

Effort to Optimize Coordination Unit in the Aerodrome Control Unit Tower of Airnav Indonesia

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Abstract— In providing air traffic services, *adequate equipment* is essential to support the comfort and effectiveness of controllers and pilots in communication. Communication equipment plays a crucial role because coordination is needed between Air Traffic Controller (ATC) and pilots, as well as between ATC at different airports. With the increasing use of aircraft as a mode of transportation, there's a growing volume of communication that ATC needs to handle. Therefore, equipment is required to assist ATC in communicating with pilots and other ATC units at destination airports. This research aims to provide more effective communication tools for ATC, specifically the *Voice Communication Control System (VCCS)*. At the Gorontalo Branch Control tower unit of Airnav Indonesia, there are frequent *communication errors* during navigational services due to an excessive and *inefficient navigation equipment setup*, resulting in increased workload for ATC. Data collection methods involve field observations, interviews, and document analysis. The research findings conclude the necessity for more effective and efficient communication tools for ATC. The author suggests that the Gorontalo Branch Control tower unit of Airnav Indonesia enhance communication facilities by implementing the *Voice Communication Control System (VCCS)*, enabling more effective and monitored communication through a single tool.

Keywords— *inefficient equipment, Communication error, ATC*

I. INTRODUCTION

As a fast and safe mode of transportation, the operation of aircraft involves many personnel from different units, all with the same goal of ensuring safe, secure, and comfortable air travel. Traffic movement around the airport begins from aircraft *block-off* to *takeoff*. Each personnel plays their role using an integrated communication system, with communication being carried out through various electronic facilities to ensure that messages and information are delivered accurately[1].

Communication is the process in which one or more individuals, groups, organizations, and communities create and use information to interact with their environment and others. In carrying out communication activities, specific components or elements of the communication process must

be considered to achieve communication goals effectively. These factors are as follows:

1. **Communicator:** The communicator is the initiator of the communication process, the source who sends a message to others.
2. **Message:** The message in the communication process is what the sender conveys to the receiver. Messages can be delivered through face-to-face interactions or through various communication media. Messages should have a core theme as a guide in attempting to change the attitudes and behaviors of the communicants. In the communication process conducted by Air Traffic Control personnel with pilots through communication media.
3. **Media (Channel):** The media mentioned here are the tools used to convey messages from the source to the receiver. There are various channels or media available.

ATC is the closest partner to the pilot in the air, and their role is crucial in achieving flight objectives. All aircraft operations in maneuvering areas must receive ATC commands first, which will then provide information, instructions, maneuvers, or authorizations to pilots for flight safety purposes. All communication is carried out with complete equipment and in compliance with regulations. Communication strategies serve as guidance for planning and management to achieve specific goals in their operational practice. To achieve these goals, communication strategies should demonstrate how tactical operations should be carried out, meaning that the approach can vary depending on the situation and conditions[2][3].

In communicating between ATC and pilots or ATC with other units, it's crucial for the communication to be clear without any errors. To achieve this, adequate communication facilities are necessary, ones that are effective and efficient in their usage[4].

This research article aims to optimize coordination in ATC so that it makes it easier to coordinate between the *Aerodrome Control Tower* and various units, without any obstacles caused by inefficient communication tools. This research also helps ATC by providing solutions where



navigation services are carried out optimally.

Optimization in coordinating the ATC is expected to reduce the workload in providing navigation services in various units. In providing services to the Aerodrome Control Tower unit itself, coordination is expected to be carried out as maximally and effectively as possible so as to avoid *communication errors*.

An Air Traffic Controller must be disciplined and possess good focus. Air Traffic Controllers work by communicating through a specialized communication network assisted by the instrument systems available in their workspace. These instruments should also be able to reduce stress levels and provide comfort in delivering navigation services[5].

This research was conducted at Djalaluddin Airport, specifically within the Aerodrome Control Tower (TWR) Unit of the Branch of Air Navigation Services for the Flight Navigation Services Branch in Gorontalo, commonly known as Airnav Gorontalo Branch. The Airnav Aerodrome Control Tower (TWR) Unit in Gorontalo is responsible for providing Aerodrome Control Services in the vicinity of the airport and the maneuvering area of Djalaluddin International Airport. Air Traffic Controllers (ATC) have the objective of air traffic services, which encompasses the 'five objectives of Air Traffic Services,' aimed at delivering safe, comfortable, and efficient air traffic services.

Based on observations of the obstacles faced in providing flight operations services, namely facilities that support performance in coordination. Coordination plays a very important role in air traffic services. Coordination between Air Traffic Controllers must be clearly established because it involves providing *clearance, instructions* and information which are very important in air traffic services. Coordination is that part of the process which, according to the following ICAO description, will lead to the transfer of Control to another ATS unit.

In ICAO 4444 Air Traffic Management chapter 10.1.1 The process of coordinating and transferring control of a flight between successive ATC units and control sectors involves a structured dialogue consisting of the following stages: Firstly, notifying the flight to prepare for coordination when needed. Secondly, coordinating the terms and conditions for the transfer of control by the ATC unit relinquishing it. Thirdly, coordinating, when necessary, and gaining acceptance of the terms and conditions for transferring control by the ATC unit that will assume responsibility. Finally, the actual transfer of control occurs, transitioning it to the accepting ATC unit or control sector. This procedure ensures an organized and efficient transition of control, emphasizing the importance of clear communication and coordination in air traffic management[6].

The coordination equipment available in the Djalaluddin Tower unit includes: 1 *Handie-Talkie* (HT) connected to the HT unit at Djalaluddin Gorontalo Airport, 1 *direct speech* communication link with Manado Approach, 1 SLJJ used for coordination with other ATS units in the Gorontalo region, 1 *direct speech* communication link for coordination with the ACC, 1 *direct speech* communication link for coordination with Info Unit, and 1 *Private Automatic*

Branch Exchange (PABX) for coordination with other units at Djalaluddin Airport.



Fig.1 Unit Coordination Aerodrome Control tower tool

Based on observations regarding coordination with adjacent units, both internal and external units. On the controller's desk there are several communication tools such as *direct speech*, PABX and long distance. There are at least 5 communication tools whose positions are not precise enough to fill the control desk. The voice of Manado Approach direct speech and direct speech with the same tip of info and direct speech with almost the same ACC tip causes the assistant/controller to often pick it up incorrectly.

In the Djalaluddin Tower unit, the telecommunication facilities for Direct Speech have not yet reached their optimal level for establishing communication among Air Traffic Control units, as specified in Annex 11 Chapter 6.2 of Aeronautical Fixed Service (Ground-Ground Communication). The use of *Direct Speech* and/or *data link communication* is mandated for ground-ground communication in the context of air traffic services. It's worth noting that the indication of time frames for communication establishment serves as a reference for communication services, particularly in determining the required communication channel types. For instance, "instantaneous" refers to immediate access between controllers, "fifteen seconds" relates to switchboard operations, and "five minutes" pertains to methods involving retransmission[7].

It is hoped that this research will be able to provide insights to ATC on the importance of communicating optimally and efficiently in providing navigation services. This research also aims to provide a solution that certainly reduces the workload of the ATC itself so as to avoid the occurrence of error calls or other errors in communication which of course hinder activities in providing navigation services. Apart from that, it is hoped that this research will contribute to ATC's understanding of the communication tools they use.

II. LITERATURE REVIEW

Aviation safety is a condition in which the safety requirements for the utilization of airspace, aircraft, airports, air transportation, flight navigation, as well as supporting facilities and other public facilities are met. Law Number 1 of 2009 concerning aviation has stipulated severe sanctions for anyone who uses aviation radio frequencies for purposes other than aviation activities or who directly or indirectly interferes with aviation safety through the use of aviation radio frequencies [8][9].

Fluency in communication is something that is needed between ATC and pilots in providing flight navigation services. Supporting equipment is an important factor in achieving safe and smooth communication. Supported by adequate equipment, it can certainly reduce human error in providing services [10].

III. METHODOLOGY

In this research, data collection was conducted using a hybrid approach comprising three techniques: field observations, interviews, and document analysis. Field observations allowed for firsthand examination of work practices associated with the research subject. Interviews were employed to delve deeper into the viewpoints of respondents concerning the phenomenon under investigation. Additionally, document analysis was employed to gather and assess information contained within relevant documents. By integrating these three methodologies, researchers were able to acquire comprehensive and detailed data [11].

Observation is one of the empirical scientific activities that rely on field facts or texts, achieved through sensory experiences without any manipulation. The objective of observation is description, which in qualitative research leads to the development of theories and hypotheses, while in quantitative research, it is used to test theories and hypotheses. To approach social phenomena, an observer needs to have close access to the research setting and subjects. Researchers made observations at the *Aerodrome Control Tower Unit*, Gorontalo branch. Observations were carried out by looking at how effective and safe communication was between the pilot and ATC and several other units. Researchers here also calculated how many mistakes were made by ATC when coordinating with various units [12].

Interviews are a form of data collection which is most often used in qualitative research. Nurses often think interviews are easy because in their daily lives, nurses often communicate with its clients to obtain important information. In this case, the researcher also conducted interviews with the relevant ATC so that he could gain direct experience and a broader view of the problems faced related to the *ineffectiveness communication tools* [13].

In this case, the researcher also looked at and collected some written data related to how often problems occurred due to the lack of effectiveness of ATC in communicating. Document analysis techniques are techniques for collecting data from written sources by researchers in order to obtain support for analysis. In this case, the researcher analyzed the data in the daily ATC logbook in the Gorontalo branch of the *Aerodrome Control Tower unit* [14].

This research uses interview, observation and documentation techniques. By testing the validity of data in qualitative research. Qualitative research is to understand a condition context by directing a detailed and in-depth description of the portrait of conditions in a natural context (natural setting), regarding what actually happens according to what is in the field of study. In this

case, qualitative research is needed to see how aware ATC is regarding effectiveness and accuracy in communication[15].

IV. RESULT AND DISCUSSION

From the existing issues, it can be concluded that the inefficiency of coordination at the Djalaludin Tower unit is primarily attributed to the excessive use of telephone lines for coordination purposes. This results in connection errors due to misdialled calls and errors associated with one of the telephone lines.

Given the various challenges in providing air traffic services and considering the smooth, safe, and efficient flow of air traffic at Djalaluddin Gorontalo Airport, it becomes an issue that requires immediate resolution and the exploration of potential solutions. The basis for addressing this problem lies in ICAO Annex 11, Air Traffic Services Chapter 6.2.4, which emphasizes the need for the development of appropriate procedures for direct-speech communications to facilitate immediate connections for highly urgent calls related to aircraft safety. These procedures may include the interruption, if necessary, of less urgent ongoing calls. Furthermore, CASR PART 139 Subpart G point 139.213 stipulates that the equipment used must not interfere with the communication equipment utilized by the air traffic service at the aerodrome [16].

Based on the above rationale, the author proposes a problem-solving alternative through the procurement of communication equipment known as VCCS (*Voice Communication Control System*). This system only requires a single device that can connect to various necessary units using supporting devices such as a microphone, headset, and push-to-talk (PTT) button. The VCCS system functions similarly to direct speech but is more advanced and allows for seamless switching as per the ATC requirements.

Voice Communication Control System (VCCS) is equipment designed to make it easier for users to communicate by voice by integrating all users (clients) and communication facilities in one system and controlled using a control panel. VCCS is a switching device for voice used in VHF A/G and Direct Speech communications. The benefit of using VCCS is that when a user makes flight communications it becomes easy because all frequencies and telephones are combined in a VCU (Voice Control Unit) so that the control desk/ATC work desk is not filled with communication devices. Apart from that, to make it easier to use, the VCCS client control panel uses a touch screen system [17][18].

The exceptional adaptability of VCCS in handling increased communication loads demonstrates its efficiency in managing high communication volumes compared to other options in the market. Conversely, research depicting the success of implementing VCCS in major airports shows a significant improvement in security and operational efficiency in complex air traffic environments. References from this research provide a strong foundation for analyzing solutions that integrate VCCS, consistently proven to enhance efficiency and safety in the air traffic communication system[19][20].

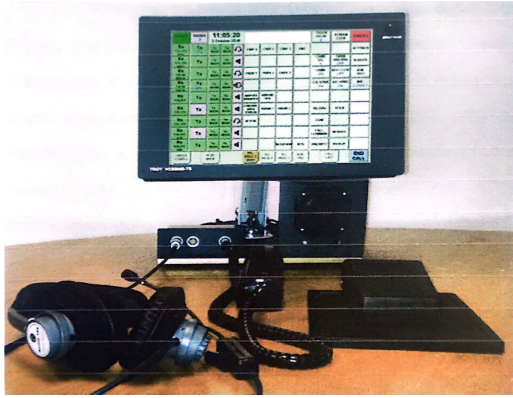


Fig.2 Voice Communication Control System (VCCS)

By using VCCS, simultaneous coordination can be avoided. For example, if there are incoming calls from both Manado APP and Info Unit, VCCS will coordinate these incoming calls simultaneously, enabling efficient coordination to take place.

Clear and smooth communication greatly facilitates air traffic controllers in providing services such as clearance, instructions, or information to aircraft, and vice versa. Effective communication between air traffic controllers and aircraft is essential for achieving the objectives of air traffic services. Therefore, during the installation of VCCS, it is necessary to measure the performance of the communication system, including checking the signal strength in VCCS.

Additionally, another alternative solution is to incorporate indicator lights on the telephone sets. These lights would activate when there is an incoming call, allowing *Controllers/Assistants* to quickly identify incoming calls, thus enhancing communication effectiveness and reducing *calling errors*.

V. CONCLUSION

The Assistant Branch Office at Djalaluddin Airport in Gorontalo requires heightened safety measures to enhance air traffic safety and efficiency. This location serves as an excellent site for conducting On the Job Training (OJT), allowing participants to apply their ATC expertise in both Approach Control Unit (APP) and Aerodrome Control

Tower scenarios. However, the presence of five imprecisely positioned communication devices has led to congestion in desk control. The similarity in sound between various communication sources has further contributed to errors in call handling. Coordination stands as a critical factor in air traffic services, demanding focused attention due to its direct impact on ensuring the smooth operation of flight activities.

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