

# Actual Time Departure Coordination Application Between Tower Units and FIC Units Based on Website

Ach. Yuliadi Mubarok<sup>1</sup>, Laila Rochmawati<sup>2\*</sup>, Hasri Akbar Awal Rozaq<sup>3</sup>, Iwansyah Putra<sup>4</sup>

<sup>1,2,4</sup>Politeknik Penerbangan Surabaya, Surabaya, Indonesia

<sup>3</sup>Computer Science, Gazi University, Ankara, Turkiye

\*Corresponding author. Email: [lailarochmawati@poltekbangsby.ac.id](mailto:lailarochmawati@poltekbangsby.ac.id)

## ABSTRACT

Reporting from movement message data in the ATS RO Logbook Operational Airnav Sentani. in one of day, Sentani serves more than 100 flights with an average breakdown of 69 departure movements and 72 arrival movements with a total of 141 movements every single day so that with sending departure messages that are still manual, delays and irregularities often occur. suitability. Because of this, the authors developed a website as a coordination tool so that recording data departures was easier and faster. The purpose of writing this final project is to answer the formulation of the problem, namely to design a Website-based Actual Time Departure Coordination Application between the TOWER Unit and FIC at Perum LPPNPI Sentani Branch. The research method used in making this website is Research and Development with the waterfall method. This method is carried out with a systematic approach, starting from the system requirements stage, then moving on to the Requirements Analysis, Design, Implementation, Integration and System testing stages, and maintenance with testing techniques. used is black box testing. The results of this study are expected to assist ATS personnel at the FIC Unit at Airnav Sentani in sending Departure Messages in order to improve flight service and safety.

**Keywords:** *Coordination; Departure; Website; FICUnit; Actual Time.*

## 1. INTRODUCTION

Coordination in computer science is concerned with information, whereas organizations are concerned with values. Values have properties information does not have, since, for example, it cannot be duplicated, or it can perish [1, 2, 3] and Coordination is the art of communicating with other parties to reach agreement or agreement in solving a problem [4]. If described in the problems discussed by the author, it can be concluded that coordination is an effort that is carried out regularly between units to provide efficient service quality in quantity and time so that it leads to one goal, namely maximum coordination services. In the world of aviation coordination is needed as a means of communication by the Flight Information Center (FIC), which is a service provided for the purpose of providing advice and information that is useful for conducting safe and efficient flights, in this type of service provides essential information for aircrafts such as weather information, departure clearance, approach clearance, and so on [5, 6].

Through the coordination of aviation communication officers will get information to support the smoothness and safety of a flight.

Aeronautical Communication Officer (ACO) personnel are one part of AirNav Indonesia that has a contribution in ensuring the safety and smoothness of a flight, so every personnel is expected to work in accordance with their duties and functions based on existing procedures and provisions [7, 8, 9]. Sentani Airport is one of the airports with a fairly high density in Papua, apart from the many small airports or airfields served, Sentani Airport, which is located in the capital region of Papua, has become one of the centers of economic development in the Papua region, therefore the author attracted the author to carry out research from November 2022 to early February 2023 at Sentani Airport and obtained the following data:

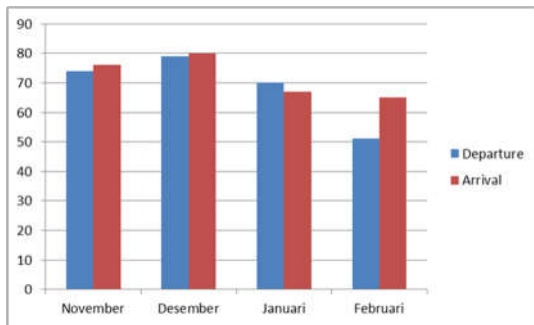


Figure 1 Traffic Density Data November 2022 – February 2023

Reporting from the movement message data on the ATS RO Logbook Operational Airnav Sentani which is converted in the form of a diagram in the figure explains that in a day in Sentani serves more than 100 flights with an average breakdown of 69 departure movements and 72 arrival movements with a total of 141 movements per day. If it is further broken down into per-hour with 12 hours of service, then in one hour personnel serve sending ATS messages as many as 12 messages. This task has not been added to the Transfer of Responsibility service in the form of estimate coordination obtained or given to the Airport Adjacent Unit that passes through the Jayapura FIC area. In the AMS SOP of Airnav Sentani Branch, Aeronautical Communication Officer personnel are tasked with sending Departure messages informed by the TOWER Unit and Flight Watch Procedures [10]. In carrying out their duties at Perum LPPNPI Sentani Branch, ACO personnel not only send Departure messages from Sentani departure airport only, but also have an additional workload to send Departure messages from 10 airports that carry out Flight Watch procedures, making the delivery of departure messages not optimal.

Airnav Sentani serves 10 airports with flight watch procedures, 4 of which are airports that also serve C-Taf procedures so that with the responsibilities they have, the performance of ACO personnel is often hampered, cause Perum LPPNPI Sentani Branch still uses the old type of news delivery facility (manual delivery) which has not used the Auto Departure facility. In addition, the author and ACO personnel at Airnav Sentani several times found obstacles in sending messages so that the message could be sent actually. The obstacles include delays in the delivery of ATD information, call signs and Aerodrome Destination conveyed by the TOWER Unit sometimes do not match so that the delivery of departure messages is delayed.

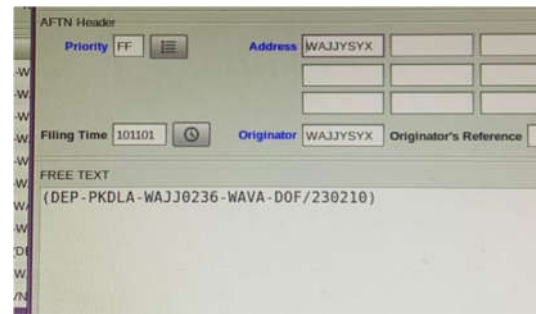


Figure 2 Departure Message delivery error

The picture above explains (DEP - PKDLA - WAJJ0236 - WAVA - DOF/230210) Aircraft Message PKDLA departure from Sentani airport at 0236 UTC to Mulia airport on February 10, 2023 sent from Sentani airport to Mulia airport WAVA. At that time Tower was wrong in carrying out aerodrome destination coordination ACO personnel had sent ATS Message Aircraft with registration PKDLA departing from Sentani airport WAJJ to Mulia airport WAVA should be with the same registration PKDLA from Sentani WAJJ heading to Elelim Airport WAVE using AFTN application.



Figure 3 Disregard Departure delivery error

The picture above explains DISREGARD (DEP - PKDLA WAJJ0236 - WAVA - DOF/230210) can be interpreted as giving a sign of canceling the delivery of the message PKDLA aircraft departure from Sentani airport at 0236 UTC to Mulia airport on February 10, 2023. ACO personnel must send a message canceling the departure of the PKDLA aircraft to the destination airport, namely WAVA or Mulia airport.

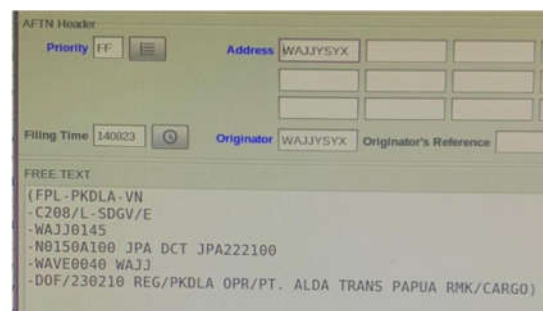


Figure 4 PK-DLA flight plan content

The picture above explains After checking by looking at the Flight Plan of the Aircraft with registration PKDLA

Visual flight with aircraft type C208 from Sentani departure airport or WAJJ slot time at 0145 UTC with a cruising altitude of 10 thousand feet heading to Elelim airport or WAVE with a flight duration of 40 minutes on the 10th of February in 2023. ACO personnel get a destination mismatch on the Flight Plan with the Departure message sent, then ask again using Direct Speech to the Tower Unit to make sure the data is correct.

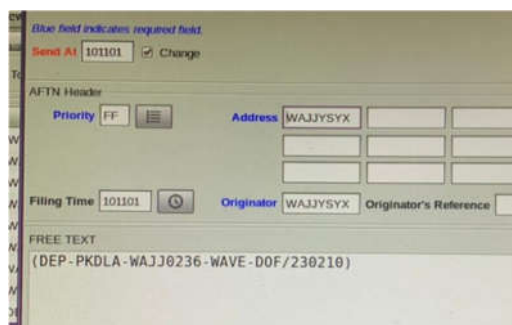


Figure 5 Revised Departure message delivery

The image above explains (DEP - PKDLA WAJJ0236 - WAVE - DOF/230210) Aircraft Message PKDLA departure from Sentani airport at 0236 UTC to Mulia airport on the 10th of February in 2023. ACO personnel sent back the departure message with the correct format..

The delay in sending the Departure message will also affect the alerting service reported in PM 65 of 2017 The Aviation Traffic Service Unit must inform immediately when an aircraft is experiencing an emergency during the Uncertainty Phase, namely if the Aviation Traffic Guide does not receive information from the aircraft with a period of 30 (thirty) minutes after the time the communication should have been received or from the time when the communication should first be received, also if the aircraft fails to land within 30 (thirty) minutes of the Estimate Time Arrival submitted by the aircraft or estimated by the Aviation Traffic Guide, unless information is obtained about the safety of the aircraft and passengers..

A total of 30 incidents of obstacles to sending Departure messages in 4 months from November 2022 - February 2023 including obstacles from Sentani Tower that were late, forgotten and wrong in carrying out coordination with Jayapura FIC which hampered the performance of ACO personnel in carrying out their duties. According to the author, coordination using DS (Direct Speech) [11] takes longer and adds to the Assistant's workload, so it has the potential to cause errors in mentioning the Aerodrome Destination and delays in submitting Actual Time Departure (ATD) information which affects the performance of personnel in the process of sending departure messages. The author wants to cut the coordination scheme that has been

running using the system through the design of a Website-based coordination application.

The flow of coordination between the Tower and FIC units currently running at Sentani airport, the Tower Unit Coordinates to provide Actual Time Departure information to the FIC Unit using direct speech, ACO personnel receive and ensure the correctness of the information submitted in the form of aircraft registration, destination and departure time, ACO personnel record on the departure record form using table paper then ACO personnel check the flight plan on AFTN that has been sent before sending the departure message, ACO personnel send a departure message on AFTN to the destination and alternative airports containing aircraft registration, departure airport, destination airport, and departure time. The coordination scheme can be shortened by applying the Actual Time Departure Coordination Web designed by the author with the following description, the Tower Unit fills in the coordination column on the Actual Time Departure Coordination Website between the Tower unit and the FIC containing aircraft registration, destination and departure time, ACO Personnel sends a departure message using AFTN containing the destination airport and alternative containing aircraft registration, departure airport, destination airport, and departure time. Then ACO personnel check the check list on the Actual Time Departure Coordination Website to indicate to Tower and FIC personnel that the Departure message has been sent.

The author conducts this research based on the theories collected by the author including the definition of Design, namely Design is a process for defining something that will be done using various techniques and in it involves a description of the architecture and details of the components and also the limitations that will be experienced in the process of working on it. [12] [13]. Website can be defined as a set of pages consisting of several pages that contain information in the form of digital data provided through an internet connection in the form of text, images, video, audio and other animations. [14] [15]. Departure messages (DEP) are aircraft departure messages that have filled out the Flight Plan and distributed to the relevant ATS Unit [16] . Aerodrome control Tower (ADC) is A Unit established to provide air traffic control service to aerodrome traffic [17]. Flight information centre (FIC) is A Unit established to provide Flight Information Service and alerting service [17].

Based on the background and theories that the researchers described, the researchers identified the problems that will be discussed are:

1. How to design a Web-based Actual Time Departure Coordination Application at Perum LPPNPI Sentani Branch?

2. What steps are used in making the Actual Time Departure Coordination website?

## 2. METHODS

The research method used by the author is the Waterfall method. This method is carried out with a systematic approach, starting from the system requirements stage and then moving to the analysis, design, coding, testing/verification, and maintenance stages. There are 5 stages of the waterfall model, namely (1) defining and analyzing requirements; (2) software and system design; (3) implementation and unit testing; (4) system integration and testing; (5) operation and maintenance.

This method is a method that is often used by system analyzers in general. The essence of the waterfall method is to work on one system sequentially or linearly [18]. So each stage must be completed first in full before proceeding to the next stage to avoid repetition of stages. Broadly speaking, the waterfall method has the following steps:

- a. Requirement Analysis

At this stage, researchers identified a problem at Perum LPPNPI Sentani Branch. Initially, researchers identified the problem of Actual Time Departure Coordination between the TOWER Unit and FIC. From the results of the identification of researchers found a problem that at Perum LPPNPI Sentani Branch still uses the old type of coordination and news delivery (manual). Here the researcher wants to develop a Website-based online Actual Time Departure coordination application in order to reduce ATS personnel errors in sending Departure messages.

- b. System and Software Design

After conducting the analysis stage, researchers designed an Actual Time Departure Coordination Website. Researchers made a flow chart first and made a rough design of the appearance of a website. Here researchers use epizy.com to make the design.

- c. Implementation and Unit Testing

The implementation and unit testing stage is the programming stage. At this stage the researcher implements the coding. And display the output of the ATD Coordination Website. After that the researcher checks the Website, whether there are errors or bugs on the ATD Coordination Website. If a bug / error occurs, the researcher will fix the coding section so that no errors occur.

- d. Intergration and system Testing

At the Integration and system testing stage. Researchers conducted trials with ATS Unit

TOWER and FIC personnel at Perum LPPNPI Sentani Branch online. And at this stage the researcher assesses the performance of the Website.

- e. Operation and Maintenance

At the last stage in the Waterfall Method, the finished software is operated by users and maintenance is carried out. Here researchers provide guidelines for operating the Coordination Website to users. And then the maintenance stage will be given to Perum LPPNPI Sentani Branch.

The testing technique used by researchers is black-box testing or functional testing. Functional testing is carried out to determine the results of the execution of the process of each feature in the program that has been developed, whether the Website is in accordance with the needs of the User or there are still many problems in the system, the author uses the All pair testing system or also known as pairwise testing. This test is used to test all possible combinations of all pairs based on the input parameters.

In this case the author conducts testing by accessing the Website on two devices, the first device as a TOWER Unit and the second device as a FIC Unit to analyze its advantages and disadvantages. The test will be tested on Airnav Sentani personnel and cadets who have carried out OJT in Sentani, the test is carried out to find out whether there are errors in the Website.

## Participants

Participants consisted of Airnav Sentani personnel and cadets who had conducted OJT in Sentani. Participants in this study were selected based on their competence in distributing flight data. The research was conducted at Perum LPPNPI Sentani Branch located at Jl. Yabaso, Sentani City, Sentani, Jayapura Regency, Papua. This research was conducted from November 2022 to February 2023.

## 3. RESULT AND DISCUSSION

In this section the author will explain the results of the research and discussion that has been carried out by the author. This research implementation report includes the results of analysis, design, implementation, integration and system testing, operation and maintenance. To facilitate the discussion, the research results will be presented at each stage of development.

- a. Analysis

This research was carried out from seeing the potential for delays in sending departure messages that have an impact on flight safety because they still use manual methods which according to researchers are less

efficient. Knowing this, researchers have a suggestion regarding the creation of a Website-Based Actual Time Departure Coordination Application to facilitate FIC personnel at Perum LPPNPI Sentani Branch in facilitating the delivery of departure messages. Design

The author starts from the design of the login display containing the username and password used by the admin and user to access the website, the dashboard display that will appear after the user logs in contains the Airnav company logo a brief history and menu on the website, the user data display can be selected on the dashboard menu containing user data that has been added by the admin, the departure logbook data display contains flight information that has been entered including aircraft registration, departure time and destination airport, to the document library containing documents that can be entered and accessed by employees if needed.

#### b. Design

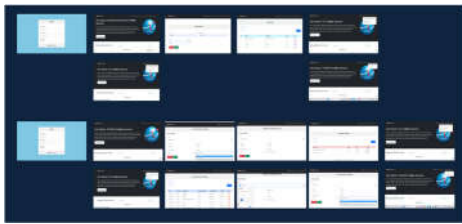


Figure 6 Website initial appearance design

The author starts from the design of the login display containing the username and password used by the admin and user to access the website, the dashboard display that will appear after the user logs in contains the Airnav company logo a brief history and menu on the website, the user data display can be selected on the dashboard menu containing user data that has been added by the admin, the departure logbook data display contains flight information that has been entered including aircraft registration, departure time and destination airport, to the document library containing documents that can be entered and accessed by employees if needed. The images below are the four core website designs created by the author:



Figure 7 Log in view

The picture above is a login view created by the author, this view can be accessed after the user accesses the website in the browser, in the login view there are 2 columns containing username, password and one login option, in this view the user can enter the username and password that has been created by the admin used by the admin and user to access the website.

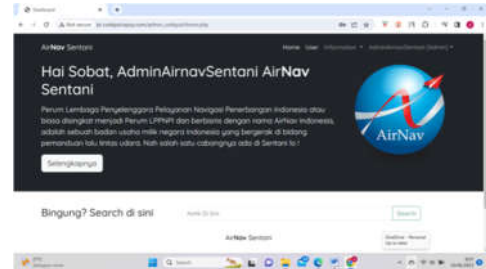


Figure 8 Dashboard view

The picture above is the dashboard display that appears after the user logs in, this display contains the Airnav company logo, a brief history and features that can be accessed including the Home feature as the main display of the dashboard, the User feature to view and add User data, the Information feature to access departure logbook data, document library, and BMKG website links to the admin/User feature to change passwords and leave the website.

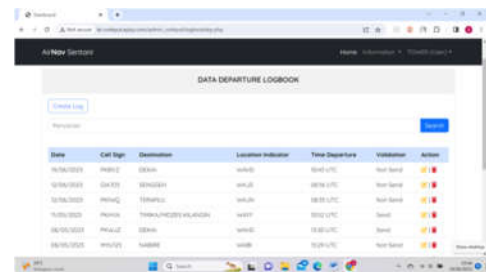


Figure 9 Departure logbook data display

The picture above is a display of departure logbook data containing flight information that has been entered including Date, Call Sign, Destination, Location Indicator, Time Departure, Validation, and Action features. Users can also search for data that has been entered with the Search feature.

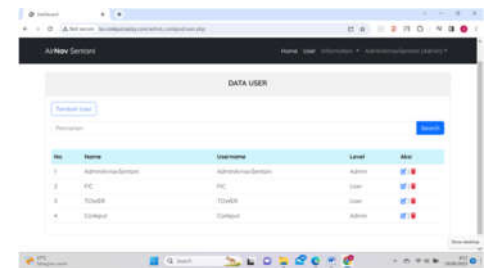


Figure 10 User data view

The picture above is a user data display on the admin where this display contains user data that has been added. In this view the admin can add users using the add user feature and delete users in the action feature.

#### c. Implementation

The author implements the coding results to become a coordinating Website product for use in the Tower Unit and FIC Unit at Perum LPPNPI Sentani Branch. There is a login view created by the author that can be accessed after the user accesses the website in the browser, in the login view there are 2 columns containing username, password and one login option, in this view the user can enter the username and password that has been created by the admin used by the admin and user to access the website. The dashboard view will appear after the user logs in, in this view contains the Airnav company logo, a brief history and features that can be accessed including the Home feature as the main display of the dashboard, the User feature to view and add User data, the Information feature to access departure logbook data, document library, and BMKG website links to the admin/User feature to change passwords and leave the website. The departure logbook data display contains flight information that has been entered including Date, Call Sign, Destination, Location Indicator, Departure Time, Validation, and Action features. Users can also search for data that has been entered with the Search feature.

#### d. Integration and system testing

The author's usage trial was conducted by seeking an assessment of the coordination website designed for the FIC Unit and Tower Unit. With respondents from cadets who have been on the Job Training FIC in Sentani, ATS Employees FIC Unit and Tower Unit Perum LPPNPI Sentani Branch. In the trial, the author tested the use of the website at the FIC Unit in Sentani, the author asked Airnav Sentani personnel to access the website and try to monitor departure messages using the website. After carrying out System testing through questionnaires distributed to Employees and Cadets of On the Job Training FIC Sentani, the authors also distributed validation sheets to Surabaya Aviation Polytechnic Lecturers and Airnav Sentani Employees who are experts in their fields. The author uses black box testing [19] as a method of testing the website created, the first of which is carried out on airnav personnel and the second to cadets who have been on the job training in Sentani.

Table 1 Black box testing of admin features

No.	Factor Test	Result	Remark
1.	Admin Log in Feature	Log in to the <i>website</i>	Success
2.	<i>User Feature</i>	Log in to the user data feature	Success
3.	add data to the user data feature	Go to the add data feature	Success
4.	save feature	saved data	Success
5.	action on user data feature	Go to the data editing feature	Success
6.	Save feature	Saved data	Success
7.	ATD Coordination Logbook on Information feature	Go to the Data departure logbook feature	Success
8.	<i>Create logs in the Data departure log feature</i>	Go to the add departure log data feature	Success
9.	Save feature	Saved data	Success
10.	<i>action on the Data departure log feature</i>	Go to the edit departure log data feature	Success
11.	Save feature	Saved data	Success
12.	Document Library on the Information feature	Go to the Document Library feature	Success
13.	Add PDF in Document Library feature	go to the add document feature	Success
14.	Save feature	Saved pdf	Success
15.	Change Password on Admin Feature	Go to the change password feature	Success
16.	Save feature	Saved password	Success
17.	Log out on Admin Feature	Successfully log out from the website	Success

From the results of black box testing on the admin, it has shown that the features on the admin have run well because of the 17 questions asked by the author, none of the features were unsuccessful.

Table 2 Black box testing of User features

No.	Factor Test	Result	Remark
1.	User Login Feature	Login to the website	Success
2.	ATD <i>Coordination Logbook on InformationFeature</i>	Go to the departure logbook data feature	Success
3.	Create log on departure log data feature	Go to the add departure log data feature	Success
4.	Save feature	Saved data	Success
5..	Action on departure log data feature	Go to the add departure log data feature	Success
6..	Save feature	Saved data	Success
7..	Document library on information feature	Go to the Document Library feature	Success
8..	Add PDF on <i>Document Library feature.</i>	Go to the add document feature	Success
9..	Save feature	Saved pdf	Success
10..	Change <i>Password</i> on admin feature	Go to the Change Password feature	Success
11.	Save feature	Saved passowrd	Success
12.	<i>log out</i> on admin feature	Successfully log out from the <i>website</i>	Success

From the results of black box testing on the user side, it has shown that the features on the admin are running well because of the 12 questions asked by the author, none of the features are unsuccessful. It can be concluded that the performance of the actual time departure coordination website is as expected, from the login process to the log out process everything runs as expected.

e. Operation and maintenance

At this stage the author explains how to operate the features of the Actual Time Departure coordination website starting from the initial operation, operating as an Admin, and operating as a User. In the admin feature there is a column that can be used to add, delete, and edit users. While in the user feature, Users can enter the Dashboard page, Admins can perform or monitor departure data if they have logged in using a registered account. The implementation of this test aims as a test of whether or not the website still needs improvement. The testing technique that researchers use is the black box testing technique where this technique does not require expertise in programming, which means that anyone who does not understand programming languages can participate in testing the performance of the website. Testing is done by checking every element in the application and looking for malfunctions of the website features.

The implementation of this test aims to test whether the website is running or not whether it still needs improvement. The testing technique that researchers use is black box testing technique where this technique does not require expertise in the field of programming which means that anyone who does not understand programming languages can participate in testing the performance of the website. In this test, the researcher took respondents Design Expert Mr. Ramli Restu Fauzi from Airnav Sentani as admin and OJT Sentani cadets from D3 Aviation Communication class VI as website users. Coordination website between Tower Unit and FIC at Perum LPPNPI Sentani Branch has advantages and disadvantages. The advantages include no need to use paper as a recording medium, display, language and features are easy to understand, can be used with local hosts, and website access speed is 100 mbps. So that the data transfer process can be sent in a timely manner. However, this website has several shortcomings, including the Add Departure Data feature which needs to add scheduled flight data, and the features offered are limited as a coordination tool.

## 4. CONCLUSION

Based on the research that has been done, the existence of a website make work easier [20]. Website-based Actual Time Departure coordination application can facilitate ATS personnel at Perum LPPNPI Sentani Branch in recording departure message coordination. In addition, the Website-based Actual Time Departure coordination application designed is in accordance with the needs both in terms of Use, Display, Content, and Features. So that Admin and users can easily use the website.

Website-based Actual Time Departure coordination application is easy to use and in accordance with the guidelines made by the author. This can be proven related to the respondent's statement on the questionnaire statement, users feel that the website-based coordination application that has been made can help employee performance.

## REFERENCES

- [1] B. Guido and T. L. Van Der, "Coordination and Organization: Definitions, Examples and Future Research Directions," *Electronic Notes in Theoretical Computer Science*, vol. 150, no. 3, pp. 3-20, 2006.
- [2] S. Tichkiewitch and D. Brissaud, "Co-Ordination Between Product and Process Definitions in a Concurrent Engineering Environment," *CIRP Annals*, pp. 75-78, 2000.
- [3] M. Joacuin and M. Anotion, "A new definition of coordination number and its use in lanthanide and actinide coordination and organometallic chemistry," *Polyhedron*, pp. 2431-2437, 1989.
- [4] I. C. A. Organization, Doc. 9426-AN/924 Air Traffic Services Planning Manual, First (Provisional) Edition Chapter 2 Coordination subsection, Canada: ICAO, 1984.
- [5] I. Satorou, N. Sinya and Y. Kazuhiko, "Practical Design based on User Experience Approach for Remote Aerodrome Flight Information Services," *IFAC-PapersOnline*, pp. 325-330, 2016.
- [6] W. Rui, L. Mihail, Z. Zhou, Z. Xiaoping, D. Yuxing and Z. Qingfeng, "Least global position information based control of fixed-wing UAVs formation flight: Flight tests and experimental validation," *Aerospace Science and Technology*, 2023.

- [7] D. A. Abdullah , "PEDOMAN PEMBAGIAN SHIFT KERJA PERSONEL AERONAUTICAL COMMUNICATION OFFICER DI COMM UNIT PERUM LPPNPI CABANG KUPANG," *Prosiding SNITP (Seminar Nasional Inovasi Teknologi Penerbangan)*, 2020.
- [8] D. R. Sari, N. P. Purwanti and S. Wijayanti, "RANCANGAN APLIKASI SISTEM UJIAN RATING TEORI BERBASIS WEBSITE BAGI PERSONEL AERONAUTICAL COMMUNICATION OFFICER DI PERUM LPPNPI CABANG PONTIANAK," *Prosiding SNITP (Seminar Nasional Inovasi Teknologi Penerbangan)*, 2021.
- [9] H. A. Amirullah, "THE IMPACT OF AERONAUTICAL COMMUNICATION OFFICER (ACO) WORKLOAD ON FLIGHT COMMUNICATION SERVICES AT PERUM LPPNPI MANADO BRANCH," *Prosiding SNITP (Seminar Nasional Inovasi Teknologi Penerbangan)*, 2020.
- [10] A. Indonesia, "Prosedur Operasi Standar Pelayanan Lalu Lintas Penerbangan Aeronautical Mobile Service (AMS) Kantor Cabang Sentani.," Airnav Indonesia, Jakarta, 2020.
- [11] A. C. Jenny D, "The development, evaluation and application of an aviation radiotelephony specialised technical vocabulary list," *English for Specific Purposes*, vol. 69, pp. 51-66, 2023.
- [12] S. Rizky, *Konsep Dasar Perangkat Lunak*, Jakarta: PT. Prestasi Pustakarya, 2011.
- [13] Mulyadi, *Sistem Perencanaan dan Pengendalian Manajemen*, Jakarta: Salemba Empat, 2007.
- [14] Abdullah, *Pemrograman Web Untuk Pemula*, Jakarta: Media Komputindo, 2018.
- [15] H. Bekti, *Mahir Membuat Website dengan Adobe Dreamweaver CS6, CSS dan JQuery*, Yogyakarta: ANDI, 2015.
- [16] A. Indonesia, "Manual Airnav Indonesia Tentang Petunjuk ATS Message terkait Movement Message," Direktorat Keselamatan, Keamanan & Standarisasi, Indonesia, 2017.
- [17] I. C. A. Organization, "Procedure for Air Navigation Services Air Traffic Management Sixteenth edition.," ICAO, Canada, 2016.
- [18] A. Wubalem, T. w. Reynolds and A. Wodaju, "Estimating the recreational use value of Tis-Abay Waterfall in the upstream of the Blue Nile River, North-West Ethiopia," *Heliyon*, vol. 8, no. 12, 2022.
- [19] J. S. N. D. Duarto Felisio, "RapiTest: Continuous Black-Box Testing of RESTful Web APIs," *Procedia Computer Science*, vol. 219, pp. 537-545, 2023.
- [20] Rochmawati, L., Fatmawati & Sukma, M.M. Motivation, anxiety, and self-efficacy in learning aviation English: a study of Indonesian aviation cadets. *Asian. J. Second. Foreign. Lang. Educ.* 8, 40 (2023). <https://doi.org/10.1186/s40862-023-00212-6>