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Analisa Penyebab Terjadinya Alarm Pada Modul Receiver Unit (RU) 7-12 Peralatan Multilateration di PERUM LPPNPI Cabang Surabaya

Anistazkia Miftahul Jannah[1], Irvan[2], Johan Wahyudi[3]

[1] Teknik Navigasi Udara, Politeknik Penerbangan Indonesia Curug
[2] AirNav Indonesia Cabang JATSC
[3] Teknik Navigasi Udara, Politeknik Penerbangan Indonesia Curug

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Abstract

This research aims to analyze damage to one of the Multilateration equipment (MLAT) modules which causes a red alarm on the Receiver Unit (RU) monitor. Multilateration (MLAT) is equipment used to accurately determine target positions at airports so that Multilateration (MLAT) equipment is required to operate normally so that it can help the Air Traffic Controller (ATC) in guiding flights. In this research, one of the Multilateration equipment (MLAT) modules was damaged. So that equipment performance decreases and causes a readable alarm condition. The research method used in this research is Literature Study.

Keywords: *Multilateration (MLAT), Receiver Unit (RU), alarm, Malfunction.*

(*) Corresponding Author: anistazkiamifta24@gmail.com

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INTRODUCTION

Based on KP 103 of 2015, Multilateration (MLAT) is equipment used to accurately determine target positions at airports using differences in arrival times known as Time Difference of Arrival (TDOA)[1]. Multilateration (MLAT) is observation equipment that works in a cooperative system which aims to identify aircraft and vehicles that have been equipped with a Vehicle Locater (VEELO) in the movement area[2]. Multilateration (MLAT) also functions to help air traffic control officers to regulate and estimate the distance or separation between aircraft in active flight conditions. Multilateration (MLAT) uses a number of receivers placed on the ground in strategic locations around the airport in order to receive as many targets as possible in the area around the airport[3].

This MLAT observation tool works as a system, which requires other components or additional tools to support the performance and function of the MLAT equipment itself, including: Remote Unit (RU), Refran Tran (Reference Transmitter), Antenna. The Receive Unit (RU) module is a key component in the Multilateration (MLAT) system which is used to accurately determine target positions around the airport area[1]. The Receiver Unit (RU) module has an important role in collecting signal data received from aircraft or other vehicles equipped with a Vehicle Locater (VEELO) around the airport movement area. This module is responsible for receiving and processing signals from targets, as well as transmitting target position information to the control center or other monitoring stations. By working together with a reference transmitting station (Refren Tran) and antenna, RU enables the MLAT system to identify and track aircraft positions in real-time. Knowing the characteristics and functionality of RUs is crucial in understanding how MLAT systems operate and how system performance can be

improved[4]. RU components include signal reception, data processing, information transmission, as well as maintenance and monitoring functions. The RU installation location around the airport movement area was also chosen strategically to ensure optimal coverage in detecting targets[2].

Apart from that, the RU also functions as a communication point between other components in the MLAT system, such as between the receiving station and the control station or data processing center. The information collected and processed by RU is not only useful for tracking aircraft positions, but also to assist air traffic control officers in managing distances and separation between aircraft during flight operations. Thus, RU plays a very important role in the overall functioning of the MLAT system. Without a properly functioning RU, the MLAT system will not be able to do its job effectively. Therefore, maintenance and monitoring of the condition and performance of the RU is very important to ensure smooth and accurate operations in managing air traffic around the airport area[4].

Alarm is one of the important concepts in the MLAT system which is used in managing and monitoring air traffic around the airport area. In the context of MLAT, alarms are used to provide warnings or notifications to system users when abnormal conditions occur or have the potential to threaten system security or performance. There are several types of alarms that can be found in an MLAT system, and each alarm has a specific purpose and function. One common type of alarm is one related to signal quality. This alarm will be triggered when the signal quality received by the Receive Unit (RU) module or reference transmitting station is considered low or inadequate[3]. This may be caused by electromagnetic interference, interference, or other technical problems. This type of alarm is important because poor signal quality can result in inaccuracies in determining the target position, which in turn can affect the safety of flight operations.

In addition to signal quality alarms, there are also alarms related to operational or hardware functions. This alarm will be triggered when there is a malfunction or technical problem in hardware such as the RU module, antenna, or system software. This alarm allows operators or technicians to immediately identify and respond to problems that arise, so that necessary repair or maintenance actions can be taken to restore system performance. The importance of the alarm concept in MLAT systems cannot be ignored. With timely and effective alarms, operators or technicians can immediately recognize problems that arise in the system and take the necessary actions to prevent their negative impact on flight operations. Therefore, the development and implementation of good alarms is key in maintaining system performance and security.

Currently Multilateration equipment (MLAT) is only installed at two airports, namely Soekarno Hatta International Airport, Tangerang Banten and Juanda International Airport, Sidoarjo Surabaya. Perum LPPNPI Surabaya Branch is equipped with thirteen MLAT antennas installed around the movement area, except for RU 12 and RU 13 which are on top of the tower. There are 10 MLAT antennas that function as Receiver Only, namely RU 1, RU 2, RU 3, RU 4, RU 5, RU 6, RU 7, RU 9, RU 10, and RU 11. Meanwhile, RU 8, RU 12, and RU 13 functions as a Transreceiver Unit[5].

The author carried out On the Job Training (OJT) II activities at Perum LPPNPI Surabaya Branch. On the Job Training (OJT) is an activity that must be

carried out and participated in by Cadets of the Indonesian Aviation Polytechnic Curug as an implementation of the theoretical knowledge that has been obtained on campus. Apart from that, this On the Job Training (OJT) activity provides benefits so that Curug Indonesian Aviation Polytechnic Cadets can get to know the real world of work, can train directly at the airport with navigation equipment at the airport and can know what actions to take if a problem occurs. on aviation equipment specifically in the field of aviation navigation.

In this research the author raises a problem in order to find out how to solve one of the problems that exist in the world of aviation. Apart from that, this research was carried out so that it could be developed at a later date.

METHODS

The research methods used in this research are:

1. Study literature

Literature study is a method or way to find out how to solve a problem by looking for sources that have been created previously.

2. Data collection

Data collection at this stage includes checking the damaged parts and preparing the equipment for repair.

3. Improvement process

The repair process is the stage of implementing the repair process on damaged equipment parts,

4. Test it out

The trial stage is the stage of testing the results of improvements to find out whether the improvements made were successful or not.

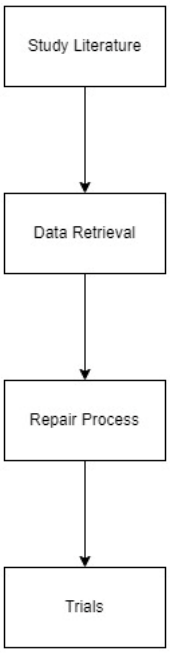

Figure 1. flow of research methods

RESULTS & DISCUSSION

Based on the research methods listed, the results and discussion are explained as follows:

A. Literature Study

The literature study was carried out by tracing previous sources related to transmission lines, equipment block diagrams, equipment modules, and components contained in the modules. Apart from that, a literature study was carried out to find out the SOP for equipment so that technicians know what actions must be taken first in the equipment repair process.

B. Data Retrieval

The problem was discovered when the author found that the RU 7-12 server gave an alarm indication on the System Monitor MLAT display in the Main Equipment Room. In this display, the MLAT System Monitor gives a message that there is an error indication from and to the RU 7-12 configuration between the data being shared does not match the configuration expected by the MLAT system itself (configuration doesn't match).

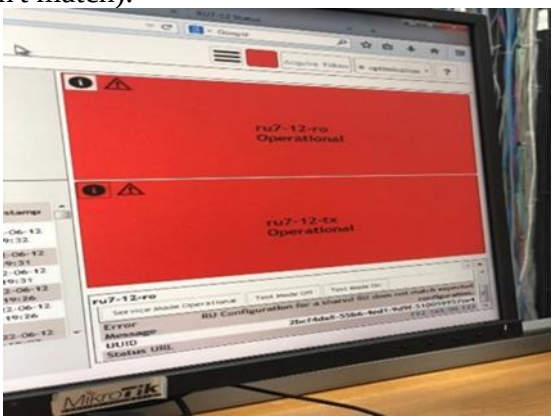

Figure 2. Alarm RU 7-12

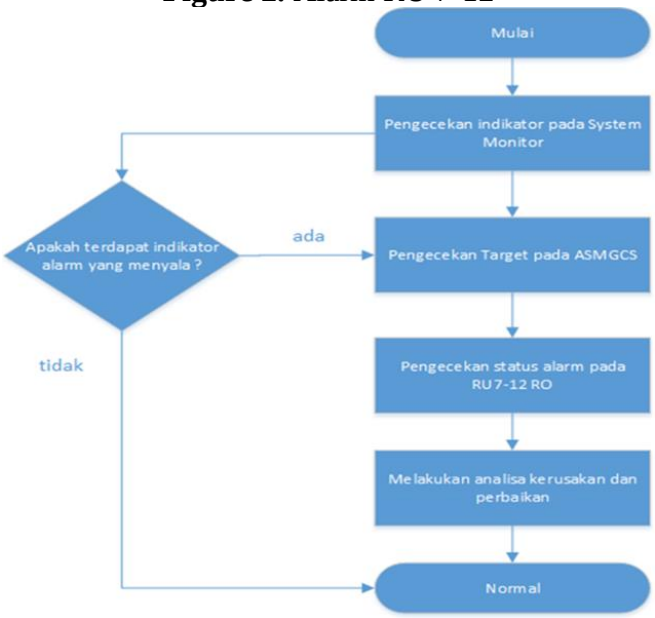

Figure 3. alarm checking flow chart

Analysis of the alarm checks that the author conveyed during the problem resulted in several points as follows, including:

1. Before checking the RU 7-12 panel outdoors, check the MLAT System Monitor.

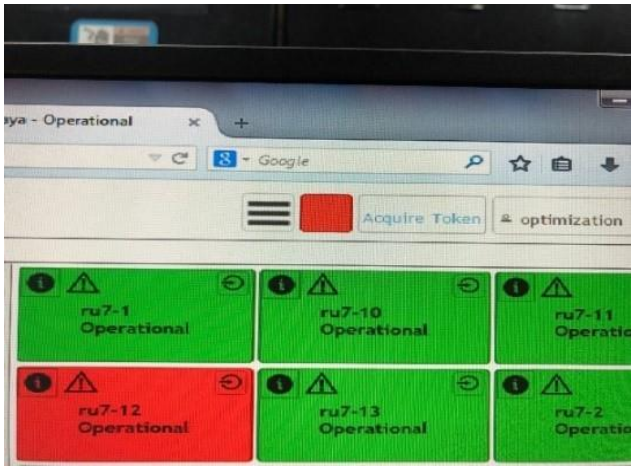

Figure 4. RU display in System Monitor

2. Select the RU that is indicated as an error with a red alarm indicator on the system monitor display. Then check the Traffic Display (TRADIS) at ASMGCS to ensure that the aircraft target remains monitored by other RU.

Figure 5. Target Detected at TRADIS ASMGCS

3. Then a direct check was carried out on the RU7-12 panel on the rooftop of the Surabaya Airnav Tower and it was found that the Receiver Only Module LED was flashing red or operational, fault detected.

Figure 6. Checking RU Panel 7-12

C. Repair Process

After carrying out the alarm checking analysis, the following analysis steps are carried out:

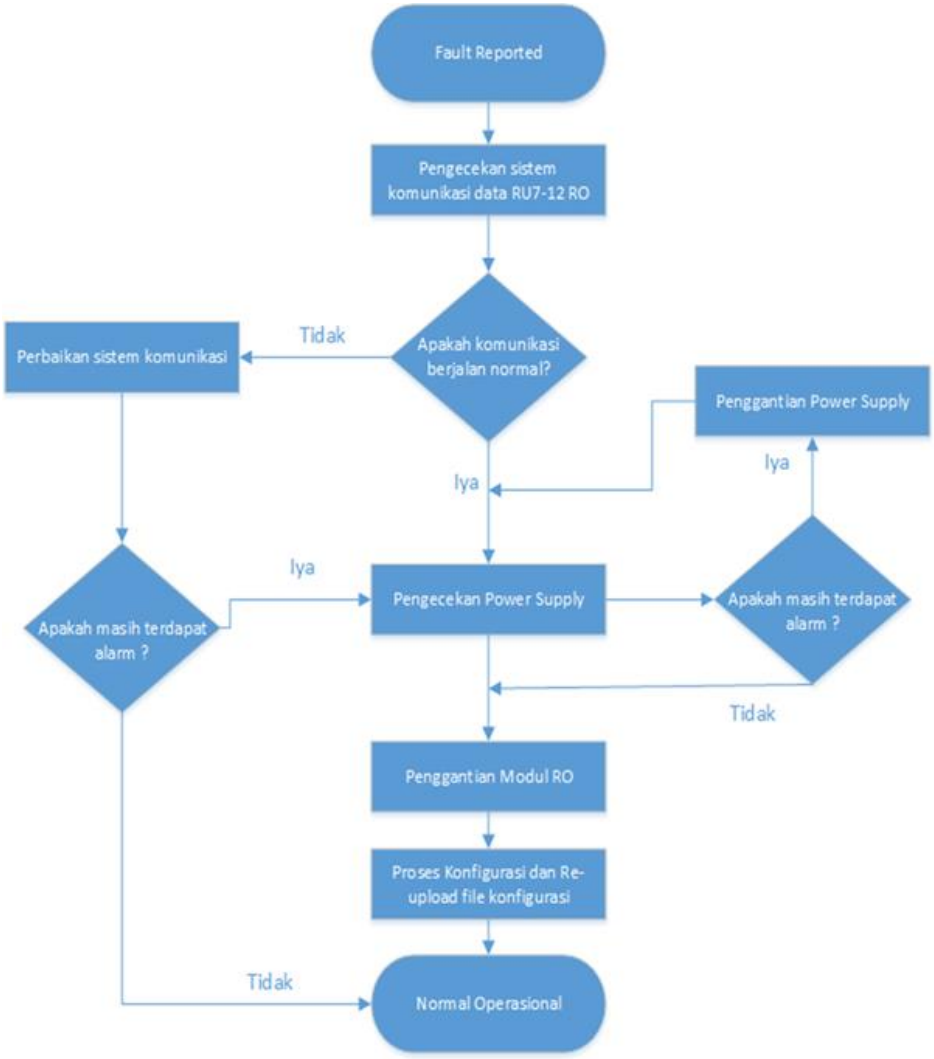

Figure 7. Repair Flow Chart

1. Check the MLAT data communication line, check the UPS panel and measure the input voltage on the UPS panel at the outdoor Airnav Tower Surabaya for the MLAT RU7-12 RO panel. The result is that the Power Supply voltage for the panel is normal and the UPS is ON.
2. Then troubleshooting was carried out on RU7-12 on the rooftop of the Surabaya Airnav Tower by carrying out experiments on replacing spare parts for the RU module. After replacing the module, the RU7-12 Module LED indicator was flashing Alternating red/green or was in maintenance mode.

Figure 8. Process troubleshooting

3. On June 12 2022, further troubleshooting was carried out, namely checking the module components and attempting to replace the SD card from the old module to the new module. It was found that RU 7-12 was still experiencing an alarm.

Figure 9. Advanced troubleshooting process

4. On June 15 2022, the situation was still experiencing an alarm, so it was decided to replace the module with a new spare part. The purpose of replacing this spare part is to ascertain whether the module system has experienced a functional failure in its operation and to determine where the problem point of the module is. The old module with number S/N S32357 was replaced with a new module with number S/N S32354.

Figure 10. Replacement of spare parts

Figure 11. New RO spare part module

D. Equipment Testing (Trials)

After changing the module, the next step is to reconfigure it. Where reconfiguration is carried out to restore the function of the old RU7-12 RO module which has been replaced by a new module so that it can still be operational and read by the MLAT system with its configuration file settings. This configuration is carried out starting from setting the IP Address of the new module to uploading the default files for the RU7-RO module from the MLAT system itself.

CONCLUSION

The conclusion of this research is that there is damage to the Receiver Only module which causes an alarm condition on the RU 7-12 server and there is a mismatch in the messages sent and received by the MLAT server. Therefore, improvements were made by replacing the Receiver Only module and as a result the RU server could operate normally.

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