



# Controlling Air Side Birds to Maintain Safe Flight Operations at Yogyakarta International Airport

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**Abstract:** The airside is a vital object of an airport because the airside area is a high-risk area that should be free from threats such as birds and wild animals. But the real situation is still found flocks of birds that are often on the air side, which is very dangerous if the bird enters the aircraft engine can cause an incident that can harm the airport. This research uses a qualitative descriptive research method by referring to the SKEP/42/III/2010 regulation concerning "Guidelines and Procedures for Civil Aviation Safety Regulations Part 139-03 Management of Wild Animal Hazards at Airports and Their Surroundings" and KM 20 of 2009 concerning the Safety Management System. In collecting data using observation, literature study and interview methods. The method used to test the validity of the data is the credibility test which in the credibility test is carried out by extending observation, increasing accuracy, and triangulating sources, techniques and time [1]. In previous research, it was mentioned that controlling birds and wild animals is very necessary because if this continues to be allowed and does not get special attention, birdstrikes or animal attacks on aircraft can occur. By making short-term and long-term handling solutions so that the risk of aircraft damage due to birds crashing or entering the aircraft engine can be prevented. This research shows that the control and supervision of bird flocks affect flight safety. The results of this study are expected to be a recommendation in optimizing the control and supervision of bird flocks on the air side of Yogyakarta International Airport so that flight safety on the air side of Yogyakarta International Airport can be created.

**Keywords:** *Wildlife, Safety, Control*

## 1 Introduction

As one of the largest maritime countries in the world whose territory is in a very large sea area and has many islands. Indonesia really needs air transportation to facilitate community mobility in terms of economic development, tourism development and strengthen national unity. Yogyakarta International Airport - Yogyakarta is one of the airports managed and under the management of PT Angkasa Pura 1 (Persero), as one of the airports that has a large capacity to accommodate domestic passengers and foreign passengers, Yogyakarta International Airport has always experienced an increase in passengers from within or

outside the country. The number of flights in one day in 2023 reached eighty-six domestic flights and eight international flights. The current situation on the airside of Yogyakarta International Airport can be seen in the presence of grass or plants in the air strip area which reaches more than 30 cm in height. The growth of grass or plants in the air strip area can invite groups of birds to stop in the area because the place has a lot of food from the flock of birds themselves, including: worms, caterpillars, insects, and seeds which are abundant in the water strip area. Birds visit the grass or bushes also because the water strip area can be used as a good breeding ground, because the area has many food sources for the birds themselves.

Birds that feed in the air strip area are generally the type of birds that feed in groups, which can endanger the movement of aircraft in the runaway zone and taxiway zone because it can cause birdstrike incidents or bird attacks on aircraft. Therefore, it is necessary to manage and control the height of grass in the air strip zone [2], where SKEP / 42 / III / 2010 Article 3 and KM 20 Year 2009 control the matter.

Usually flocks of birds come to the airside area in the morning and evening, the arrival of this flock of birds in the morning is at 08.00 WIB until 10.00 WIB while in the afternoon this group of birds comes at 15.00 WIB until 16.00 WIB. The data obtained by the author is the result of observations when conducting On The Job Training activities in the Cargo, Apron Movement Control, and Avsec units. The presence of flocks of birds that usually feed in the airside area comes from the Ngentak mangrove forest which is approximately 5 to 10 km west of Yogyakarta International Airport.

In the period from January 2022 to January 2023 there have been 3 birdstrike incidents, for this reason it is necessary to take special measures and attention so that birdstrike incidents do not occur again which can cause aircraft accidents in the initial climb, approach and landing phases. In previous research, it was mentioned that controlling wild birds and animals is very necessary because if this continues to be allowed and does not get special attention, birdstrike incidents or animal attacks on aircraft can occur.

By making short-term and long-term handling solutions so that the risk of aircraft damage due to birds crashing or entering the aircraft engine can be prevented.

## **2 Research Methods**

In this The definition of research method according to [3] is a step owned and carried out by researchers in order to collect information or data and investigate the data that has been obtained. The research method provides a description of the research design which includes, among others: procedures and steps that must be taken, research time, data sources, and by what steps the data is obtained and then processed and analyzed.

### **2.1 Research Design**

The research design that the author took in writing this final project used a qualitative method with a descriptive approach. Research through a descriptive qualitative approach is part of the decision-making process, namely to compare an event, activity, product with a predetermined program standard that serves to explain a phenomenon [4].

This research was conducted to find out about the role of the AMC unit in controlling bird flocks on the air side of Yogyakarta International Airport. In connection with this, the implementation of this research will use a descriptive qualitative research approach, which is carried out through observation, questionnaires, and library studies.

### **2.2 Research Object**

According to [5] states that, the object of research is an attribute or trait or value of people, objects or activities that have certain variations set by researchers to study to study and then draw conclusions. In this study the authors took the research objects:

- a) Flocks of birds on the air side of Yogyakarta International Airport and;
- b) Flight safety at Yogyakarta International Airport.

### **2.3 Data Collection**

The data collection method is a statement about, nature, circumstances, certain activities and the like. Data collection is done to obtain the information needed in order to achieve research objectives [6] The author's data collection method aims to make it easier for the author to collect data on bird flock control on the airside of Yogyakarta International Airport, therefore the author uses the following data collection methods.

## 1. Observation

Observation in the Big Indonesian Dictionary means careful observation or review. According to [7]"Observation is a way to collect research data by having a naturalistic nature that takes place in a natural context, the culprit participates naturally in the interaction."

The purpose of observation is to describe the setting being studied, the activities taking place, the people involved in the activities, and the meaning of events seen from the perspective of those seen in the observed events. In this case the author made observations at PT Angkasa Pura I (Persero) Yogyakarta International Airport when the author carried out On the Job Training (OJT) activities on September 26, 2022 to February 2, 2023.

## 2. Literature Study

Literature study is a data collection technique by conducting a study of books, literature, records, and reports that have to do with the problem being solved [8].

The literature research attempted by the author includes rules and requirements for reviewing things that are thought to cause problems to arise, guidelines and references regarding interpretations in the discussion of problems, listed explanations of the title of the problem raised along with some comments from experts edited from various sources. In this research, literature study is used to solve the problem of controlling airside bird flocks to maintain flight safety at Yogyakarta International Airport.

## 3. Documentation

Documentation according to [9] is a method of collecting data and information in the form of books, archives, documents, written figures and images in the form of reports and information that support research. Documentation [10] is needed to collect data which will then be analyzed. With this method, researchers collect data from existing documents, so as to obtain records related to research such as: an overview of the airport, conditions related to handling wildlife, records, and so on.

## 4. Data analysis technique

The writing method in this Final Project is descriptive qualitative. Qualitative research methods are used for research with natural objects, and researchers are the key instruments of the study. Data collection techniques from qualitative methods are triangulated, data analysis is inductive, and emphasizes meaning over generalization [11]. According to [12] qualitative research methods produce descriptive data in the form of spoken words from people whose behavior can be observed by researchers. After obtaining data related to the research, the next step taken is to analyze the data obtained which is done after data from all respondents has been collected.

The technique used by the author in this qualitative analysis has three stages, namely data reduction, data presentation and conclusion drawing and verification, among others: data display, data reduction, and conclusions and verifications [13].

## 5. Data validity

Basically, the examination of data validity, apart from being used to refute the accusations against qualitative research that say it is not scientific, is also an inseparable element of the body of qualitative research knowledge [12]. Data validity is carried out to prove whether the research conducted is truly scientific research as well as to test the data obtained.

Data validity tests in qualitative research include credibility, transferability, dependability, and confirmability tests [14]. In order for data in qualitative research to be accounted for as scientific research, it is necessary to test the validity of the data. The data validity test that can be carried out is as follows:

### a. Extension of Observation

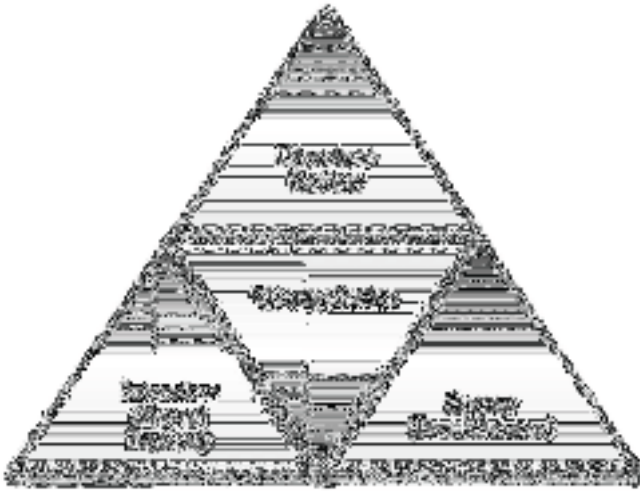
In collecting data, observations are carried out in the field to ensure that the incident occurs.

### b. Increase accuracy in research

In order to check the certainty of the data and the sequence of events can be recorded, it is necessary to be careful in managing and sorting the data. Data correctness is done by tracing data from several other sources.

### c. Triangulation

Triangulation is one of the approaches taken by researchers to explore and perform qualitative data processing techniques. The triangulation technique can be likened to a data validity checking technique by comparing the results of interviews with research objects [1].



**Figure 1** *Triangulation Chart*

### **3 Findings And Discussion**

In the research the author will discuss efforts to control and expel flocks of birds that are often on the air side of Yogyakarta International Airport to improve flight safety. In order to support the smooth movement of aircraft and flight operations on the air side of Yogyakarta International Airport, prevention and mitigation procedures that must be carried out to control and expel flocks of birds that are often on the air side of Yogyakarta International Airport by coordinating with related units such as the Apron Movement Control unit and the Safety Management System which handles problems about this bird flock.

#### **a) Conditions at Yogyakarta Internasional Airport**

Yogyakarta International Airport is located in an area adjacent to nature and residential areas where the location of the airport is bordered by the sea and hills and around it is bordered by settlements and plantations owned by residents, the Yogyakarta International

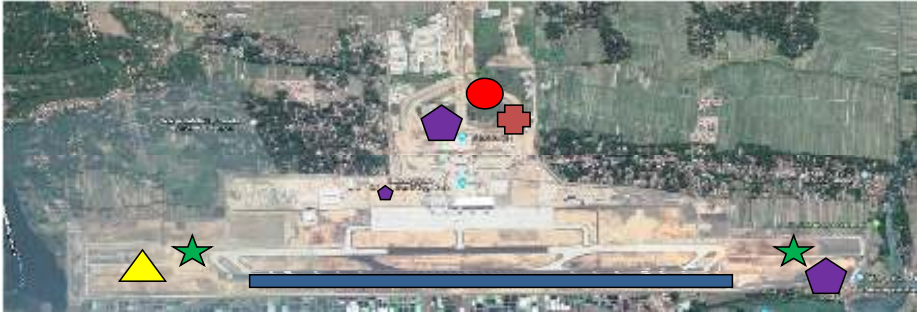
Airport airside area is built right next to the shoreline of Gelagah beach and Congot beach.

Then it is directly adjacent to the Bogowonto river estuary and the Kali Progo river estuary, besides that the area around Yogyakarta International Airport is found in many rice fields, plantations and residential areas. Yogyakarta International Airport stands on an area of 583,000 m<sup>2</sup> with a terminal area of 219,000 m<sup>2</sup>, Apron 1051 x 167 m<sup>2</sup> and has a runway of 3,250 m and a runway width of 75 m.

#### **b) Flock Activity and Risk of Birdstrike Incident**

Based on data and observations made from September 2022 to February 2023, where observations of the number and types of bird flocks were made, 6 bird species were found to frequent the airside area of Yogyakarta International Airport.

Yogyakarta International Airport is directly adjacent to the congot and gelagah shoreline then adjacent to the Bogowonto river estuary and Kali Progo river estuary besides that around Yogyakarta International Airport there are many rice fields, plantations and residential areas, in monitoring can be divided into 4 bird distribution zones based on habitat or environmental conditions, namely zones A, B, C and D. Zone A covers the landside area which consists of the western area of Mount Lanang and the western side of Bale Kambang. Zone B covers the airside area which includes runway 29, the western airstrip and the fire station. Zone C covers the airside area which includes runway 11 and the east side airstrip area. Zone D covers the landside which consists of the eastern balekambang area. From the results of observations and observations in each zone there are still many flocks of birds, but the most flocks of birds are found in zone B and zone C which is the airside area. flocks of birds usually come from the Bogowonto river estuary area, Progo river estuary and Ngentak village mangrove forest.



**Figure 2** Bird Distribution Map at Yogyakarta Internasional Airport by Species

A map of the distribution and species of birds in the Yogyakarta International Airport area. Bird flocks are most abundant in the airside area, especially on the airstrip side of Yogyakarta International Airport. In the airside area, four types of bird flocks are often seen, namely small egrets, cabak birds, kirik kirik birds and perkutut birds, which when carrying out patrols these four types of birds are often found in the airside area of Yogyakarta International Airport. For the types of birds that are in the landside area, they are usually found in the Bale Kambang area because in that area there is a large rainwater collection pond, when carrying out patrols, flocks of buffalo egrets are often seen, and also ash egrets can sometimes also be found in groups of small egrets and parrots in the area.

There are six species of birds: buffalo egret, little egret, kirik-kirik, cabak and ash egret. The arrival of these birds is due to the availability of food sources and a comfortable habitat in the airside area. The many food sources of these birds are because the grass in the airside area exceeds the specified limit of 20 cm in height so that worms and insects breed a lot, then in the airstrip area there are many weeds and tree branches so that insects, worms and also rats are easily visible to birds which are the main food of birds. In addition, in the airside area there is a rainwater catchment ditch which is a perfect habitat for flocks of birds.

Based on this, it can be concluded that bird flocks often feed and breed on the airside of Yogyakarta International Airport because the



airside of the airport is very supportive of bird flocks to migrate to the airside area of Yogyakarta International Airport, in order to make new homes or look for their main food such as seeds, insects, worms and rats. The arrival of this flock of birds in the airport area is due to the geographical location of Yogyakarta International Airport close to river estuaries, rice fields, plantations and shorelines as well as residential areas around Yogyakarta International Airport. The presence of food sources such as seeds, insects, worms and other small animals, as well as the availability of good breeding places can encourage bird flocks to enter the airport area, especially the airside area. These factors can also affect the behavior of bird flocks at Yogyakarta International Airport such as the presence of food, predators, human disturbance, weather and other factors.

### **c) Bird Flock Routes and Movement Directions**

Based on observations and existing data, it is agreed that there may be an increase in the number of bird flocks entering the Yogyakarta International Airport area. This is evidenced by the map of the movement routes of bird flocks coming and going to Yogyakarta International Airport.

direction of bird movement from or going to Yogyakarta International Airport. The direction of movement of bird flocks in the morning came from the west, namely the mangrove forest of Ngentak village heading east towards Yogyakarta International Airport at 08.00 - 10.00, then the flock of birds moved back west to the Bogowonto river estuary at 10.00 - 12.00. at 15.00 - 16.00 the flock of birds moved back east from the Bogowonto river estuary to Yogyakarta International Airport and at 17.00 - 18.00 the flock of birds moved back west towards the mangrove forest of Ngentak village.

### **d) Birdstrike Incident that Occurred at Yogyakarta International Airport**

there is a very drastic increase from 2021 and 2022, from the data above illustrates the movement of aircraft in the last 6 months in 2022 and its comparison in 2021. In July 2021 it only reached 408 while in July 2022 it reached 1866, in August 2021 the aircraft movement was 439 and while in August 2022 it increased to 1786, in September 2021 the aircraft movement was 638 then in September 2022 it increased to

1726, in October 2021 the aircraft movement began to increase by 918 movements then in October 2022 it increased again to 2021 aircraft movements.

In November 2021 aircraft movements increased by 1074 and in November 2022 increased to 2277 movements, in December 2021 it increased again to 1318 movements and the peak occurred in December 2022 where aircraft movements increased to 2476 aircraft movements. The total aircraft movements in July - August in 2021 were 4769 aircraft and in 2022 were 12,148 aircraft. So it can be concluded that aircraft movements at Yogyakarta International Airport experienced a very significant increase from 2021 to 2022.

**Table 1.** Birdstrike Occurrence Data in 2022 and 2023

Date of incident	Type Aircraft	Aircraft Registration	Route
January 15, 2022	Airbus A320	PK-GLW	BPN-YIA
June 16, 2022	Airbus A340-300	16 02	FRA – YIA
January 29, 2023	Airbus A320	AK-349	YIA – KUL



**Figure 3** *Birdstrike Incident at German Presidential Plane*



**Figure 4** *Birdstrike Incident at Citylink Airplane*



**Figure 5** *Birdstrike Incident at Airasia Airplane*

On January 15, 2022 there was a birdstrike incident or bird attack on an aircraft, involving citilink airline with flight number PK-GLW on

a flight route from Balikpapan to Yogyakarta. The type of aircraft that experienced this birdstrike incident was the Airbus A320 type owned by Citilink Airlines, in this report submitted by Citilink Airlines to the General Manager of Yogyakarta International Airport that Citilink Airlines requested mitigation and prevention efforts against this incident so that flight safety at Yogyakarta International Airport could be achieved and did not cause losses from various parties. From this incident there were no casualties, only blood spots on the cockpit window of the aircraft.

On June 16, 2022 there was another Birdstrike incident or bird attack on aircraft, where this incident involved the presidential aircraft of the German state where the type of presidential aircraft is the type of Airbus A340-300 which carries out official flights from Germany to Indonesia which the meeting of the two countries occurred in the city of Yogyakarta, so that the German presidential aircraft landed at Yogyakarta International Airport. The chronology of the incident the pilot of GAF901 made contact with ATC Yogyakarta International Airport that he had hit a bird when landing, then after landing the team from AMC, Safety and PT JAS checked the aircraft and found blood spots under the FO Window and found a bird carcass in the touchdown area of runway 11 then continued with technicians from the German presidential aircraft who checked the Presidential aircraft. No damage was found to the aircraft but the Yogyakarta International Airport received a stern warning to mitigate and control the flocks of birds at Yogyakarta International Airport.

January 29, 2023 there was another birdstrike incident which involved Airasia airline with Airbus A320 aircraft type with flight number 9MAHY on the Kuala Lumpur - Yogyakarta route, this incident occurred when the plane belonging to Airasia airline was about to take off from Yogyakarta International Airport to Kuala Lumpur Malaysia, the pilot of this aircraft made contact with ATC because he felt he hit a bird during take-off, then a team from the AMC, Safety and PKP units traced and inspected the runway and

found a bird on runway 11.

## **Bird Flock Control Efforts on the Airside of Yogyakarta International Airport**

The responsibility and task of controlling and monitoring bird flocks on the airside of Yogyakarta International Airport is the task of the apron movement control unit, safety management system and aviation firefighting. Specifically tasked to identify the potential danger of bird attacks on aircraft or also called birdstrike, implement bird and wild animal habitat management, record bird surveillance and coordination between related units. These tasks should be carried out with complete guidelines of applicable regulations and rules. In the actual situation, the author found several things that were not in accordance with the applicable regulations and regulations so that the author compared the existing situation and the situation in accordance with the SKEP 43/III/2010 and KM 20/2009 regulations. The author has mapped the results of the gap analysis of field conditions in accordance with applicable regulations:

**Table 2** *Gap Analysis*

Source	Ideal condition	The real situation
SKEP / 42 / III / 2010 (On Instructions and Procedures for Safety Regulations) Civil Aviation Safety Regulations Part 139 - 03 Management of Wild Animal Hazards at Airports and Their Surroundings)	Chapter 2 Article 3 C states that: Minimize or eliminate the causes of the entry of birds and wild animals, by clearing shrubs, limiting the height of grass, covering drainage, and arranging for the disposal of food waste	The actual situation is that the height of the grass in the airside area, especially those in the airstrip area, exceeds the predetermined height of 20 cm - 30 cm so that many insects, small animals and seed plants are found which are the main food of flocks of

		birds. For the ILS navigation equipment area, the height of the grass should be 10-15 cm so that the ILS navigation equipment can be seen [2].
SKEP / 42 / III / 2010 (On Instructions and Procedures for Safety Regulations) Civil Aviation Safety Regulations Part 139 - 03 Management of Wild Animal Hazards at Airports and Their Surroundings)	Chapter III Article 5 Paragraph 1 states that: At airports that experience or have the potential for bird strikes and wild animal disturbances, airport operators must provide equipment or animals for the prevention, supervision and control of bird and wild animal disturbances.	The actual situation is the unavailability of bird repellent tools or also known as (bird deterrents) so that birds in the airside area are difficult to control [2].
SKEP / 42 / III / 2010 (On Instructions and Procedures for Safety Regulations) Civil Aviation Safety Regulations Part 139 - 03 Management of Wild Animal Hazards at Airports and Their Surroundings)	Chapter 2 Article 3 B explains that understanding the habitat of birds and wild animals in the airport and its surroundings endangers flight safety.	There are still many habitats found in the airside area and around the Yogyakarta International Airport area and there has been no meaningful effort to clean up or relocate habitats by the relevant units [2].

<p>PM 83 TAHUN 2017 concerning Civil Aviation Safety Regulation part 139 concerning airports (AERODROME)</p>	<p>In Section 139 B.2 on the Obligations of Airport Operators with Airport Certificates, it explains that airport operators must ensure that facilities and land use within the airport and its development do not attract wild birds or animals.</p>	<p>In the actual state of facilities and land use in the airside and landside areas of Yogyakarta International Airport, there are still many flocks of birds that nest in the area [15].</p>
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In the implementation of observations that have been carried out for 5 months starting on September 26, 2022 until February 2, 2023, in controlling and supervising flocks of birds entering the airside area must get special attention from the relevant units responsible, such as the apron movement control unit, safety management system and aviation firefighting. When there are flocks of birds that are looking for food in the airside area, especially those in the airstrip area, the expulsion will only be carried out if the relevant officers get a report from the tower unit, the expulsion of bird flocks in the airside area should be carried out regularly and continuously. Not only when getting a report or report from the tower unit to evict flocks of birds looking for food in the airstrip area where this reactive action causes birdstrikes or bird attacks on aircraft to occur and cause losses to the airport, airlines and related stakeholders.

When patrolling the airside area there are still very many conditions that have the potential to invite or become a new habitat for flocks of birds, such as grass that exceeds the applicable regulations as high as 20 cm to 30 cm, then many trees are found that change within the perimeter,

the surface of the airstrip is found to be a lot of shrubs in the form of tree branches and weeds. Which is where this situation can invite flocks of birds to look for food in the airside area, because the food of these flocks of birds such as insects, worms and fruit is found in the airside area. the existence of a ditch that is used to collect rainwater in the airside area can also attract flocks of birds to play, drink and hunt for food. With these conditions, many flocks of birds enter the airside area to find food and even develop in the airside area which is very dangerous for aircraft operating in the airside area of Yogyakarta International Airport.

## **Interview Results**

In this study, interviews were conducted virtually through the zoom application media in an open and unstructured manner to AMC and SMS personnel when conducting field observations and observing documentation related to bird flock control, this aims to ensure that the events and observations observed really happened, and to know the details of the incident caused by bird flocks and how the handling was carried out for birdstrike incidents that occurred at Yogyakarta International Airport in a period of 1 year from January 2022 to January 2023.

From the list of questions asked to informants in the writing of this final project, an explanation of the layout of YIA airport, information about what types of birds are at YIA airport, the condition of the air side of YIA airport, the distribution of bird flocks at YIA airport, the main factors of bird flocks coming to YIA airport, handling of bird flocks on the air side of YIA airport, and what handling has been done by the AMC and SMS units in handling bird flocks.

Data that were not available in the interviews were supplemented with data from participatory direct observations conducted between September 2022 and January 2023.

### **a) First interviewee**

The first resource person is Mr. Aleandro Nurdiyanto as the Safety Management System Officer, from the results of the questions asked the author obtained information that the presence of flocks of birds is not every day but every day there are just a few birds looking for food



in the airside area, the presence of flocks of birds is most abundant during the migration season which occurs in June to October, the presence of flocks of birds mostly comes from the mangrove forest of ngentak village which is 5 to 7 km to the west of the airport. The types of birds that are often encountered are small egrets, cabak, kirik kirik and perkutut. In controlling bird flocks, the SMS unit has formed a Birdstrike team which functions to control and record flocks of birds entering the airside area every day, the data obtained is written into a logbook and sent to the airside manager every day.

**b) Second resource person**

The second resource person is Mr. Benedictus Bagus Widiyanto who is the AMC Supervisor at Yogyakarta International Airport. He is responsible for organizing, supervising and monitoring activities in the airside area. AMC also conducts patrols or checks in the apron, taxiway and surrounding areas to maintain the safety and security of the aircraft manouvering area. From the questions that were asked, information was obtained that the airside area of Yogyakarta International Airport is located on the edge of the beach, river estuaries, plantations and residential areas. Flocks of birds are often in the airside area especially in the airstrip area because the height of the grass in the area has exceeded the applicable provisions so that many insects and small animals are found which are the main food of the bird flock, the company that has been done is to cut the grass in the area but after cutting the grass a new problem is present where when cutting the grass many flocks of birds are looking for food on the land that has just been cut grass. According to the informant, birds that are often encountered are small egrets and parrots when patrolling the airside area.

**c) Third resource person**

The third informant is Mr. Ritzqi Jati Wahyudi who is the AMC Supervisor at Yogyakarta International Airport. He is responsible for organizing, supervising and monitoring activities in the airside area, especially in the apron, taxiway, runaway and surrounding areas. AMC also conducts patrols and surveillance in the aircraft manouvering area. From the questions that the author asked him, the author got information that the condition of the airstrip area which is very wide makes it difficult for officers to cut grass besides that in the

airstrip area there are many ratings and also stones so that the mower tool cannot work optimally. In controlling flocks of birds in the airside area, especially in the airstrip area, related units such as AMC and SMS units carry out evictions using patrol cars and follow me because there is no special car available to control flocks of birds entering the air side. Lack of personnel is also one of the causes of less than optimal bird flock control, the area of the airside area and the number of personnel in one shift are not comparable so that bird control on the airside needs to be further improved.

#### **d) Fourth resource person**

The fourth resource person is father Junani who is an AMC officer at Yogyakarta International Airport. He is responsible for plotting, making reports and conducting patrols and surveillance in the airside area of Yogyakarta International Airport. From the questions the author asked him, the author obtained information that the presence of flocks of birds on the airside of Yogyakarta International Airport does not come in large numbers every day. The most flocks of birds are found during the migration season and when the officers cut the grass in the airside area, because when the grass is cut insects and small animals are more easily seen. In addition, the geographical location of Yogyakarta International Airport is adjacent to the sea, rivers, plantations and residential areas where geographical locations like this are favored by flocks of birds. In handling and supervising only using sirens and horns from AMC unit cars, control and supervision of bird flocks is not maximized because Yogyakarta International Airport does not yet have bird deterrents and patrol cars have not yet installed tools that can be used to expel and control these flocks of birds.

#### **4. Conclusion**

As for the results of observations and research related to the title, it can be concluded that, In controlling activities against flocks of birds on the air side by the Apron Movement Control unit and the Safety Management System at Yogyakarta International Airport, optimization needs to be carried out because flocks of birds are still often found on the air side of Yogyakarta International Airport. Efforts to optimize the control of bird flocks on the air side of Yogyakarta International Airport are good where grass cutting has

been carried out, research on how to fly and also patrols in the air side area, but it is good that these activities need to be re-optimized by solving short-term and long-term problems. Short-term problem solving includes improving the scheduling of grass cutting, expelling flocks of birds when patrolling, cleaning the airside area and clarifying the duties of the birdstrike team that has been formed. For long-term solutions, the apron movement control unit and the safety management system unit should procure bird deterrent tools, procure special bird control vehicles and increase personnel so that bird flock control on the airside of Yogyakarta International Airport can be done optimally and ultimately flight safety on the airside of Yogyakarta International Airport can be created.

According to the author, there is a need for special attention and control of bird flocks in the airside area of Yogyakarta International Airport by carrying out the mitigations that the author has conveyed in the previous chapter, besides that cooperation between relevant stakeholders in controlling and supervising needs to be increased which aims to create a safe situation and ultimately flight safety can be achieved at Yogyakarta International Airport.

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