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Development of Facilites for Aviation Safety Services

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***Abstract*— Aviation is a unit that cannot stand on its own. Aviation consists of the use of airspace, aircraft, airports, air transportation, flight navigation, environmental safety and security and other facilities. The data collection carried out in this study was based on the author's observations and data on the Cakrabhuwana Cirebon Standard Operating Procedure from November 2021 to January 2022, to obtain results in carrying out their duties. Based on the author's observations, the lack of facilities at Cakrabhuwana Cirebon Airport can have consequences that can interfere with flight safety.**

Keywords*— *aerodrome facilitation, designation, ATC

I. INTRODUCTION

Air Traffic Control or ATC plays an important role in the implementation of an orderly, smooth, and safe air traffic in the world of aviation. In meeting the needs of air traffic controllers, the government has collaborated with the Transportation Human Resources Development Agency (BPSDM) under the auspices of the Ministry of Transportation to build educational institutions capable of producing competent air traffic controllers. One of the educational institutions that play a role in this matter is the Curug Aviation Polytechnic of Indonesia.

The Air Traffic Control Study Program, with a length of education of 4 years, is taken in 8 semesters, applying several methods. In addition to the method of understanding theory, this study program provides methods of fieldwork practice known as on-the-job training (OJT). At this stage, students undergo direct fieldwork practice in various areas that have air traffic guidance facilities and infrastructure.

In accordance with PM 59 of 2015 concerning the criteria, duties, and authorities of the Flight Inspector it is stipulated that it is obligatory to carry out On Job Training, based on this, cadets of Air Traffic Controller of the Indonesian Aviation Polytechnic Curug (PPIC) are equipped with special skills both theory and practice are required carry out On The Job Training as one of the graduation requirements. Developing skills in managing and controlling air traffic must be guided by the Five Objectives of Air Traffic Services listed in Annex 11 point 2.2,:

- Prevent collisions between aircraft;
- Prevent collisions between aircraft in the movement area and obstacles in the area;
- Maintain an orderly flow of air traffic;
- Provide advice and information that is useful for the safe and efficient conduct of flight;
- Notify the appropriate organization regarding aircraft in need of search and rescue aid and assist such organization as required.

Therefore, On The Job Training which is guided by the Five Objectives of Air Traffic Services and other documents is expected to be able to complete the learning stages well.[1][2]

II. LITERATURE REVIEW

The function and role of transportation is very important and strategic human life, namely as a driver, driver and supporter development activities in all sectors, including the transportation sector, trade, social and economic, and environmental. Airports are important infrastructure for activities air transportation in every country, especially Indonesia which is an archipelagic country where air transportation plays a very important role smooth activities of its residents.

The development of the world of aviation plays a very big role in providing air transportation services. This is known by many establishment airlines in the world, which aim to fulfill demand for air transportation flows that are increasingly wider in scope and heavy in traffic flow. Air transportation services make travel very easy, fast, and efficient, especially for very long trips.[3][4]

Aviation is a unified system consisting of the use of airspace, aircraft, airports, air transportation, flight navigation, safety and security, the environment, as well as supporting facilities and other public facilities. An airport is a certain area on land or water (including buildings, installations, and equipment) intended either in whole or in part for the arrival, departure, and movement of aircraft. An airport is an area on land and/or waters with certain boundaries that is used as a place for aircraft to land and take off, take off passengers, load and unload goods, and a place for transfers between modes of transportation equipped with safety, flight security, and basic facilities. other support[5].

Airports must have airside facilities such as runways, taxiways, aprons and landside facilities such as terminals, entrances, parking and baggage facilities. Airside facilities are aircraft movement facilities. A very important role is airside facilities which include runway, taxiway and apron. These

three airport facilities are very supportive, especially on the air side or in direct contact with aircraft.This facility must meet the structural strength to serve the movement of aircraft operating according to plan. [6][7][8]

III. METHODOLOGY

In this study, the data was gathered using a mix of two methods, document analysis and field observation. To directly examine work procedures connected to research phenomena, field observations were done. Additionally, data from research-related documents was gathered and evaluated by document analysis. Both of these methods can be combined to produce extensive and in-depth data for researchers.

A. Data Collecting

The data collection carried out in this study was based on the author's observations and data on the Cakrabhuwana Cirebon Standard Operational Procedure from November 2021 to January 2022. Researchers also collected and analyzed related documents. Document analysis is used to evaluate consistency or suitability between one document and another to find the required data.[9]

B. Data Analysis

After the data obtained from field observations are collected, they will be analyzed qualitatively. Qualitative research was carried out with a research design whose findings were not obtained through procedures or in the form of calculations, but revealed a holistic-contextual phenomenon by collecting data from researchers in natural settings/settings and using it as a key instrument. Qualitative research has a descriptive nature and tends to use an inductive approach to analysis, so that the process and meaning based on the subject's perspective are highlighted in this qualitative researchIn the context of this study, qualitative analysis can be used to understand the experiences and perspectives of ATC.[10]

IV. RESULT AND DISCUSSION

In general, each airport has the main task of providing aviation security and safety services to all aircraft as well as passengers and goods, including all buildings and installations at the airport, therefore to create and realize a condition for proper flight operations. free from disturbances and/or threats that may occur, one of the preventions is the role of airport markings (Aerodrome Marking) and designation on parts of the aerodrome, which can make it easier for Air Traffic Controllers as air traffic guides and pilots to understand each other when the aircraft is in the maneuvering area.

The airport has supporting facilities for aircraft services, including:

- Runway, which is a defined rectangular area at an airport on land or water used for landing and taking off of aircraft
- Highway (taxiway), is a connecting road between the runway and the apron, hangar, terminal, or other facilities at an airport

The following data must be measured or explained accordingly for each facility provided at an airport as stated in ICAO Annex 14 Chapter 2 Section 2.5.1

- runway — true bearing to one-hundredth of a degree, designation number, length, width, displaced threshold location to the nearest meter or foot, slope, surface type, type of runway and, for a precision approach runway category I, the existence of an obstacle free zone when provided;
- strip runway end safety area length, width to the nearest meter or stopway foot, surface type; and arresting system — location (which runway end) and description;
- taxiway — designation, width, surface type;
- apron — surface type, aircraft stands;
- the boundaries of the air traffic control service;
- clearway — length to the nearest meter or foot, ground profile;
- visual aids for approach procedures, marking and lighting of runways, taxiways and aprons, other visual guidance and control aids on taxiways and aprons, including taxi-holding positions and stopbars, and location and type of visual docking guidance systems;
- location and radio frequency of any VOR aerodrome checkpoint;
- location and designation of standard taxi routes; and
- distances to the nearest meter or foot of localizer and glide path elements consisting of an instrument landing system (ILS) or azimuth and elevation antenna of a microwave landing system (MLS) in relation to the associated runway extremities.

Inside a taxiway there is a Runway-Holding Position which is a position determined for aircraft and vehicles taxiing to hold their position and stop, unless permitted by the Aerodrome Control Tower. This is in accordance with ICAO Document 4444 which states

“A designated position intended for traffic control at which taxiing aircraft and vehicles shall stop and hold until further cleared to proceed, when so instructed by the aerodrome control tower.

Note. — In radiotelephony phraseologies, the expression “holding point” is used to designate the runway-holding position.”[11]

This is also in accordance with ICAO Annex 2 which states:

"An aircraft taxiing on the maneuvering area shall stop and hold at all runway-holding positions unless otherwise authorized by the aerodrome control tower."[12]

The provision of Taxiway Designations and Runway-Holding Positions on runways is aimed at avoiding Runway Incursions in order to create safety on flights, as is the case as stated in **PM 83 of 2017** concerning Civil Aviation Safety Regulations section 193 which reads "Airport operators are obliged to operate and carry out maintenance of airport in accordance with airport operating procedures including procedures to prevent runway excursions and incursions, unless there are other provisions issued by the Director General." [13]

In general, every airport has the main task of providing aviation security and safety services to all aircraft, passengers and goods, including all buildings and installations at the airport, therefore to create and realize a situation for the operation of flights that free from interference and/or threats that may occur, one of the precautions is the role of airport markings (Aerodrome Marking) and designations on aerodrome parts, which can make it easier for Air Traffic Controllers as air traffic guides and pilots to understand each other when the aircraft is in the maneuvering area.

Providing Taxiway Designation and Runway-Holding Positions on the runway is intended to avoid Runway Incursion in order to create flight safety, as stated in PM 83 of 2017 concerning Civil Aviation Safety Regulations section 193 which states "Airport operators are obliged to operate and carry out maintenance on airports in accordance with airport operating procedures including procedures to prevent runway excursions and incursions, unless there are other provisions issued by the Director General."

Based on the Cakrabhuwana Cirebon Standard Operating Procedure (S.O.P) data, the Aerodrome and Physical Characteristic designation taxiway at the airport is only named "TAXIWAY" and for the apron it is only named "APRON" while at Cakrabhuwana airport there are 2 aprons, namely the Main Apron and the Military Apron. Based on Annex 14 Chapter 1, the definition of an apron is "A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fuelling, parking or maintenance." Thus the existence of a Military Apron should also be included in the SOP.[14][15][16]

Problems arise with the existence of a Military Apron that is opposite the Main Apron, each of which has a taxiway and a holding point that connects the apron with the runway, thus Cakrabhuwana airport should have more than one taxiway and holding point, and with no designation taxiway and holding point. may pose a safety hazard that may result in a runway incursion.[17]

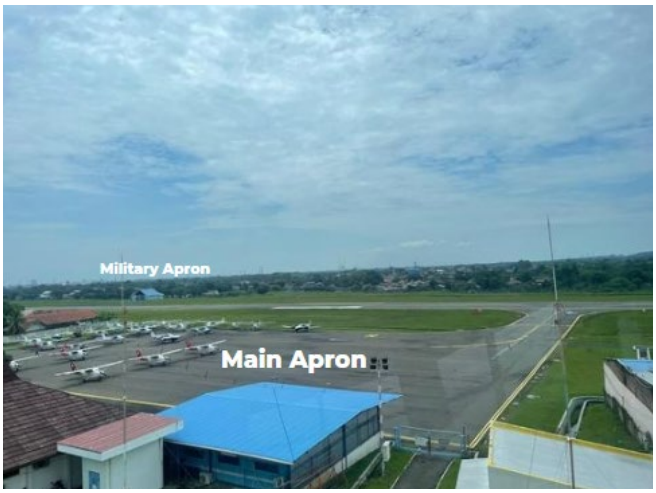

Fig 1. The location of the Military Apron and Main Apron from the Tower

According to Document 4444 Runway Incursion is "Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take off of aircraft."[18]

Solutions that can be considered in order to optimize air traffic services in terms of safety at Cakrabhuwana Cirebon Airport are:

A. Provide designation of taxiways

There are 2 taxiways that connect the apron and runway at Cakrabhuwana Cirebon Airport, namely those that connect the runways at the Military Apron and the Main Apron. In order to avoid runway incursion due to an error in taxiway selection, each taxiway located at the airport is given a designation or naming.

Airport planning should be based on regulations - the rules that have been made and determined by experts are good based on Federal Aviation Administration (FAA) regulations or International Civil Aviation Organization (ICAO), Indonesia also created some guidelines that can be used among others Government Regulation of the Republic of Indonesia Number 70 2001 concerning Airports, Minister of Transportation Decree No. KM 44 of 2002 concerning National Airport Order, as well as Law Number 1 of 2009 concerning Flights as well as several other related guidelines.[19]

The following are the KP 39 of 2015 guidelines regarding naming taxiways:

- Must Use Single Letters, Without Numbers, To Designate Each Main Taxiway;
- The Same Letter Must Be Used For The Entire Length Of The Taxiway, Unless A Turn Of 90 Degrees Or More Is Made To Join The Runways, Then Another Letter May Be Used For That Part Of The Taxiway After The Turn;
- For Each Intersection Taxiway, A Different Single Letter Is Used;
- To Avoid Confusion, The Letters I, O And X Are Not Used, The Letter Q Is Only Used When It Cannot Be Avoided;
- At Airports That Have Or Will Have A Large Number Of Taxiways, Alphanumeric Indications May Be Used For Short Taxiway Intersections. The Next Taxiway Intersection Must Use The Same Letter, With Consecutive Numbers. If Sequential Numbers Cannot Be Applied Because Of The Geometry Of The Taxiway System Then All Taxiway Plans (Airport Charts) Used By The Pilot Must Include Information Regarding The Missing Designator.
- The Use Of Letters And Numbers Should Be Easily Understood. If It Is Necessary To Use A Two-Digit Alphanumeric Designator, Care Should Be Taken To Ensure That The Number Used On The Taxiway Designator Is Not Confused With The Runway Designation.[20][21]

Fig 2. Use "X" for Closed Taxiway Marker

That way, taxiways at Cakrabhuwana Airport can be given names such as Taxiway Alpha, Bravo, Charlie, or other alphabets besides "I", "O", and "X". The following is an example of giving a designation in an SOP:

No	Name	Length	Width	Surface
1	Alpha	70 m	15 m	Asphalt
2	Bravo	70 m	15 m	Asphalt

Fig 3. Taxiway

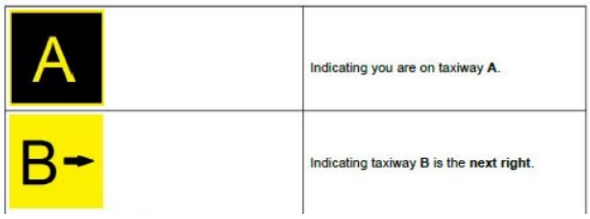

Fig 4. Taxiway sign example

B. Provide signs on runway-holding positions

Runway-holding positions are vulnerable positions in maneuvering areas, so the mention of clearance limits must be very clear so that there can be synchronization between air traffic controllers and pilots and the creation of flight safety and security.

Giving a holding point a designation such as Holding point A1, A2 or B1, B2 can clarify the clearance limit and where the aircraft is located, for example "Taxi to holding point Alpha 1 runway 04 via taxiway Alpha" in the taxi clearance it is very clear if the aircraft will taxi via taxiway Alpha and will stop at holding point A1, so that runway security can be maintained and runway incursion can be avoided for the sake of smooth security and safety at Cirebon's Cakrabhuwana Airport. The naming convention for alphanumeric designations on taxiway connectors is application of the primary taxiway letter followed by the applicable numeral designation of the taxiway connector. For example, taxiway C5 is a taxiway connector originating from primary taxiway C.[22]

Fig 5. Holding Position Sign

V. CONCLUSION

In organizing aviation traffic services, the important role of aviation units is inseparable. One of them is an Air Traffic Controller or what is often called an Air Traffic Controller (ATC). Behind ATC's success in providing air traffic services, it cannot be separated from all the supporting facilities.

By adding a taxiway and holding point designation it will greatly assist the controller in providing air traffic services so that clear communication is created between the controller and the pilot during the operating hours of air traffic services at Cakrabhuwana Airport.

From this problem, the author provides several suggestions that are expected to be realized, including the following:

1. Give a name to the main apron taxiway with the mention of Taxiway Alpha and for the military apron with Taxiway Bravo;

2. Name the main apron holding point as Alpha 1 holding point and for the military apron holding point with the mention of Alpha 2 holding point;

3. Provide additional signs in the form of a holding point designator sign and taxiway designator at each holding point and taxiway to clarify and make it easier for pilots.

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