ANALYSIS OF NEW OBSTACLES IN THE AVIATION OPERATIONSAFETY AREA AT ISKANDAR PANGKALAN BUN AIRPORT, CENTRAL KALIMANTAN PROVINCE

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ABSTRACT

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

Keywords: New Obstacle, Iskandar Pangkalan Bun Airport, Aviation Operations Safety Area (KKOP).

1. INTRODUCTION

The Iskandar Pangkalan Bun Class II Airport Organizing Unit is located in Pasir Panjang Village, South Arut District, Pangkalan Bun, West Kotawaringin Regency, Central Kalimantan Province at coordinates 02º42'15.41"S 111º40'13.67"E with Aerodrome Reference Code IV C and Runway Classification, namely NonPrecision Instrument IV C.

In 2011, observations about obstacles were carried out in the Aviation Operations Safety Area at Iskandar Airport with the condition of the ultimate runway along 2,250 meters. However, until now the existing runway owned by Iskandar Airport is 2,120 meters.

The condition of infrastructure, facilities, and infrastructure in the area around the airport which has developed very rapidly compared to 13 years ago has caused many allegations of the emergence of new obstacleobjects in the form of tall trees, buildings/multi-storey buildings, and electric poles.

Based on the results of the discussion and visual observation of the author together with the supervisor and the UPBU Iskandar bangland from the runway side, the physical objects that are suspected to be new obstacles at the Iskandar Airport KKOP are approximately 12 points. Therefore, it is very necessary to observe the new obstacle point of the KKOP in real time in the area around the KKOP Iskandar Airport for the security and safety of flight activities.

Therefore, this study was conducted in 2024 to analyze 12 points of physical objects that are suspected to be new obstacles in the Flight Operations Safety Area (KKOP) and have the potential to endanger flight safety and determine which areas are included in which objects are suspected to be new obstacles in the Flight Operations Safety Area (KKOP) and their excess altitudes.

2. LITERATURE REVIEW

2. 1 Definition of Aviation Operational Safety Area (KKOP)

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

The Flight Operations Safety Area (KKOP) is a large airspace owned by an airport. The KKOP stretches from theedge of each runway to a radius of 15,000 meters and, relative to the airport's reference point, to a relative elevation of 150 meters.

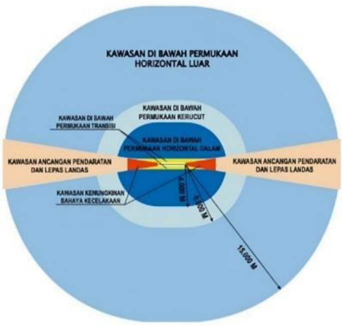


Figure 1. Diagram KKOP

2. 2 KKOP Classification

The classification of the boundaries of the Aviation Operations Safety Area (KKOP) is divided into several parts withreference to KM 44 of 2005, which is as follows:

1) Main surface area

Each point on the main surface area is determined to be equal to the height at the nearest point on the runway axis. The surface is flat and the centerline coincides with the runway axis. This surface extends to a specified length and width, about 150 m beyond each end of the runway edge.

2) Approach and take-off area

The area that stretches from the endof the runway to a horizontal distance of 15,000 m is called the approach andtakeoff area. This area is under the trajectory of the aircraft after takeoff or will land, with the inner edge boundaryof 60 m from the end of the runway. From each end of the main surface, theregion extends out regularly at an angleof 10% or 15% and has a 2% elevationslope limit between +0 m to +150 m (AES).

3) Possible accident hazard areas

This area is part of the approach and take-off area that stretches for 3,000 mhorizontally from the end of the main surface which is considered the highest potential accident hazard area. This area has the same altitude limit asthe approach and take-off areas.

4) Areas below the transition surface This area is an area that has an altitude limit of 0 to 45 m (AES) with a slope of 14.3%. The area below the transition surface is a plane thatextends outwards as far as 315 m from the side of the length of the main surface that is parallel and is at the edge of the main surface.

5) The area below the deep horizontalsurface

The area is a flat plane above and around the airport, with a radius between 465 m and 4,000 m from the runway center point and a maximum elevation of 45 m above the runway threshold height (AES).

6) Area below the surface of the cone The area below the surface of the cone is an area with a cone-shaped plane whose lower half extends between 4,000 m and 6,000 m from themidpoint of the runway, with a maximum height of 145 m above the runway threshold height (AES) and a slope of 5%.

7) The area below the outer horizontal surface

This area is a flat field around the airport, with a radius of 6,000 m to 15,000 m from the center point of the runway. In this area, there is a maximum height limit of 150 m abovethe runway threshold (AES) height.

2. 3 KKOP Classification Analysis

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

1) Instrument precision, cat I code 1 and2
2) Instrument precision, cat II code 3 and4
3) Instrument precision, cat III and IVcode 3 and 4
4) Instrument non precision code 1 and 2
5) Instrument non precision code 3
6) Instrument non precision code 4
7) Non instrument code 1
8) Non instrument code 2
9) Non instrument code 3
10) Non instrument code 4

The classification of runways is determined based on 2 factors, namely:

1) Flight navigation aids at the airport The complete equipment of flight navigation aids consists of:

a. Instrument precision

Visual landing 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 landing 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) tools.

2) Runway dimensions

Runways are categorized accordingto 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

1) Coordinate system

a) Geographical coordinates According to KM 44 of 2005, geographical coordinates are the position of a point on the earth's surface, expressed in latitude (L) and longitude (B) in degrees, minutes, and seconds, referring to the reference field of the 1984 World Geodetic System (WGS'84). However, after collecting data using WGS'84 coordinate points, it needs to be changed to the UTM coordinate system so that there are no differences when adjusting into the Google Earth Pro application.

b) Aerodrome Coordinate System(ACS)

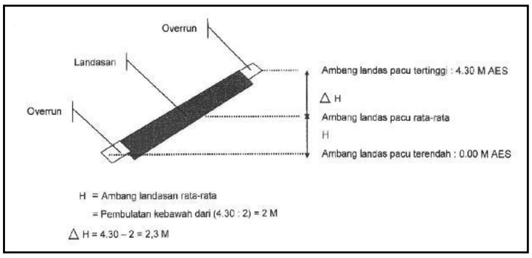
According to KM 44 of 2005, the airport coordinate system is a local coordinate system located at the airport using the Cartesiansystem for reference of coordinate points (X = + 20,000 m; Y = + 20,000 m) is located at the intersection of the X-axis line that is squeezed by one of the runway axis lines and the Y-axis line perpendicular to the X-axis line located at the end of the runway (which is estimated to have undergone no change in runway extension).

c) UTM (Universal Transverse Mercator) Coordinates

UTM coordinates are a map projection system used to determinelocation coordinates on the earth's surface. These coordinates do not refer to the statement that the earth is spherical, but refer to the shape of the earth being flat or through a certain projection. In mapping the Google Earth Pro application, previously it would be necessary to convert coordinate points from the WGS'84 system to the UTM system. Because the UTM coordinate system determines the coordinates of locations on the earth's surface (Kejora, 2022).

2) Elevation system

a) Runway threshold height (H) According to KM 44 of 2005, the height of the runway threshold is the difference in height between the two runway thresholds divided by two, and then the result is rounded down.



H = (Highest Threshold Elevation – Lowest Threshold Elevation)/2

b) MSL (Mean Sea Level) altitudesystem

The MSL (Mean Sea Level) altitude system measures an obstacle point or location relative to the average height of sea level over a certain period. This system involves observing the tides of seawater in its measurements which are taken as an average value (Indosurta Group, 2023).

c) erodrome Elevation System (AES)

According to KM 44 of 2005, the airport elevation system/AES is a local airport altitude system where the lowest runway threshold (overrun end) is used as a reference point or reference point for the elevation of other points with the lowest runway threshold height of 0.0 m AES to the Mean Sea Level (MSL).

2. 5 Various Color Signs and Obstacle Lights

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

1) Color

a) The colors used are very bright and attract attention throughout the day, as they are patterned with the same checkered boxes stacked alternately. Some examples of these colors include red-white, orange-white, and other colors that stand out from the building and its surroundings.

b) Interrupt sign patterns with box side lengths ranging from 1.5 m to 3 m are used by buildings with uninterrupted horizontal or vertical planes greater than or equal to 4.5 m.

c) The pattern of alternating rectangular billboards perpendicular to the longest side of the box and the width of the box 1/7 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 of 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 should 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. Instead, a more attractive color should be usedif the color of the signboard is almost the same as the surroundingcolor.

f) Red for emergency services and yellow for operational services if structures or goods are in motion.

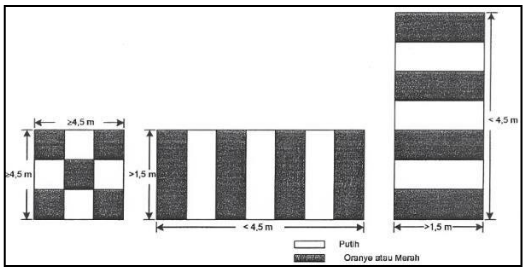


Figure 3. Marker color archetypes

2) Lamp

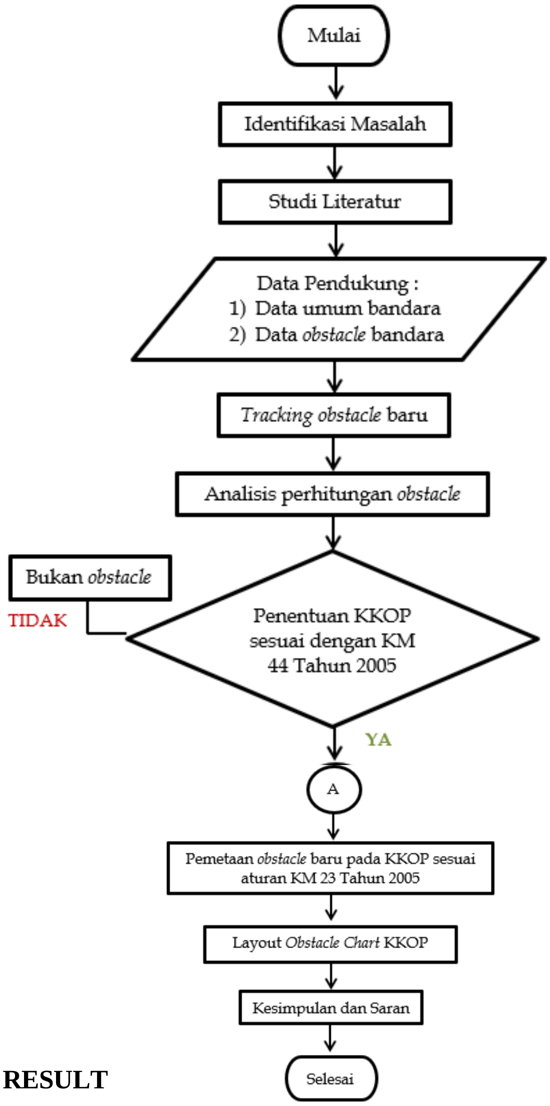
Obstacle marker lights are lightsthat stand out in low light relative to their environment. These lights can beeither solid red or white or flashing white. It is recommended that the lights be mounted on top of the structure.

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 in buildings should be easily visible from any angle.

3. METHODOLOGY

This study uses a descriptive analysis method which is a method to describe an event or problem that is actual or currently occurring as it is, then the data from the research results will be processed and analyzed to draw a conclusion.

In short, this study took data from an observation carried out as it was using the Nikon Forestry Pro II and Garmin GPSMAP 65s hyposometer binoculars and then analyzed and mapped on an obstacle chart using AutoCAD and Google Earth Pro applications so that it could be drawn clearly. The following is the reference framework of the research conducted.



4. RESULT

Figure 4. Research design diagram

4. 1 Procedure for using the measuringinstrument

In the research conducted in determining whether an object is included in the Flight Operations Safety Area (KKOP) in the Iskandar Pangklana Bun Air Band, several tools are used to support the efficiency and effectiveness of research activities. There are 2 types of tools used by researchers, namely the Nikon Forestry Pro II hyposometer binoculars and the Garmin GPSMAP 65s.The following is a brief procedure for using the tool:

a) Nikon Forestry Pro II Hyposometer Binoculars
1) Press the POWER button on the top of the appliance to turn it on
2) Select the measurement mode to be used on the MODE button at the top of the appliance by pressing it once
3) After specifying the desired mode, press the MODE button twice to specify what unit to use
4) Point the tool at the object to be elevated,aligning one of our eyes at the lens hole ofthe tool
5) Aim at the point by pressing the POWERbutton
6) The measurement range of the device is at a distance of 7.5 to 1,600 meters

b) Garmin GPSMAP 65s
1) Switch on the appliance by pressing the POWER button on the side of theappliance
2) Press the MENU button
3) Hover the tool at the object to be measured
4) Press the MARK key to save the coordinate point
5) Select the MANAGE POINTS menu on the display to see the coordinates that have been recorded.

4. 2 Runway point analysis

1) Geographical Coordinates of 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

2) Runway Elevation

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

Table 3. Runway Elevation

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

3) Different Elevations of Runway

Based on the soil elevation data from each end of the threshold on the airport runway, it is necessary to find the height of the threshold and the difference in height so that it can be used as a reference for measurements in the observation of the object being carried out. Here's the calculation:

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

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

4. 3 Object analysis suspected of obstacle Based on direct visual observations made by the author accompanied by supervisors and the UPBU Iskandar Bangland in the Aviation Operations Safety Area (KKOP) area of Iskandar Pangkalan Bun Airport, the author identified a sample of 12 points suspectedto be new obstacles which were then tracked to find out the coordinate point using a hyposomter binoculars, to find out the height of an object using Garmin GPSMAP 65s and to measure the elevation of the object using the Google Earth Pro application.

After that, it was continued with calculation and analysis in accordance with the rules of KM 44 of 2005 which are described as follows:

1) Hotel Mercure Pangkalan BunData:
- Coordinate points WGS'84 = 2°40'23.17"S ; 111°38'21.81"E
- Object ground elevation = 9 m (obtained from the elevation of the point in the application Google Earth Pro)

- Object height = 35 m

Account:

- Object distance to the end of the runway strip = 4,045 m
- Elevation difference = 9 m – 23 m

  =- 14 m
- Excess height = (object height + elevation height difference) – (maximum height limit)

  = (35 m + (- 14 m)) – (4.045 m x 2%)

  = 21 m – 80.9 m

  = - 59.9 m **(NOT CONFIRMED AS AN OBSTACLE)**

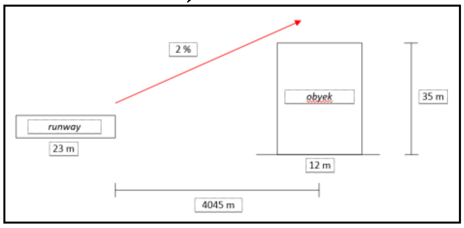


Figure 5. Mercure Pangkalan Bun Hotel Calculation

2) Tower Abdul Rasyid Pangkalan BunData:

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

Account:

- Object distance to the end of the runway strip = 4,019 m
- Elevation height difference = 12 m – 23 m

  =- 11 m
- Excess height = (object height + elevation height difference) – (maximum height limit)

  = (27 m + (- 11 m)) – (4.019 m x 2%)

  = 16 m – 80.38 m

  = - 64.38 m **(NOT CONFIRMEDAS AN OBSTACLE)**

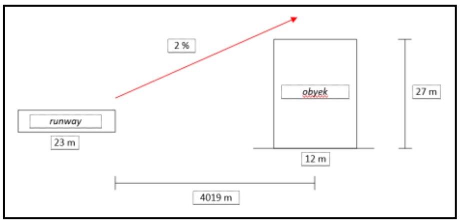


Figure 6. Calculation of Tower Abdul Rasyid Pangkalan Bun

3) Power pole 1Data:

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

Account:

- Object distance to the end of the runway strip = 400 m
- Elevation difference = 24 m – 23 m

  = 1 m
- Excess height = (object height + elevation height difference) – (maximum height limit)

  = (11 m + 1 m) – (400 m x 2%)

  = 12 m - 8 m

  = 4 m **(CONFIRMED AS OBSTACLE)**

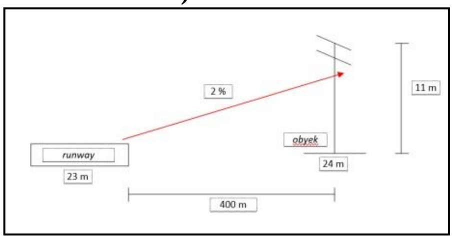


Figure 7. Calculation of electric poles 1

4) Power pole 2 Data:

- Coordinate points WGS'84 = 2°42'54.67"S; 111°41'3.29"E
- Object ground elevation = 24 m (obtained from the elevation of the point in the application Google Earth Pro)
- Object height = 11 m

Account:

- Object distance to the end of the runway strip = 374 m
- Elevation difference = 24 m – 23 m
  = 1 m
- Excess height = (object height + elevation height difference) – (maximum height limit)
  = (11 m + 1 m) – (374 m x 2%)
  = 12 m – 7.48 m
  = 4.52 m **(CONFIRMED AS OBSTACLE)**

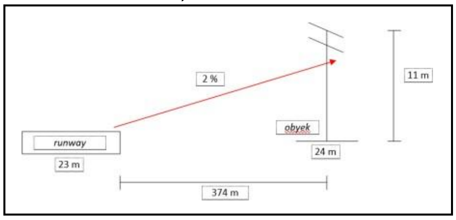


Figure 8. Calculation of the Electric Pole 2

5) Electric pole 3
Data:

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

Account:

- Object distance to the end of the runway strip = 350 m
- Elevation difference = 24 m – 23 m
  = 1 m
- Excess height = (object height + elevation height difference) – (maximum height limit)
  = (11 m + 1 m) – (350 m x 2%)
  = 12 m – 7 m
  = 5 m **(CONFIRMED AS OBSTACLE)**

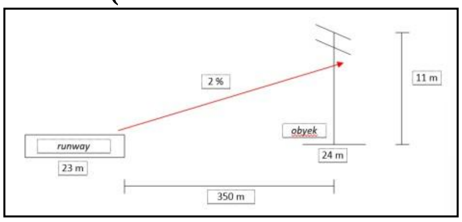


Figure 9. Calculation of the Electric pole 3

6) Power pole 4
Data:

- Coordinate points WGS'84 = 2°42'55.38"S; 111°41'2.32"E
- Object ground elevation = 25 m (obtained from the elevation of the point on the application Google Earth Pro)
- Object height = 11 m

Account:

- Object distance to the end of the runway strip = 367 m
- Elevation difference = 25 m – 23 m
  = 2 m
- Excess height = (object height + elevation height difference) – (maximum height limit)
  = (11 m + 2 m) – (367 m x 2%)
  = 13 m – 7.34 m
  = 5.66 m **(CONFIRMED AS OBSTACLE)**

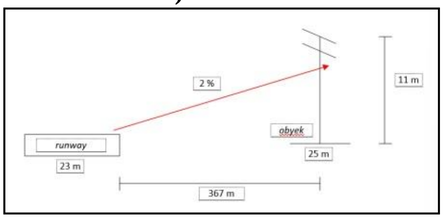


Figure 10. Calculation of the Electric pole 4

7) Power pole 5
Data:

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

Account:

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

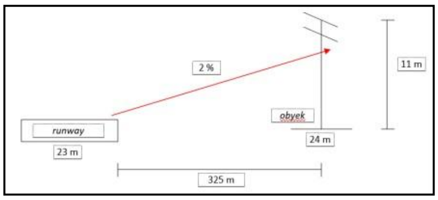


Figure 11. Calculation of the Electric pole 5

8) Power pole 6
Data:

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

Account:

- Object distance to the end of the runway strip = 430 m
- Elevation height difference = 23 m – 23 m = 0 m
- Excess height = (object height + elevation height difference) – (maximum height limit)
  = (11 m + 0 m) – (430 m x 2%)
  = 11 m – 8.6 m
  = 2.4 m **(CONFIRMED AS OBSTACLE)**

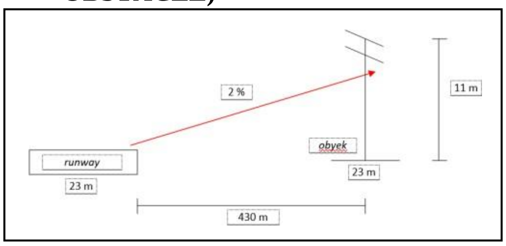


Figure 12. Calculation of the Electric pole 6

9) Power pole 7
Data:

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

Account:

- Object distance to the end of the runway strip = 404 m
- Elevation height difference = 23 m – 23 m
  = 0 m
- Excess height = (object height + elevation height difference) – (maximum height limit)
  = (11 m + 0 m) – (404 m x 2%)
  = 11 m – 8.08 m
  = 2.92 m **(CONFIRMED AS OBSTACLE)**

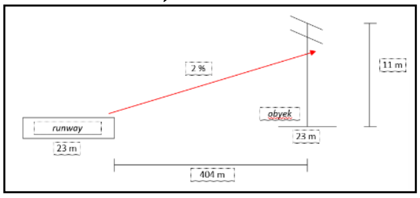


Figure 13. Calculation of the Electrical pole 7

10) Palm tree
Data:

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

Account:

- Object distance to the end of the runway strip = 441 m
- Elevation height difference = 23 m – 23 m
  = 0 m
- Excess height = (object height + elevation height difference) – (maximum height limit)
  = (12 m + 0 m) – (441 m x 2%)
  = 12 m – 8.82 m
  = 3.18 m **(CONFIRMED AS OBSTACLE)**

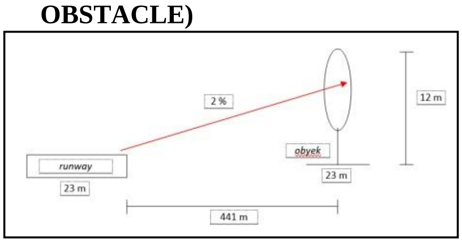


Figure 14. Palm tree calculation

11) Runway side tree 1
Data:

- Coordinate points WGS'84 = 2°42'27.48"S; 111°40'36.73"E
- Object ground elevation = 25 m (obtained from the elevation of the point on the application Google Earth Pro)
- Object height = 12 m

Account:

- Object distance to the end of the runway strip = 51 m
- Elevation height difference = 25 m – 23 = 2 m
- **(CONFIRMED AS AN OBSTACLE)**

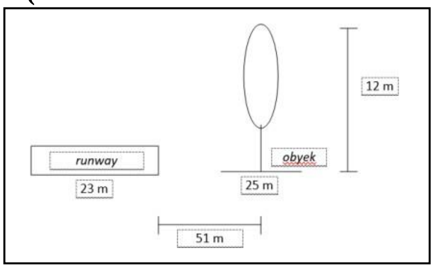


Figure 15. Runway side tree calculation 1

12) Runway side tree 2

Data:

- Coordinate points WGS'84 = 2°41'57.04"S; 111°40'3.67"E
- Object ground elevation = 21 m (obtained from the elevation of the point in the application Google Earth Pro)
- Object height = 13 m

Account:

- Object distance to the end of the runway strip = 53 m
- Elevation height difference = 21 m – 23 m = -2 m
- **(CONFIRMED AS AN OBSTACLE)**

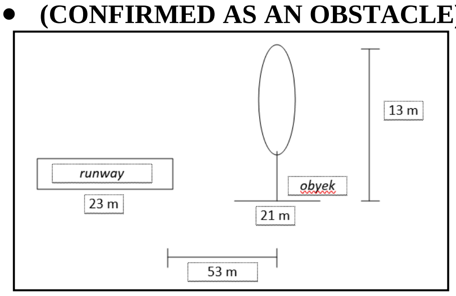


Figure 16. Runway side tree calculation 2

5. DISCUSSION

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

Among the 12 points, there are 10 objects that are new obstacles in the airport KKOP, 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 of 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 , there must be actions taken against these objects for the sake of optimizing the safety and security of flight activities in the KKOP area of Iskandar Pangkalan Bun Airport.

Handling actions for obstacle objects in the form of electric poles are by giving lights or signs in accordance with KM 23 of 2005 regulations on these poles and asking stakeholders to propose the relocation of the electric poles to the local government to a safe place from the height limit of the airport KKOP or by making a planted/underground cable channel so that it does not endanger aviation activities or community around the airport.

Meanwhile, actions that can be taken to follow up on the obstacle object in the form of trees are by cutting or felling the tree after the height limit and periodically monitoringtrees that have the potential to exceed the permitted height limit, for more details, then described in the table below:

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

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

6. CONCLUSIONS AND SUGGESTIONS

6. 1 Conclusion

The following information makes it possible to draw many conclusions based on the research that has been carried out and the presentation of the analysis and debate in the previous chapter:

1) In analyzing 12 points of physical objects suspected to be obstacles, measurements were made of the coordinate points and ground level elevation using the Garmin GPSMAP 65s tool, measuring the height of the object with the Nikon Forestry Pro II hyposometer binoculars, and mapping the points of the object using the AutoCAD application, Global Mapper,and Google Earth Pro.
2) After observation, of the 12 points suspected to be new obstacle objects,there are 10 points confirmed as new obstacles at the KKOP Iskandar Pangkalan Bun Airport consisting of 2points in the main surface area in the form of 2 trees and 8 points in the area of possible accident danger in the form of 1 tree and 7 electric poles with a height of between 2.4 – 14 meters whose details are described in Table 4.

6. 2 Suggestion

In view of 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. It is necessary to carry out regular inspections and surveys regarding physical objects in the airport KKOP area so that no new objects are identified as obstacles.
2. It is necessary to follow up on the proper handling of the obstacle object in the form of an electric pole, namely by submitting to the stakeholders in order to be able to give signs or lights on the electric pole in accordance withthe rules of KM 23 of 2005 and make an Aerodrome Manual to be submitted to the government, so that the government will later be more strict in enforcing rules regarding development management in the KKOP area of Iskandar Pangkalan Bun Airport.
3. It is necessary to take action to handle obstacles in the form of trees, namely by cutting down or cutting off excess trees so as not to endanger the safety and security of flight activities and be included in the airport KKOP.
4. For further research, in order to be able to develop the objectives and methods of conducting research using differentmeasuring tools and applications for the diversity of research results from obstacle objects in airport KKOP.

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