STUDY OF EXPECTED APPROACH TIME CALCULATION IN STANDARD OPERATING PROCEDURES FOR APPROACH CONTROL UNIT SERVICES AT PERUM LPPNPI AMBON BRANCH, INDONESIA

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ABSTRACT

This study examines the calculation of Expected Approach Time (EAT) within the Standard Operating Procedure (SOP) of the Approach Control Unit at Perum LPPNPI Ambon Branch, as no standardized EAT procedure currently exists. EAT is vital for air traffic management, directly affecting efficiency, safety, and flight orderliness. The study reviews Air Traffic Control (ATC) methods for calculating and providing EAT, its impact on traffic flow and safety, and its role in special situations such as lost communication. Using a qualitative descriptive approach, data were collected through observation at Pattimura Airport, structured interviews with the Operations Manager and ATC personnel, and document analysis. Results indicate that EAT provision is suboptimal due to unclear SOP guidance, causing pilot uncertainty, reduced efficiency, and increased communication load. Recommendations include establishing a clear SOP, ATC training, and proper EAT implementation.

Keywords: Expected Approach Time (EAT), Standard Operating Procedure (SOP), Approach Control Unit, Perum LPPNPI Ambon Branch, Air Traffic Control (ATC).

1. INTRODUCTION

Patimura Airport (IATA: AMQ, ICAO: WAPP) is the main airport in Ambon City, Maluku, located about 38 km from the city center on Ambon Island. The airport, managed by PT Angkasa Pura since 1995, was inaugurated on March 3, 2004, and is bordered by the Seram Sea, Banda Sea, and Arafura Sea. In flight operations, air navigation services are handled by AirNav Indonesia with the support of air traffic controllers (ATC), who are required to be professional in maintaining flight safety and efficiency.

The Air Traffic Services Unit of Perum LPPNPI Ambon Branch consists of the Aerodrome Control Tower (Pattimura Tower) and Approach Control (Ambon Approach). ATCs are responsible for managing air traffic safely, orderly, and efficiently in accordance with ICAO Annex 11. Their main objectives are to prevent collisions between aircraft and with obstacles, ensure smooth traffic flow, provide information for flight safety, and offer assistance in case of emergencies or search and rescue operations(Services, 2018).

Air traffic services play a crucial role in maintaining flight safety and efficiency. One of its key aspects is the Expected Approach Time (EAT), which is the estimated time given by ATC for an aircraft that is delayed to leave the holding fix and commence its approach for landing. EAT helps regulate the sequence of arrivals, reduces holding, and enhances both efficiency and safety (ICAO, 2016).

With the increasing number of aircraft movements, traffic density often causes aircraft ETAs to be close to one another. So far, ATC has only provided arrival sequencing, leading pilots to frequently request traffic position information, which in turn increases communication workload and reduces efficiency. According to ICAO Doc. 9859 (2013), this dynamic situation raises risks such as near mid-air collisions, runway incursions, and loss of separation, making optimal ATS management essential for safety (ICAO Doc 9859, 2013).

The provision of Expected Approach Time (EAT) is part of standard clearance as stated in ICAO Doc. 4444 (2016) Chapter 6, point 6.5.1.1, which emphasizes that operators must be informed of any delays and subsequent changes. EAT information from ATC is crucial for pilots to ensure the continuation of the approach after holding, support maneuver efficiency, and maintain smooth air traffic flow (ICAO, 2016).

2. LITERATURE REVIEW

2.1 Study

A study is the process of examining or learning something in depth in order to gain a better understanding. According to the Indonesian Dictionary (KBBI), the word *"kaji"* means to learn, examine, or test. In an academic context, a study is a structured scientific activity conducted using systematic methods, aimed at producing accurate and high-quality knowledge, findings, or reports (Nr Jamil, 2011).

2.2 *Expected Approach Time* (EAT)

Expected Approach Time (EAT), according to ICAO Doc. 4444, is the time determined by ATC for a delayed aircraft to leave the holding fix and continue with its landing approach. According to Bahrawi (2021), "the provision of EAT can affect the smoothness and safety of air traffic, especially in certain situations such as when communication disruptions occur. In such conditions, pilots will use the EAT given by ATC as a reference to commence the approach without further communication with the air navigation service provider."(Bahrawi, 2021).

The provision of EAT is essential as it affects flight efficiency and safety, especially in cases of communication failure, where pilots use EAT as a reference. ATC is obliged to provide EAT as well as updates if changes occur, as stipulated in ICAO Doc. 4444 (2016) Chapter 6, point 6.5.1.1. This is included in the approach clearance, which must be immediately communicated to the pilot. However, when traffic is dense, risks such as loss of separation, near mid-air collisions, or runway incursions increase (ICAO Doc 9859, 2013), making it important to avoid excessive communication that could add to ATC workload (ICAO, 2016)

Before calculating EAT, the initial step is to determine the Average Time Interval (ATI) based on airport characteristics and to establish the Entry Procedure for aircraft conducting an instrument approach. According to ICAO Doc. 4444 (2016) Chapter 6, point 6.5.6.2.2, the determination of aircraft intervals takes into account relative speed, distance to the runway, wake turbulence separation, runway occupancy time, weather conditions, and other influencing factors. Local instructions must specify the minimum separation and special conditions requiring increased spacing between aircraft (ICAO, 2016).

2.3 Average Time Interval

According to ICAO Doc. 4444 (2016), the Average Time Interval (ATI) is the time or distance interval between arriving aircraft as determined by the approach control unit. Meanwhile (ICAO, 2016)

According to Seahorse Batfish ATC Procedures (2015), ATI is the average time required by an aircraft from the Initial Approach Fix (IAF) to the Missed Approach Point (MAPt) (Budi Pradana, 2015).

2.4 Standar Operasional Prosedur (SOP)

According to De Treville et al. (2005), a Standard Operating Procedure (SOP) is a detailed guidance document used by employees to perform specific tasks. Edelson and Bennett (1998) and Suzaki (1993) further state that SOPs are part of process documents required to ensure consistency in production or operations, along with flowcharts, material specifications, and other supporting documents (De Treville et al., 2005).

Meanwhile, according to Tathagati (2014), "Standard Operating Procedures (SOPs) serve as guidelines or references in carrying out tasks and duties according to each job function. With the existence of SOPs, all activities within the company can be well-planned and implemented in line with the company's objectives. SOPs can be described as documents that detail daily operational activities, with the aim of ensuring that the tasks are performed correctly, accurately, and consistently, so that the resulting products meet predetermined standards."(Gabriele, 2018).

SOPs serve as a guide for task execution in accordance with each role, ensuring that organizational activities are planned, properly implemented, accurate, consistent, and produce outcomes that meet standards [4]. According to Prasanna (2013), SOPs are a series of routine activities documented as written instructions to guide employees in performing tasks correctly, thereby maintaining the integrity and quality of both products and services (Nabilla & Hasin, 2022).

2.5 *Standard Operating Procedure* (SOP) Pelayanan Lalu Lintas Udara

ICAO Circular 247-AN/148 *Human Factors Digest No. 10* states that the development, implementation, and adherence to SOPs represent an important management contribution to improving safety, as failure to comply with SOPs is often associated with accidents. SOPs serve as logical, efficient, and error-resistant work guidelines, designed based on a broad operational concept and linked to an operational philosophy known as *The Four Ps of Operations* (Re & Canada, 1993).

2.6 *Standard Operating Procedure* (SOP) Perum LPPNPI Cabang Ambon

According to the Approach Control Service (APP) SOP of Ambon Branch (AirNav, 2019), Expected Approach Time (EAT) is the estimated time at which an aircraft begins its approach, which must be established if a delay exceeds 10 minutes. The information must be provided as soon as possible and revised if it differs by more than 5 minutes from the previous estimate. However, this SOP does not include a procedure for calculating EAT, which means ATC cannot yet provide pilots with accurate EAT information (Airnav Ambon, 2019).

2.7 Air Traffic Services

According to Annex 11, air traffic services include traffic control, flight information, and communication, navigation, and surveillance services to ensure flight safety, orderliness, and efficiency. ICAO Doc. 4444 (2016) regulates ATC operational and communication procedures to ensure consistent and effective coordination between units in managing air traffic safely and efficiently (Services, 2018)

3. METHODOLOGY

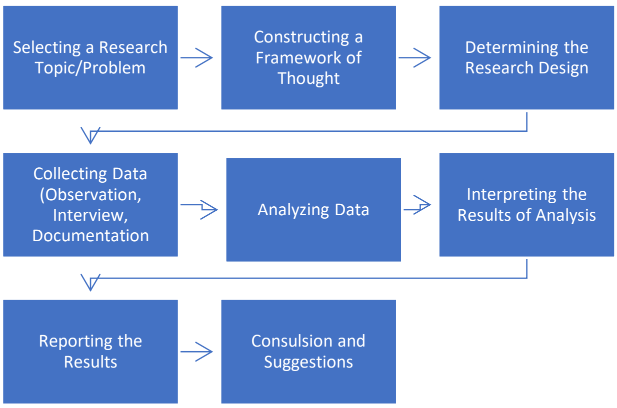

Figure 1. Planning Flowchart

Source: Author's Processing, 2025

3.1 Research Subject

The research subjects are individuals who serve as informants to provide information in accordance with the research objectives [6]. In this study, the subjects are the Operations Manager and ATC personnel at Perum LPPNPI AirNav Ambon Branch (Sugiyono, 2023).

3.2 Research Object

In qualitative research, the object of study refers to the subject being examined to understand what occurs within it, encompassing activities, actors, and specific settings [6]. In this study, the objects include the SOP for calculating Expected Approach Time (EAT), the services of the approach control unit, ATC personnel, and operational data at Perum LPPNPI Ambon Branch, with a focus on analyzing the impact of EAT calculation on the smoothness of air traffic flow (Sugiyono, 2023).

3.3 Data Collection Techniques

In qualitative research, the main data collection techniques include participant observation, in-depth interviews, document studies, as well as a combination of these methods or triangulation [6]. To obtain data related to the calculation of Expected Approach Time (EAT) in the SOP for the services of the Approach Control Unit at Pattimura Airport Ambon, the researcher employed several techniques, namely observation, interviews with relevant parties, and document study to support the research analysis (Sugiyono, 2023).

3.4 Research Instrument

In qualitative research, the researcher is the main instrument whose readiness must be validated before entering the field [6]. The researcher plays an active role in designing, collecting, interpreting, and analyzing data, and is supported by auxiliary instruments such as interview guidelines, observation sheets, and documentation aligned with the research focus (Sugiyono, 2023).

3.5 Data Analysis Technique

Qualitative data analysis is conducted from the data collection process until completion. For instance, during interviews, the researcher directly analyzes the responses and continues the questioning if the data are not sufficient [6]. In this study at Pattimura Airport Ambon, a descriptive qualitative method was applied using Miles and Huberman's data analysis technique, which includes data reduction, data display, and conclusion drawing/verification. This process is carried out interactively until the data reach saturation (Sugiyono, 2023).

4. RESULTS AND DISCUSSION

4.1 Validator's Validation Results

The validation of observation and interview instruments was carried out by Paramita Dwi Nastiti, S.ST., MS.ASM as the first thesis advisor on June 12, 2025. The purpose was to ensure that the instrument items were clear, measurable, relevant, and aligned with the research objectives. The assessment consisted of two categories, Valid and Not Valid, with a column for notes or suggestions for improvement.

The validation results showed that 8 indicators on the observation sheet were declared valid without any suggestions for revision, making the instrument feasible for observing the implementation of Expected Approach Time (EAT) calculation in the Approach Control Unit. For the interview sheet, 9 indicators were declared valid by the validator. This means the instrument can be used to explore the understanding, challenges, and expectations of ATC personnel regarding the implementation of EAT calculation in the Approach Control Unit at Perum LPPNPI Ambon Branch.

4.2 Observastion Result

Observations at Perum LPPNPI Ambon Branch were conducted to examine the actual conditions related to the calculation and provision of Expected Approach Time (EAT) by ATC. The focus was on compliance with procedures, the issuance and revision of EAT, and its impact on the smoothness and safety of air traffic. Observations also covered ATC's understanding of the importance of EAT, as well as the technical and procedural obstacles encountered.

Table 1 Observation Result

No	Indicator	Observed Aspect	Observation Result
1.	Provision of Expected Approach Time (EAT) information to aircraft. Revision of Expected Approach Time (EAT).	EAT information is provided at first contact (in approach clearance) with the aircraft.	At first contact, EAT information was not conveyed to the Arrival aircraft because there was no clear EAT calculation included in the applicable SOP, so ATC had not carried out the calculation or delivery of EAT in accordance with the procedure.
2.		ATC performs the calculation and provision of EAT in accordance with the applicable Standard Operating Procedure (SOP).	The provision of EAT to the Arrival aircraft has not been implemented. The main reason why EAT information has not been delivered is the absence of a clear EAT calculation included in the applicable SOP, so ATC has not carried out the calculation or delivery of EAT in accordance with the procedure.
3.	Impact of providing Expected Approach Time (EAT) on traffic flow.	If there are changes in conditions, EAT must be revised and communicated to the pilot.	The revision of EAT when changes in conditions occur has also not been applied procedurally. EAT must be updated and re-communicated to the pilot so that the aircraft maneuver can be adjusted to the latest situation. However, due to the absence of an EAT calculation in the SOP, ATC has not made revisions or reissued notifications to pilots, which could lead to uncertainty in the execution

			of approach maneuvers and potentially affect the safety and smoothness of air traffic.
4.	Provision of Expected Approach Time (EAT) information to aircraft.	The provision of EAT can help optimize sequencing and facilitate the flow of air traffic.	EAT is very helpful in managing aircraft sequencing and facilitating the flow of air traffic. EAT can serve as an important reference for pilots in carrying out approach maneuvers, especially in the event of communication failure with ATC. Without EAT, pilots must perform holding without time certainty, which can lead to inefficiency and potential delays in traffic management.
5.		EAT is used as a reference for aircraft maneuvers during approach by the pilot, and also in case of communication failure.	The main technical obstacle is the absence of a clear and standardized EAT calculation in the SOP. As a result, the provision of EAT is still approximate and not based on systematic calculation, so ATC has not included EAT delivery to arriving aircraft, which can also reduce the effectiveness of air traffic control.
6.	Obstacles in the implementation of Expected Approach Time (EAT) calculation and provision.	There are technical, communication, or procedural obstacles during the implementation of EAT.	There is still no proper calculation method because it is not yet included in the SOP. Therefore, a revision or addition to the SOP is needed that contains clear and structured EAT calculation procedures so that ATC can provide EAT in accordance with the applicable procedures, thereby improving the safety and efficiency of air traffic in the area controlled by the Approach Control Unit of Perum LPPNPI Ambon Branch.

7.	Availability and understanding of SOP related to the calculation of Expected Approach Time (EAT).	EAT calculation is not yet available in the Standard Operating Procedure (SOP).	ATC already understands the importance of providing EAT, as well as the rules that should apply in providing EAT to aircraft according to the SOP. However, they have not been able to implement it optimally because they do not yet know the proper calculation method due to the absence of such a procedure in the SOP.
8.		ATC's understanding of EAT calculation within the SOP.	At first contact, EAT information was not conveyed to the Arrival aircraft because there was no clear EAT calculation included in the applicable SOP, so ATC had not carried out the calculation or delivery of EAT in accordance with the procedure.

Source: Author's Processing, 2025

Based on the observation, the researcher conducted data reduction by summarizing the field findings into main points that represent the core issues. The purpose is to simplify the analysis and conclusion drawing regarding the calculation of Expected Approach Time (EAT) in the Approach Control Unit services at Perum LPPNPI Ambon Branch. The results of the data reduction are presented based on the following indicators:

a. Provision of Expected Approach Time (EAT) information to aircraft
EAT information has not been delivered at first contact because the SOP does not clearly include its calculation method, thus ATC has not performed the calculation or provided EAT.
b. Revision of Expected Approach Time (EAT)
EAT revision has not been carried out because the SOP does not provide procedural guidelines. As a result, when changes in aircraft sequencing or air traffic occur, ATC does not update EAT information to pilots, which may cause uncertainty in approach maneuvers.
c. Impact of providing Expected Approach Time (EAT) on traffic flow
Providing EAT has proven to support smooth traffic flow and sequencing of aircraft, but it has not been optimally utilized. In fact, EAT is important as a reference for pilots during approach as well as in lost communication situations. Without EAT, arriving aircraft are at risk of holding without time certainty.
d. Obstacles in the implementation of Expected Approach Time (EAT) calculation and provision
The main obstacle lies in the absence of a systematic calculation method in the SOP, resulting in inconsistent EAT provision and reliance on ATC's subjective estimation without an accountable standard.
e. Availability and understanding of SOP related to Expected Approach Time (EAT) calculation
The SOP does not yet include a written method for calculating EAT. Although ATC understands the importance of EAT for efficiency and safety, its implementation has not been optimal due to the lack of official guidelines. Therefore, a clear calculation method, operational trials, and systematic inclusion of EAT procedures in the SOP are required.

Based on the observations at Perum LPPNPI Ambon Branch, the Flight Progress Strip (FPS) showed aircraft experiencing holding due to having an ETA close to another aircraft. On the yellow FPS, the blue circle indicates close ETAs, the red circle shows an aircraft in holding, while the green line indicates that EAT has not been recorded or communicated to the aircraft.

The observation results at Perum LPPNPI Ambon Branch showed that the Flight Progress Strip (FPS) recorded aircraft in holding as a result of ETAs being close to other aircraft. On the yellow FPS, the blue circle indicates close ETAs, the red circle shows an aircraft in holding, while the green line indicates that EAT has not been noted or communicated to the aircraft.

4.3 Interview Results

The interviews were conducted in July 2025 via Zoom Meeting and WhatsApp Call, adjusted to the interviewees' shift schedules. The three interviewees were active ATC personnel at Perum LPPNPI Ambon Branch, consisting of the Operations Manager, an ATC assigned to perform EAT calculations, and an ATC who accompanied the researcher during observation. The interviewees provided information related to the implementation of EAT calculation, challenges, and the need for EAT inclusion in the SOP. The purpose of the interviews was to gain a deeper understanding of the implementation, obstacles, and expectations in supporting the smoothness and safety of air traffic.

The results show that all three interviewees agreed that there is no clear method for calculating Expected Approach Time (EAT) in the SOP, hence a standardized calculation procedure is required as a reference. The reduced interview data are presented as follows:

1. Importance of Establishing EAT Calculation and SOP
   The interviewees agreed that establishing EAT calculation in the SOP is crucial, as there is no official procedure yet. It is needed as a standard reference for ATC to provide pilots with time certainty, improve efficiency, and reduce potential conflicts.
2. Impact of EAT on Traffic Flow
   EAT is considered positive as it provides pilots with definite time references, ensures smoother traffic flow, reduces emissions from holding, and accelerates aircraft sequencing during high traffic.
3. Impact of the Absence of EAT Provisions in SOP
   The absence of EAT provisions in the SOP has led to inconsistencies among ATCs, particularly in managing approaches at Ambon's semi-opposite runway. As a result, EAT instructions are often uncertain, and traffic management lacks consistency.
4. Service Efficiency with EAT
   EAT calculation improves ATC service efficiency by providing clear references for decision-making and runway scheduling, while also reducing holding, improving arrival punctuality, and speeding up services.\
5. Contribution of Research to SOP
   This research contributes significantly by providing data and recommendations as a basis for drafting or revising the EAT calculation SOP at the Ambon Branch, while also adjusting to the specific conditions of the runway and terrain to make it more relevant and effective.
6. Challenges of EAT Calculation in Ambon
   The main challenges include the opposite/semi-opposite runway conditions that require high precision, the complexity of diverse entry procedures, and the limitations of manually collected data, which make precise estimation of EAT difficult.
7. Key Aspects in Developing the EAT SOP
   Important aspects in drafting the SOP include the validity of field data, adjusting reference documents to Ambon's local runway opposite conditions, and the use of Average Time Interval (ATI) as the primary basis for determining EAT in each entry procedure.
8. Integration Challenges and Solutions
   The main challenge in integrating the EAT SOP is ensuring calculations are in line with standards and field conditions as well as maintaining consistency in ATC understanding. The solutions include utilizing references, conducting socialization, and carrying out trial implementations of EAT calculations to familiarize personnel.
9. Plan for Revising or Adding SOP Related to EAT
   All interviewees supported revising or adding the EAT SOP as a strategic step to enhance efficiency, smoothness, and operational safety in the Approach Control Unit, in line with the SOP team's plans and the research recommendations.

4.4 Documentation

This study employs a documentation review to examine ICAO regulations and SOPs that serve as the basis for EAT calculation at the Approach Control Unit of Perum LPPNPI Ambon Branch. Data reduction focused on sections of the documents relevant to the implementation and calculation of EAT. The documentation review is summarized as follows:

1. ICAO Doc. 4444 (2016) emphasizes that in the event of arrival delays, the operator or pilot must be promptly informed, along with any subsequent revisions. This highlights the importance of EAT as part of approach clearance to maintain flight safety and efficiency.
2. Doc. 4444 (2016), Chapter 6, Section 6.5.6.2.2 explains that the determination of aircraft approach intervals must consider speed differences, distance to the runway, wake turbulence separation, runway occupancy time, weather conditions, and other influencing factors. When using ATS surveillance systems, the minimum separation distance is regulated by local instructions, including provisions for increased separation and its minimum limits.
3. ICAO Doc. 9859 (2013), Chapter 17, Section 17.1.2 highlights that maintaining aircraft separation while ensuring smooth traffic flow in dynamic situations

is a major challenge. ATC workload, traffic density, and complexity increase the risk of incidents such as loss of separation, runway incursions, and near misses, which may potentially lead to accidents.

4. Approach Control Service SOP, Ambon Branch (2019), Article 2.18.4, Point G stipulates that EAT must be issued for aircraft experiencing a delay of ≥10 minutes (or as determined by the authority). EAT should be communicated as early as possible, ideally before descent from cruising altitude. If a revision of ≥5 minutes occurs, the updated information must be promptly provided to the aircraft, or as coordinated with the relevant ATS authority.

In this documentation study, data reduction was carried out by selecting document sections relevant to EAT implementation, covering both international regulations and internal procedures. The results focused on two main provisions in ICAO Doc. 4444, namely 6.5.1.1 and 6.5.6.2.2. Section 6.5.1.1 emphasizes the obligation of ATC to communicate and update EAT in case of delays, as part of the approach clearance procedure.

The second provision explains that ATC must consider technical factors such as speed differences, distance to the runway, wake turbulence, and runway occupancy time when determining aircraft approach intervals. This is critical because, prior to calculating EAT, the Average Time Interval (ATI) must first be established as the basis for safe and efficient arrival sequencing. These two provisions were selected because they are directly related to the procedures and core technical aspects of the study, namely the absence of a standardized EAT calculation method at the Approach Control Unit of Perum LPPNPI Ambon Branch.

4.5 Discussion of Research Results

Based on observations at Perum LPPNPI Ambon Branch, the provision of EAT to aircraft has not been optimal due to the absence of a clear and standardized calculation method in the SOP. ATC personnel still rely on subjective judgment, especially during high traffic density or abnormal conditions, resulting in EAT being given as an estimate and inconsistently. This leads to inefficient aircraft sequencing, the occurrence of holding or delays without definite timing, and creates uncertainty for pilots during approach.

An interview with Mr. Nanto Alam, Operations Manager of Perum LPPNPI Ambon Branch, emphasized the importance of EAT calculation, which has not yet been included in the SOP, causing inconsistency in standards among ATC personnel. EAT is crucial for traffic flow, providing pilots with time certainty, and preventing prolonged holding. Mr. Nanto stressed the need for data validity and alignment with runway conditions at Pattimura Airport, and he supports integrating a standardized EAT method into the SOP to improve the efficiency and safety of approach control services.

The results of interviews with three informants confirmed that EAT calculation is important and must be included in the SOP. Without standardized procedures, ATC make different decisions, and pilots lack certainty regarding their approach time. EAT is needed to improve efficiency, reduce holding, optimize runway capacity, and ensure smooth air traffic flow. Challenges include the semi-opposite runway configuration and the absence of an Entry Procedure. Technical understanding, simulations, and internal socialization are required to ensure consistent EAT implementation. This research is relevant as a reference for SOP updates to improve safety and the quality of approach control services in Ambon.

Documentation studies show that the SOP of Perum LPPNPI Ambon Branch has not yet included EAT calculation in writing. ATC must refer to regulations and guidelines, and deliver EAT optimally to avoid risks, including reducing communication workload during high traffic, in accordance with ICAO Doc. 9859.

The researcher conducted EAT calculations through observations at Perum LPPNPI Ambon Branch to obtain accurate data on aircraft arrival approach times. The results of these calculations are expected to serve as the basis for recommending procedural improvements and drafting a more effective SOP tailored to operational conditions. The EAT calculation was also discussed with Mr. Dedi Bima, personnel in charge of calculating EAT, to formulate the parameters influencing the calculation.

Before determining EAT, the Average Time Interval (ATI) or spacing between successive approaching aircraft must be calculated, as EAT is based on ATI. ATI calculation considers factors such as aircraft speed differences, distance to the runway, turbulence separation, runway occupancy time, weather conditions, and other factors as stated in Doc. 4444 Air Traffic Management Chapter 6, point 6.5.6.2.2.

Table 2 Observation Data

NO	AIRCRAFT IDENTIFICATION	TYPE OF AIRCRAFT	TIME IAF	TIME *OVER THRESHOLD*	HASIL (TIME)
1.	CTV212	A320	20:31	20:36	5'
2.	BTK6164	A320	21:13	21:18	5'
3.	GIA646	B738	05:55	06:00	5'
4.	BTK6170	B738	21:13	21:19	6'
5.	LNI888	B739	03:02	03:07	6'
6.	BTK6170	B738	21:13	21:19	6'
7.	WON1505	AT76	23:32	23:38	6
8.	WON1533	AT72	03:44	03:50	6'
9.	WON1515	AT72	02:53	02:59	6'
10.	TGN432	AT42	23:10	23:17	7'

Based on these observational data, the author calculated the average time using the statistical mean formula:

$$X = \frac{X1 + X2 + \cdots + Xn}{n}$$

X = average

x1, x2, …,xn = amount of data

n = a lot of data

T= time interval of aircraft from IAF AUDRI to runway 04

$T = \frac{X1+X2+\cdots+Xn}{n}$

$T = \frac{5+5+5+6+6+6+6+6+6+7}{10}$

$T = \frac{58}{10}$

T = 5,8 minutes (Rounded to 6 minutes)

The average travel time of aircraft from the IAF to Runway 04 is 6 minutes. The EAT calculation is focused on Runway 04 because the majority of arrivals at Pattimura Airport Ambon use this runway alternately (opposite runway).

Pattimura Airport Ambon does not have a rapid exit taxiway; therefore, arriving aircraft must backtrack at the end of the runway, which increases the vacating time. However, for aircraft with an MTOW below 23,000 kg (AT72, AT42, C208), if they stop before taxiway B, the aircraft can vacate the runway directly; if they have already passed taxiway B, backtrack is not required, allowing the runway to be cleared more quickly. Runway Occupancy Time Landing (ROTL) needs to be considered in determining ATI. However, at Pattimura Airport Ambon, aircraft holding can be given an Initial Approach Clearance (IAC) immediately after the previous aircraft has landed safely, in accordance with the APP Ambon Branch SOP. Therefore, ROTL does not affect ATI, which is determined based on the interval time of aircraft from IAF AUDRI to Runway 04, namely 6 minutes.

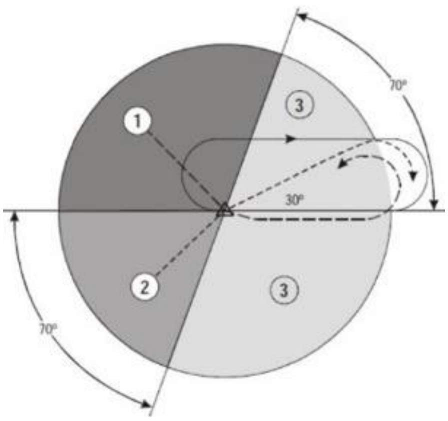

Figure 1 Standard Entry Procedure

Before entering the Instrument Approach Procedure (IAP), arriving aircraft must follow the Entry Procedure. According to Doc. 8168 Aircraft Operations, there are three categories of procedures for entering the Initial Approach Fix (IAF).

1. Sector 1 – Parallel Entry
   a. The aircraft passes the holding fix and then turns to the outbound heading for a certain distance or time before approaching.
   b. It then turns left to intercept the inbound track or return to the holding fix.
   c. On the second arrival over the holding fix, the aircraft turns right to follow the holding pattern.

2. Sector 2 – Offset Entry
   a. After passing over the holding fix, the aircraft proceeds to a direction forming a 30-degree angle from the inbound track, opposite to the holding pattern.
   b. The aircraft flies outbound.
   c. On the second arrival at the holding fix, the aircraft turns right to follow the holding pattern.

3. Sector 3 – Direct Entry
   The aircraft passes the holding fix and then turns right to enter the holding pattern.

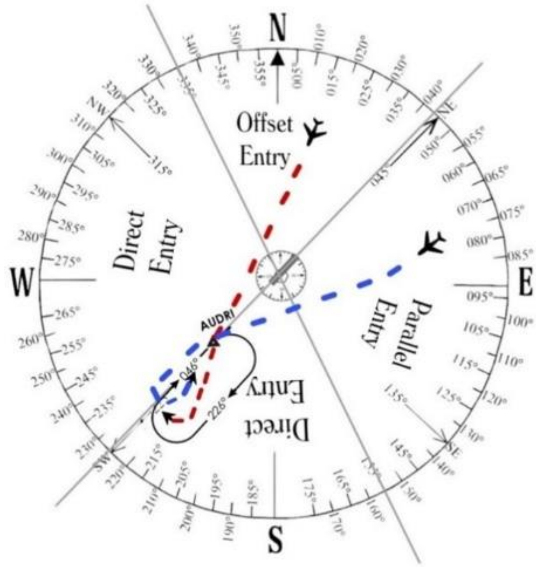

Figure 5. Ambon Entry Procedure
Source: Author

Entry Procedure for an IAF with a right-turn holding pattern. Based on the Entry Procedure studied from the Aeronautical Information Publication of Pattimura Airport, the provision of EAT at IAF AUDRI can be classified as follows:

a.Parallel entry

Aircraft coming from radial 042–155 AMN use the sector procedure (parallel entry). For EAT calculation,

an additional 3 minutes is applied: 2 minutes for two legs (1 minute per leg) and 1 minute as a buffer.
b. Offset entry
Aircraft coming from radial 335–041 AMN use the sector 1 procedure (parallel entry). For EAT calculation, an additional 3 minutes is applied: 2 minutes for two legs (1 minute per leg) and 1 minute as a buffer.
c.Direct entry
Aircraft coming from radial 156–334 AMN use the sector 1 procedure (parallel entry), so the EAT calculation is carried out normally without additional time.

After analysis, the determination of EAT can be provided to aircraft based on Budi Pradana, A. (2015), *Seahorse - Batfish Air Traffic Control Procedures (Non-Radar)* 2.3.8.8.1, using the following formula:

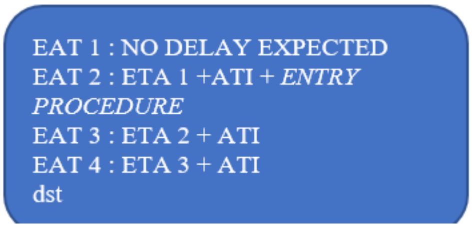

Figure 6. EAT Calculation
Source: *Seahorse – Batfish Air Traffic Control Procedures (Non-Radar)*

The calculation results show that the average time from IAF AUDRI to the runway threshold (ATI) is 6 minutes. An additional 3 minutes applies to parallel and offset entries, while direct entry does not require any addition. Considering the operational conditions at Pattimura Airport, including the absence of a rapid exit taxiway, this approach is relevant as a reference for EAT.

These results can be applied in the Approach Control Unit service by incorporating EAT calculations and Entry Procedure classification into the SOP. It is recommended to conduct trials or simulations beforehand to evaluate the effectiveness and accuracy of the EAT before official implementation, ensuring its application remains consistent, safe, and supportive of smooth air traffic flow in Ambon.

Based on this, the author formulates recommendations for points that should be added to SOP 2.18.4 Arrival Procedures, particularly Point G concerning Expected Approach Time (EAT), to complement the regulation of EAT calculation and implementation at the Approach Control of Perum LPPNPI Ambon Branch.

g. Expected Approach Time (EAT)

i. The first aircraft in the arrival sequence is given immediate approach clearance without delay.
ii. If there is more than one aircraft inbound to Pattimura Airport within a close time frame, the subsequent aircraft will be assigned an EAT.
iii. Estimated Approach Time (EAT) calculation:
   a) Average Time Interval (ATI) runway 04 = 6 minutes
   b) Additional time based on type of Entry Procedure:
      - Parallel entry procedure: add 3 minutes
      - Offset entry procedure: add 3 minutes
      - Direct entry procedure: no additional time
   c) EAT calculation formula:
      - EAT 1 = NO DELAY EXPECTED
      - EAT 2 = (EAT 1 + ATI + ENTRY PROCEDURE)
      - EAT 3 = (EAT 2 + ATI)
      - EAT 4 = (EAT 3 + ATI)
   d) EAT is provided to pilots via radio communication and recorded on the strip in accordance with standard operating procedures.

5. Conclusion

The calculation of EAT for Arrival Traffic at the Approach Control Unit of Perum LPPNPI Ambon Branch is essential to ensure orderliness, efficiency, and safety of air traffic. Up to now, EAT has not been fully optimized due to the absence of a written method in the SOP. EAT plays a role in managing arrival sequencing, providing time certainty for pilots, and reducing holding duration. The author developed an EAT calculation method based on documents and operational conditions, with an Average Time Interval (ATI) for Runway 04 of 6 minutes, plus 3 minutes for parallel and offset entries, and no addition for direct entries.

6. Recommendations

Based on the results of the calculation and analysis, several recommendations for the implementation of EAT at the Approach Control Unit of Perum LPPNPI Ambon Branch can be formulated as follows:

1. Trial Implementation of the EAT Calculation Method
   ATC personnel are advised to conduct limited trials of the EAT calculation method during peak hours, for example over one month, to evaluate accuracy, procedural smoothness, and its impact on air traffic efficiency, while also serving as the basis for SOP improvement.
2. Formulation and Establishment of EAT Calculation Procedures in the SOP
   The SOP team is advised to revise and add detailed EAT calculation procedures based on the study results. SOP drafting should be carried out after the trial, so that EAT provision to pilots can be consistent and accurate.

3. Dissemination for Air Traffic Controllers (ATC) Once the SOP is updated, the SOP team is advised to disseminate the EAT calculation procedures to all ATC personnel through briefings or operational simulations during the first month, so that implementation can run optimally and air traffic efficiency is improved.
4. Regular Evaluation of EAT Implementation ATC supervisors are advised to evaluate the implementation of the EAT procedures every three months, reviewing field reports, personnel feedback, and air traffic efficiency data. With a clear EAT SOP, the Approach Control Unit service in Ambon is expected to become more efficient, safe, reduce holding, and enhance both flight safety and traffic flow.

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