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Analysis of Helicopter Movement Procedures in Air Traffic Services

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***Abstract*— This study is aimed at providing advice for Perum LPPNPI Branch Banda Aceh to regulate helicopter traffic more efficiently. By using the observation method for approximately three months in Perum LPPNPI Branch Banda Aceh, there were several cases that could support the advice in order to increase the efficiency of helicopter traffic. Based on the cases, the solution for the issue concerned is by providing entry point that can act as reporting point for helicopters in the airspace of Aceh.**

Keywords—entry point, helicopter, efficiency

I. INTRODUCTION (*HEADING 1*)

Air-traffic services is a term covering the provision of advice and information useful for the safe and efficient conduct of aircraft flights, and includes air-traffic-control services provided to ensure separation of aircraft to prevent collisions and to expedite and maintain an orderly flow of air traffics[1]. The efficient and safe operation of air traffic services is paramount in modern aviation systems. These services play a pivotal role in ensuring the orderly flow of aircraft, preventing collisions, and providing essential guidance for flight operations[2]. In recent years, the aviation industry has witnessed significant growth, with a diverse range of aircraft types and operational requirements[3].

One particular segment of aviation that has seen notable expansion is helicopter operations. Helicopters serve a multitude of critical functions, from search and rescue missions to medical evacuations, aerial surveys, and transportation services in remote areas. Their versatility and ability to access locations with limited infrastructure make them indispensable assets in various scenarios[4].

However, with the increase in helicopter movements, the need for robust procedures and guidelines tailored specifically to helicopter operations has become increasingly apparent. This need is not only driven by the growing volume of helicopter traffic but also by the unique operational characteristics and requirements of rotary-wing aircraft[3].

The Perum LPPNPI Branch Office in Banda Aceh, Indonesia, stands as a vital hub within the air traffic services landscape, serving a wide range of aviation activities, including both fixed-wing and helicopter operations. Ensuring the safe and efficient integration of helicopters into the airspace and air traffic services at this location is of utmost importance.

This study delves into the analysis of helicopter movement procedures within the air traffic services provided by Perum LPPNPI Banda Aceh. It seeks to address the challenges, uncertainties, and ambiguities that may exist in the current procedures and aims to identify opportunities for improvement. By doing so, it strives to enhance the safety, efficiency, and overall quality of air traffic services for both fixed-wing and rotary-wing aircraft operating in this critical region.

In this context, this article presents an in-depth analysis of helicopter movement procedures, their associated challenges, and the proposed solutions to address them. Through this analysis, we aim to contribute valuable insights to the aviation community, enhance operational practices, and ultimately foster safer and more efficient air traffic services at Perum LPPNPI Banda Aceh.

Sultan Iskandar Muda International Airport is an international airport serving the city of Banda Aceh, Aceh Besar Regency, and its surrounding areas. According to ICAO Annex 14 , an airport is a specific area on land and/or water (including buildings, installations, and equipment) with defined boundaries used for the takeoff, landing, and movement of aircraft[5].

The provision of air traffic services at Sultan Iskandar Muda Airport is carried out under Regulation PP 77 of 2012[6], by the State-Owned Enterprise of the Indonesian Flight Navigation Service Institution (Perum LPPNPI)[6], also known as Airnav Indonesia Branch Banda Aceh, in a combined service capacity. The Aerodrome Control Unit at Sultan Iskandar Muda Airport has a lateral responsibility extending up to 30 NM from the BAC VOR position and a vertical responsibility up to 10,000ft. They are also obligated to continuously monitor all flight movements around the airport to ensure flight safety objectives are met[7].

One of the air traffic services provided by Sultan Iskandar Muda Airport is assistance to both civilian and military helicopters. According to Law No. 1 of 2009 on Aviation, "Helicopters are aircraft that are heavier than air, with rotary wings that are powered by an engine."[8].

At Sultan Iskandar Muda Airport, helicopter traffic is serviced similarly to providing air traffic services for VFR flights. During the On the Job Training (OJT) conducted at Sultan Iskandar Muda International Airport and through discussions with the On the Job Training Instructor (OJTI) and senior air traffic controllers (ATC), there was an issue identified that is considered to reduce ATC efficiency and flight safety in providing air traffic services. This issue pertains to the lack of entry points and/or reporting points in helicopter arrival procedures.

In other similar journals, it is mentioned that there is a need for helicopter reporting points as checkpoints for both departing and arriving helicopters to facilitate smooth air traffic flow[9][10][11].

II. Methodology

In this study, data collection involved the utilization of a blend of three approaches: field observations, interviews, and document analysis. Field observations were conducted to directly observe the practical aspects associated with the research subject. Interviews, on the other hand, were employed to delve into the perspectives of the respondents regarding this phenomenon, providing deeper insights. Furthermore, document analysis was executed to compile and assess information contained within relevant documents pertaining to the research. The integration of these three methods allowed researchers to acquire a thorough and profound dataset, ensuring comprehensive coverage[12].

A. Data Collecting

In this study, the researchers employed three distinct methods to gather the necessary data. Firstly, we conducted a comprehensive literature review, drawing from a wide array of sources including annexes, documents, journals, laws, regulations, and written resources[13]. This literature review aimed to establish a robust theoretical foundation and compile relevant information crucial to addressing the research problem.

Secondly, the researchers employed unstructured interviews as a means of extracting detailed insights from flight data, encompassing both real-world observations and documented records. These open-ended discussions did not rigidly adhere to structured interview guidelines but instead relied on outlines of discussion topics[14]. They conducted interviews with Air Traffic Controllers from the Perum LPPNPI Banda Aceh Branch during the initial phases, benefitting from their diverse work experiences. In the subsequent phase, experts in procedure design, ATC education, and ATC practitioners were interviewed to further enrich the dataset.

Finally, the researchers utilized documentation analysis, a method that did not involve direct interaction with research subjects. They scrutinized a variety of materials, including unofficial documents such as diaries, personal letters, reports, meeting minutes, case notes, and more. This approach allowed them to collect valuable data from sources like the Standard Operating Procedure (SOP) of the Perum LPPNPI Banda Aceh Branch and the Aeronautical Information Publication (AIP), which played a pivotal role in substantiating and supporting their research findings. By combining these three data collection methods, the researchers aimed to ensure the comprehensive and robust nature of their dataset.

B. Data Analysis

In the research process, several key data handling and analysis steps are followed to ensure the quality and reliability of the findings. Firstly, data reduction involves summarizing and selecting the most relevant information from the collected data, transforming the initially raw and voluminous data extracted from written records into a more concise and coherent form. This reduction process aims to provide a clearer understanding of the data[15].

Once the data has been condensed, the next step is data presentation. Here, the author organizes the information, which may be in textual descriptions, with the potential inclusion of visual aids like charts and tables. These presentation methods facilitate the author's ability to draw conclusions and make informed decisions based on the analyzed data.

In addition to these steps, the authors incorporate reference materials as supplementary evidence to support their research findings. These reference materials typically take the form of documents that reinforce and substantiate the data uncovered during the study. By adhering to these comprehensive data handling and analysis techniques, researchers enhance the rigor and credibility of their research outcomes.

III. Result (Research Findings)

While undergoing On the Job Training (OJT) at Perum LPPNPI Branch Banda Aceh, the author identified several conflicts based on observations made during the OJT, one of which involved an unscheduled helicopter, P3301, arriving from Aceh Tamiang with an estimated over BAC VOR at 10:00 UTC. However, during its approach, P3301 made its first contact at 09:21 UTC, 7 NM away from BAC VOR, and was observed crossing the take-off area of RWY 35 from the east coastline without ATC clearance. Meanwhile, five minutes earlier, at 09:14 UTC, a fixed-wing aircraft, ATR 72-600, had just taken off from RWY 35.

On October 10, 2022, helicopter P3301 flew from Kualanamu Medan to Mapolda Aceh, located northwest of the airport, at Radial 301, 5.5 NM from BAC VOR. P3301 made its first contact at 04:13 UTC at Radial 115 and 14 NM from BAC VOR, requesting descent from an altitude of 3000 feet. While the ATC allowed the aircraft to descend to 2000 feet, the pilot requested a further descent. Subsequently, P3301 was cleared to descend to 1000 feet and instructed to report its position when 10 NM from BAC VOR. However, P3301 only reported its position when 8 NM from BAC VOR at Radial 150 and passing 1500 feet. At this point, a fixed-wing Boeing 737-800, taxiing to RWY 35, received traffic information and clearance to line up on RWY 35. As the fixed-wing aircraft was lining up, the helicopter appeared in the vicinity, seen crossing the final approach area of RWY 35 once again without ATC clearance.

These incidents raised concerns regarding air traffic services provided to helicopters. The uncertainty in the flight paths of helicopters can impact flight safety and efficiency. The absence of entry points for helicopters also complicates their traffic management, leading pilots to decide their flight paths independently, resulting in ambiguity in the controlled position of the helicopter by ATC and disruptions in flight traffic at Sultan Iskandar

Muda Airport. These issues do not align with the regulations outlined in PM 81 of 2017, Civil Aviation Safety Regulations (CASR) Part 91 (Ministry of Transportation, 2017) concerning Aircraft Operations, which stipulate that pilots operating within controlled airspace must adhere to the clearances and instructions provided by ATC.

From the analysis of the aforementioned issues, both factors impact ATC in providing flight navigation services, including maintaining separation between aircraft. It's worth noting that Sultan Iskandar Muda International Airport serves flight traffic with combined services in Indonesia. Thus, these problems can hinder ATC's effective and efficient provision of air traffic services, which is crucial for ensuring flight safety at Sultan Iskandar Muda Airport.

IV. Discussion

Based on the issues outlined above, it can reduce efficiency in providing air traffic services and also expedite the flow of air traffic. The action that the author can suggest, which is the result of discussions with the On the Job Training Instructor (OJTI) and ATC personnel, is to establish entry points and/or reporting points for helicopter traffic[16].

Every ATC officer in carrying out their duties must adhere to the ICAO Document 4444 Air Traffic Management, specifically the 5 Objectives of Air Traffic Services, one of which is providing air traffic services to both military and civilian helicopters. Pertaining to the 5 Objectives of Air Traffic Services, points 1, 3, and 4 state "(1) Prevent collision between aircraft; (3) Expedite and maintain an orderly flow of air traffic; (4) Provide advice and information useful for the safe and efficient conduct of flight." This means that ATC's role includes preventing aircraft collisions, ensuring the smooth flow of air traffic, and offering essential information for safe and efficient flight operations[1][17].

To address these issues, the author suggests the creation of helicopter entry points to facilitate ATC tasks. These entry points will serve as checkpoints for helicopters before entering the aerodrome traffic circuit in local helicopter procedures. As stated by Haris et al. (2021), it is advisable for visually flying aircraft to report their positions based on predetermined waypoints during their flight routes[18].

In their arrivals, helicopter traffic must avoid the flow of fixed-wing aircraft, in accordance with the FAA Aeronautical Information Manual, which states that "Pilots approaching to land in a helicopter must avoid the flow of fixed-wing traffic. However, in all instances, an appropriate clearance must be received from the tower before landing."[19]. Therefore, the establishment of procedures, such as entry points, is needed as a guideline to create separation between fixed-wing aircraft and helicopters.

According to ICAO Document Annex 11 Air Traffic Services, Chapter 1 Definitions, a Reporting Point is a significant geographic location, either a place or a specific ground position, associated with the movement of aircraft that can be reported as a reference for an aircraft's position[20]. Therefore, it can be used as an entry point or reference point for helicopter positions before entering the aerodrome traffic circuit, especially for incoming helicopter traffic[20].

Considering the discussed issues, the author has designed four entry points, taking into account the direction of helicopter traffic and the use of opposite runways at Sultan Iskandar Muda Airport, referencing ICAO Document 8168 Volume II Construction of Visual and Instrument Flight Procedure[21]. These four entry points are labeled as points A, B, C, and D (pronounced alphabetically in aviation radiotelephony). According to ICAO Document Annex 11 Air Traffic Service Chapter 1 Definitions, a "Reporting Point" is a specific geographic location associated with aircraft movement that can be reported[20]. Based on this, the criteria and requirements outlined in ICAO Document 9426 Air Traffic Services Manual that cover being suitable as reporting points, such as landmarks visible to the naked eye, have been considered[22]. Below are the author's proposed helicopter entry points.

Fig. 1. Design of Helicopter Entry Point

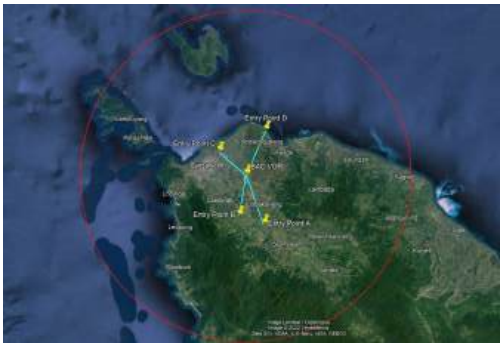

Fig. 2. Design of Helicopter Entry Point within Aceh CTR

(Source: Google Earth Pro)

A. Entry Point A

Entry Point A is located in the South East area, southeast of Sultan Iskandar Muda Airport. Entry Point A is identified by the landmark of the Indrapuri Toll Gate, Sigli-Banda Aceh Toll Road. This point is situated at coordinates 5°23'51.69"N 95°28'0.73"E, at a distance of 7.93 NM from BAC, and is estimated to be at Radial 160 from BAC. Entry Point A can be used as a reporting point for helicopters arriving from the South and Southeast, heading towards Runway 35 or intending to cross the final area of Runway 35. At this point, helicopters must maintain an altitude of 2000 feet or below.

Fig. 3. Visual Reference of Entry Point A

Fig. 4. Position of Entry Point A

(Source: Google Earth Pro)

B. Entry Point B

Entry Point B is situated in the South West area, southwest of Sultan Iskandar Muda Airport. Entry Point B is identifiable by the landmark of a water amusement park, namely Wahana Impian Malaka 69. This point is located at coordinates 5°25'10.24"N 95°24'14.53"E, at a distance of 6.24 NM from BAC, and is estimated to be at Radial 190 from BAC. Entry Point B can be utilized as a reporting point for helicopters arriving from the South and Southwest, heading towards Runway 35 or intending to enter the right-hand downwind leg for Runway 17. At this point, helicopters must maintain an altitude of 2000 feet or below.

Fig 5. Visual Reference of Entry Point B

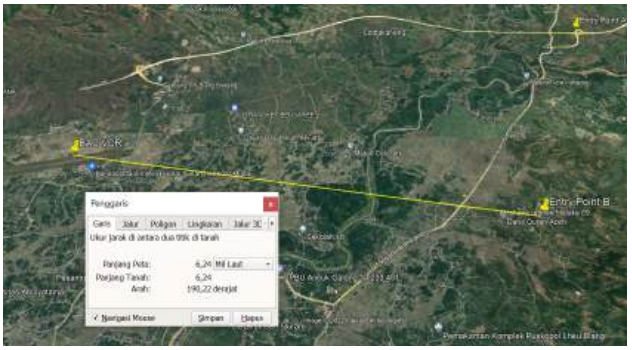

Fig 6. Position of Entry Point B

(Source: Google Earth Pro)

C. Entry Point C

Entry Point C is located in the North West area, northwest of Sultan Iskandar Muda Airport. Entry Point C is identifiable by the landmark of a pen-shaped monument at the roundabout junction adjacent to the Krueng Aceh River, known as the Tugu Pena Simpang Mesra. This point is situated at coordinates 5°34'50.62"N 95°21'13.78"E, at a distance of 5.38 NM from BAC, and is estimated to be at Radial 310 from BAC.

Entry Point C can be utilized as a reporting point for helicopters arriving from the North and Northwest, heading towards Runway 17 or intending to enter the Aerodrome Traffic Circuit of Sultan Iskandar Muda Airport, specifically the left-hand downwind leg for Runway 35. At this point, helicopters must maintain an altitude of 2000 feet or below.

Fig. 7. Visual Reference of Entry Point C

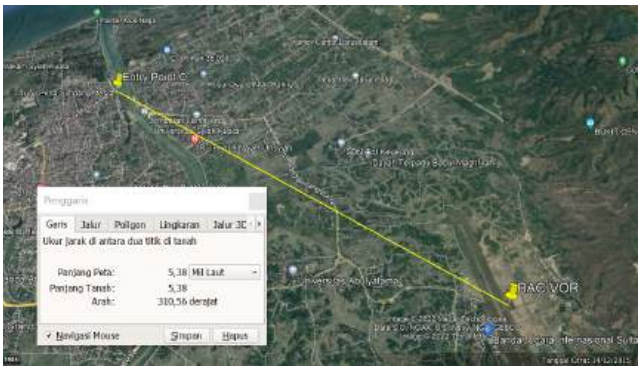

Fig. 8. Position of Entry Point C

(Source: Google Earth Pro)

D. Entry Point D

Entry Point D is situated in the North East area, northeast of Sultan Iskandar Muda Airport. Entry Point D is identifiable by the landmark of a historical fortress on the eastern coast of Aceh, known as Benteng Indra Patra. This point is located at coordinates 5°38'2.19"N 95°28'16.93"E, at a distance of 7.27 NM from BAC, and is estimated to be at Radial 205 from BAC.

Entry Point D can be used as a reporting point for helicopters arriving from the North and East, heading towards Runway 17 or intending to cross the final area of Runway 17. At this point, helicopters must maintain an altitude of 2000 feet or below.

Fig. 9. Visual Reference of Entry Point D

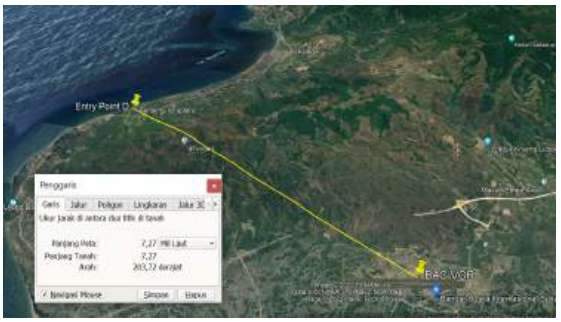

Fig. 10. Position of Entry Point D
(Source: Google Earth Pro)

To put this into action, there is a need for amendments to be made to the Standard Operating Procedures at the Perum LPPNPI Branch Office located in Banda Aceh. Currently, these procedures lack guidelines pertaining to helicopter arrival maneuvers[7]. Furthermore, it is necessary to make additions to the Aeronautical Information Publication (AIP) of Sultan Iskandar Muda Airport. This would enable helicopter pilots who intend to carry out flight operations in the vicinity of the airport to access the entry points established by the Perum LPPNPI Branch Office in Banda Aceh. With these designated helicopter entry points in effect, it is anticipated that flight safety will be improved, and the efficiency of Air Traffic Control (ATC) operations in providing air traffic services at the Perum LPPNPI Branch Office in Banda Aceh will be enhanced.

V. Conclusion

The key takeaway from this problem is the presence of ambiguity and uncertainty surrounding the positioning and flight trajectories of helicopters, primarily because there are no established local procedures specifically addressing entry points that could serve as fixed reference points for helicopter locations[16]. To rectify this issue, it becomes imperative to introduce designated helicopter entry points, which would function as reporting markers during helicopter movements. This measure aims to minimize any ambiguity or uncertainty associated with helicopter positions and flight paths, ultimately leading to improved flight smoothness, safety, and increased operational efficiency for the ATC in delivering air traffic services at the Perum LPPNPI Branch Office located in Banda Aceh.

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