THE EFFECT OF MONITORING THE APRON MOVEMENT CONTROL (AMC) UNIT WITH CLOSED CIRCUIT TELEVISION (CCTV) ON ORDER IN THE APRON AREA AT THE AIRPORT MUTIARA SIS AL-JUFRI PALU

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ABSTRACT

Supervision in the airport apron area is an important aspect in ensuring the safety and order of flight operations. One of the supporting technologies used is Closed Circuit Television (CCTV) which functions to help the Apron Movement Control (AMC) unit in monitoring activities on the apron. However, at Mutiara Sis Al-Jufri Palu Airport, a number of violations of standard operating procedures (SOPs) were still found, such as personnel who did not wear high-visibility clothing while on duty. This condition raises questions about the effectiveness of CCTV-based surveillance. This study aims to analyze the influence of AMC supervision with CCTV on the order of the apron area. The method used was a descriptive quantitative approach through a survey with a questionnaire instrument using the Likert scale, which was distributed to 30 respondents consisting of AMC officers and ground handling with saturated sampling techniques. The data was analyzed using simple linear regression through the SmartPLS 3 application. The results showed that surveillance with CCTV had a significant effect on the order of the apron area, as shown by the path coefficient value of 0.644, T-statistic of 9.844, and p-value of 0.000 ($p < 0.05$). These findings confirm that improving the quality of the CCTV system, increasing monitoring coverage, and routine evaluation between units are needed to support the creation of more effective supervision and better operational discipline.

Keywords: CCTV, Apron Movement Control, Supervision, Apron, Order.

1. INTRODUCTION

In the era of globalization marked by increasing mobility of people and goods between regions, the role of airports has become very vital as a transportation infrastructure that is able to connect various regions and countries with high efficiency. Air transportation is considered the most effective and efficient means of transportation, especially for long-distance travel that takes a short time. Airports, as stipulated in Law Number 1 of 2009 concerning Aviation, not only function as a landing and takeoff point for aircraft, but also as an important point for the transfer of modes of transportation, loading and unloading of goods, and passenger services. In this context, the existence of airports is not only a technical facility, but also an integral part of the national transportation system that supports economic growth, tourism, and community mobility.

However, along with the increase in aviation activities, the complexity of activities at the airport is also getting higher, especially in the airside area,

especially the apron. The apron is a crucial part of the airport which is the main location for various aircraft operational activities, such as parking, passenger boarding and disembarkation processes, loading and unloading baggage, refueling, and the movement of Ground Support Equipment (GSE) vehicles. With a high intensity of activity, the apron has a significant potential hazard if not properly supervised. Therefore, security and order on the apron are a major concern, because the slightest negligence can have a direct impact on flight safety and personnel on duty.

In maintaining security and order on the apron, one of the important units that plays a role is Apron Movement Control (AMC). Based on the Regulation of the Director General of Civil Aviation Number KP 038 of 2017 concerning Apron Management Service, AMC has an obligation to supervise all apron areas to ensure that activities take place in accordance with standard operating procedures (SOP). This unit is at the forefront of maintaining the regularity of vehicle traffic and personnel on the apron, so that the potential for incidents can be minimized. The supervision carried out by AMC is not only administrative, but also technical through direct monitoring of activities in the field.

However, the reality in the field shows that the implementation of safety awareness by personnel working on the apron still often faces challenges. It is not uncommon to find violations of safety procedures, such as ground handling personnel who do not wear high-visibility clothing (safety vests) when on duty on the apron, even though this has been regulated in the Regulation of the Minister of Transportation Number 21 of 2023 concerning Technical and Operational Standards – Apron Safety Management (point 9.5.5). The habit of replacing standard procedures with more practical or experience-based ways of working is one of the factors that increases the risk of accidents. This shows the need for more effective supervision improvement, one of which is through the use of technology.

The use of Closed Circuit Television (CCTV) technology is one of the relevant solutions to strengthen the surveillance system on the apron. CCTV functions as a tool that allows real-time monitoring of activities, both the movement of aircraft, GSE vehicles, and ground handling personnel. The presence of CCTV can help AMC officers in detecting violations of work procedures, following up on incidents faster, and documenting evidence of violations that can be used for evaluation and corrective actions. Theoretically, the application of CCTV is in line with modern safety management principles that emphasize the importance of technology-based monitoring systems to support manual surveillance.

However, the effectiveness of the use of CCTV is highly dependent on the number, placement, and monitoring systems available. Based on the results of observations at Mutiara Sis Al-Jufri Palu Airport, it is known that this airport has 9 parking stands, but not all of them are equipped with CCTV facilities that can be accessed by AMC units. Only some parking stands such as R1, 4, and 5 are equipped with CCTV devices for AMC, while others are only supervised by Aviation Security (Avsec). This condition causes the supervision carried out by AMC to be suboptimal, because the limited camera

angle makes some areas of the apron not monitored thoroughly.

The limitations of these facilities have an impact on the low effectiveness of supervision carried out by AMC, so potential violations of work procedures are still often found. This not only has implications for the flight safety aspect, but also for the operational order aspect. For example, the placement of GSE vehicles that are not in accordance with the rules, delays in baggage handling, and violations in the use of personal protective equipment. These problems show that there is a gap between the regulations that have been set and the practice of supervision in the field, so it is necessary to conduct more in-depth research on the influence of the use of CCTV on the effectiveness of AMC supervision.

This research is important considering that the role of AMC in the aviation safety system on the apron is very strategic. If supervision can be improved through the use of CCTV, then the level of compliance of ground handling personnel with SOPs will be higher, and potential violations can be reduced. On the other hand, if supervision is inadequate, violations will continue to occur and risk causing accidents that can disrupt the airport's overall operations. Thus, the influence of the use of CCTV on the effectiveness of AMC supervision is the main focus that needs to be researched to provide recommendations for future improvements.

In addition, research on the influence of CCTV in supporting AMC supervision on the apron can also make an academic contribution to the development of aviation safety management science, as well as a practical contribution for airport managers in improving the surveillance system. This is in line with the regulatory mandate that requires each airport to provide adequate supporting facilities to support AMC's operations. With the existence of scientific studies, it is hoped that the results of the research can be the basis for policy-making in adding CCTV facilities and improving supervision governance in the apron.

Based on the description above, it can be concluded that the effectiveness of AMC supervision through the use of CCTV on the apron of Mutiara Sis Al-Jufri Palu Airport is a strategic issue that needs attention. The problem of limited CCTV facilities and the frequent violation of procedures on the apron emphasized the importance of this research being conducted. Therefore, the study entitled "The Effect of Apron Movement Control (AMC) Unit Supervision with Closed Circuit Television (CCTV) on Order in the Apron Area at Mutiara Sis Al-Jufri Palu Airport" is expected to be able to provide answers to the problem formulation and provide applicable recommendations to improve safety and order on the apron.

2. METHOD

This study uses a quantitative approach with an evaluative descriptive design. The quantitative approach was chosen because this research is based on a positivistic paradigm that emphasizes numerical data measurement, statistical analysis, and hypothesis testing that has been formulated previously (Sugiyono, 2013). The researcher sought to systematically describe how the supervision of the Apron Movement Control (AMC) unit using Closed Circuit Television

(CCTV) technology affects the level of order in the apron area of Mutiara Sis Al-Jufri Palu Airport. In addition, the use of evaluative descriptive methods allows researchers to not only explain phenomena in the field, but also evaluate the suitability of supervisory practices with established standards. Thus, the design of this study not only produces a quantitative picture, but also provides an evaluative basis for improving the governance of apron supervision.

The research variables are set into two, namely independent variables and dependent variables. The independent variable (X) in this study is AMC surveillance with CCTV, which is defined as a form of technology-based surveillance to monitor, regulate, and ensure that all activities in the apron area are carried out in accordance with safety and operational procedures. Meanwhile, the dependent variable (Y) is the order of the apron area, which is defined as the condition of regularity in vehicle activities, aircraft movements, and the behavior of ground handling personnel in accordance with SOPs and aviation safety regulations. These two variables will be analyzed to find out whether CCTV-based surveillance really has a significant contribution to improving order in the apron.

The study population was set at 30 people consisting of 9 AMC officers and 21 ground handling personnel who were on duty at Mutiara Sis Al-Jufri Airport, Palu. Given the relatively small population, the sampling technique used is a saturated sample, i.e. all members of the population are used as a research sample (Suriani et al., 2023). With this method, the results of the study are expected to be more accurate in representing real conditions in the field, because the entire population is involved as respondents. This technique also minimizes the possibility of sampling bias and increases the validity of the research results.

The main instrument of the study is a questionnaire prepared in the form of statements using the Likert scale. This scale was chosen because it was able to measure respondents' attitudes, perceptions, and levels of compliance with the research variables. Respondents were asked to give answers in the categories of strongly agree (SS), agree (S), disagree (TS), and strongly disagree (STS), with a score of 4 to 1. The questionnaire was designed to measure the indicators of AMC surveillance variables with CCTV and order on the apron. The use of Google Form-based questionnaires was chosen to facilitate the distribution of instruments, improve the efficiency of data collection, and speed up the tabulation process of results.

The data analysis process is carried out through several stages, namely validity test, reliability test, and simple linear regression analysis. The validity test was carried out using a construct validity approach by involving three expert validators who assessed the feasibility of the question item based on the theory. The validity calculation is carried out using the Content Validity Ratio (CVR), where an item is declared valid if it produces a value above 0.6. Furthermore, the reliability of the instrument was tested using Cronbach's Alpha method with the help of Smart PLS software, where the reliability value was considered adequate if it was greater than 0.60 (Ghozali, 2018). Simple linear regression analysis is used to determine the magnitude of the influence of

variable X on variable Y, with the regression equation: Y = a + bX.

The data collection technique is carried out in two forms, namely primary data and secondary data. Primary data was obtained through filling out a questionnaire by respondents consisting of AMC officers and ground handling personnel. Meanwhile, secondary data was obtained from official airport documents, related laws and regulations, and academic literature relevant to the research topic. The use of these two types of data is intended to make the research results more comprehensive, because it combines empirical data from the field with supportive regulatory and theoretical references.

The research location was carried out at Mutiara Sis Al-Jufri Palu Airport, especially in the Apron Movement Control (AMC) unit. The selection of this location is based on methodological and practical considerations, namely the experience of researchers who have carried out the On the Job Training (OJT) program at the airport's AMC unit. This experience makes it easier for researchers to access data, understand operational procedures, and interact directly with personnel who are research respondents. The research time is scheduled according to the availability of respondents in the field so as not to interfere with airport operational activities. Thus, the research method used is expected to be able to produce valid, reliable, and applicable findings to increase the effectiveness of supervision in the apron area.

RESEARCH RESULTS

4.1 Validity Test Results

4.1.1 Construct Validity Test

Table 1 Validity Test Results *Construct*

HASIL UJI VALIDITAS INSTRUMEN PENELITIAN			
Variabel	Jumlah Instrumen	Jumlah Instrumen Valid	Jumlah Instrumen Tidak Valid
(X) Pengawasan AMC dengan CCTV	11	10	1
(Y) Ketertiban Area Apron	8	3	5
Jumlah	19	13	6

The construct validity test in this study was carried out using the Content Validity Ratio (CVR) method using the help of Microsoft Excel software. The goal is to ensure that each item of statement in the questionnaire is able to adequately represent the research variables. Based on the test results shown in Table 4.1, out of a total of 19 statements, 13 items were declared valid and 6 items were declared invalid. For variable X (AMC Surveillance with CCTV), there are 10 valid statements and 1 invalid statement. Meanwhile, in variable Y (Apron Area Order), only 3 statements are valid, while the other 5 statements are invalid. In accordance with the CVR validity criteria, a statement is declared valid if it has a value of more than 0.6.

4.1.2 Results of Variable X and Y Respondents

Results of Variable X Respondents

Analysis of the data from the distribution of the questionnaire on variable X (AMC Supervision with CCTV) showed variations in respondents' assessments of the indicators tested. The tabulation results show the total score value, percentage index, and average score of each indicator. The indicator with the highest score was X1.5 (CCTV system runs continuously without interruption) with a total score of 110, a percentage index of 72.72%, and an average of 3.66. This shows that the sustainability aspect of the system is the most dominant factor in supporting the effectiveness of AMC supervision with CCTV.

Meanwhile, the indicator with the lowest score was X1.10 (Coordination between CCTV operators and field officers went smoothly) with an average of 3.03. These results illustrate that coordination between CCTV supervisors and field personnel is still not optimal. Overall, the average variable X is 3.3, which can be categorized as good, but still requires improvement in the aspect of operational coordination.

Results of Variable Y Respondents

The results of the questionnaire distribution for variable Y (Order of Apron Area) are presented in Table 4.3. Of the three indicators tested, the highest score was obtained by Y1.2 (Personnel always use required safety equipment) with a total score of 114, a percentage index of 94.73%, and an average of 3.8. This shows that compliance with the use of safety equipment is the most orderly and maintained aspect in the apron area.

The lowest scoring indicator was Y1.8 (The work environment on the apron looked orderly and controlled) with an average of 3.2, which indicates that there are still challenges in creating a truly orderly and controlled work environment on the apron. Overall, the average Y variable was 3.5, which signifies the level of order of the apron area is in the good category, although there is still room for improvement.

4.1.3 Convergent Validity Test (Outer Loading)

In addition to the construct validity test, this study also conducts a convergent validity test (outer loading) to ensure that the indicators used are able to adequately reflect the constructs of variables. The test results showed that out of a total of 13 indicators tested, only 5 indicators were declared valid (loading factor > 0.70), while the other 8 indicators were declared invalid.

Indicators that are declared valid include X1.5 (0.835), X1.7 (0.757), X1.8 (0.819), X1.9 (0.927), and Y1.8 (0.873). These indicators have a loading factor above the threshold of 0.70, so they can be used as a basis for further analysis. On the other hand, invalid indicators such as X1.1, X1.2, X1.3, X1.4, X1.6, X1.10, Y1.1, and Y1.2 cannot be used because they have a loading factor value below 0.70 and some even have negative values, which means they do not reflect the construct correctly.

4.2 Reliability Test Results

The reliability test is carried out by calculating *the Cronbach's Alpha* value of each indicator on each variable that is declared valid. The AMC surveillance variable with *Close Circuit Television* (CCTV) (X) consists of 4 statement items and the *Apron Area Order* variable (Y) consists of 1 statement item. The test results are presented as follows:

Table 2. Reliability Test Results

Variabel	*Cronbach's Alpha*	*Composite Reliability*
X (Pengawasan AMC dengan CCTV)	**0.890**	**0.925**
Y (Ketertiban Area *Apron*)	**1.000**	**1.000**

The construct reliability test uses the reference of two statistical indicators, namely *Cronbach's Alpha* and *Composite Reliability* (CR).

According to Streiner (2010), a *construct* can be said to be reliable if it has *Cronbach's Alpha* or *Composite Reliability* values greater than 0.70.

4.3 Simple Linear Regression Results

A. Value of Determination Coefficient (*R Square*)

Table 3. R *Square*

Variabel	R *Square*	R *Square Adjusted*
Y (Ketertiban Area *Apron*)	0.414	0.393

Based on the table above, that variable Y (Order of *Apron* Area) has an influence of 0.414, this value means that 41.4% of variable Y (Order of *Apron* Area) is influenced by variable X (AMC Surveillance with CCTV) while the remaining 58.6% is influenced by other factors.

B. Path Coefficients

Table 4. Path Coefficients

	Original Sample (O)	T *Statistics* (|O/STDEV|)	P *Values*
X (Pengawasan AMC dengan CCTV) >> Y (Ketertiban Area *Apron*)	0.644	9.844	0.000

Based on the table above, the relationship between these variables has a path coefficient of 0.644 and a value of P = 0.000 which means that 64.4% of the AMC Surveillance variable with CCTV is directly and significantly influenced by the Apron Area Order variable. Thus, Hypothesis 1 (H1) is acceptable.

DISCUSSION

AMC (Apron Movement Control) surveillance with the help of CCTV systems has been proven to have a significant influence on the order of the apron area at Mutiara Sis Al-Jufri Palu Airport. Based on the results of the analysis, the path coefficient value was 0.644 with a T-statistic of 9.844 and a p-value of 0.000 ($p < 0.05$). These results show that the better the supervision using CCTV, the higher the level of operational order in the apron. These findings confirm that technology-based supervision systems are able to improve personnel compliance and create a more organized work environment. This is in line with the opinion of Fandi (2021) who states that the optimal use of CCTV can increase security while reducing the potential for procedural violations in vital work areas.

The application of CCTV in apron surveillance provides significant advantages because it is able to overcome the limitations of manual supervision. Cameras installed at strategic points allow AMC supervisors to monitor all activities in real-time, including vehicle movements, ground handling activities, and personnel compliance with operational standards. Thus, potential violations can be detected and followed up immediately. The results of this study show that the existence of CCTV not only functions as a documentation tool, but also as an effective control instrument to maintain operational discipline and order.

The research indicators show that one of the aspects with high scores is the ability of CCTV to detect violations, such as personnel who do not follow safety procedures. This confirms that the existence of CCTV is able to strengthen the traditional surveillance function which usually only relies on field inspections. These findings are in line with the results of previous research which showed that the use of CCTV in high-risk areas can reduce disciplinary actions and increase personnel awareness of the applicable rules. In other words, CCTV not only serves as an additional eye, but also

as a psychological factor that encourages workers to be more compliant with regulations.

Furthermore, the effectiveness of CCTV in supporting the order of the apron can be seen from its contribution in improving coordination between AMC units and field officers. Although the results of the study show that the coordination aspect is not fully optimal, the use of CCTV provides objective data that can be used as a basis for communication between supervisors and operators in the field. With visual evidence, coordination is easier because decisions can be made based on facts, not just oral reports. This directly impacts the operational effectiveness and environmental order of the apron.

In addition, CCTV-based supervision also has a positive impact in encouraging a culture of discipline among airport personnel. Ground handling personnel and apron officers tend to be more careful at work when they know that their activities are being monitored in real-time. This effect is known as the *deterrent effect*, which is the influence of supervision that makes individuals reluctant to commit violations because of the risk of being caught. Thus, the existence of CCTV indirectly increases compliance with SOPs and strengthens the safety culture at the airport.

The results of this study also reveal that the order of the apron area depends not only on individual factors, but also on the systematic arrangement reinforced by surveillance technology. CCTV helps create order by providing thorough monitoring, so that any potential violations can be immediately identified. The resulting order is not only the result of the instructions of the superior, but also of an integrated control system. Therefore, these results support the view that technology plays an important role in building safety and order governance in the air transportation environment.

However, the study also found that several surveillance indicators still need to be improved, especially in the aspect of coordination between CCTV operators and field officers. This shows that technology alone is not enough, but must be accompanied by increasing the capacity of human resources. CCTV can provide accurate data and information, but its effectiveness will depend on the extent to which the information can be responded to quickly and appropriately by officers. In other words, the technological and human factors must run in balance to achieve an optimal level of order.

If associated with modern supervision theory, the results of this study are in line with the concept *of management control system*, where supervision not only functions as a detection tool, but also as a control system to ensure that all activities are in accordance with organizational goals. AMC as the unit responsible for movements on the apron has proven to be helped by CCTV-based surveillance. This reinforces the view that successful surveillance in a complex environment such as an airport requires a combination of regulation, manual surveillance, and advanced technology support.

These findings also have important practical implications. First, airport management needs to expand the use of CCTV by adding installation points in areas prone to violations. Second, it is necessary to conduct intensive training for AMC operators to be able to make optimal use of CCTV technology, including in terms of recording analysis and decision-making based on visual data. Third,

coordination between CCTV operators and field officers must be strengthened through clear and fast communication procedures, so that any detected violations can be followed up immediately without posing a risk to flight safety.

Overall, the results of this study confirm that AMC surveillance with CCTV has a significant role in improving the order of the apron area. The influence shown through the path coefficient value of 0.644 shows that the relationship between variables is strong and real. This success cannot be separated from the function of CCTV as a surveillance instrument that is able to detect violations, strengthen coordination, and encourage a culture of discipline among personnel. Thus, it can be concluded that the optimization of technology-based supervision is a strategic step to maintain operational order at the airport while ensuring flight safety.

CONCLUSION

Based on the results of a study conducted on the effect of surveillance using Closed Circuit Television (CCTV) on the order of the apron area at the Mutiara Sis Al-Jufri Palu Main Class 1 Airport, it can be concluded that surveillance with CCTV has been proven to have a significant effect on improving order. This is shown through the results of simple linear regression analysis with a path coefficient value of 0.644, a T-statistic of 9.844, and a p-value of 0.000 ($p < 0.05$), so that the alternative hypothesis (H1) is accepted and the null hypothesis (H0) is rejected. These findings show that CCTV-based surveillance is able to support the performance of the Apron Movement Control (AMC) unit in maintaining the regularity of ground handling personnel, vehicles, and aircraft operations on the apron, so that their existence is an important factor in ensuring safety and smooth flights.

Based on the results of the research and the conclusions obtained, it is recommended that the airport management increase the effectiveness of CCTV surveillance through stronger synergy between AMC, ground handling, and airport security with routine evaluation of CCTV footage and strict follow-up on any violations. In addition, there is a need for continuous socialization and coaching regarding apron safety procedures for all personnel, accompanied by a reward system for those who are disciplined and the implementation of consistent sanctions for rule violators. With these steps, CCTV-based supervision is not only a monitoring tool, but also a means of forming a culture of discipline and sustainable work safety in the apron area.

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