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Changing Local Bali App With UjungPandang ACC Regarding Runway Changes In Use

Ni Komang Putri Mirah Berliandari[1] and Rany Adiliawijaya P[2]

[1]Indonesian Aviation Polytechnic CurugTangerang, Indonesia
160719100019@ppicurug.ac.id

[2]Indonesian Aviation Polytechnic Curug
Tangerang, Indonesia
rany.adiliawijaya@ppicurug.ac.id

Abstract— Bali Ngurah Rai International Airport serves local, domestic, international, and overflying traffic passing through Bali CTR airspace. Based on the procedures that have been implemented, APP Bali has a coordination flow with adjacent units both in the form of direct coordination and also based on the LOCA (Letter OF Coordination Agreement). At LOCA Makassar ATSC, Bali ATS, and Surabaya ATS, there has been no notification of changes in runway use for ACC Ujung Pandang and APP Surabaya. The purpose of this study is to add a runway change notification to the coordination section. The research method used is qualitative descriptive. Data collection techniques are observation, interviews, and literature review. Data processing techniques use data reduction, data presentation, and verification. The results of this study, the author compares with DOC 4444 to make changes and additions to information coordination in LOCA Makassar ATSC, Bali ATS, and Surabaya ATS in the coordination timing section. The advice that the author can give by adding coordination to ACC Ujung Pandang regarding runway changes at RKT Bali and ATZ Banyuwangi followed by the use of SID / STAR at ATZ Banyuwangi because Banyuwangi has 4 different typesof SID / STAR by following runway changes at Bali CTR.

Keywords— runway in use, Letter of Coordination Agreetment, Bali APP, coordination section, runway changes

I. INTRODUCTION

The country of Indonesia is located on the Asian continent with an area of 1,919,440 km2 which placesIndonesia as the 15th largest country in the world [1]. As an archipelagic country, Indonesia stretches fromlatitude 07o 20' N to 14o LS and 92o BT to 141o BT which connects the islands in Indonesia [2]. Indonesia, which is an archipelagic country, needs transportation facilities that can meet the high level of population mobility. Aviation transportation was chosen as a link between islands because it was able to reach the destination in a short time [3]. Aviation transportation has high safety standards regulated in the International Civil Aviation Organization (ICAO) which can be seen from several aspects both human factors in ground control and air control as well as from weather factors [4].

The weather in Indonesia is divided into 2 seasons, rainy and dry season [5]. The change of the rainy season and dry season is influenced by changes in monsoon winds [6]. Monsoon is the alternation of winddirection that blows from the hemisphere of the Asian Continent with the Australian Continent [7]. In the world of aviation, wind changes affect the determination of runway use [8]. As mentioned in DOC 4444 Chapter 7 Procedures for Aerodrome Control Service Point 7.2.2 states that "normally, an aircraft will landand take off into wind unless safety, the runway configuration, meteorological conditions and available instrument approach procedures or air traffic conditions determine that a different direction is preferable. Inselecting the runway-in-use, however, the unit providing aerodrome control service shall take into consideration, besides surface wind

speed and direction, other relevant factors such as the aerodrome traffic circuits, the length of runways, and the approach and landing aids available". Any changes in wind such as crosswind, tailwind, and headwind will affect aircraft performance during takeoff and landing, because the wind that supports to perform these performance has different [10].

According to DOC 4444 in Chapter 9 Point 9.1.3 Transmission of information point 9.1.3.2.1 states that "information shall be disseminated to aircraft by one or more of the following means as determined by the appropriate ATS authority" meaning that any information must be disseminated to aircraft by one or

more of the means determined by the ATS authority. In DOC 4444 Chapter 9 point 9.1.3.1.2 it is also stated "disseminate important information to multiple aircraft without delay, e. g. sudden occurrence of a hazard, change in runway use, or failure of a key approach and landing assistance" that changes in runway use are included in important information. Based on DOC 4444 Chapter 9 Point 9.1.3 that for every runway change, it is necessary to immediately disseminate information to each aircraft as determined by the ATS authority. Dissemination of information on runway changes requires notification with other adjacent units, especially with Ujung Pandang [9].

Bali APP/TMA has a coordination flow with adjacent units in the form of direct coordination and also based on LOCA. This coordination if done well will make it easier for the authorities to carry out better work effectiveness [11]. In carrying out coordination, the procedure must be appropriate, according to Burhanudin the procedure is a series of specific actions, actions or operations that must be carried out or executed in the same way in order to always obtain the same results from the same situation [12]. In aviation, Air Traffic Services (ATC) is responsible for all information provided to the aircraft including being responsible for its movements. Therefore, without it a coordination with Air Traffic Services (ATC) will endanger flight operations so that it deviates from the 5 objectives of Air Traffic Services and the Letter of Coordination Agreement [13]. Good coordination with adjacent units is expected to prevent the occurrence of Breakdown of Coordination (BOC) and Breakdown of Separation (BOS) [14]. So to ensure good coordination, personnel can record every operational activity of flight communication services in the operational logbook and report any operational events that are not in accordance with the Letter of Coordination Agreement (LOCA) and Standard Operational Procedure (SOP) and as soon as possible coordinate with related adjacent units [15].

In this study, the author found a problem, namely the Letter of Coordination Agreement (LOCA) between Makassar ATSC, Bali ATS, and Surabaya ATS has not included the coordination of notifications related to Bali's runway change to Ujung Pandang [16]. Even though following the rules in DOC 4444, runway change notification needs to be done [9]. This aims to avoid the occurrence of BOS and BOC against SID / STAR which will be used mainly in Banyuwangi [14]. The use of SID / STAR Banyuwangi is very dependent on the runway in use used by Bali. If information on runway changes in use is not conveyed to Ujung Pandang followed by the submission of SID / STAR that will be used by Banyuwangi, there can be traffic conflicts that lead to broken separation due to opposite traffic. Therefore, coordination of runway in use changes needs to be carried out followed by the delivery of SID / STAR that will be used by Banyuwangi to Ujung Pandang. The start of SID/STAR in Banyuwangi will only be implemented in 2023. Banyuwangi has 4 SIDs/STARS in use with 2 SID/STARS on each runway. For SID / STAR used in Banyuwangi ATZ there are MOVMO 1G, MOVMO 1B, MOVMO 1K, and MOVMO 1J. For MOVMO1G it is used if Banyuwangi uses Runway 08 and in Bali uses Runway 09, but if in Bali it uses Runway 27 then it uses MOVMO 1B. The use of SID / STAR will also be different if Banyuwangi uses Runway 26 and in Bali uses Runway 09 then what will be used is MOVMO 1K but if in Bali using Runway 27 then MOVMO 1J will be applied [17].

Banyuwangi ATZ is included in the Bali region, so every change in the Banyuwangi runway will be connected to the Bali runway changes and needs to be conveyed to Bali if there are changes in Banyuwangi [17]. This runway change will be followed by the determination of the SID/STAR to be used by Banyuwangi [9]. However, in the LOCA, changes in runway in use in Bali have not been listed following the provision of SID / STAR to be used by Banyuwangi from Bali to Ujung Pandang [16].

II. Literature Review

Makassar Air Traffic Service Center (MATSC) provides services on several types of flights such as domestic, international, overflying and military flights. In carrying out their duties, personnel have the obligation to provide efficient and safe flight services that can support flight safety. One of them is by coordinating every aircraft that will enter or leave the Makassar Sector area as stated in the Standard Operational Procedure (SOP) and Letter of Coordination Agreement (LOCA)

[15]. Letter of Coordinationof Agreement (LOCA) an agreement between two or more adjacent aviation traffic service units or between aviation traffic service authorities in different countries whereby aviation traffic services must becarried out by the parties concerned stating the conditions, methods and procedures used to regulate cooperation or how to conduct special operations for traffic services cross flight [18].

Based on Annex 11 Chapter 3 of the Air Traffic Control Service in section 3.6.2.5 states "applicable coordination procedures, including transfer of control points, shall be specified in letters of agreement and ATS unit instructions as appropriate" this can make it a benchmark that in any applicable coordination procedures must be stipulated in the letter of agreement and based on the ATS unit [19]. In KP 41 of 2021 the technical and operating standards of civil aviation safety regulations part 170-05 (manual of standard part 170-05) Letter of Operational Coordination Agreement (LOCA) between aviation traffic service

units in article 5 point 1 LOCA between ATS units that have been agreed can be changed provided that there are changes to ICAO Standards and Recommendations, changes occur in laws and regulations, and changes required by ATS related units [20]. In DOC 4444 Chapter 10 Coordination 10.1.3 Exchange of Movement and Control Data point 10.1.3.3 in this section explains that the approach control service must provide relevant information to ACC immediately and runway in use is one of the mandatory information that must be submitted immediately [9].

III. RESEARCH METHOD

Based on the predetermined goal to increase knowledge and insight, in uncovering problems, methodsare needed in taking rational, empirical, and systematic data [21]. Researchers use this method to be able todescribe or sharpen research explanations so that later they can be easily understood by people who read [22]. Such methods can explain facts related to problems so that valid facts and data will facilitate effectiveand efficient problem solving [23].

A. Data Collecting

In conducting this study, researchers use methods that aim to obtain valid data and can support the completeness of problem solving to be analyzed. The method in this study uses qualitative descriptive. Thequalitative descriptive method is a research method that emphasizes observation of phenomena and examines more deeply the substance of the meaning of phenomena [24]. This method is used to understand a phenomenon in depth and detail, as well as explore the meanings and experiences associated with the phenomenon [25]. In this study, several data collection techniques were carried out that can be used relatedto the importance of runway notification information to other units:

- Observe the object of research, conduct interviews, and dig up related documents. Observations were made during On the Job Training at Bali APP every time they experienced runway changesin Bali CTR and Banyuwangi ATZ [26].
- Conducting literature review with secondary source data collection methods obtained by researchers in Doc 4444, Annex 11, Decree of the Director General of Civil Aviation, Letter of Coordination Agreement, and Standard Operational Procedure [27].

B. Data Analysis

In conducting the process of analyzing the data obtained, researchers made direct observations by paying attention to the procedures carried out by ATC Bali APP every time there was a runway change [17]. Observation is a data collection technique, where researchers make direct observations to the object of research to see closely the activities carried out [28]. According to Margono, "basically observation techniques are used to see and observe changes in social phenomena that grow and develop which can thenbe made changes to the assessment for the executor (observe) to see certain objects, so as to be able to separate what is needed from what is not needed" [29].

This observation was made by researchers when carrying out On the Job Training at Bali APP from October 6, 2023 to December 8, 2023. From the observations obtained by researchers, ATC Bali APP always coordinates every runway change that occurs in Bali to Ujung Pandang ACC and Surabaya APP. However, all of coordination so far are not listed in the Makassar ATSC LOCA, Bali ATS, and Surabaya ATS. Especially with the implementation of the use of SID / STAR on Banyuwangi ATZ in June 2023, Ujung Pandang ACC also needs to know what STAR will be applied to aircraft that will enter the Bali CTR area. The interview was conducted by the author with a list of questions that had been prepared in advance to get

as much information as possible about the problems that occurred so as to strengthen the author's data [16][17].

IV. Analysis And Discussion

Indonesia which is a tropical country is on the equator which has two seasons namely, dry and rainy [30]. This seasonal difference is influenced by the movement of the west and east monsoons. Monsoons are also called monsoons because of the movement of air masses that occur due to pressure differences between land and ocean.[31]. In the world of aviation, all activities carried out are very vulnerable to weather and climate conditions. This condition, on the one hand flight activity will affect when it will take off, cruising, and also when it will land [32]. The influence of weather and climate on the world of aviation has actually started far from the operation of the aircraft itself. When planning an airport, the condition of the airport will be studied. Generally, the climatic conditions needed are wind factors to find out the most wind direction. This is to determine the movement of the wind whether the occurrence of cross wind affects the position of the runway. The runway will be made parallel to the most wind direction [33].

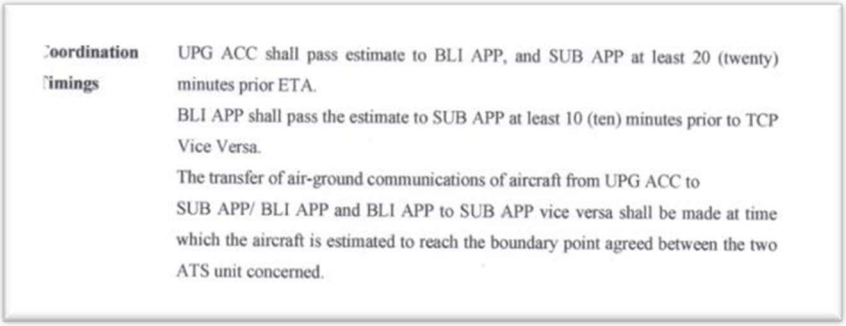
The runway is made parallel to where the wind direction is headed, but the use for aircraft to take off and land is chosen based on the opposite wind direction. Doc 4444 Chapter 7 Procedure for Aerodrome Control Service 7.2 Selection of Runway-in-use explains in point 7.2.2, "Normally, an aircraft will land and take off into wind unless safety, the runway configuration, meteorological conditions and available instrument approach procedures or air traffic conditions determine that a different direction is preferable."determine that a different direction is preferred. So, every take-off and landing movement of an aircraft is influenced by the direction of the wind and its movement will always face where the wind direction is pointing or rather the opposite direction [9].

Pada Doc 4444 Chapter 7 Procedure for Aerodrome Control Service 7.2 Selection of Runway in use explained in point 7.2.6 in points D and E also mentioned in determining the use of runways can be determined by where the wind shift is based on the report and based on how much wind speed occurs. Point D “when wind shear has been reported or forecast or when thunderstorms are expected to affect the approach or departure” dan point E “when the crosswind component, including gusts, exceeds 28 km/h (15kt), or the tailwind component, including gusts, exceeds 9 km/h (5 kt)”[9].

In Indonesia, including in Bali, at the end of the year is the rainy season which is influenced by the movement of the west monsoon. This westerly monsoon moves from the Asian Continent to the Australian Continent. At this time, the sun is in the southern hemisphere or 23.5° south latitude. Then the sun will move towards the equator. In this condition, the Australian plain will get maximum sunlight. That will make the air pressure in Australia low, and the temperature will be relatively high. While on the plains of Asia there will be winter. This makes the temperature low while the air pressure becomes high. Therefore, every period starting from October to April, Indonesia will experience rain [34].

From the rainy season that occurs, this has an impact on changing the runway that is always used by I Gusti Ngurah Rai International Airport in providing flight traffic services. This change often occurs every time it enters the rainy season caused by changes in wind to erratic which makes the use of runways also change. The impact of runway changes often makes route changes in flights because the SID / STAR applied to each runway has different movements and names at each point it passes. This runway change is included in important information that must be and immediately communicated to all aircraft controlled. Whether it's an aircraft that is still under the constraints of our service or going to our control zone area. This information is important and must be submitted immediately to determine separation and also the order in which the controlled aircraft can land. This can be done through broadcasting on the frequency we hold and coordinating related to delivery to other units where the aircraft they still control will go to our control zone.

While carrying out OJT at Bali APP/TMA, Bali APP/TMA always coordinates with other units, especially Ujung Pandang ACC in delivering important information related to the aircraft being controlled. However, during the implementation of coordination to Ujung Pandang ACC and also Surabaya, at LOCA Makassar ATSC, Bali ATS, and Surabaya ATS in the coordination procedure section there was no obligation to coordinate in runway changes in use, even though so far ATC has always worked to convey important information such as changes in runway use.



Coordination Timings	UPG ACC shall pass estimate to BLI APP, and SUB APP at least 20 (twenty) minutes prior ETA. BLI APP shall pass the estimate to SUB APP at least 10 (ten) minutes prior to TCP Vice Versa. The transfer of air-ground communications of aircraft from UPG ACC to SUB APP/ BLI APP and BLI APP to SUB APP vice versa shall be made at time which the aircraft is estimated to reach the boundary point agreed between the two ATS unit concerned.

Figure 1. Coordination Timings

Source: LOCA Makassar ATSC, Bali ATS, dan Surabaya ATS

According to DOC 4444 Chapter 9 flight information service and alerting service Point 9.1.3.2.1 and Point 9.1.3.2.2 runway in use is important information that must be immediately disseminated to every aircraft controlled or to be controlled, where the delivery is carried out as determined by the ATS authority."Information shall be disseminated to aircraft by one or more of the following means as determined by theappropriate ATS authority. Disseminate important information to multiple aircraft without delay, e. g.

sudden occurrence of a hazard, change in runway use, or failure of a key approach and landing assistance". That is, the Information must be disseminated to aircraft in one or more of the following ways as determined by the appropriate ATS authority. Disseminate critical information to multiple aircraft without delay, e.g. sudden occurrence of hazards, changes in runway use, or failure of main approach and landing assistance [9].

Pada DOC 4444 Chapter 10 Coordination 10.1.3.3 Exchange of Movement and Control Data Point 10.1.3.3, explained that the approach control service must provide relevant information to ACC immediately and one of information that must be submitted is the use of runways. “The unit providing approach control service shall keep the ACC promptly advised of pertinent data on controlled traffic such as runway in use and expected type of instrument approach procedure” [9].

The submission of runway in use must be carried out and needs to be included in the LOCA, considering that in DOC 4444 runway in use is important information and must be conveyed to all controlled aircraft and also conveyed to other units. Moreover, BALI APP/TMA oversees Banyuwangi ATZ and Lombok ATZ. This submission to other units serves to determine the SID / STAR that will be used by the unit. The most influential unit for runway changes in use Bali APP/TMA is Banyuwangi itself.Banyuwangi has four different SIDs / STARS depending on the runway used by Bali APP / TMA. The four SIDs/STARS are MOVMO 1G, MOVMO 1B, MOVMO 1K, and MOVMO 1J. For MOVMO 1G it is

used if Banyuwangi uses Runway 08 and in Bali uses Runway 09, but if in Bali it uses Runway 27 then it uses MOVMO 1B. The use of SID / STAR will also be different if Banyuwangi uses Runway 26 and in Bali uses Runway 09 then what will be used is MOVMO 1K but if in Bali using Runway 27 then MOVMO 1J will be applied [17].

Following the notification of the use of the Bali APP/TMA runway to Ujung Pandang, it is necessary to follow the notification of the use of SID/STAR to be used by Banyuwangi to Ujung Pandang. SID/STAR Banyuwangi has just been established in 2023, if the use of SID/STAR Banyuwangiis not conveyed to Ujung Pandang, BOS and BOC can occur due to inappropriate traffic arrivals and departures. This can create less traffic separation conflicts in Banyuwangi and Bali if the SID / STARused is not appropriate [14].

V. CONCLUSION

In Annex 11 Chapter 3 Air Traffic Control Service 3.7.4 Coordination of Clearances Point 3.7.4.3, it is stated that an air traffic control clearance shall be coordinated between air traffic control units to cover the entire route of an aircraft or a specified portion thereof as follows. When an aircraft intends to depart froman aerodrome within a control area to enter another control area within a period of thirty minutes, or such other specific period of time as has been agreed between the area control centers concerned, coordination with the subsequent area control center shall be effect prior to issuance of the departure

clearance. It is explained that any air traffic control permit must be coordinated between air traffic control units covering all flight routes and if an aircraft intends to depart from an airport within the control area to enter another control area within, coordination with the next air traffic control center must be carried out prior to the issuance of the departure permit [19].

Following on from Annex 11 Chapter 3 of the Air Traffic Control Service Section 3.6.2.5 states "applicable coordination procedures, including transfer of control points, shall be specified in letters of agreement and ATS unit instructions as appropriate" which explains that any applicable coordination procedures, including the transfer of control points, shall be specified in the letter of agreement and the appropriate ATS unit instructions [19].

It is necessary to add to the coordination section about runway changes in use Bali APP/TMA to UjungPandang. This must be stated considering DOC 4444 Chapter 10 Coordination 10.1.3.3 Exchange of Movement and Control Data Point 10.1.3.3, that the approach control service must provide relevant information to ACC immediately and one of information must be conveyed is the use of runways. "The unit providing approach control service shall keep the ACC promptly advised of pertinent data on controlled traffic such as: runway(s)-in-use and expected type of instrument approach procedure"[9].

This is done to avoid a breakdown of coordination, in accordance with the Decree of the Director General of Civil Aviation Number: Skep / 284 / X / 1999 PJP4U / PJP in point 2 states that Breakdown OfCoordination (BOC) can occur if in the process of air traffic guidance where the coordination procedure between ATS units is not in accordance with the established coordination procedure, then in each procedure it is necessary to establish and implement so that there is no breakdown of coordination [35].

Therefore, it is necessary to add a notification procedure for runway changes in use with the followingnotification of the use of SID / STAR to be used in Banyuwangi ATZ [16].

A. Changes or revisions to LOCA Makassar ATSC, Bali ATS, and Surabaya ATS.

Changes or revisions to the LOCA between the two related units need to be made. In accordance with Annex 11 Chapter 3 of the Air Traffic Control Service under Point 3.6.2.5 and DOC 4444 Chapter 10 Coordination 10.1.3.3 Exchange of Movement and Control Data Point 10.1.3.3, that the APP needsto coordinate with the ACC and the applicable coordination procedures must be set out in the agreement letter and the appropriate ATS unit instructions [19][9].

B. Changes or revisions to the LOCA may be made following KP 41 of 2021

Related to technical and operational standards of civil aviation safety regulation part 170-05 (manual of standard part 170-05) guidelines for the preparation of letters of operational coordination agreement (LOCA) between aviation traffic service units (ATS units). In article 5 point 1, the LOCA between ATS Units that have been agreed can be changed with provisions, one of which is following ICAO Standards and Recommendations, changes to laws and regulations, and changes required by ATS related units [20].

C. In KP 41 of 2021 Chapter II Scope of article 2 point 1.

A LOCA should be created with the ATS of the relevant unit to help improve traffic service delivery and speed up coordination between aviation traffic service delivery units[20].

The following coordination must be added to the Makassar ATSC LOCA, Bali ATS, and SurabayaATS:

TABLE I. ADDITIONAL SUBMISSION OF COORDINATION TIMINGS

Runway In Use	Bali APP shall inform current RIU WADD to UPG ACC and SUB APP
	SUB APP shall inform current RIU WARR to UPG ACC and BALI APP
	Bali APP shall inform current RIU WADY to UPG ACC and SUB APP

	Implementation SID/STAR WADY refer to CURRENT RIU WADD: a. RIU 09 WADD and RIU 08 WADY following SID/STAR MOVMO 1G b. RIU 09 WADD and RIU 26 WADY following SID/STAR MOVMO 1K c. RIU 27 WADD and RIU 08 WADY following SID/STAR MOVMO 1B d. RIU 27 WADD and RIU 26 WADY following SID/STAR MOVMO 1J

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