Optimization Of The Use Of ATC Automation Approach Control Surveillance At Perum LPPNPI MATSC Branch

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Abstract- ATC (Air Traffic Control) automation system is a complex system, which helps maintain air traffic order, guarantee flight intervals, and prevent aircraft collisions. This is important to ensure the safety of air traffic. Failure effect evaluation is an important part of ATC automation system reliability engineering. However, changes like these also present challenges and ethical considerations that need to be considered to ensure that aviation safety remains a top priority. In optimizing the use of ATC Automation, research was carried out using qualitative analysis, which means that in this study, data, interviews and documents related to the problem were used. The data used is the result of interviews submitted to the ATC. In conducting this research, the study was conducted in May 2023 using descriptive analysis. The intended purpose of this study is to find out that the use of ATC Automation has been running optimally and has also reduced workload. Accurate in dealing with complex traffic situations. This research is also expected to be used as further research in the use of ATC Automation.

Keywords— ATC Automation; ATC, optimization

I. INTRODUCTION

States that the ATC Automation system and humans interact to fulfill the functions of a system and can also include the right things to provide appropriate and satisfying services. The ATC Automation System is a complex system, which helps maintain air traffic order, guarantees flight intervals, and prevents aircraft collisions [1] The ATC Automation System is used to maintain air flight order, ensure separation, prevent aircraft collisions, and ensure flight safety stated that this system would improve handling, information, and expand surveillance with ADS and also improve navigation accuracy which could lead to reduced separation and an increase in airspace capacity.

ATC Automation is needed to increase productivity, efficiency, and enable humans to complete their tasks in difficult or complex environments to prevent or limit errors[2].The radar function is part of radio engineering, which is used to determine the position of the aircraft. Air traffic control radar uses active radiolocation with passive response and active radiolocation with active response to determine aircraft position and flight characteristics. The reliability of the software under certain conditions and at certain times, the possibility of the software running without errors. because the ability of ATCAS is directly related to the lives of passengers, once something goes wrong the consequences are unimaginable. So strict requirements are applied to reliability [3].

It states that the ATC Automation system and humans interact to fulfill the functions of a system and can also include the right things to achieve appropriate and satisfactory service delivery, and also in the document explains that the personnel who will use the system must be trained and also meet standards to be able to control the ATC automation system and also be able to assist in the development of a technology that has been used. The use of automation systems can facilitate the decision-making process because the fast processing of large amounts of data allows operators to make more complex choices. and also One of the key factors in the human-automation relationship is the level of one's trust in automation[5]. In (Directorate General of Civil Aviation, 2015) *CASR 171 – 02* stated that the purpose of ATC Automation is to provide information from observation devices and for other ATS units and also ATC Automation can improve flight safety.

MATSC has its own ATC Automation system called TopSky, this system aims to help ATC work and also reduce fatigue as well This system functions to process all data that enters the system (RADAR data, ADS data, CPDLC data, AFTN data, METEO data, etc.), then displayed on the display and used by the controller to manage air traffic. This system is also designed to limit the occurrence of errors that will harm ATC personnel. The study of safety in "complex socio-technological systems" stated that "*automation systems* have a tendency to change the places where human error can occur in the system and sometimes even potentially increase the magnitude of human error as a result." in other words that *automation system* sometimes it can make mistakes that have been made by humans and can also add to a problem which ultimately impacts on the humans themselves.
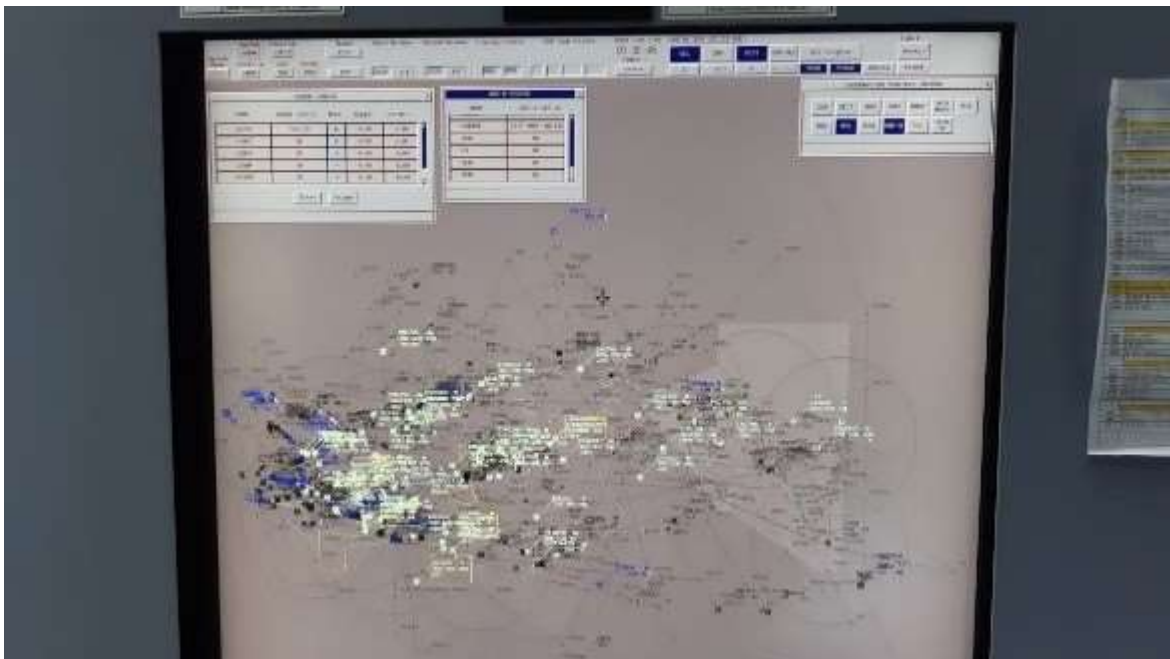

Figure 1. TopSky radar system [4]

Mentioned in the book about *THALES automation system main features* explained some of the benefits obtained by using the Top Sky system such as accurate tracks for Enroute/TMA/RNW/apron, updated position data update rate of 1 report/sec, accurate trajectory prediction for equipment prediction, and also dynamic distribution of flight data and flexibility. However, the TopSky system in MATSC that is used in the APP has an obstacle that affects and can reduce the safety factor and also the personnel. Where the TopSky system does not show an accurate track such as the position of the target on the screen is unstable and

sometimes at certain distances the target shown changes places or the target is separated into 2 where the ADS-B target and the Flight Plan target are in the same place different or sometimes the target disappears from the radar in a fraction of a second[5].

Table 1. daily logbook report [6]

No	Date	Operational Report
1.	15 Jan 2023	Radar target unstable
2.	20 Jan 2023	18 nm at "MKS" VOR radar target unstable
3.	20 Jan 2023	Radar still unstable
4.	23 jan 2023	30 nm at "MKS" VOR radar target unstable

Judging from the table and figure above, these incidents occurred repeatedly which disrupted the concentration of ATC personnel because they focused on the moving target and created more workload which could cause ATC personnel to become fatigued, if this problem is not followed up it will have an impact on safety. flights and also have an impact on the work efficiency of ATC personnel.

The results support the use of automation to increase situational awareness while reducing mental workload. This work has potential implications for the design of automation and operating procedures [7]. The literature review shows that problems of stress, trust, and boredom are predicted to be more significant. Researchers should develop measures to assess these issues and their impact on ATC performance. The solution to reducing the high level of mental workload is by enhancing the radar equipment system, setting work shifts, and improving the habits of individual Air Traffic Controller operators when working [8]. The purpose of this research is to reduce the ATC workload.

II. LITERATURE REVIEW

In evaluating the ATC Automation system, the focus is on the effects felt by the ATC, as for the components that can affect the performance and functionality of the system. By analyzing and evaluating causes and effects. As for some of the Actions and those that plan to make improvements and evaluate and determine these plans. By analyzing and evaluating the failure modes and their causes and consequences, some reasonable corrective actions and preventive maintenance plans can be established (Li et al., 2017). ATC Automation can be recognized as having reduced the workload of an ATC and this system also has the goal of increasing situational awareness in a small scope in providing a service (Schrefl et al., 2022).

III. RESEARCH OF METHOD

In conducting this research the authors used a qualitative descriptive technique in which the resulting data were in the form of sentences or words obtained from interviews with several sources concerned, observations at the scene, or by using documents related to the research. The data used is data related to ATC automation, daily reports, as well as other data as well as documents or laws that are in accordance with the research.

Qualitative research is research based on positivism which is used in scientific conditions in which the researcher himself becomes the instrument, for data collection techniques and analysis which are qualitative in nature, more emphasis is placed on the meaning that is embodied. Qualitative research is used for problems that are (1) explorative in nature; (2) descriptive; and explanatory. This research is also a type of research that is exploratory and understands the meaning of a number of groups and individuals originating from social and humanitarian issues [9]. Qualitative research is invaluable in exploring complex questions and understanding the human perspective at greater depth.

IV. ANALYSIS AND DISCUSSION

TOP SKY is ATC System equipment used to facilitate ATC in guiding air traffic in a Flight Information Region (FIR). TOP SKY is the newest system released by THALES to make the Main Application System operate as a Single Operation to replace the previous system, namely EUROCAT-X which is also made by THALES. Currently in Indonesia TOP SKY is only operating at the Makassar Air Traffic Service Center (MATSC) which was inaugurated on January 16, 2016[10]. The TOP SKY ATC

System functions to process all data that enters the system (RADAR data, ADS data, CPDLC data, AFTN data, METEO data, etc.), then displayed on the display and used by the controller to manage air traffic. Functions of the TOPSKY ATC System:

1. Improving air traffic services

2. Improve flight safety

3. Reducing the work load of the controller

4. Handle electronic strip (less paper)

5. Billing system

6. Ability to display max tracks. 500 ms from when the tracking message was received

7. Ability to display alarm status less than 3 seconds since event detected

The other system owned by the TOP SKY system is Supporting Equipment.

Thermal Flight Line Printer, Flight Plane Holder, Flight Plane Holder Shelf, Dimmer, and there are many more advantages to be gained in using the TOP SKY system. However, the implementation of TOP SKY experienced a problem that made the ATC work extra and could also cause ATC to feel tired. Considering that MATSC is the East Gate in aviation in Indonesia, it requires MATSC to have sophisticated equipment to make it easier for ATC to provide good service.

In terms of the problems experienced and conducting interviews related to these problems, As for things or suggestions and conclusions that can be done at the MATSC Branch Housing LPPNPI in order to optimize ATC Automation and ATC performance. These results can be described as follows:

In the Regulation of the Director General of Civil Aviation (KP 35 of 2019) concerning procedures for maintenance and reporting of aviation telecommunication facilities it reads as follows[11]:

a. Regular preventive maintenance is carried out, such as:

1) Cleaning of units or modules of aviation telecommunication facilities.

2) Observation of display and targets on surveillance facilities.

3) Examination of output (signal/data/ and voice) on surveillance and aviation telecommunication facilities.

b. If a problem or disturbance occurs, it is mandatory to write down the problem or disturbance in the facility logbook or commonly known as a diary (daily logbook).

c. repairs are required to record these activities in the available logbook, where the logbook contains:

1. date/month/year/hour of maintenance implementation;

2. maintenance records/actions;

3. the name of the technician carrying out the maintenance;

4. maintenance technician initials.

There are other ways that can be done as follows:

a. Conduct training / Re-refresh in the use of ATC Automation in order to increase familiarity in using ATC Automation, especially using the TopSky system. In this case, it is not only the ATC that does it but the stakeholders involved in the use as well as the arrangements regarding the TopSky system

b. Checking the system that will be used when changing service shifts so that we can identify the use of the system and ensure that the system used can run properly and can also help identify potential in serving air traffic.

c. Read reports (daily reports) before changing service shifts in order to be able to anticipate a potential or problem that exists in the system or in carrying out air traffic services.

    d. Report problems that occur to the unit concerned so that evaluation and testing can be carried out in using the system, can also improve and update the system that is currently used, and can work together in taking or providing input in making a decision.

V. CONCLUSION

1. In optimizing ATC Automation, routine checking/maintenance is carried out in dealing with unexpected situations (abnormal situations), so that ATC personnel can carry out their duties and obligations properly.

2. Using ATC Automation can help ATC personnel work even better. Not only is the system expected to help ATC personnel, however, ATC personnel also need to increase awareness and skills in using ATC Automation which will help be able to interact effectively in emergency situations and when needed.

3. When you encounter problems in using ATC Automation, write down these obstacles in the daily or available logbook reports and then inform the relevant units to ensure that the use of the system can be used properly and does not interfere with ATC in communicating not only with pilots but also with the stakeholders involved, one of which is the Air Traffic Service Reporting Office (ARO) unit

4. In involving various parties to optimize ATC Automation at Perum LPPNPI MATSC Branch can ensure all existing perspectives so that the process of identifying and implementing ATC Automation can run well and can improve the performance of ATC personnel and system performance.

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