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Runway Occupancy Time Landing Analysis of Runway 06/24 at Soekarno-Hatta International Airport

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Abstract— This research is to determine the value of Mean Runway Occupancy Time Landing (MROTL) owned by runway 3 (24/06) Soekarno-Hatta International Airport. The Runway Occupancy Time Landing (ROTL) calculation method refers to the Doratask method used by Perusahaan Umum Lembaga Penyelenggara Pelayanan Navigasi Penerbangan (Perum LPPNPI) in calculating runway capacity. It can be seen from the results of this study, that runway 06 has a Runway Occupancy Time Landing (ROTL) value of 69,6 seconds for category C aircraft and 68,2 for category D aircraft. Meanwhile, that runway 24 has a Runway Occupancy Time Landing (ROTL) value is 71,5 seconds for category C aircraft and 69,9 seconds for category D aircraft. The results of this study can be used as a baseline for further research regarding runway capacity

Keywords— Doratask, Runway Occupancy Time Landing, Runway Capacity.

I. INTRODUCTION

Airport capacity is an important indicator in the process of implementing traffic flow management.[1] There is a factor that affects the value of the capacity of an airside. One of the main factors is the layout of an aerodrome. Several components can be limited so that a capacity can be measured with certainty. A transportation system can be said to be effective if the system can balance between capacity and demand.[2] warnings that increase over time require a system to increase its capacity.

Generally, an airport has a system that regulates movement so that delays do not occur at one time simultaneously. This system is called air traffic flow management (ATFM), which is a system that regulates in such a way that aircraft movements do not exceed the available capacity.[3]

To increase between capacity and delay, runway operation becomes the main thing. Many supporting factors can affect the value of runway capacity including:

- Layout taxiway (runway exit)
- Size and type of aircraft using the runway and taxiway
- Weather conditions
- Regulations from ATC regarding separation

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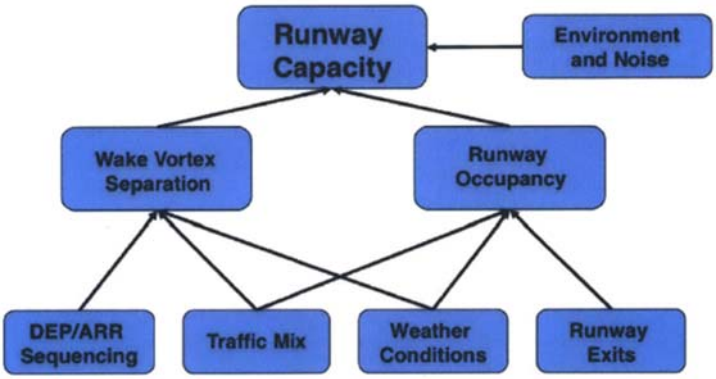

Figure 1. Influence Diagram

Among the several factors above, all of them will refer to two main indicators, namely the length of time needed for an aircraft to use a runway or what is termed as Runway Occupancy Time (ROT) and a separation system that uses the Wake Vortex Turbulence principle.[4]

Runway Occupancy Time (ROT) is the average time each aircraft has while using a runway for both takeoff and landing.

Based on the standard operating procedure of the aerodrome control tower unit at Soekarno-Hatta International Airport, runway 3 (24/06) is only used for the arrival process and is not used for the aircraft departure process. This refers to the runway 1 type of operation in mode 1 (Semi-mixed parallel operation)

The operating model of Semi-Mixed Parallel Operations is as follows:

- Runway 24/06 for arrivals.
- Runway 25R/07L for departures.
- Runway 25L/07R for departures and arrivals.

If runway 24/06 and 25R/07L are operated simultaneously, runway 24/06 and runway 25R/07L are considered as a single runway because the distance between the center lines is only 500 meters and they are operated as parallel dependent runways.

On this occasion, the author conducted research by looking for the Mean Runway Occupancy Time Landing (MROTL) value of category C and D aircraft at Soekarno-Hatta International Airport, especially those owned by runway 3 (06/24) which is in operation, this runway is very dependent on runway 2 (07L/25R).[5]

II. METHODS

The research method is a scientific way to obtain data with specific uses and purposes.[6] Scientific means research based on scientific characteristics, namely rational, empirical, and systematic. Below the author describes several points related to the research method used in this study.

1. Research location

   The location of data collection in this study was the Main Branch of Perum LPPNPI Jakarta Air Traffic Service Center which has the function of providing flight navigation services at Soekarno-Hatta International Airport.

2. Type of research

   This research is field research (research field) with the observation method. This method is a method of collecting data which in the process of collecting it uses direct or indirect observation.[7] In practice, the authors apply a descriptive observational research design. This research was conducted in a structured manner and emphasized the authenticity of the data. In this observational study, the authors did not manipulate or intervene in the subjects studied.

3. Data Collection Methods

   The author uses 2 data collection methods, namely:

1. Observation, this method is a data collection technique that is carried out based on observation, accompanied by a recording of a condition or behavior of the target object.[8] The type of observation in this study was participatory observation where the observations were made directly by the researchers themselves. In this study, the authors observed, recorded, and calculated the length of movement of category C and D aircraft that landed using runway 3 (06/24) Soekarno-Hatta International Airport
2. Literature Study, is a data collection method by collecting several books, magazines, or references related to the problem or purpose being researched.[9] In this study, the authors used the Aerodrome Information Publication WIII AD 2.24-1A Soekarno-Hatta International Airport which was published on May 19 2022 by the Ministry of Transportation and the Standard Operating Procedure TWR Perum LPPNPI Main Branch JATSC edition VII published by Perum LPPNPI.

4. Methods of Data Analysis

The author uses the Doratask method as a technique in analyzing data to obtain the mean runway occupancy time landing (MROTL) value, namely by observing and recording the duration of time each aircraft uses the runway based on category.

ROTL is calculated when the aircraft crosses the imaginary threshold (t0) until it leaves the runway (t1) as shown in the image below:

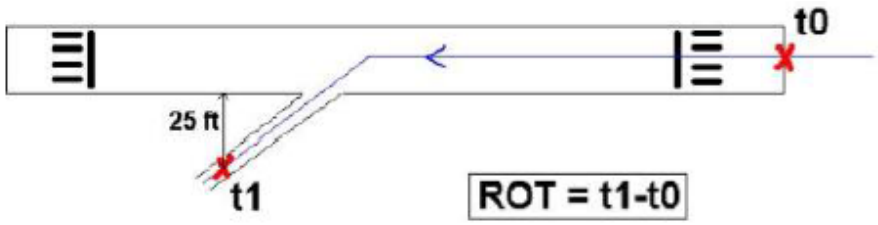

Figure 2. Runway Occupancy Time Landing Calculation

To obtain the mean runway occupancy time landing (MROTL) value, the total runway occupancy time landing (ROTL) for each aircraft is divided by the number of aircraft observed.

5. Population and Sample

The population in this study were category C and D aircraft that landed using runway 3 (06/24) at Soekarno-Hatta International Airport. This study uses a saturated sampling method, meaning that all populations are samples.[6] so the authors make observations during peak hours and peak seasons, namely when the 2023 Eid homecoming season is approaching.

III. Result And Discussion

The category of aircraft is based on the speed of the aircraft during the approach, according to ICAO Document 8168 PANS-OPS, there are 5 categories of aircraft, namely as follows:

Table 1. Aircraft Category

AIRCRAFT CATEGORY	*Stall Speed In Knots*	*Typical Aircraft in This Category*
A	*Less Than* 91 Knots	*Small Single Engine*
B	91 To 120 Knots	*Small Multi Engine*
C	121 To 140 Knots	*Airline Jet*
D	141 To 165 Knots	*Large or Heavy Aircraft*
E	*Above* 166 Knots	*Military Jet or special military*

ROTL duration is also affected by factors from the layout of the runway and taxiway, the following is the layout of the 06/24 runway and its exit taxiway:

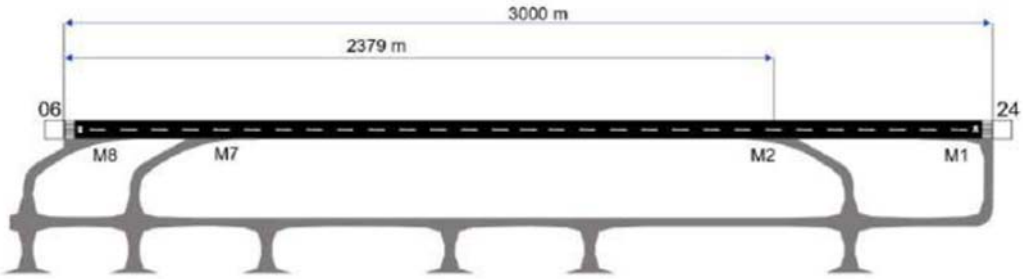

Figure 3. *Exit distance preference runway* 06

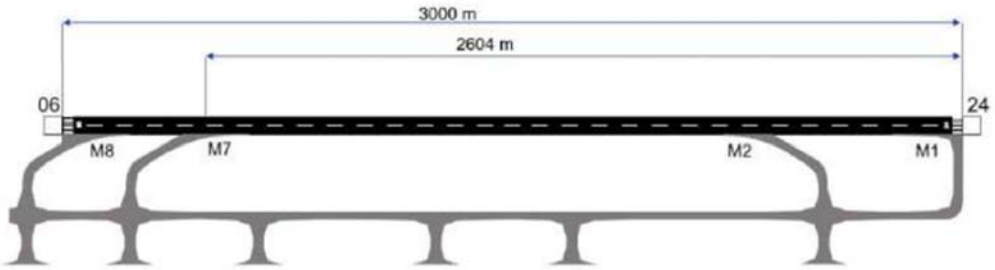

Figure 4. *Exit distance preference runway* 24

Based on the standard operating procedure, the following is a recommended exit taxiway:

Table 2. Preferred Exit Taxiway runway 06/24

PREFERRED EXIT TAXIWAY				
Runway	Aircraft Type	Rapid Exit Taxiway	Angle from RWY Centre Line	Length from Threshold
06	A330,A340,B747,B777	M1	30^{O}	3000 m
	B737,B738,B739,A320	M2	30^{O}	2379 m
24	A330,A340,B747,B777	M8	30^{O}	3000 m
	B737,B738,B739,A320	M7	30^{O}	2604 m

From the observation activities that have been carried out, the following is the ROTL runway 06/24 data that the author observed:

Table 3. ROTL runway 06

Category of Aircraft	Runway 06		
	Total ROTL	n Aircraft	MROTL
C	10159	146	**69,58219**
D	955	15	**68,21429**

Table 4. ROTL runway 24

Category of Aircraft	Runway 24		
	Total ROTL	n Aircraft	MROTL
C	10.224	143	**71,4965**
D	1189	17	**69,94118**

After the authors add up the respective ROTL values of each runway and divide these results by the total number of aircraft observed, it can be seen from the table above that the MROTL value owned by runway 06 is 69.6 seconds for category C aircraft and 68.2 seconds for category D aircraft. Meanwhile, the MROTL value owned by runway 24 is 71.5 seconds for category C aircraft and 69.9 seconds for category D aircraft.

IV. CONCLUSION

The conclusion from the research activities that the authors have carried out is that the value of the runway occupancy time (ROT) is influenced by several things such as the layout of the runway & taxiway and the category of the aircraft itself. From the observation results, it can be seen that runway 3 (06/24) Soekarno-Hatta International Airport has a different mean runway occupancy time landing (MROTL) on both sides, this is because there is a significant difference in distance between the threshold and the rapid exit taxiway on both sides of the runway. For runway 06, the MROTL value is 69.6 seconds for category C aircraft and 68.2 seconds for category D aircraft. Meanwhile, the MROTL value for runway 24 is 71.5 seconds for category C aircraft and 69.9 seconds for category D

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