www.bircu-journal.com/index.php/birci
Budapest International Research and Critics Institute-Journal (BIRCI-Journal)
Humanities and Social Sciences
ISSN 2615-3076 Online)
ISSN 2615-1715 (Print)

Analysis of Damage to Localizer Equipment (Case Study of Sultan Iskandar Muda Airport, Banda Aceh)

Asri Santosa[1], Mutiara Widasari Sitopu[2], Donna N. M Sirait[3], Darmeli Nasution[4]
[1,2,3,4]*Telecommunication and Air Navigation Study Program, Politeknik Penerbangan Medan, Indonesia*
mutiara.sitopu@poltekbangmedan.ac.id

Abstract

In the world of aviation, localizer equipment is an important piece of equipment is important in the instrument landing system. If the localizer equipment is damaged, it will disrupt the flight process that occurs at the airport. For this reason, to keep the localizer equipment in optimal condition, the technicians must always check the condition of the equipment so that it is always in good condition when it is run. If the localizer equipment is damaged, the technician must quickly where the damage to the equipment is. The process of checking the condition of the connected RS232 DB9 serial cable, and checking the voltage on the serial port on the LCP module. If the RS232 DB9 serial cable is damaged or disconnected, you must replace the RS232 cable, then when checking the voltage of the LCP module serial port, the voltage on the LCP port must match the standard, which is 8 V if the voltage drops, the LCP module must be replaced immediately.

Keywords
localizer; instrument landing system

I. Introduction

In modern times, sophisticated and modern equipment is commonplace, especially in the field of aviation. Sophisticated and modern equipment is supported by professional experts in the use of equipment in the field of aviation to operate the equipment. In this operation, accuracy is needed so that there are no fatal errors that can cause accidents during flight. One of the equipment facilities needed in flight is the ILS (Instrument Landing System) which is an instrument landing aid (nonvisual) that provides information to the aircraft to make a landing on the runway.

ILS is intended to make it easier for aircraft to land on the runway, especially during bad weather and limited visibility used to assist pilots in performing approach procedures. ILS consists of three sub-systems, namely the localizer, glide slope, and marker beacon, which will be discussed as the localizer.

Air traffic services provided by an aviation traffic guide based on the Five Objectives of Air Traffic Services based on ICAO Annex 12 – Air Traffic Services are supported by various air navigation equipment that is expected to ensure flight safety, but in practice sometimes it is different. Likewise, during observations at Perum LPPNPI, Batam District, they found problems with the tool to find the Localizer which was obtained from the pilot report that did not receive the beam signal from the Localizer, namely the aircraft that failed to do so because at that time the weather was Instrument Meteorological Condition (IMC) and could not perform the procedure the Instrument Landing System (ILS) approach. It was recorded that several planes had a trip (a failed approach and attempted to re-approach to land), from the above incident there was a discrepancy with Law no. 1 of 2009 concerning Aviation Article 219 and Article 272 Therefore, Based on the background of the problems that have been described, the authors formulate several problems, namely

DOI: https://doi.org/10.33258/birci.v4i3.2546

are the placement of localizer equipment at Sultan Iskandar Muda Airport, Banda Aceh Airport by SKEP/113/VI/2002 Regarding Criteria for Placement of Aviation Electronics and Electrical Facilities And does the placement of equipment and community mobility At Sultan Iskandar Muda Airport, Banda Aceh affect the localizer emission where Government Regulation no. 3 of 2001 concerning Aviation Security and Safety, aviation safety is a condition for realizing that flights are carried out safely and safely by flight plans and also flight safety is a condition that is realized from smooth flight operations by operating procedures and technical feasibility requirements for facilities and equipment aviation infrastructure and its supports.

And based on the Regulation of the Minister of Transportation No: K.M. 8 of 2010 concerning the National Aviation Safety Program, Safety Study of Localizer Landing Aids for (Endang Sugih Arti., SE., MSI)

Aviation is a condition where safety requirements are met in the use of airspace, aircraft, airports, air transportation, flight navigation tools, as well as supporting facilities and other public facilities so that the regulation of the Government of the Republic of Indonesia no. 3 of 2001 concerning aviation security and safety states: Article 50. Airport operations are required to maintain the airport environment to avoid the occurrence of a) Bird population in the airport work environment. b) Other animal populations that roam on the airside c) Disturbance to hygiene and sanitation d) Noise disturbance. e) Other disturbances that can endanger flight security and safety. 4) RI Law number 1 of 2009 concerning Aviation, Paragraph 2 Airport Facilities Article 219, namely: paragraphs 1 and 3.

a) Every airport business entity or airport operating unit is obligated to provide airport facilities that meet aviation safety and security requirements, as well as airport services by established service standards.
b) To maintain the readiness of airport facilities, airport business entities, or the airport operator unit is required to carry out maintenance within a certain period by means of checking, testing, verification, and/or calibration.

In several cases of Aviation Navigation Service Providers, Article 272 paragraph 2. The obligation of flight navigation services as referred to in paragraph (1) starts from the first communication contact until the last communication contact between the flight captain and the flight navigation officer or facility.

In the era of globalization, especially related to the very rapid progress in the field of transportation, with an era that is very easy to be able to travel across continents from one country to another with only a few hours, causing a shift in the epidemiology of the disease. This is indicated by the transmission of diseases from one continent to another. The existence of diseases that have never existed before and arises in a region because the Globalization era will launch a course of disease between countries made possible by the number of population movements from one country to another. Precautions, prevention and supervision activities are very necessary to overcome the possibility of transmission of the disease to other regions. The threat of global diseases and public health can be prevented.

Based on the above definition, it can be seen that surveillance is a disease observation activity carried out continuously and systematically on the occurrence and distribution of diseases and the factors that affect them to the community so that mitigation can be carried out to be able to take effective action, policy making, Epidemiological surveillance is going well, it will have an impact on the decrease in CFR and IR cases of disease. Health services in Indonesia, especially at the entrance to the Indonesian territory which includes ports, airports and cross-country land borders.

The leading health care facilities in Indonesia, the Port Health Office has the duty to prevent and discharge diseases from and to Indonesia, especially potential infectious diseases which can cause public health emergencies that are of concern to the world. Epidemiological Surveillance at the Port Health Office Class III of Banda Aceh Working Area of Sultan Iskandar Muda Airport is the timeliness and completeness of the report not yet achieving a good performance indicator that is 80% because of the facilities and infrastructure that are still simple and limited, so the results of inspection and reporting coverage affect lack of information produced as a basis for controlling policy makers.

This study uses a qualitative approach to get in-depth information from informants / data sources about the activities that have been carried out, so that this research is able to describe the actual conditions in the field. The results of the study will be compared with the theory of surveillance. The research subjects were the epidemiological surveillance system activities at the Class III Health Office of the Banda Aceh Working Area at the Sultan Iskandar Muda Airport. The informants in this study amounted to 4 people consisting of 1 official head of the epidemiological surveillance section and 3 surveillance officers, 2 medical officers and 5 environmental health workers who were directly involved in epidemiological surveillance activities at the Class III Health Office of Banda Aceh Airport Work Area Sultan Iskandar Muda. The technique of collecting data for surveillance activities was obtained through in-depth interviews using an interview guide and document observation instruments to see the implementation of surveillance activities.

II. Review of Literature

The localizer is part of the ILS which functions to guide the aircraft to be on the centerline of the runway in the landing process. The transmitter transmits an AM (Amplitude Modulated) carrier frequency with two sinusoidal signals, namely 90 Hz and 150 Hz. If the aircraft is in the extended position of the runway, it will receive a 90 Hz and 150 Hz modulation signal with a phase to the carrier so that (DDM=0). The signals given by the localizer are CSB signal (carrier sideband) and SBO signal (sideband only). The localizer signal emission can be seen in Figure 1.

2.1. CSB (Carrier and Side Band)

The carrier signal and the sideband signal are carrier frequencies that will be modulated with two audio frequencies, 90 Hz and 150 Hz, to produce an amplitude modulated signal which has four parts, namely:

a. RF Carrier (carrier frequency)
b. Upper Sideband, RF plus 90 Hz (+ 90) and RF plus 150 Hz (+ 150)
c. Lower Sideband, RF minus 90 Hz (-90) and RF minus 150 Hz (-150)
d. The amount of AM modulation consisting of audio frequency (90 Hz or 150 Hz) at the carrier frequency is 20% of the total modulation and the two audio frequencies are 40%.

2.2 SBO (Side Band Only)

The sideband-only signal is the carrier frequency and the carrier frequency is attenuated/eliminated. The sideband-only signal has two audio modulation frequencies, namely the 90 Hz frequency and the 150 Hz frequency. The results of the sideband frequency modulation are:

a. Carrier RF Frequency plus and minus 90 Hz (± 90)
b. Carrier RF frequency plus and minus 150 Hz (± 150

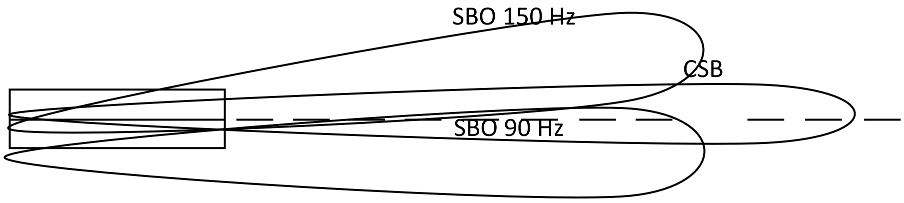

***Figure 1**. Localizer Signal Beam*

To produce the required ILS radiation, it is necessary to change the phase relationship of the SBO :

1. Phase shift 180 between 90 Hz sideband and 150 Hz sideband.
2. Next phase shifts the SBO signal 180º on the half antenna array system.
3. A portion of the antenna array will emit a combination of CSB and SBO signals where the 90 Hz sidebands will add to each other (same phase), while the 150 Hz sidebands will cancel each other out (180 phase difference).
4. A portion of the antenna lineup will otherwise emit a combination of CSB and SBO signals where the 150 Hz sidebands will add to each other (same phase), while the 90 Hz sidebands will cancel each other out (180 phase difference).
5. The CSB signal is emitted from the central pair of antennas of the localizer antenna array. The results of Carrier Side Band frequencies are +150 Hz -90 Hz and -150 Hz and +90 Hz. CSB returns DDM = 0 on the ground. DDM = 0 is obtained by the following calculation formula[9,10]:
   DDM = +90 Hz + (-90 Hz) = 0 (1)
   DDM = +150 Hz + (-150 Hz) = 0 (2)

The localizer position in the aircraft automatically calculates the difference in depth of modulation (DDM) which is derived from the 90 Hz and 150 Hz frequency signals. For the localizer, the modulation index of each modulated frequency is 20%. The difference between the two signals has differences depending on the aircraft that will have a landing position at the runway centerline position. If the 90 Hz modulation or 150 Hz modulation is too much, the aircraft position may result in an incorrect position on the runway centerline center line position. If this situation occurs, the horizontal situation indicator (HSI) or course deviation indicator (CDI) needle in the cockpit of the aircraft will indicate that the aircraft must turn to the right or the left to land at the centerline position of the runway centerline. . If the difference in depth of modulation (DDM) displays a number in the zero position, it indicates the aircraft has a runway centerline position.

The localizer uses a multielement array of antennas to generate the planned/requested signal radiation. Two signals are emitted by the transmitter which produces: 1. Carrier and Side Band (CSB) signal 2. Side Band Only (SBO) Signal The signal emitted in the air consists of a combination of these two signals and produces a composite radiation pattern. CSB signal is Carrier frequency RF which is modulated with two audio frequencies, 90 Hz and 150 Hz, and produces an amplitude modulated signal consisting of 1. RF Carrier (FC) 2. Upper Sideband, RF plus 90 Hz and RF plus 150 Hz. 3.Lower Sideband, RF minus 90 Hz and RF minus 150 Hz. The amount of AM audio frequency modulation (90 Hz or 150 Hz) on the carrier frequency is 20%, the total modulation of the two audios is 40%. The SBO signal is Sideband frequency only and the carrier frequency is omitted (attenuated). Since there is two frequency modulated audio (90 Hz and 150 Hz), the sideband frequency results are 1. Carrier RF frequency plus and minus 90 Hz. 2. Carrier RF frequency plus and minus 150 Hz. When the two signals (CSB and SBO) above are emitted, the result of the combination of the two signals is no different in ModulationDepth, because both signals have the same Modulation Depth and phase. To produce the required ILS radiation, it is necessary to change the phase relationship of the Sideband (SBO): 1. Shift the phase 180º between the 90 Hz Sideband and 150 Hz Sideband. 2. However, the above has not produced the desired radiation results because one sideband of the SBO will add to the CSB radiation, while the sideband of the other SBO will cancel each other out because the phase is shifted by 180º. By adjusting the CSB and SBO signal levels, the beam width (Course Width) can be adjusted. Adding SBO power to CSB power will result in a narrower beam (Course Width angle decreases) and vice versa. If only the CSB signal is transmitted (not with SBO), the system will be non-directional and will produce DDM=0 in all areas. It is used to tune the equipment and ensure that the 90 Hz and 150 Hz modulation levels are balanced. Source: Handbook – ILS Basic Theory Coverage localizer (ANNEX 10: specification for ILS) Coverage must reach 25 NM (46.3 km) at ±10 degrees, and 17 NM (31.5 km) at ±10-35 degrees. The exception is if there are obstacles, the coverage must be 18 NM (33.4 km) at ±10 degrees, and 10 NM (18.5 km) at ±10-35 degrees. Localizer signals must be received at an altitude of 600 m (2000 ft) above the threshold, or 300 m (1000 ft) above the obstacle elevation.

III. Research Methods

The research method carried out in checking the damage to the localizer tool can be seen in Figure 2.

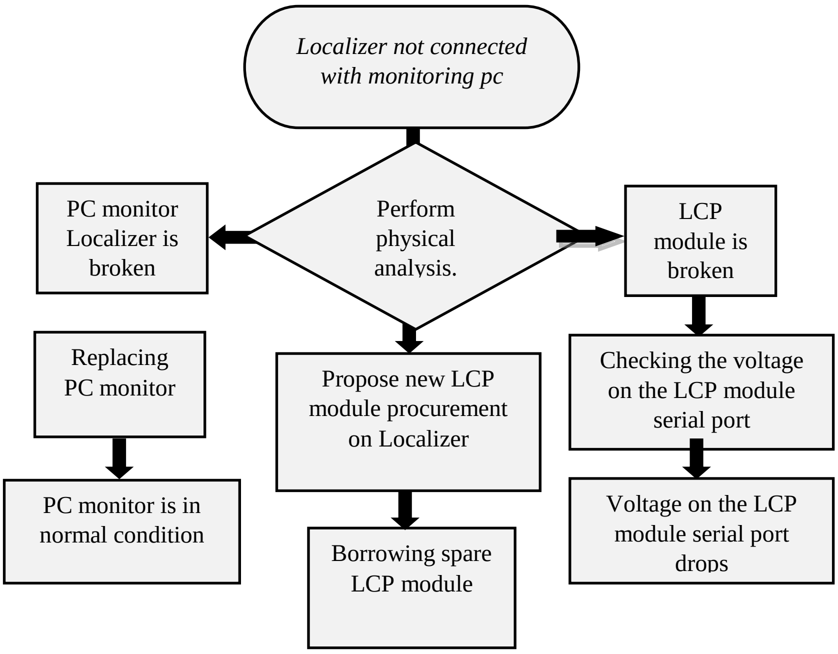

Figure 2. *Flowchart of checking localizer equipment*

IV. Results and Discussion

To overcome the problems that occur in the localizer equipment, the following steps are needed:

1. PC monitoring on the localizer is turned off first.
2. Replace the PC monitoring localizer with a new PC.
3. After that, upload data from the equipment to be displayed on the monitoring PC as shown in Figure 3.

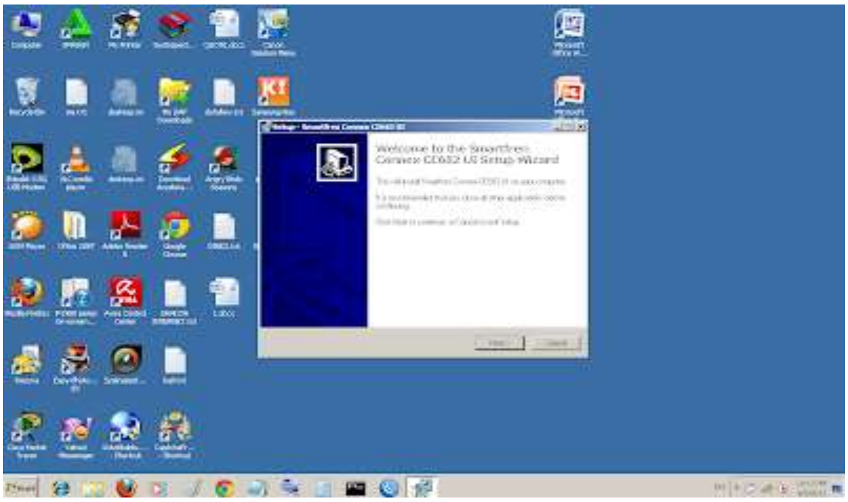

Figure 3. *Screen display when uploading data*

The steps are as follows:

a. Copy data from SITE to PC using ADRACS software.
b. The data has been successfully retrieved from the device and stored in the PC, but cannot be displayed yet.
c. So that the data can be displayed, copy the data from the PC to RAM.

Reopen the File Transfer menu and select Copy PC file to RAM.

a. Wait for the data to be uploaded to the PC monitor.
b. After the data is uploaded the technicians try to connect the Localizer with the new pc.
c. After the Localizer is connected to the PC monitor, the data does not appear on the monitor layer as shown in Figure 4.

Figure 4. *The display of the localizer that is not connected to the PC monitor*

1. Checking on the RS232 DB9 serial cable which is the link to transmit data from the equipment to the monitoring PC. Checking is done by looking at the cable that is connected to the pin on the RS232 DB9. Each of the existing pins has a different function and some are not used as shown in Figure 5.

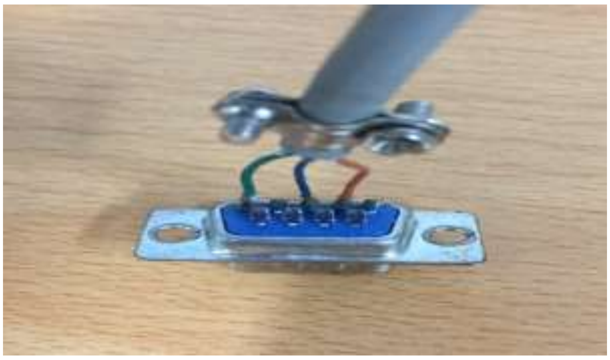

Figure 5. *RS232 DB9 on localizer*

2. The RS232 serial cable indicates that it is in good condition, that is, there are no broken or loose cables.
3. After that the technicians check the voltage on the LCP module serial port as shown in Figure 7.
4. The voltage on the serial port on the LCP module has decreased, which should have been 8 volts but was only 4.5 volts.

V. Conclusion

The problem that occurs is damage to the LCP module due to a decrease in the voltage on the LCP module serial port which results in Localizer parameter data cannot be displayed on the PC monitoring equipment which results in not being able to see Localizer parameter data on the monitoring PC at the shelter. The way to solve this problem is to do a physical inspection of the equipment, check the voltage on the LCP module serial port, and propose a new LCP module replacement.

References

A. Novak, K. Havel, M. Janovec, "Measuring and Testing The Instrument Landing System at The Airport Zilina Internasional" Confrence on air Transport INAR, Vol 2 No.2. hlm. 117-126, 2017.

ANNEC 10 Vol 1, Aeronautical Telecomunications- Radio Navigation AIDS, ICAO,2015.

B. Ebenezer, "Peran ICAO dalam Pengawasan Penerbangan Sipil Internasional", Skripsi Hukum Internasional Fakultas Hukum Universitas Sumatera Utara, 2018.

Darwis, O. Hendra, S. Purnomo, "Penyimpangan Parameter Glide Slope Pada Periodisasi Kalibrasi Instrument Landing System di Balai Besar Kalibrasi Fasilitas Penerbangan" Langit Biru Jurnal Ilmiah Aviasi, Vol 13 No.1 hlm.213-222, 2020.

J. Merkiz, M. Galant, M. Bieda, " Analysis of Operating Instument Landong System Accuracy Under Simulated Conditions" Scientific Journal of Silesian University of Technology, Vol 94 hlm. 163-173, 2017.

K. Putra, dan I. Yasri, "Analisa Kinerja Localizer Sebagai Landing System dari Perspective Rangkaian Elektronika Telekomunikasi", Jurnal Online Mahasiswa Fakultak Teknik (Jom FTEKNIK), Vol.4 No.2 2017.

S.Shrivastava, R.K.Verma, Gp.Capt M. Shrivastava, “Instrument Landing System and Its Requirement in India” Journal of Critical Reviews, Vol 7 Issue 14, hlm.1337-1346, 2020.

Thales ILS Instrument Landing System Market 420 Technical Manual, Stuttgart: NAVAIDS. Manual Book Localizer Perum LPPNPI Kantor Cabang Banda Aceh, 2004.krostrip Meander-Lin9

Thales ILS Instrument Landing System Market 413 Technical Manual, Stuttgart: NAVAIDS. Manual Book Localizer Perum LPPNPI Kantor Cabang Banda Aceh, 2004.

Warta Ardiah, “Metode Pengukuran Localizer di Bandara Udara (Studi Kasus Bandar Udara Sam Ratulangi-Manado)”, Jurnal Perhubungan udara, Vol 4 No. 3, hlm. 173-188, 2014.