated t value = 29.741 > t table 0.005 = 1.966 and p value = 0.00 < 0.005 so it can be concluded that the null hypothesis (H0) isrejected. What needs to be optimized is rescheduling based on time slot demand based on flight frequency levels at busy times which show high demand to be able to accommodate more passengers. Requests for time slots withthe same time allocation, then the priority determination has a better assessment of the timeliness of the use of time slots, will get higher priority for requests for flight route planning for the next period.

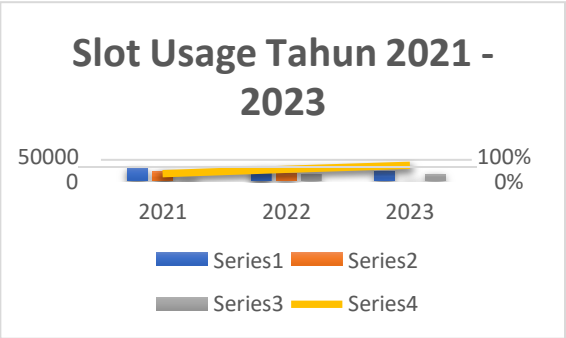
Keywords: slot time, passengers during peak hours, Minangkabau International Airport.

1. INTRODUCTION

Minangkabau International Airport with IATA code: PDG and ICAO code: WIPT or usually abbreviated as BIM is the main international airport in West Sumatra province which serves flights to the city of Padang [1]. This airport is approximately 23 km from the center of Padang City and is located in the Ketaping area, Batang Anai District, Padang Pariaman Regency. Minangkabau International Airport began construction in 2002 and was fully operational on July 22 year 2005, replacing Tabing Airport as the domestic airport in Padang City, until in 2006 Minangkabau International Airport was designatedand authorized by the Ministry of Religion as a place of embarkation and disembarkation. Hajj for West Sumatra, Bengkulu and parts of the Jambi region[2].

A number of flight routes served by Minangkabau International Airport are the same as the previous airport, Tabing Airport, for Domestic flight destinations include Jakarta, Surabaya, Batam, Medan, Bengkulu, Sungaifull routes. Meanwhile, for international routes Kuala Lumpur and Jeddah.

Rising from paralysis after the COVID-19 virus pandemic, slowly but surely the aviation industry, especially in Indonesia, is slowly recovering [3]. The increase in flight activity at Minangkabau International Airport after COVID-19 in 2023 is in line with economic growth and tourism which is starting to improve in the region. In 2019 the number of flights was 24,133, then this figure decreased in 2020 due to the COVID-19 pandemic to 12,286, then the pandemic ended and the number of flights increased until 2023 at 15,029[4]. The usage of time slots at Minangkabau International Airport has increased significantly post-COVID-19 in 2023, such as calculating slot usage by dividing the actual number of flights by the target flights Below is the slot usage data from 2021 to 2023



From the usage data above, it is evident that there is a significant increase from 2021 to 2023 In 2021, the target flight slots were 31,828 with an actual utilization of 10,365, resulting in a 33% usage rate This figure then rose to 53% in 2022 However, in 2023, the flight target decreased to 20,542 with an actual utilization of 15,029, resulting in an 85% slot usage This represents a 52% increase from 2021 to 2023.

Although the increase in the number of passengers in 2021 - 2023 will have a positive impact on the aviation industry, it also raises challenges related to flight time slot management. Slot time is a time window or flight allocation given to airlines to make altitude and take off at the airport [5]. Flight time with heavy traffic can be allocated at flight times with more moderate traffic so that the flight flow at the airport becomes effective and maximized[6]. Slot time aims to manage busy or overcrowded schedules and allocate them to more spaced-out schedules in order to reduce delays and congestion at parking stands The function of slot time is not only to allocate dense schedules to more spaced-out ones, but also to provide time limits that each airline must adhere to during ground time In accordance with KP 112 of 2018, airport slot time management consists of a specialized unit formed by the Director of Operations of PT Angkasa Pura I (Persero), the Director of Technical and Operations of PT Angkasa Pura II (Persero), and the Director of Operations of the Public Corporation (PERUM) of the Indonesian Air Navigation Service Provider, namely Indonesia Airport Slot Management (IASM); and the Airport Operators and the local PERUM LPPNPI In the context of slot time approval (slot clearance), the Directorate General of Civil Aviation establishes an organization divided into two parts: airport slot time organizers and operational units coordination.

The submission of time slots by airlines must also pay attention to the Notice of Airport Capacity (NAC) of the origin and destination airports, which consists of runway capacity, apron capacity, and terminal capacity[7] by being guided by the Decree of the Director General of Civil Aviation number PM 57 of 2016 which has been based on provisions that refer to the International Air Transport Association – Worldwide Scheduling Guidelines (IATA-WSG) in The rules for granting airline slot permits are as stated in KP 112 of 2018 that every aircraft movement must obtain flight approval[8].

Minangkabau International Airport has a total of 10 parking spaces on its apron. The runway is sized from 2,750 x 45 square meters to 3,000 x 45 square meters to accommodate large aircraft operations [9]. The average flight at Minangkabau International Airport reaches 10 movements every hour with almost12 [4] available flight slots. given is not used optimallyevery day. Looking at the number of runways at Minangkabau International Airport, the increase in the number of passengers both domestic and international, and the number of flight slots that are not used every day, the uneven movement of aircraft every hour, and the absence of research that discusses these problems, especially in Minangkabau, the author takes a formulation of the problem, whether there is an influence on the number of passengers on flight time slots at Minangkabau International Airport.

Therefore, this research aims to determine the effect of the number of passengers on flight slot times at Minangkabau International Airport. The goal is to understand the value of influence, and along with this to take better action in flight operational efficiency.

2. METHOD

2.1 Research Design

This study utilized a quantitative research approach. The quantitative method was selected because of its capacity to produce valid and relevant data that accurately reflect real-world conditions. The research design adopted for this study falls within the realm of quantitative research [10]. Quantitative or statistical data analysis involves dissecting the data into smaller parts to address the research questions. By using statistical methods, such as comparing groups or individual scores, researchers can gather information to answer the research questions, test the formulated hypotheses, and ultimately reach conclusions.

2.2 Research Setting

The researcher selected Minangkabau International Airport, Padang Pariaman, west sumatra. This location was chosen because the author conducted On The Job Training from December 2023 to March 2024, which provided an opportunity for airport observation and data collection During the on-the-job training, the researcher identified specific issues at the location, leading to the continuation of this final project research until July 2024.

2.3 Research Variables

The independent variabel (x) and dependen variable (Y) in this study are as follows.

1. Variable X (Independent Variable) is a variables whose values affect the change of dependent variables (bound variables)[11]. It can also be known as a stimulus, predictor, antecedent, or exogenous variable. In this study, Variable X represents Number of passengers during peak hours.
2. On the other hand, Variable Y (Dependent Variable) is variables whose values are influenced or depend on the value of independent variables[11]. It reflects the outcome resulting from the independent variable. In this study, Variable Y refers to the aviation safety.

2.4 Data Collection Techniques

Data collection methods are conducted to obtain information about the nature, conditions, and specific activities needed to achieve research objectives [12].

2.4.1 Secondary Data

Secondary data, which is historical data that already exists[13]. The required data includes daily busy-hour passenger data in hourly units from January 2023 to December 2023, sourced from the AMC sheet of Minangkabau International Airport This data allocates daily passenger data within one hour and also includes flight slot usage data based on the highest passenger count This secondary data is collected and used in this research from January 2023 to December 2023, and it is sourced from official records provided by the management of Angkasa Pura II Minangkabau Airport

2.4.2 Studi Literature

A sequence of activities involving methods for collecting library data, reading, taking notes, and processing research materials is referred to as a literature study. [14]. Literature Study is a research conducted by researchers by collecting a number of books, magazines related to research problems and objectives[15]

When searching for relevant theories, researchers gather as much information as possible from the literature on the topic. Possible sources include books, magazines, periodicals, research results (such as articles and dissertations), as well as other appropriate sources such as the Internet, newspapers, and others. The literature review conducted by the researchers included regulations and requirements aimed at reviewing the factors that may have contributed to the problem. It also contains guidelines and reference definitions related to the issues discussed, as well as an analysis of the name of the issue supported by various expert opinions from various references.

This study uses a literature review to investigate the problem of the influence of the number of passengers on the duration of flights in Minangkabau.

The first study is taken from a research journal titled, Analysis of Flight Slot Time at Juanda Surabaya Airport by Rani Dwi Putri and Hary Moetriono [16]. Furthermore, the second research is, "The Impact of the Implementation of Slot Time at Adistujipto International Airport Yogyakarta" from Aprilita Lucki Purwaningtyas[17].

2.5 Data Analysis Technique

Data analysis technique is a method or approach to obtain data in the field and turn it into information so that the characteristics of the data are easily understood and useful Data can be obtained from various sources such as interviews, notes, images, or documents The data analysis technique is carried out after conducting data analysis, and it is used to organize and process data into accurate and factual information obtained during data collection The method used for analyzing this final project research is quantitative Quantitative research involves collecting numerical data, which is then analyzed using statistical calculations.

2.5.1 Pearson Correlation Test

Pearson correlation coefficient is used to express the linear relationship between the independent variable and the dependent variable. Pearson correlation coefficient analysis is used to measure whether or not there is a linear relationship between the number of passengers (X) and aircraft movements (Y) and has the aim of ensuring that in reality there is an influence of the number of passengers on slot time. The direction of the correlation is seen in the correlation coefficient number as well as the level of strength of the correlation. The correlation coefficient ranges from +1 to -1. A positive correlation coefficient indicates that the two variables have a direct relationship, meaning if variable X increases, variable Y also increases. On the other hand, a negative correlation coefficient signifies that the relationship

between the two variables is in opposite direction. with coefficient intervals as follow:

Table 1. Categories of Pearson Correlation Coefficient[18]

Interval Koefisien	Koefisien Korelasi
0,00 - 0,199	Very Low
0,20 - 0,399	Low
0,40 - 0,599	Currently
0,60 - 0,799	High
0,80 - 1,000	Very High

2.5.2 Simple Linear Regression Test

Linear regression is a technique used to obtain a model of the relationship between 1 dependent variable and 1 or more independent variables. If only 1 independent variable is used in the model [19]. Regression analysis is used to provide a basis for making predictions. One variable can be predicted by another variable [19]. Therefore, simple linear regression analysis is used to determine the existence of a linear influence or relationship between an independent variable and a dependent variable. which is formulated as follows:

$$Y\chi = a + bX$$

Furthermore, hypothesis testing in simple linear regression analysis is intended as a way to determine whether a conjecture or hypothesis is accepted or rejected. In this context, there are two references that can be used as a basis for decision-making: first, by examining the significance value, and second, by comparing the calculated t-value with the t-table. [18]. The basis for decision-making in hypothesis assessment in simple linear regression analysis is that if the significance probability value is less than 005 (5%) or the calculated t-value is greater than the tabled t-value, it can be said that an independent variable x significantly influences the dependent variable y [20]

Then, to find out how much influence the independent variable (X) has on the dependent variable (Y) in simple linear regression analysis, you can look at the R Square (R^2) value in the Model Summary table contained in the SPSS output results. The coefficient of determination (R2) is used to determine the proportion of variation in the dependent variable (Y) explained by one or more independent variables A small value of the coefficient of determination indicates that the ability of the independent variables to explain the dependent variable is very limited, whereas if the value approaches 1 (one) and moves away from 0 (zero), it means that the independent variables have the ability to provide all the necessary information to predict the dependent variable [21]. According to Hair et al, there are three categories of grouping for the R Square (R^2) value: strong, moderate, and weak [22].

3. RESULT AND DISCUSSION

The first step in this research is data collection. The data required includes daily busy time passenger data in hours using the Minangkabau International Airport AMC sheet report data source, by allocating daily passenger data within one hour from January 2023 to December 2023, and flight slot time usage data using the number of slots. which is used within 1 hour with the largest number of passengers. This data is secondary data from January 2023 to December 2023, the data collected and used in this research are official records provided by the management of Angkasa Pura II Minangkabau Airport.

Daily peak time passenger counts begin in a full year, from January to December 2023, the daily passenger numbers at airports during peak times show interesting and significant variations. This analysis aims to provide a detailed picture of daily passenger travel patterns and their distribution in hourly time frames, as well as a comparison with 2022.

In the morning, between 05:00 and 09:00, the airport experiences a surge in activity The number of passengers begins to sharply increase from 05:00 onwards, with an average of 800 passengers per hour in 2023, compared to 600 passengers per hour in 2022 The peak occurs between 07:00 and 08:00, where the passenger count can reach up to 2,000 people per hour in 2023, up from 1,200 people per hour in 2022 The morning is a very busy time as many passengers prefer early flights to maximize their time at their destination Additionally, international flights departing and arriving in the early hours also contribute to the increase in passenger numbers during this time.

After the morning peak, the number of passengers decreases slightly but remains high From 09:00 to 11:00, the average number of passengers ranges between 1,500 to 2,000 per hour in 2023, compared to 1,000 to 1,500 per hour in 2022 During lunchtime, from 12:00 to 13:00, there is a slight increase, reaching around 2,500 passengers per hour in 2023, compared to 2,000 per hour in 2022 This time is usually dominated by business flights and medium-distance travel The stable passenger movement during midday indicates diverse travel destinations and varied flight schedules.

During the afternoon, from 13:00 to 17:00, the number of passengers remains stable with an average of 1,000 to 1,500 passengers per hour in 2023, compared to 900 to 1,000 per hour in 2022 During this time, medium-haul flights and some international flights usually depart in the afternoon The afternoon is often preferred by passengers who want to avoid the morning and evening crowds, as well as those arriving at their destination at a convenient time Airport activities remain busy but more organized, allowing for more efficient operations.

The busy hours increase again in the evening, especially between 17:00 and 19:00 The average number of passengers during this time can reach 2,000 per hour in 2023, with the highest peak around 18:00 to 19:00, compared to 1,500 per hour in 2022 After that, from 19:00 to 21:00, the number of passengers decreases to around 1,000 to 1,200 per hour in 2023, compared to 800 to 1,000 per hour in 2022 The evening is another busy time at the airport, with many domestic and international flights scheduled for departure and arrival The increase in activity during the evening reflects passengers' need to reach their destinations on time before the end of the day.

During late night hours, the number of passengers significantly decreases From 21:00 to 23:00, the average number of passengers ranges between 900 to 1,000 per hour in 2023, compared to 700 to 900 per hour in 2022 After midnight until 05:00 in the morning, the passenger count is very low, ranging between 500 to 1,000 per hour in 2023, reflecting fewer departing flights during this time, compared to 400 to 800 per hour in 2022 Nevertheless, long-haul international flights arriving at night still maintain airport activity Passengers arriving during the night often choose this time to avoid congestion and seek comfort.

According to the annual trend, the beginning of the year started with a relatively stable number of passengers, although there was a slight increase during the New Year holiday The average daily passenger count reached around 20,000 people in 2023, with the highest peak on January 1st, reaching 25,000 passengers, compared to 18,000 to 22,000 passengers in 2022 January often serves as a transitional month from the holiday season to normal routines, resulting in a more stable passenger pattern after the first week.

During the following months, from February to April, there was moderate fluctuation In February, the daily passenger count slightly decreased, ranging between 18,000 to 20,000 in 2023, compared to 16,000 to 18,000 in 2022 In March and April, the passenger numbers increased again due to the Easter holiday season and local events, reaching an average of 22,000 passengers per day in 2023, compared to 20,000 to 21,000 per day in 2022 During this period, special events and school holidays contributed to the increase in passenger numbers, although not as much as the year-end holiday season.

During the months of May and June, the number of passengers has started to increase significantly The average daily passenger count has risen to approximately 24,000 to 26,000 in 2023, compared to 22,000 to 24,000 in 2022, with the highest peak occurring during weekends and national holidays This period also marks the beginning of the peak travel season, with many families starting their summer vacations.

The peak number of passengers occurred in July and August, where the average daily passenger count reached 28,000 to 30,000 in 2023, compared to 25,000 to 28,000 in 2022 The highest peak in a year was recorded on August 15th, with a passenger count of 35,000 in 2023, compared to 32,000 in 2022 The airport is bustling with activity, and proper resource management is crucial to handle this surge in passengers.

After the summer season ends, from September to November, the number of passengers decreases again, but remains relatively high due to events and festivals The average daily passenger count ranges from 22,000 to 24,000 people in 2023, compared to 20,000 to 22,000 in 2022 In November, the passenger count slightly increases again due to year-end holiday preparations These months demonstrate a more stable travel pattern, with moderate declines after the peak summer season but still showing significant activity.

At the end of the year, in December, there has been a significant increase in the daily number of passengers, reaching an average of 26,000 to 28,000 in 2023, compared to 24,000 to 26,000 in 2022 The Christmas and New Year holidays are the main factors contributing to this increase, with the highest peak on December 24th, reaching 32,000 passengers in 2023, compared to 30,000 passengers in 2022 December is one of the busiest months, where many people travel to celebrate the holidays with family and friends.

The Data shows that the daily busy times at the airport occur in the morning and evening, with the highest peaks at 07:00 to 08:00 and 18:00 to 19:00. Additionally, there is a clear seasonal pattern, with peaks during summer and year-end holidays, and declines during non-holiday months. A comparison with 2022 shows that ridership figures in 2023 are higher, reflecting increased mobility and recovery from the impact of the COVID-19 pandemic.

3.1.1 Pearson Corellation Test

The correlation test is used to measure the relationship between variable X and variable Y The direction of the correlation is observed in the correlation coefficient, indicating the strength of the correlation The value of the correlation coefficient ranges from +1 to -1 If the correlation coefficient is positive, then the relationship between the two variables is said to be in the same direction Based on the results of the Pearson correlation test conducted using the SPSS program, the following output was obtained:

Correlations

		penumpang	slot time
penumpang	Pearson Correlation	1	.842**
	Sig. (2-tailed)		.000
	N	365	365
slot time	Pearson Correlation	.842**	1
	Sig. (2-tailed)	.000	
	N	365	365

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 1. Pearson Corelation Result

The image in Figure 1 represents the output of the Pearson correlation test A correlation coefficient of 0842 was obtained, which falls into the high correlation category, with a significance value of 0000 < 005 Therefore, the relationship between variables x and y is significant According to Sugiyono (2018), this value falls within the very strong category (0,80-100).

3.1.2 Simple linear regression test

The next step in this research is to analyze using simple linear regression equations to determine the influence of one variable on another variable In this study, it is to understand the impact of the number of passengers (X) on flight time slots (Y) Based on the results of the simple linear regression test processed using the SPSS program, the following output was obtained:

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.077	.159		6.766	.000
	penumpang	.005	.000	.842	29.741	.000

a. Dependent Variable: slot time

Figure 2. Simple Linear Regression Result

Base on the general formula for simple linear regression, where 'a' represents the constant value obtained as 1077 This constant value comes from the unstandardized coefficients of the Flight Slot Time variable (Y), which means that if the number of passengers (X) is 0 or nonexistent, the constant slot time value (Y) is 1077 Meanwhile, 'b' represents the regression coefficient for variable X, with a value of 0005 This value indicates that for every one-unit increase in the number of passengers (X), the slot time value (Y) will increase by 0005

In this study, the regression coefficient has a positive value so that it can be said that the direction of influence of the number of passengers variable (x) on the slot time variable (Y) is positive Therefore, the simplified linear regression equation is Y = 1077 + 0005X.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.077	.159		6.766	.000
	penumpang	.005	.000	.842	29.741	.000

a. Dependent Variable: slot time

Figure 3. Simple Linear Regression Result

Based on the results of the calculated t-value, it has been determined that the significance value (Sig) is 0.000, which is smaller than the probability value of 0.05. Furthermore, comparing the calculated t-value of 29,741 with the critical t-value of 1,9665, it is evident that the calculated t-value is greater, leading to the rejection of H0 and acceptance of H1. Thus, it can be concluded that there is an impact number passanger (X) on slot time (Y).

Next, to assess the extent of the influence of variable X on variable Y in simple linear regression analysis, the R square (R^2) value can be used as a reference, obtained from the model summary.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.842[a]	.709	.708	.745

a. Predictors: (Constant), penumpang

Figure 4. Simple Linear Regression Result

Furthermore, to assess the extent of the influence of variable X on variable Y in simple linear regression analysis, the R square value (R^2) can serve as a reference. It is known from the model summary output that the R square value is 0.709, which falls into the moderate category [23]. This value indicates that the impact number of passanger (X) on slot time (Y) is 70,9%, Meanwhile, the remaining 29.1% is influenced by other variables that were not examined in this study.

4. CONCLUSION

The increase in the number of passengers at Minangkabau International Airport, especially after COVID-19, led the author to choose the title The Influence of Passenger Numbers on Flight Slot Times at Minangkabau International Airport The analysis results show a strong and positive relationshipbetween passenger numbers and the use of flight timeslots at Minangkabau International Airport, with a Pearson correlation coefficient of 0842, which falls into the category of very strong The t-test value of 29741 > t-table value of 0005 = 19665 confirms that the influence of passenger numbers on slot time usageis significant, with the regression equation Y = 1077 + 0005X indicating that each additional passenger unit increases slot time usage by 0005 units It can be concluded that passenger numbers have a significant impact on slot time usage.

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