

## THE RELATIONSHIP BETWEEN UNDERSTANDING LOCA CONTROL OF HAWK 100/200 AND AVIATION SAFETY AT AIRNAV PONTIANAK BRANCH

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### **Abstrak**

Bandar Udara International Supadio merupakan bandar udara enclave militer. Personel ATC diharuskan memahami setiap latihan yang dilakukan oleh pesawat Hawk. Tujuan dari penelitian ini adalah untuk mengetahui seberapa besar tingkat hubungan dan besaran kontribusi pemahaman LOCA koordinasi dan pemanduan HAWK 100/200 terhadap keselamatan penerbangan. Dalam mengukur pemahaman ATC tentang LOCA, peneliti menggunakan uji benar-salah. Pengambilan sampel dengan non probability sampling (seluruh personel ATC berjumlah 37 orang). Disimpulkan bahwa keselamatan penerbangan berada pada level sedang dengan koefisien korelasi spearman rank sebesar 0.5433. Pemahaman ATC terhadap LOCA berkontribusi terhadap Keselamatan Penerbangan sebesar 29.5%.

**Kata Kunci :** ATC; keselamatan penerbangan; aktifitas penerbangan militer

### **Abstract**

*Supadio International Airport is a military enclave airport. ATC personnel are required to understand every exercise that will be carried out by the Hawk aircraft. The purpose of this study is to determine the level of relationship and the amount of contribution that the understanding of LOCA coordination and guidance on the HAWK 100/200 has made to aviation safety. In measuring ATC's understanding of LOCA, researchers used a true-false test. Sampling the non-probability side (all ATC personnel, totaling 37 people). It can be concluded that aviation safety is at moderate level, with a Spearman rank correlation coefficient of 0.5433. ATC's understanding of the LOCA contributed to Aviation Safety by 29.5%.*

**Keywords:** ATC; Aviation Safety; Military Aviation Activity

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## **INTRODUCTION**

Supadio International Airport, located in Pontianak City, West Kalimantan, is a military enclave airport that serves military aviation under the command of the Indonesian National Air Force (TNI AU), Supadio Air Base. Lestari et al. (2020) stated that Military Enclave Airport is a military aviation activity that utilizes civilian airport facilities. This is also regulated in Undang-Undang No.1 Tahun 2009 concerning

Aviation, which specifies that the Joint Use of Airports and Air Bases must pay attention to one of them: the safety and security of the flight (Indonesia, 2009). Civil-military cooperation, as referred to in paragraph (1), aims to ensure Aviation Safety by giving priority to Military Aircraft in carrying out sovereignty enforcement, law enforcement, military operations and exercises (PP No.4/2018, 2018).

Supadio International Airport has a 1<sup>st</sup> Squadron of the 7<sup>th</sup> Air Wing Supadio Air Base, a military base with Hawk 100/200 aircraft that routinely carries out exercises under the guidance of the Pontianak Approach Control Unit and the Supadio Aerodrome Control Tower. LOCA Koordinasi Dan Pengendalian Lalu Lintas Udara Pesawat Tempur Hawk 100/200 Skadron Udara 1 Wing Udara 7 Lanud Supadio Di Bandara Supadio Pontianak (2017), stated there are various military aviation activities that the 1<sup>st</sup> Squadron of the 7<sup>th</sup> Air Wing typically performs, including formation take-off, area exercises (training area, box route, over the field), scramble/response alert, night flight, air refuel, practice force landing (PFL), force down, low approach, tactical recovery and visual recovery.

With the simultaneous activities of civil aviation and military aviation exercises, ATC is required to understand every type of exercise and movement of military aircraft operating during operating hours. Co-ordination between the responsible military authorities and the appropriate ATS authorities is essential to the safety of civil aircraft operations whenever activities potentially hazardous to such operations are planned and conducted by any military units (ICAO, 1990). Then the LOCA, which concerns guidance and coordination, must be truly mastered and understood by the ATC. Adhani & Rupa (2020) stated that conceptual understanding is the ability to explain a situation in different words and be able to infer or draw conclusions from tables, data, graphics and so on. ATC's understanding of LOCA Coordination and Control of Air Traffic for Hawk 100/200 of the 1<sup>st</sup> Squadron of Air Wing 7 at Supadio Air Base is very important in maintaining aviation safety at Supadio Airport and in the airspace managed by Perum LPPNPI Pontianak.

An air traffic controller performs guiding services to controlled aircraft and is contained in Annex 11: Air Traffic Services, which outlines the objectives of the air traffic services and places much emphasis on aviation safety (ICAO, 2016). Aviation safety is the state of meeting safety requirements in the use of airspace, aircraft, airports, air transportation, and air navigation, as well as supporting facilities and other public facilities, as well as the fulfillment of aviation safety procedures such as Letters of Agreement (LOA) (Puspandari et al., 2018). DOC 9426, Part 4, Chapter 2, stated that the form of coordination agreement between the Aviation Traffic Service units or between the Aviation Traffic Service units and other authorities is letter of agreement or memorandum of understanding. The Letters of Agreement (LOA) are periodically reviewed, if necessary, updated to ensure compliance with current operational requirements and policies (ICAO, 1984).

Safety is defined as a condition where the risk of injury to a person or the risk of damage to something has been reduced and maintained at a predetermined level or at a lower level by identifying hazards and risk management processes on an ongoing basis (Melissa et al., 2017). Hazard is an intrinsic factor inherent in something in the form of goods or conditions that has the potential to have an effect on human safety and the environment on an ongoing and have a negative impact. Risk is an accumulation of potential hazards, the consequences they cause, the duration of exposure and the probability they cause (Eko Poerwanto & Mauudzoh, 2016). In terms of aviation safety, breakdown in separation and coordination result in accidents and incidents that become safety indicators (Putu Krisna Surya Wardana et al., 2021). Agustini (2012) stated that BOS (breakdown of separation) is an event in the process of guiding aviation traffic that results in separation less than the minimum standard specified for each service classification, and BOC (breakdown of coordination) is an event in the process of guiding aviation traffic where the coordination procedure between ATS units concerned is not carried out according to the established coordination procedures.

According to the Safety Management Manual by ICAO (2012), the SHELL Model Theory is a concept developed by Professor Elwyn Edwards in 1972 from an old system called the Men-Machine-Environment System and modified into a diagram model to display signs of relationships. Then, in 1987, Frank Hawkins again developed a model made by Elwyn Edwards, now known as the widely accepted SHELL model. In 1992, the International Civil Aviation Organization (ICAO) established and suggested the use of the Human Factors Analysis Framework in the aviation industry, which is divided into 4 main factors according to the concepts and theories of the SHELL Model as follows and divided based on their relationships, one of which is liveware (software). According to Hawkins and Frank H (2017), liveware (software) covers non-physical aspects of the system such as procedures, manual layouts and checklists, symbology and, increasingly, computer programs.

In the research of Aswia et al. (2022), which collects data from KNKT, it is revealed that the main causes of latent failures in accidents and serious incidents in 2015-2019 using the SHELL model approach were a mismatch between liveware (software) in as many as 31% or 11 events. To be able to achieve safe aviation operations, it is important to ensure that the software (standard operating regulations and procedures) is truly capable of being implemented by liveware (humans), especially when it comes to standard operating rules, agreements, and procedures that have been agreed upon in advance by relevant parties. According to the findings of a study conducted by Charoensook (2019), ATC Phuket has a favorable opinion on liveware (software) in all aspects.

Maulana & Setijono (2018) stated that in practical activities, operators are required to understand the procedures and know the procedures before and after carrying out the practice properly and correctly. Standard Operating Procedures (SOPs) themselves are very important as they standardize the way operators complete work procedures and minimize the occurrence of errors and accidents in practice. Adequate standards of procedures and regulations are important but not sufficient to achieve high safety performance in the absence of compliance and responsibility

demonstrated by aviation personnel and organizations. Safety will be achieved if compliance with regulatory standards, documentation and procedures is deemed mandatory (Menteri Perhubungan Republik Indonesia, 2010).

The purpose of this study is to find out how big the breakdown of separation (BOS) and the breakdown of coordination (BOC) are, to find out the incidents and accidents when 1<sup>st</sup> Squadron conducts the exercise, to find out how big the level of relationship and the amount of contribution of understanding LOCA coordination and guidance of Hawk 100/200 to aviation safety is in serving civil aviation in conjunction with military aviation training activities at International Airports Supadio.

## **METHOD**

### **Understanding of LOCA Hawk Control (Variable X)**

Sugiyono (2012) emphasized that testing is an instrument used in measuring understanding and learning achievement. However, before measuring understanding, what must be considered is that the instrument test that has been prepared has the validity of the content and is arranged based on the material that has been taught or socialized before. Sugiyono also stated that in measuring and compiling learning achievement instruments and understanding of an individual, it is first ensured that research instruments have content validity and must be compiled based on teaching materials that have been previously distributed. In this study, what is stated as variable X is the understanding of LOCA controlling Hawk 100/200 aircraft personnel at ATC Pontianak.

The variable's research instrument is a test instrument in the form of a written true or false question (true-false test) to determine ATC's understanding of LOCA guiding and coordination Hawk 100/200. This test has two answer choices, namely the letter B, which means true and the letter S, which means the statement is false. The correct answer is given a value of 1, and the wrong answer is given a value of 0. The task of the sample is to determine whether the statement is true or false.

The indicators used in measuring ATC's understanding of LOCA are adapted from Civil Aviation Safety Regulation Part 69 about License by Direktorat Jenderal Perhubungan Udara (2015), where in performance checks in the form of theoretical tests, what is expected is that ATC masters the material in SOPs such as aerodrome layout, airspace structure, arrangements, procedures, and sources of information used; flight navigation facilities; terrain and prominent landmarks; flight traffic characteristics; weather phenomena; emergency plans and rescue plans; ATS surveillance systems and other equipment used; plus the type of exercises performed by Hawk aviators in routine exercises in accordance with the LOCA.

### **Aviation Safety (Variable Y)**

In this study, what is stated as variable Y is aviation safety, and flight safety indicators are breakdown of separation and breakdown of coordination. To obtain flight safety data, secondary data in the form of BOS and BOC history is needed, which are recorded and have occurred in the LPPNPI Perum Pontianak Branch.

### **Population and Sample**

The population as a whole is target to be studied for its characteristics. If, the population is too large, however, care must be taken to draw samples that are still part of that population to be studied. The population in this study was 37 people, including all air traffic controller (ATC) employees in the Aerodrome Control Tower and Approach Control Units who had licenses and ratings at the Perum LPPNPI Pontianak Branch. A sample is a unit in a population that has been selected by a certain sampling technique and is considered to describe the characteristics of its population (Abdullah, 2015). In this study, researchers used a non-probability sampling method totaling 37 people, equal to the total population of 37 ATC personnel in Pontinak.

### **Collecting Data Methods**

#### ***Primary Data (X)***

When measuring and compiling learning achievement instruments and understanding of an individual, it is first ensured that research instruments have

content validity and are compiled based on previously disseminated teaching materials (Sugiyono, 2012). To find out ATC's understanding of LOCA controlling Hawk 100/200 in Pontianak, the researcher used a test as an instrument in this study. The test in question is the true-false test. This method is used because the detailed explanation of the material and test to find out the extent to which ATC Pontianak mastered the LOCA have not been implemented since the LOCA was agreed upon precisely in 2017. The test will display the statement by giving two preferred answers: the letter T, which indicates that the statement is true, and the letter F, which indicates that the statement is false. Correct answers will be given a score of 1, and incorrect answers will be given a score of 0. The test taker will determine whether the statements surrounding LOCA submitted by the author are true or false.

### ***Secondary Data (Y)***

The secondary data obtained was in the form of the number of ATC Perum LPPNPI Pontianak personnel, totaling 37 people. Then, the secondary data in the form of breakdown of separation, breakdown of coordination, incident and accident data related to Hawk 100/200 aircraft guidance services that are not in accordance with the LOCA that occurred during the time period determined from the LOCA to be implemented is also required.

### **Data Processing**

### **Validity Test**

Hardani et al. (2020) stated that validity is a degree of accuracy between the data that occurs in the object of study and the data that can be reported by the researcher. Thus, valid data is "no different" form the data reported by the researcher and the data that actually occurs in the object of study. Before forwarding to respondents, construction validation was tested by a designated expert based on empirical experience in the field.

After receiving a response from the respondent, the data will be tabulated and tested for validity again. In validity testing, the total score obtained by the respondent will be correlated with the scores on each question item. Thus, it will be known which

items are valid based on the acquisition of the validity index of each item. Instruments whose variables have been measured using measuring instruments with a ratio scale are instruments that have been tested and do not need to be tested for validity and reliability, unless the instrument used is damaged or fake. In the event of damage or forgery, it is necessary to first retest its validity and reliability (Sugiyono, 2012).

## **Data Analysis Methods**

### ***Reliability***

Test A test can be said to be reliable if it can give a fixed result for a certain period of time. Kurniawan & Puspitaningtyas (2016) stated that an instrument is said to have a high reliability value if the test made has consistent results in measuring what is to be measured. In this study, researchers used an internal consistency reliability approach that used Cronbach Alpha to look at how good the relationship between the points of the research instrument was. If the Cronbach Alpha result is approximately 0.70 (the reference value), then the instrument item is declared reliable. However, if the Cronbach Alpha result is less than 0.70, the instrument item is declared unreliable.

### **Correlation Test**

In determining and testing the correlation between one independent variable and one dependent variable, the author uses the Spearman Rank Correlation test. Spearman enters into nonparametric statistics, where this statistic does not require normally distributed population data, so it is not required to test the normality of the data. Spearman also provides tests to measure relationships such as the correlation coefficient of rank sequences, which is measured at the ordinal or interval level (Kurniawan & Puspitaningtyas, 2016).

Researchers chose Spearman Rank Correlation because the data obtained through the Guttman scale and form were ordinal data. the hypothesis of this study is the associative hypothesis. To find out the level of relationship between variables, the results of the spearman rank correlation coefficient are interpreted in the correlation coefficient interpretation table (Sugiyono, 2012).



**Table 1. Guidelines Provide Interpretation of the Correlation Coefficient**

Correlation Value ( $\rho$ )	Relationship Level
0,00 – 0,199	Very Weak
0,20 – 0,399	Weak
0,40 – 0,599	Moderate
0,60 – 0,799	Strong
0,80 – 0,100	Very Strong

### ***Significance Test***

The researchers used a one-sided test, one-tailed test with a confidence interval ( $\alpha$ ) of 0.05 or 5%. For spearman rank decision making with a sample of more than 30, it is necessary to make adjustments to z-table. Drawing conclusions on the hypothesis can be done when the calculated z value is compared to the z-table.

### ***Determination***

In statistics that look for the relationship of one variable to another, they are used by calculating the coefficient of determination. The coefficient of determination (determinant) is expressed in percent by squaring the correlation coefficient multiplied by one hundred percent.

## **RESULTS AND DISCUSSIONS**

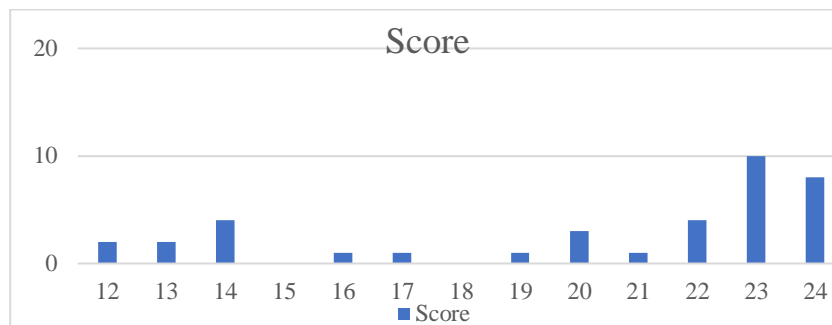
### **Validity Test**

Data obtained from 25 question items from 37 samples was tested for validity using Microsoft Excel 2019. To determine its validity, compare r count and r table. It states that it is valid if r counts greater than the table's r. If the significance rate used is 5%, then the r of the table for the sample is  $df = N-2$ , which is 0.325. From all of the 25 instrument items, one item was found to be invalid because the value of the calculated r was smaller than the r table (the 13th item with calculated  $r = 0.042$  while the r table was 0.325). So, it can be concluded that one of the instrument items cannot be used. Data processing will continue by not involving the invalid item.

### **LOCA Comprehension Test Results (X)**

The distribution of test questions was carried out using a Google Form containing 25 questions with two answer choices. Because in the validity test there is one invalid

question item, the measurement is 24 questions that have been tested for validity. The respondent's task is to determine whether the statements that have been presented are true or false in accordance with the respondent's understanding of the LOCA. The maximum score that respondents can get is 24, and the minimum score is 0. The total score of 37 respondents in understanding the LOCA of coordination and guidance of Hawk 100/200 fighters (Variable X) is as follows:



**Figure 1.** Respondent Score

From all the points of the question above, it can be concluded that the highest score obtained by the respondent is 24 and the lowest value is 12. An ATC should ideally pass the theory exam with a score of at least 70% (Airnav Indonesia, 2019).

### Aviation Safety (Y)

The data for the aviation safety variable was obtained by the author directly from the Perum LPPNPI Pontianak Branch, so it can be said that the data of the variable Y is secondary data. The following is aviation safety data, including data on the number of breakdowns of separation, breakdown of coordination, accidents, and incidents that have occurred between traffic hawks 100/200 and civil aircraft in the period when the LOCA is effective from 2017 to 2022.

**Tabel 2.** Quantity of BOC and BOS

Year	BOC	BOS
2017	0	0
2018	0	0
2019	0	0
2020	0	1
2021	0	0
2022	0	0

Based on the table data above, it is recorded that there has never been a breakdown in coordination involving Hawk 100/200 traffic with civil aircraft belonging to airlines in Pontianak. However, a one-time separation breakdown involving Hawk 100/200 traffic with civil aircraft owned by airlines in Pontianak was recorded in 2020.

## Reliability Test

In testing the reliability of the data, the researchers used Cronbach's Alpha ( $\alpha$ ). Before testing the reliability of the instrument item, the researcher first did not include the invalid question item. Instrument item reliability testing involves 24 instrument items that have been tested for validity.

**Table 3. Reliability Test Table**

Assessment Criteria		
Reference Value	The Value of Cronbach's Alpha	Conclusion
0.7	0.863599464	Reliable

Reliability test results from Variable X. Because  $0.859 > 0.7$ , variable X data is reliable.

## Correlation Test

In this correlation test, researchers used Spearman Rank correlation. The result of the calculation of the correlation coefficient between understanding the LOCA (X) and aviation safety (Y) is 0.5433.

Furthermore, if we compare Table 1 with the correlation value to determine the level of relationship is possessed from the results of the spearman rank correlation with the acquisition of  $\rho = 0.5433$ , the level of the relationship is moderate.

## Significance Test

Because the correlation coefficient is known and the number of samples is greater than 30, in order to make decision based on the hypothesis, the researcher needs to know the magnitude of the z count. Researcher calculate z manually and get a result of 3.26. After getting the calculated z value, the next step is to determine the z table on the Spearman Rank correlation test with a sample of more than 30. Z tables are determined by one-sided (one-tailed) test with the confidence interval ( $\alpha$ ) of 0.05 or 5%. Of the values closest to 0.05, one is 0.05050. By using the Z Table, draw the line to the left so that it meets the value  $1.60 + 0.04 = 1.64$ . The left limit of decision-making with a curve is  $-1.64$ ; its right limit is  $+1.64$ . Based on the description before, then at the right border of  $+3.26 > +1.64$  (z count > z table) and the left limit  $-3.26 < -1.64$  (Z count < Z table).

It means there is a positive relationship between the ATC's understanding of LOCA control of Hawk 100/200 and aviation safety. So in conclusion, the correlation

coefficient of 0.5433 between the ATC's understanding of LOCA control of hawk 100/200 aircraft and aviation safety is significant, meaning that the correlation coefficient can be generalized.

### **Determination Test**

To be able to see how much the contribution of the understanding LOCA of Hawk 100/200 variable to aviation safety can be calculated, squaring the spearman correlation coefficient of 0.5433 multiplied by 100% results in a coefficient of determination of 29.5%. Thus, the understanding of LOCA Hawk 100/200 contributes 29.5% to aviation safety. Meanwhile, 70.5% was influenced by other variables that were not described in this study.

### **CONCLUSION**

Throughout 2017 to 2022, when this LOCA began to be implemented, there was one breakdown of separation that occurred in 2020 between Hawk 100 and Boeing 737-800 aircraft. The efficiency of the correlation variable between understanding the LOCA of Hawk 100/200 (X) and the aviation safety variable (Y) was 0.5433. This indicates a positive correlation and a moderate level of relationship between the variables.

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