Journal of Nesia Engineering Science (JNESc)
JNESc, Vol. 2, No. 1, March 2025
ISSN : 3032-2642

New Obstacle Analysis in the Aviation Operations Safety Area at Iskandar Pangkalan Bun Airport Central Kalimantan

Aulia Nur Labibah[1], Siti Fatimah[2] , Wiwid Suryono[3*], Achmad Setiyo Prabowo[4]
[1,2,3,4)]Politeknik Penerbangan Surabaya, Jl. Jemur Andayani 1 No. 73, Surabaya, Indonesia
Correspondent Author, Email : widsuryono@poltekbangsby.ac.id

Article Info

Article history:
Submitted: February 28, 2025
Final Revised: March 15, 2025
Accepted: March 21, 2025
Published: March 27, 2025

Keywords:
Obstacle
AutoCAD
ESP32
Google Earth Pro
Garmin GPSMAP 65s

ABSTRACT

Research on the Flight Operation Safety Area (KKOP) at Iskandar Airport Pangkalan Bun was conducted in 2011. So that in 2024, research related to this matter will be carried out again in order to analyze and map objects suspected of being new obstacles. Based on discussions and visual observations that have been carried out, the objects to be studied are 12 points. This research was carried out by tracking directly to each point of the object suspected of being a new obstacle, and then the results of the observation will be analyzed for its location and height according to its location in the KKOP area of this airport. The results of this study confirmed that there were 10 out of 12 points of new obstacle objects at the KKOP of this airport, which were then mapped in the form of obstacle charts on the Google Earth Pro application.

1. INTRODUCTION

Pasir Panjang Village, South Arut District, Pangkalan Bun, West Kotawaringin Regency, and Central Kalimantan Province are home to the Class II Iskandar Pangkalan Bun Airport Operator Unit. The coordinates are 02º42'15.41"S 111º40'13.67"E, and has an Airport Reference Code of IV C and a Non-Precision Runway Classification Instrument of IV C.

There have been several observations of new obstructions, such as large trees and high-rise buildings, near the Iskandar Airport Flight Operations Safety Area since 2011, when this condition was first recorded, to electric poles. Based on the results of discussions and visual observations by the author together with the supervisor and the Iskandar UPBU bangland party from the runway, there are approximately 12 physical objects suspected of being new obstacles at the Iskandar Airport KKOP.

Therefore, this study was conducted in 2024 to Analyze 12 physical object points suspected as new obstacles in the Flight Operation Safety Area (KKOP) and have the potential to endanger flight safety and Determine which area the objects suspected of being new obstacles in the Flight Operation Safety Area (KKOP) and their excess height are included in.

Based on several explanations above, it can be concluded that the author finally conducted scientific research and drew a conclusion in the form of a final assignment with the title "ANALYSIS OF NEW OBSTACLES IN THE FLIGHT OPERATION SAFETY AREA AT ISKANDAR PANGKALAN BUN AIRPORT, CENTRAL KALIMANTAN PROVINCE.".

2. LITERATURE REVIEW

2.1. Definition of Flight Operation Safety Zone (KKOP)

Referring to the Regulation of the Minister of Transportation (KM 44 of 2005) concerning SNI 03-7112-2005 concerning Flight Operation Safety Zone (KKOP), which is a mandatory standard, this is the land and/or sea area and airspace around the airport used for flight operations in order to ensure flight safety and security.

Flight Operation Safety Zone (KKOP) is a large airspace that should be owned by an airport. KKOP extends from the edge of each runway to a radius of 15,000 meters and, relative to the airport reference point, to a relative altitude of 150 meters.

ISSN : 3032-2642

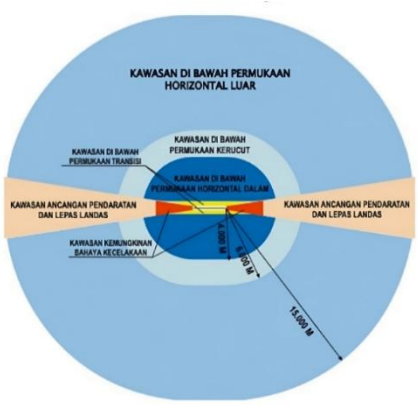

Figure 1. KKOP Diagram
(Source: Putra, 2023)

2.2. KKOP Area Classification

The classification of the Flight Operation Safety Area (KKOP) boundaries is divided into several parts with reference to KM 44 of 2005, namely as follows:

2.2.1. Main surface area

Each point on the main surface is determined to be the same as the height of the nearest point on the runway axis. The surface is flat, and its center line coincides with the runway axis. This surface extends to a specified length and width, approximately 150 m beyond each end of the runway edge.

2.2.2. Approach and take-off area

The area that extends from the end of the runway to a horizontal distance of 15,000 meters is called the approach and take-off area. This area is under the aircraft track after takeoff or landing, and its inner edge limit is 60 meters from the end of the runway. At each end of the runway, this area has a slope of 2% and a height limit of +0 m to +150 m.

2.2.3. Area of potential accident hazard

The approach and takeoff area extending three thousand meters horizontally from the end of the main surface is considered a potential accident hazard area.

2.2.4 Area below the transition surface

At the altitude limit of 0 to 45 meters (AES) and a slope of 14.3%, the area below the transition surface is a plane that extends outward 315 meters from the long side of the main surface. This plane is parallel to and at the edge of the main surface.

2.2.5. Area below the inner horizontal surface

A flat area above and around the airport, with a radius of between 465 and 4,000 meters from the runway centerline and a maximum height of 45 meters above the runway threshold height (AES), defines the area below the inner horizontal surface.

2.2.6. Area below the conical surface

Below the conical surface is a cone-shaped area, the lower half of which extends between 4,000 and 6,000 meters from the runway centerline and may only be 145 meters above the runway threshold height (AES) with a slope of 5%.

2.2.7. Area below the outer horizontal surface

A flat area around the airport, with a radius of 6,000 to 15,000 meters from the center of the runway, defines the area below the outer horizontal surface. Within this area, there is a maximum height limitation of 150 meters above the runway threshold height (AES).

2.3. KKOP Classification Analysis

Based on KM 44 of 2005, to determine the flight operation safety area at and around the airport, the runway is divided into several classifications as follows:

1) Instrument precision, category I code number 1 and 2
2) Instrument precision, category II code number 3 and 4
3) Instrument precision, category III dan IV code number 3 and 4
4) Instrument non precision code number 1 and 2
5) Instrument non precision code number 3
6) Instrument non precision code number 4

7) Non instrument code number 1
8) Non instrument code number 2
9) Non instrument code number 3
10) Non instrument code number 4

Runway classification is determined based on 2 factors, namely:

1) Completeness of flight navigation aids at the airport
   The completeness of flight navigation aids consists:
   a. Precision instruments
      Visual placement aids and Instrument Landing System (ILS) are used on the runway for aircraft navigation.
   b. Non-precision instruments
      Doppler devices with Very High Frequency Directional Omni Range (DVOR) and visual transmission aids are used on the runway for aircraft guidance.
   c. Non-instrument
      The runway uses flight navigation aids in the form of Non-Directional Beacon (NDB) devices.
2) Runway dimensions
   The runway is classified according to the following table:

Table 1. Runway dimensions

Code Number	Code Element 1 (Aeroplane Reference Field Length)	Code Letter	Code Element 2 (Wingspan)
1	P < 800 m	A	l < 15 m
2	800 m ≤ P < 1.200 m	B	15 m ≤ l < 24 m
3	1.200 m ≤ P < 1.800 m	C	24 m ≤ l < 36 m
4	P ≥ 1.800 m	D	36 m ≤ l < 52 m
		E	52 m ≤ l < 65 m
		F	65 m ≤ l < 80 m

2.4. KKOP Coordinate and Elevation System

2.4.1. Coordinate system

The coordinate system used in this study is the geographic coordinate, which refers to the World Geodetic System 1984 (WGS'84) reference plane, airport coordinate system, and UTM (Universal Transverse Mercator) coordinates

2.4.2. Elevation system

The elevation/height systems used in this study are the runway threshold height, the MSL (Mean Sea Level) height system, and the airport elevation system (Aerodrome Elevation System/AES).

2.5. Types of Color Signs and Obstacle Lights

According to KM 23 of 2005, the types of color signs and lights used on a building/obstacle object include the following:

2.5.1. Color

a. The colors used are very bright and attract attention throughout the day because they have the same checkered pattern that stacks alternately. Some examples of these colors include red-white, orange-white, and other colors that stand out from the building and its surroundings.
b. Interruption sign pattern with a box side length ranging from 1.5 m to 3 m is used by buildings with an unbroken horizontal or vertical plane of more than or equal to 4.5 m.
c. An alternating rectangular advertising pattern perpendicular to the longest side of the box and a box 1/7 of the width of the longest plane with a maximum width of 30 m is used for buildings with a horizontal plane greater than 1.5 m but a vertical plane less than 4.5 m, or vice versa.
d. Structures with a frame shape and a horizontal or vertical plane of more than 1.5 m have an alternating box pattern perpendicular to the longest side. The width of the box is 1/7 of the longest plane and must not exceed 30 m.
e. One color—either red or orange—must be used by buildings with a horizontal or vertical plane of no more than 1.5 meters. Conversely, a more attractive color should be used if the name of the board color is almost the same as the surrounding color.
f. Red for emergency services and yellow for operational services if the structure or goods are moving.

 ISSN : 3032-2642

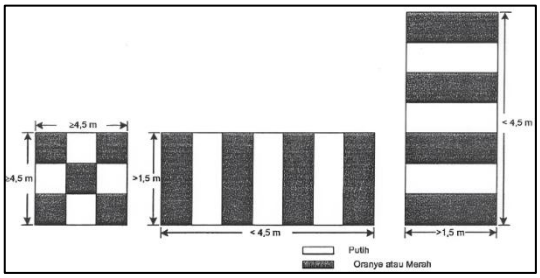

Figure 2. Basic color pattern of markings

2.5.2. Lights

Marker lights are lights that stand out in low light relative to their surroundings. These lights can be red or white, steady or flashing white. It is recommended that the lights be installed on top of the structure.

However, if the top of the building is higher than 45 meters above the surrounding ground level, then there must be lights installed at a height of no more than 45 meters between the top light and the ground level. Similarly, lights installed on buildings must be easily visible from any angle.

3. METHODOLOGY

This study uses a descriptive analysis method, which is a method to describe an actual or current event or problem as it is, and then the research data is processed and analyzed to draw a conclusion. In short, this study takes data from an observation carried out as it is using a Nikon Forestry Pro II hypsometer binocular and Garmin GPSMAP 65s, then analyzed and mapped on an obstacle chart using the AutoCAD and Google Earth Pro applications so that it can be clearly depicted. The following is a reference framework for the research conducted.

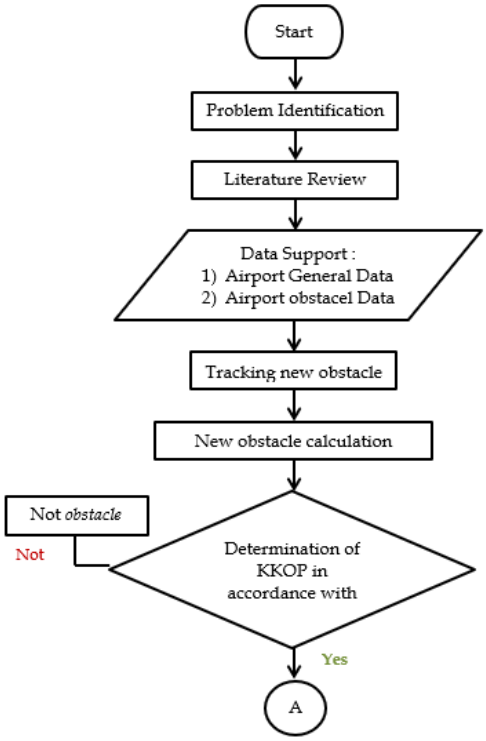

Figure 3. Research Design Diagram (1)

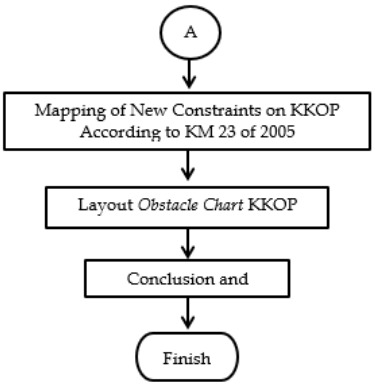

Figure 4. Research Design Diagram (2)

4. RESULTS AND DISCUSSION

4.1. Runway point analysis

4.1.2. Geographical Coordinates of the Runway

The following are the geographical coordinates of each threshold on the runway of Iskandar Pangkalan Bun Airport.

Table 2. Runway Geographic Coordinates

Runway	Koordinat *WGS'84*		Koordinat UTM (X,Y)	
TH 13	2˚41'56.02" S	111˚39'58.82" E	574066.8134	9701668.5773
TH 31	2˚42'42.66" S	111˚40'49.48" E	575629.6799	9700236.1499

4.1.2. Runway Elevation

The following is the ground elevation of each threshold on the runway of Iskandar Pangkalan Bun Airport.

Table 3. Runway Elevation

Runway	Elevasi
TH 13	23 m MSL
TH 31	23 m MSL

4.1.3. Runway Ground Level Difference

Based on the ground elevation data from each end of the threshold on this airport runway, it is necessary to find the threshold height and the height difference so that it can be used as a reference for measuring the object observations carried out. Here is the calculation:

Height difference = Highest TH elevation - Lowest TH elevation
= 23 m – 23 m
= 0 m

Threshold height = H = 0 m : 2 = 0 m
Δ H = 0 m

4.2. Analysis of objects suspected of being obstacles

4.2.1. Mercure Hotel Pangkalan Bun

Data:
- WGS'84 coordinates = 2°40'23.17"S ; 111°38'21.81"E
- Object ground elevation = 9 m (obtained from point elevation on Google Earth Pro application)
- Object height = 35 m

Calculation:
- Distance of object to end of runway strip = 4,045 m
- Difference in elevation height = 9 m – 23 m
  = - 14 m
- Excess height = (object height + difference in elevation height) – (maximum height limit)

= (35 m + (- 14 m)) – (4,045 m x 2%)
= 21 m – 80.9 m
= - 59.9 m **(NOT CONFIRMED AS OBSTACLE)**

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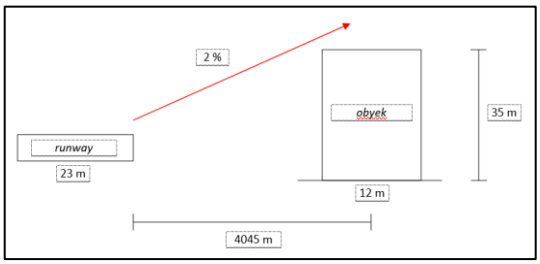

Figure 5. Calculation of Mercure Hotel Pangkalan Mom

4.2.2. Abdul Rasyid Tower Pangkalan Bun

Data:

- WGS'84 coordinate point = 2°40'23.80"S ; 111°38'23.80"E
- Object ground elevation = 12 m (obtained from point elevation on Google Earth Pro application)
- Object height = 27 m

Calculation:

- Distance of object to end of runway strip = 4,019 m
- Difference in elevation height = 12 m – 23 m
  = - 11 m
- Excess height = (object height + difference in elevation height) – (maximum height limit)

= (27 m + (- 11 m)) – (4,019 m x 2%)
= 16 m – 80.38 m
= - 64.38 m **(NOT CONFIRMED AS OBSTACLE)**

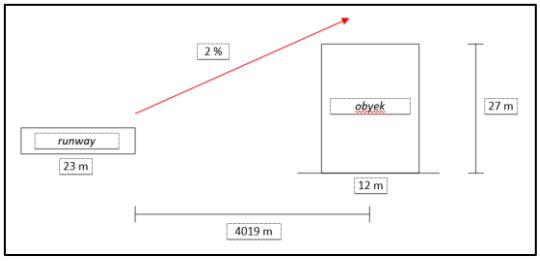

Figure 6. Calculation of Abdul Rasyid Tower Pangkalan Bun

4.2.3. Electric pole 1

Data:

- WGS'84 coordinate point = 2°42'55.23"S ; 111°41'3.81"E
- Object ground elevation = 24 m (obtained from point elevation on Google Earth Pro application)
- Object height = 11 m

Calculation:

- Distance of object to end of runway strip = 400 m
- Difference in elevation height = 24 m – 23 m
  = 1 m
- Excess height = (object height + difference in elevation height) – (maximum height limit)

= (11 m + 1 m) – (400 m x 2%)
= 12 m - 8 m
= 4 m **(CONFIRMED AS OBSTACLE)**

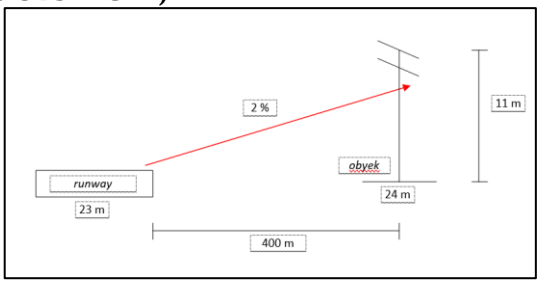

Figure 7. Calculation of electric pole 1

4.2.4 Electric pole 2

Data:

• WGS'84 coordinates = 2°42'54.67"S; 111°41'3.29"E
• Object ground elevation = 24 m (obtained from point elevation on Google Earth Pro application)
• Object height = 11 m

Calculation:

• Distance of object to end of runway strip = 374 m
• Difference in elevation height = 24 m – 23 m
= 1 m
• Excess height = (object height + difference in elevation height) – (maximum height limit)
= (11 m + 1 m) – (374 m x 2%)
= 12 m – 7.48 m
= 4.52 m **(CONFIRMED AS OBSTACLE)**

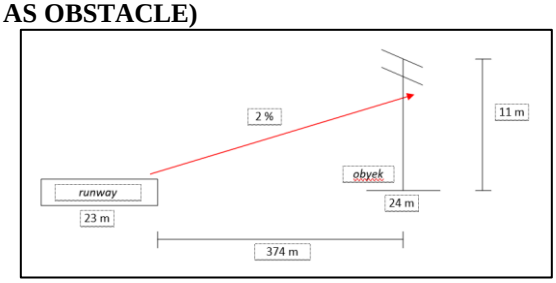

Figure 8. Calculation of electric pole 2

4.2.5. Electric pole 3

Data:

• WGS'84 coordinate point = 2°42'54.81"S; 111°41'2.07"E
• Object ground elevation = 24 m (obtained from point elevation in Google Earth Pro application)
• Object height = 11 m

Calculation:

• Distance of object to end of runway strip = 350 m
• Difference in elevation height = 24 m – 23 m
= 1 m
• Excess height = (object height + difference in elevation height) – (maximum height limit)
= (11 m + 1 m) – (350 m x 2%)
= 12 m – 7 m
= 5 m **(CONFIRMED AS OBSTACLE)**

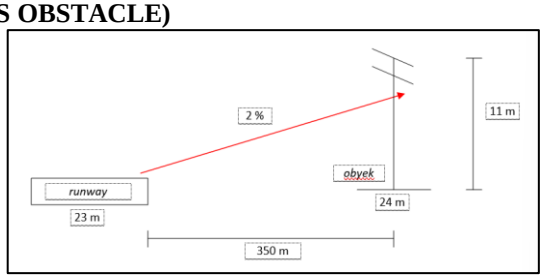

Figure 9. Calculation of Electric Pole 3

4.2.6. Electric pole 4

Data:

• WGS'84 coordinate point = 2°42'55.38"S; 111°41'2.32"E
• Object ground elevation = 25 m (obtained from point elevation in Google Earth Pro application)
• Object height = 11 m

Calculation:

• Distance of object to end of runway strip = 367 m
• Difference in elevation height = 25 m – 23 m
= 2 m
• Excess height = (object height + difference in elevation height) – (maximum height limit)
= (11 m + 2 m) – (367 m x 2%)
= 13 m – 7.34 m
= 5.66 m **(CONFIRMED AS OBSTACLE)**

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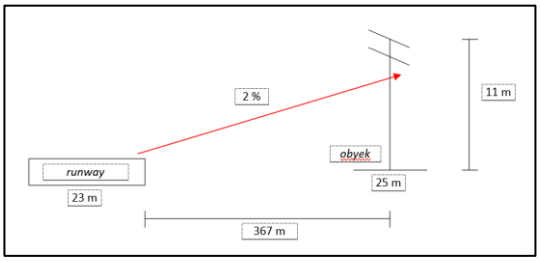

Figure 10. Calculation of Electric Pole 4

4.2.7.Electric pole 5

Data:

• WGS'84 coordinate point = 2°42'54.92"S; 111°41'0.79"E
• Object ground elevation = 24 m (obtained from point elevation in Google Earth Pro application)
• Object height = 11 m

Calculation:

• Distance of object to end of runway strip = 325 m
• Difference in elevation height = 24 m – 23 m
= 1 m
• Excess height = (object height + difference in elevation height) – (maximum height limit)
= (11 m + 1 m) – (325 m x 2%)
= 12 m – 6.5 m
= 5.5 m **(CONFIRMED AS OBSTACLE)**

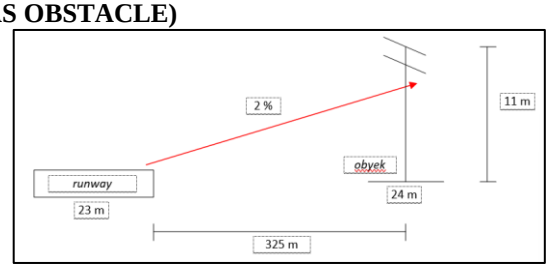

Figure 11. Calculation of Electric pole 5

4.2.8. Electric pole 6

Data:

• WGS'84 coordinate point = 2°42'55.07"S; 111°41'5.25"E
• Object ground elevation = 23 m (obtained from point elevation in Google Earth Pro application)
• Object height = 11 m

Calculation:

• Distance of object to end of runway strip = 430 m
• Difference in elevation height = 23 m – 23 m = 0 m
• Excess height = (object height + difference in elevation height) – (maximum height limit)
= (11 m + 0 m) – (430 m x 2%)
= 11 m – 8.6 m
= 2.4 m (CONFIRMED AS OBSTACLE)

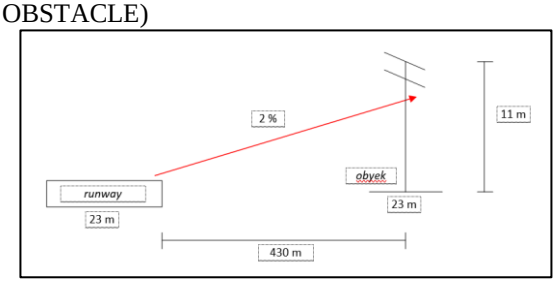

Figure 12. Calculation of Electric Pole 6

4.2.9. Electric pole 7

Data:

• WGS'84 coordinate point = 2°42'54.49"S; 111°41'4.66"E
• Object ground elevation = 23 m (obtained from point elevation in Google Earth Pro application)
• Object height = 11 m

Calculation:

• Distance of object to end of runway strip = 404 m
• Difference in elevation height = 23 m – 23 m
= 0 m
• Excess height = (object height + difference in elevation height) – (maximum height limit)
= (11 m + 0 m) – (404 m x 2%)
= 11 m – 8.08 m
= 2.92 m **(CONFIRMED AS OBSTACLE)**

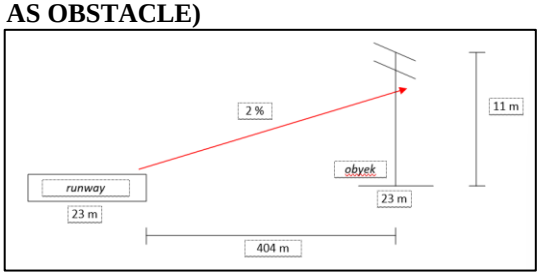

Figure 13. Calculation of Electric Pole 7

4.2.10. Sugar palm tree

Data:

• WGS'84 coordinates = 2°42'56.14"S; 111°41'4.90"E
• Object ground elevation = 23 m (obtained from point elevation in Google Earth Pro application)
• Object height = 12 m

Calculation:

• Distance of object to end of runway strip = 441 m
• Difference in elevation height = 23 m – 23 m
= 0 m
• Excess height = (object height + difference in elevation height) – (maximum height limit)
= (12 m + 0 m) – (441 m x 2%)
= 12 m – 8.82 m
= 3.18 m **(CONFIRMED AS OBSTACLE)**

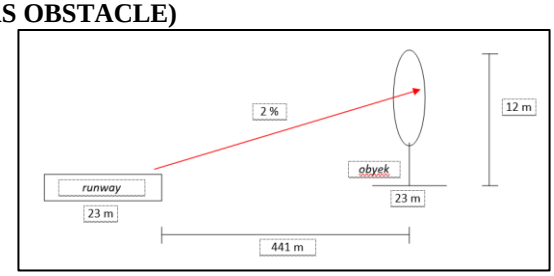

Figure 14. Sugar palm tree calculation

4.2.11. Trees beside runway 1

Data:

• WGS'84 coordinates = 2°42'27.48"S; 111°40'36.73"E
• Object ground elevation = 25 m (obtained from point elevation in Google Earth Pro application)
• Object height = 12 m

Calculation:

• Distance of object to end of runway strip = 51 m
• Difference in elevation = 25 m – 23 m
= 2 m **(CONFIRMED AS OBSTACLE)**

ISSN : 3032-2642

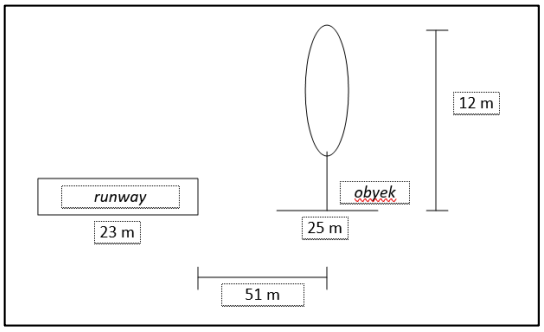

Figure 15. Calculation of trees beside runway 1

4.2.12. Trees beside runway 2

Data:

• WGS'84 coordinates = 2°41'57.04"S; 111°40'3.67"E
• Object ground elevation = 21 m (obtained from point elevation on Google Earth Pro application)
• Object height = 13 m

Calculation:

• Distance of object to end of runway strip = 53 m
• Difference in elevation = 21 m – 23 m
= -2 m
• (CONFIRMED AS OBSTACLE)

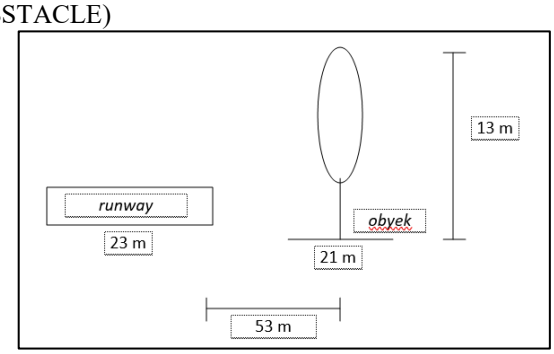

Figure 16. Calculation of trees beside runway 2

4.3. Discussion of new obstacle objects

Based on the results of observations, identification, and analysis of objects suspected of being new obstacles at the KKOP of Iskandar Airport that have been carried out, it can be seen from 12 points of objects suspected of being obstacles, some of which are confirmed as obstacles and some are not.

Among the 12 points, the objects that are new obstacles at the KKOP of this airport are 10 points, namely objects in the form of 7 electric poles and 3 trees, while the other 2 points in the form of hotel buildings and towers are not confirmed as new obstacles, as described in the following table.

Table 4. List of new obstacles in KKOP UPBU Iskandar Pangkalan Bun

No.	Nama Obyek	Koordinat Geografis		Elevasi Permukaan Tanah (m)	Tinggi Obyek	Jarak dengan *Runway Strip*	Status Obyek terhadap KKOP	Kawasan pada KKOP	Lebih Ketinggian
		Lintang Selatan (S)	Bujur Timur (E)						
1.	Hotel Mercure Pangkalan Bun	2°40'23.17"S	111°38'21.81"E	9 m	35 m	4.045 m	TIDAK	Kaw. Pendekatan dan Lepas landas	-
2.	Tower Abdul Rasyid Pangkalan Bun	2°40'23.80"S	111°38'23.80"E	12 m	27 m	4.019 m	TIDAK	Kaw. Pendekatan dan Lepas Landas	-
3.	Tiang Listrik 1	2°42'55.23"S	111°41'3.81"E	24 m	11 m	400 m	*OBSTACLE*	Kaw. Kemungkinan Bahaya Kecelakaan	4 m
4.	Tiang Listrik 2	2°42'54.67"S	111°41'3.29"E	24 m	11 m	374 m	*OBSTACLE*	Kaw. Kemungkinan Bahaya Kecelakaan	4,52 m
5.	Tiang Listrik 3	2°42'54.81"S	111°41'2.07"E	24 m	11 m	350 m	*OBSTACLE*	Kaw. Kemungkinan Bahaya Kecelakaan	5 m
6.	Tiang Listrik 4	2°42'55.38"S	111°41'2.32"E	25 m	11 m	367 m	*OBSTACLE*	Kaw. Kemungkinan Bahaya Kecelakaan	5,66 m
7.	Tiang Listrik 5	2°42'54.92"S	111°41'0.79"E	24 m	11 m	325 m	*OBSTACLE*	Kaw. Kemungkinan Bahaya Kecelakaan	5,5 m
8.	Tiang Listrik 6	2°42'55.07"S	111°41'5.25"E	23 m	11 m	430 m	*OBSTACLE*	Kaw. Kemungkinan Bahaya Kecelakaan	2,4 m
9.	Tiang Listrik 7	2°42'54.49"S	111°41'4.66"E	23 m	11 m	404 m	*OBSTACLE*	Kaw. Kemungkinan Bahaya Kecelakaan	2,92 m
10.	Pohon Aren	2°42'56.14"S	111°41'4.90"E	23 m	12 m	441 m	*OBSTACLE*	Kaw. Kemungkinan Bahaya Kecelakaan	3,18 m
11.	Pohon Samping *Runway* 1	2°42'27.48"S	111°40'36.73"E	25 m	12 m	-	*OBSTACLE*	Kaw. Permukaan Utama	14 m
12.	Pohon Samping *Runway* 2	2°41'57.04"S	111°40'3.67"E	21 m	13 m	-	*OBSTACLE*	Kaw. Permukaan Utama	11 m

In connection with the confirmation of several new obstacle objects, actions must be taken against these objects in order to optimize the safety and security of flight activities in the KKOP area of Iskandar Pangkalan Bun Airport, which are described in the table below:

Table 5. Recommendations for handling new obstacles in KKOP UPBU Iskandar Pangkalan Bun

No.	*Obstacle*	Lokasi Kawasan	Rekomendasi Penanganan
1.	Tiang Listrik 1	Kawasan Kemungkinan Bahaya Kecelakaan	Pemberian tanda atau lampu; Pemindahan lokasi; Pembuatan kabel tanam/ bawah tanah
2.	Tiang Listrik 2	Kawasan Kemungkinan Bahaya Kecelakaan	Pemberian tanda atau lampu; Pemindahan lokasi; Pembuatan kabel tanam/ bawah tanah
3.	Tiang Listrik 3	Kawasan Kemungkinan Bahaya Kecelakaan	Pemberian tanda atau lampu; Pemindahan lokasi; Pembuatan kabel tanam/ bawah tanah
4.	Tiang Listrik 4	Kawasan Kemungkinan Bahaya Kecelakaan	Pemberian tanda atau lampu; Pemindahan lokasi; Pembuatan kabel tanam/ bawah tanah
5.	Tiang Listrik 5	Kawasan Kemungkinan Bahaya Kecelakaan	Pemberian tanda atau lampu; Pemindahan lokasi; Pembuatan kabel tanam/ bawah tanah
6.	Tiang Listrik 6	Kawasan Kemungkinan Bahaya Kecelakaan	Pemberian tanda atau lampu; Pemindahan lokasi; Pembuatan kabel tanam/ bawah tanah
7.	Tiang Listrik 7	Kawasan Kemungkinan Bahaya Kecelakaan	Pemberian tanda atau lampu; Pemindahan lokasi; Pembuatan kabel tanam/ bawah tanah
8.	Pohon Aren	Kawasan Kemungkinan Bahaya Kecelakaan	Penebangan atau pemotongan pohon dan inspeksi KKOP rutin
9.	Pohon Samping *Runway* 1	Kawasan Permukaan Utama	Penebangan pohon dan inspeksi KKOP rutin
10.	Pohon Samping *Runway* 2	Kawasan Permukaan Utama	Penebangan pohon dan inspeksi KKOP rutin

5. CONCLUSION AND SUGGESTIONS

5.1. Conclusion

The following information allows us to draw many conclusions based on the research that has been conducted and the presentation of the analysis and debate in the previous chapter:

1. In analyzing 12 physical object points suspected of being obstacles, measurements were made of the coordinate points and ground surface elevation using the Garmin GPSMAP 65s tool, measuring the height of the object using the Nikon Forestry Pro II hypsometer binoculars, and mapping the object points using the AutoCAD, Global Mapper, and Google Earth Pro applications.

2. After observation, from 12 points suspected as new obstacle objects, there were 10 points confirmed as new obstacles at Iskandar Pangkalan Bun Airport KKOP, consisting of 2 points in the main surface area in the form of 2 trees and 8 points in the potential accident hazard area in the form of 1 tree and 7 electric poles with a height of between 2.4 and 14 meters, the details of which are described in Table 4.

5.2. Suggestions

Considering the above, the author offers a number of recommendations to the airport and its visitors. The following are examples of some of these recommendations:

1. Routine inspections and surveys need to be carried out on physical objects in the airport KKOP area so that no new objects are identified as obstacles.
2. Follow-up action needs to be taken regarding the proper handling of obstacle objects in the form of electric poles, namely by submitting to stakeholders to provide signs or lights on the electric poles in accordance with the KM 23 of 2005 regulations and making an Aerodrome Manual to be submitted to the government so that the government will later be more strict in enforcing regulations regarding development in the KKOP area of Iskandar Airport, Pangkalan Bun.
3. Action needs to be taken to handle obstacles in the form of trees, namely by cutting or trimming the excess trees so that they do not endanger the safety and security of flight activities and are included in the airport KKOP.

FURTHER RESEARCH

For further research, it is necessary to develop the objectives and methods of implementing research using different measuring instruments or applications for the sake of diversity of research results from obstacle objects in KKOP.

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