

Construction Layout of Parallel Taxiway at Approach Control Procedure International Airport

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Abstract: In air traffic control, aircraft need runways for landing and take-off and taxiways to connect airport terminals and runways. Taxiways are designated lanes at land airports created for landing aircraft and are intended to provide a link between one part of the airport and another. This research aims to provide additional parallel taxiways because parallel taxiways are only available on one side of the runway, not on both sides. Meanwhile, Zainuddin Abdul Madjid International Airport is also quite busy considering that there are often international events, thus increasing the controller's workload because he has to set the separation for a fairly far approach. The research method used is qualitative. The result of the research is that it is concluded that parallel taxiways are needed and the author suggests that the Lombok branch of Perum LPPNPI forward to Zainuddin Abdul Madjid International Airport to add them to improve flight safety, security and efficiency.

Keywords— Parallel Taxiway, Approach, Separation

I. INTRODUCTION

The world of aviation has a complex system when it comes to safety. From small things to big things, everything is considered in detail because it involves lives. In addition, there is a culture of safety that must also start from the beginning with discipline. The safety factor is a priority in the world of aviation, with the aim that passengers and crew members during the flight do not get disturbed both from the air media, the aircraft they are riding as well as flight supporters ranging from airport conditions, flight arrangements to operators in the air and on the ground[1].

The taxiway is one of the elements of the airport. A taxiway is a designated path on a land airport used for aircraft taxiing. Its purpose is to connect different areas of the aerodrome, such as: a) Taxilane where aircraft stand. a section of an apron that has been designated as a taxiway and is solely meant to be used for aircraft stands. c) Taxiway Apron. a section of a Taxiway system situated on an apron with the goal of offering a taxi route that passes through the apron. c) Taxiway with quick exit. a Taxiway that is acutely angled in relation to the runway and intended to minimize runway occupancy times by enabling landing aircraft to turn off faster than on other exit Taxiways. [2].

Ashford, et al (2011) explain that the key in airport layout is the taxiway system, which connects the runway to the

terminal gate apron area and the aircraft service buffer. [3]. Taxiway has a hard surface which is a layer of asphalt or concrete, the characteristics of asphalt concrete mixtures that need to be owned are stability, durability, flexibility or flexibility, resistance to fatigue (fatigue resistance), surface roughness or skid resistance, watertight and ease of implementation (workability). [4]. Although smaller airports sometimes still use gravel or grass. Busy airports generally build taxiways parallel to the runway and have rapid taxiways so that aircraft can leave the runway faster. This is done so that the runway can be cleared more quickly to make room for other aircraft to land and to increase runway capacity.

In addition, the addition of taxiways is also useful for evacuation or emergency services if there is an emergency event in a flight. A study by Dr. Antonio states that determining the number of exit taxiways based on variations in aircraft types and the density of flight schedules at airports requires additional facilities to allow aircraft movement at night with guaranteed safety standards.[5]

Zainuddin Abdul Madjid International Airport is a domestic and international airport located in Praya, Central Lombok, West Nusa Tenggara, Indonesia. [6]. Taxiway at Zainudin Abdul Madjid International Airport has 4 taxiways namely Alpha, Bravo, Charlie, and SP. [7]. Taxiway SP is the only parallel taxiway that connects the apron to runway 13 starting with taxiway bravo then taxiway alpha. As for runway 31 there is no parallel taxiway. Aircraft that will take-off from runway 31 must backtrack from taxiway Charlie. [7].

This research is located and conducted at Zainuddin Abdul Madjid International Airport, in particular. In the Approach Control Procedure (APP) unit of the Lombok Branch Aviation Navigation Service Provider Corporation or better known as the Lombok Branch Airnav. The Approach Control Procedure (APP) Unit of Airnav Lombok Branch has the responsibility of providing approach control services to aircraft under its responsibility to ensure safety, orderliness, smoothness of Aviation Traffic and prevent collisions.

Zainuddin Abdul Madjid International Airport has international events that become annual events such as MotoGp, WSBK, and others. With these international events, Zainuddin Abdul Madjid International Airport has a significant increase in the number of flight traffic every day



with various types of aircraft. Starting from medium to wide type passenger aircraft and wide type cargo aircraft.

In Doc 9157 About Aerodrome Manual Design chapter 1 point 1.1.11 b and c explain b) *The construction of a partial parallel taxiway to connect one or both turnarounds can accommodate traffic growth that results in low to moderate runway utilization (parallel taxiways offer safety benefits and greater efficiency). Additionally, as runway utilization increases, a full parallel taxiway can be provided by completing the missing sections of the partial parallel taxiway.*; This document explains that traffic density requires parallel taxiways to support safety and security and smoothness.

Lack of parallel taxiways at Zainudin Abdul Madjid International Airport plus the density of traffic along with many international events in Lombok and supporting airports or alternate aerodrome main Bali airport resulted in heavy traffic at Zainudin Abdul Madjid International Airport. Plus if the rainy season causes the wind to often come from the north so that it must take-off runway 31. If take-off 31, the plane must backtrack and requires more time and distance for the aircraft to approach. So efficiency, safety and security need to be considered again.

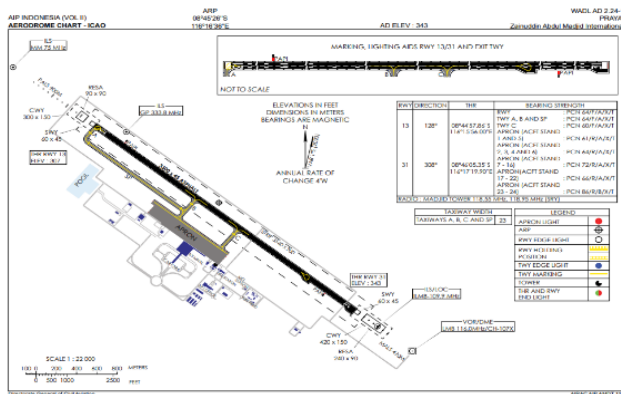


Fig 1. Zainuddin Abdul Madjid International Airport Layout

It can be seen that only one side is connected to the parallel taxiway that goes directly to runway 13. Meanwhile, runway 31 is not yet available. If the aircraft wants to take-off from 31, the aircraft must backtrack and enter via taxiway Charlie to line up. In addition, if the landing aircraft uses runway 13 and cannot vacate directly via Charlie, it must turn in the area provided for medium aircraft. If the aircraft with a wide body type, it must turn at the beginning of runway 31 and vacate on taxiway Bravo. The advantage of the taxiway configuration is that any landing aircraft can leave at the end of runway 13 and can immediately exit and head to the apron using the parallel taxiway route. This means that the runway becomes immediately clear for take-off or landing, once the aircraft exits the runway." [8]

The problem caused is that if a medium type aircraft takes-off using runway 31, it must wait long enough to enter the line up on runway 31. Coupled with rain and fog weather conditions. Forcing the controller to really make sure the runway is clear and according to the calculation which is exaggerated by 1 Nm. Because of the anticipated increase in

air traffic, runway safety is essential to aviation safety overall. Without practical, reasonable solutions, the number of incidents is certain to climb. It is essential that attention to detail result in advancements. [9].

Distance, time and fuel efficiency and passenger comfort are lacking. Because you have to wait for the runway to clear so that it can be used again. If there is a parallel taxiway, it can immediately vacate and increase efficiency and flight safety.

Through this research, it is expected to identify factors that affect ATC situational awareness. In addition, this research was conducted to suggest the construction of a taxiway on the side of runway 31 at Zainudin Abdul Madjid International Airport. The need for the addition of parallel taxiways is due to the discovery of potential risks to safety, security and efficiency when performing backtrack procedures. The parallel taxiway separation is important for aircraft to reach safe taxiing speed or full stop prior to any intersection and reverse turn. [10] This parallel taxiway is useful for increasing efficiency, safety, comfort and flight capacity at Zainudin Abdul Madjid International Airport. Then the results of this study can also be the basis for developing better training and work methods in improving services.

II. METHOD

In this research, the methods applied are qualitative approaches, observation, and document analysis. The observations made by the author were carried out during fieldwork practice directly related to the daily activities carried out. Observation Adler & Adler (1987: 389) state that observation is one of the fundamental bases of all data collection methods in qualitative research, especially concerning the social sciences and human behavior. [11]. Then document analysis is carried out to match, collect, evaluate the similarity between field conditions and predetermined documents or rules. This document analysis is not fixated on just one document but several documents concerning problems and similarities with field conditions. For the qualitative approach method, namely research that aims to understand the phenomena experienced by research subjects. [12].

Researchers went directly to the field by observing and observing control activities at Zainudin Abdul Madjid International Airport. Researchers also in addition to observing and observing, also conducted interviews with ATC on duty daily at Approach Control Procedure (APP) to dig deeper information on handling and understanding related to the field situation. Observation is one of the empirical scientific activities based on field facts and texts, through the experience of the five senses without using any manipulation [13].

An interview is an exchange of questions and answers between researchers and informants or research subjects in order to gather information. Interviews can now be conducted virtually, specifically through telecommunications media, thanks to the current state of information technology advancements. Interviews are essentially a means of gathering detailed information about a problem or topic that

has been identified through research. Alternatively put, it's a method of verifying data or data that was previously acquired using different approaches. [14].

Then researchers also study, analyze and collect data related to one of the factors supporting security. In addition, the author also collects data related to the importance of parallel taxiways in order to meet the ideal standards of an airport. Document analysis is used to evaluate the consistency or suitability of one document with another to find the data needed. [15].

III. RESULT AND DISCUSSION

From the problems that exist in the field, in order to fulfill the objectives of aviation safety and security. Government Regulation of the Republic of Indonesia Number 3 of 2001 explains that aviation safety is a condition that is realized from the implementation of smooth flights in accordance with operating procedures and technical feasibility requirements for aviation facilities and infrastructure and their support. Aviation safety is a condition of fulfilling safety requirements and utilization of airspace, aircraft, airports, air forces, flight navigation, as well as supporting facilities and other public facilities. [16], [17]. So the authors provide solutions related to this problem, namely:

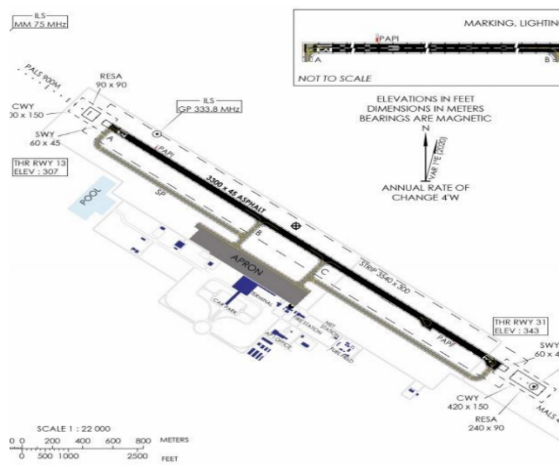


Fig 2. Layout saran penambahan taxiway

Addition of parallel taxiways from taxiway Charlie to beginning runway 31 for the efficiency of smooth traffic at Zainuddin Abdul Madjid International Airport. The author also suggests a minimum density of PCN 64 to qualify for medium to wide body aircraft because taxiway Charlie only has a density of PCN 60 so that it does not qualify for wide body. [18]

Another reason the author suggests PCN 64 is because if there is an error like what happened in the field of taxiway Charlie, namely PCN 60, it is the same as it cannot be used by wide body aircraft because the minimum standard for wide bodies is PCN 64 [7]. For the suggested PCN, after calculating for all types of aircraft on flexible pavement and rigid pavement, the results are presented in table 1 and table 2 below [19]:

TABLE 1. ACN value of Airplane with flexible pavement

TABLE 2. ACN value of Aircraft with pavement rigid

No.	Jenis	Transport Canada				Aircraft Manufacturer				COMFAA			
		A	B	C	D	A	B	C	D	A	B	C	D
		150	80	40	20	150	80	40	20	150	80	40	20
1	A124	35	48	73	100	36	49	74	101	34.8	47.3	71.1	98.1
2	A306	51	61	71	80	50	60	70	79	50	59.8	70.3	79.5
3	A310	47	56	66	75	33	39	46	54	37.5	44.8	53.1	60.7
4	A319	44	46	48	50	39	42	44	46	38.5	40.7	42.9	44.7
5	A320	42	45	48	50	45	47	50	52	43.5	46	48.4	50.4
6	A322	46	49	51	53	46	49	51	53	46.7	49.3	51.7	53.7
7	A330	48	56	66	78	48	56	66	77	52.8	61.2	72.6	84.7
8	A332	53	61	73	85	54	62	74	86	53.7	62.2	73.8	86.2
9	A333	54	62	74	86	55	63	75	88	54.9	63.5	75.3	87.7
10	ATR72	13	14	14	15	13	13	14	15	11.1	12	12.8	13.5
11	B732	35	37	39	41	34	36	38	39	34	35.9	37.8	39.3
12	B733	40	42	44	46	37	39	41	42	38.2	40.1	42	43.5
13	B734	43	45	47	49	42	44	46	48	42.3	44.5	46.6	48.3
14	B735	38	40	42	43	35	37	39	41	36.5	38.5	40.3	41.8
15	B737	43	46	48	50	41	43	45	47	41.6	43.9	46	47.7
16	B738	51	53	55	57	49	52	54	56	49.2	51.7	54.1	56.1
17	B739	51	53	55	57	51	53	56	58	55.6	58.2	60.6	62.6
18	B744	54	65	77	88	53	63	75	85	59.1	69.8	81.7	92.5
19	B772	64	84	107	129	64	82	105	127	63.8	82.8	106	128
20	B773	64	83	107	128	64	82	105	127	66.1	85.7	110	132
21	C-130	33	36	39	42					29.7	32.2	34.9	37.5
22	CRJ900	23	24	26	27	23	24	26	27	24.4	25.6	26.8	27.8
23	MD83	43	46	48	50	49.1	51.3	53.2	54.8	49.1	51.3	53.2	54.8

pavement

From the table, it can be decided that special treatment is needed for wide body aircraft compared to other aircraft. Graphs from aircraft manufacturers, we can use to determine the ACN value of an aircraft. The data required is the gross weight of the aircraft and the type of subgrade found on the runway/taxiway/apron that will be passed by the aircraft. [19]. Because Zainuddin Abdul Madjid International Airport is often involved in international events such as MotoGP, WSBK and others that take place every year and many wide body aircraft are operated. This development is expected to be in accordance with the needs of quite heavy traffic at Zainudin Abdul Madjid International Airport.

IV. CONCLUSION

The conclusion that can be drawn from the problems presented is that the construction of parallel taxiways starting from taxiway Charlie to the beginning of runway 31 is very influential in the efficiency, security and safety of flights (departure and arrival) at Zainuddin Abdul Madjid International Airport. In addition, the number of aircraft on hold will decrease (departure and arrival) because of the queue for take-off and landing. With this solution, the number of aircraft is also increasing and has a direct effect on passenger satisfaction because the possibility of delay (additional time) is decreasing and can also help ATC a little in managing existing traffic.

With this research, it is hoped that we can make an international airport in Indonesia better in its services and ideal. The existence of technological developments has made humans increasingly innovate to replace previous innovations. [20]. Therefore, we will enter aviation security safety challenges that are increasingly complex and complicated and require a better level of safety if not prepared from the start. Then it could be a boomerang in the future. We should start to organize better and follow the latest and more sophisticated technology to improve safety and security systems.

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