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# ICAO RBIS TOD PROJECT

## TERRAIN AND OBSTACLES DATA

### TOD REGULATORY TEMPLATE

[State name]

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>1 of 35</b>

*Instructions*

*[This document is an example template of a State TOD REGULATORY FRAMEWORK and provides step-by-step guidance to States on how to establish their own national TOD REGULATION in a standard consistent way in relation to ICAO ANNEX 15.]*

*International standards and regulations are in force which States are required to implement.*

*The state can provide or to delegate the authority for the provision of the TOD an agency, provided that the Standards and Recommended Practices (SARP) of Annex 15 are adequately met.*

*ICAO Reference documents:*

*Annex 15 Edition.....:*



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# TOD REGULATORY FRAMEWORK TEMPLATE

*Doc No. AFI\_AIM\_RBIS\_TOD\_RFT*

**Ed: 01 03/2023**

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**2 of 35**

## PART 0-DOCUMENT ADMINISTRATION

### 0.1. LIST OF EFFECTIVE PAGES

List of Effective Pages	
Page Number	Revision Date



 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>1 of 35</b>

### 0.3. DOCUMENTS REFERENCES

- Annex 15: Aeronautical information Services
- Procedures for Air Navigation Services — Aeronautical and information Management (PANS-AIM, Doc 10066)
- Aeronautical and information Services (AIS) Manual (Doc 8126)
- Eurocontrol TOD manual

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>2 of 35</b>

## 0.4 CONTENTS

### **PART I— PRELIMINARY PROVISIONS**

- 1 CITATION.
- 2 INTERPRETATION.
- 3 APPLICATION.

### **PART II – GENERAL PROVISIONS**

- 4 PROVISION OF TERRAIN AND OBSTACLE DATA
- 5 OPERATIONS MANUAL
- 6 HORIZONTAL REFERENCE SYSTEM
- 7 VERTICAL REFERENCE SYSTEM
- 8 TEMPORAL REFERENCE SYSTEM
- 9 MISCELLANEOUS SPECIFICATIONS

### **PART III RESPONSIBILITIES AND FUNCTIONS**

- 10 ROLE OF THE TERRAIN AND OBSTACLE DATA PROVIDER
- 11 TERRAIN AND OBSTACLE DATA PROVIDER RESPONSIBILITIES AND FUNCTIONS
- 12 OBLIGATION OF TERRAIN AND OBSTACLE DATA PROVIDERS

### **PART IV - TERRAIN AND OBSTACLE DATA PROVIDER**

- 13 DATA QUALITY SPECIFICATIONS
- 14 TERRAIN AND OBSTACLE DATA VALIDATION AND VERIFICATION
- 15 AUTOMATE TERRAIN AND OBSTACLE DATA SYSTEMS
- 16 QUALITY MANAGEMENT SYSTEM

### **PART V – SCOPE OF TERRAIN AND OBSTACLE DATA SERVICES**

- 17 SCOPE OF TERRAIN AND OBSTACLE
- 18 DATA EXCHANGE FORMAT REQUIREMENTS
- 19 META DATA
- 20 - DATA ORIGINATION REQUIREMENTS

### **PART VI – TERRAIN AND OBSTACLE SERVICES**

- 21 – DATA ORIGINATOR REQUIREMENTS
- 22 - DIGITAL DATA SETS IN GENERAL
- 23 -TERRAIN AND OBSTACLE DATA SETS GENERAL
- 24 - TERRAIN DATA SETS
- 25 - OBSTACLE DATA SETS

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>3 of 35</b>

**PART VII – TERRAIN AND OBSTACLE UPDATES**

26 DATA SET UPDATES

**PART VIII - ADMINISTRATIVE AND PERSONNEL REQUIREMENTS**

27 TERRAIN AND OBSTACLE DATA PROVIDER FACILITY, EQUIPMENT, DATA AND INFORMATION REQUIREMENTS

**PART IX – EXEMPTIONS**

28 REQUIREMENTS FOR APPLICATION FOR EXEMPTION.

**APPENDIX 1 – TERRAIN AND OBSTACLE DATA REQUIREMENTS**

**APPENDIX 2 – TERRAIN AND OBSTACLE ATTRIBUTES PROVISION REQUIREMENTS**

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>4 of 35</b>

*TOD REGULATORY FRAMEWORK TEMPLATE (No. ....)*

**IN EXERCISE** of powers conferred by section ----- (*Indicate the number of the regulation*) for Civil Aviation makes the following Regulations—

THE CIVIL AVIATION (TERRAIN AND OBSTACLES DATA) REGULATION, .....(*indicate the year of regulation promulgation*)

## PART I—PRELIMINARY

**1. Citation.** These Regulatory framework may be cited as the Civil Aviation (Terrain and Obstacles Data) Regulatory framework, .....(*indicate the year of regulation promulgation*).

**2. Interpretation.** In these Regulatory framework, unless the context otherwise requires—

*Note on the Regulations - While definitions should be included in a State's regulations, due to the diversity of national laws and regulations, this section is refer to Annex 15, to determine the definitions to be included in the State's regulations.*

“**aerodrome**” means a defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft;

“**bare earth**” means a surface of the earth including bodies of water and permanent ice and snow, and excluding vegetation and manmade objects;

“**calendar**” means discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day;

“**canopy**” means bare earth supplemented by vegetation height;

“**confidence level**” means the probability that the true value of a parameter is within a certain interval around the estimate of its value;

“**danger area**” means an airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times;

“**data accuracy**” means a degree of conformance between the estimated or measured value and the true value.

“**data completeness**” means the degree of confidence that all of the data needed to support the intended use is provided

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>5 of 35</b>

“**data format**” means a structure of data elements, records and files arranged to meet standards, specifications or data quality requirements

“**data integrity (assurance level)**” means a degree of assurance that an aeronautical data and its value has not been lost or altered since the origination or authorized amendment

“**data product**” means a data set or data set series that conforms to a data product specification;

“**data product specification**” means a detailed description of a data set or data set series together with additional information that will enable it to be created, supplied to and used by another party;

“**data quality**” means a degree or level of confidence that the data provided meet the requirements of the data user in terms of accuracy, resolution and integrity;

“**data resolution**” means a number of units or digits to which a measured or calculated value is expressed and used.

“**data set**” means identifiable collection of data;

“**data set series**” means a collection of data sets sharing the same product specification ;

“**data timeliness**” means the degree of confidence that the data is applicable to the period of its intended use;

“**data traceability**” means the degree that a system or a data product can provide a record of the changes made to that product and thereby enable an audit trail to be followed from the end-user to the originator;

“**datum**” means any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities;

“**Digital Elevation Model**” means the representation of terrain surface by continuous elevation values at all intersections of a defined grid, referenced to common datum;

“**feature**” means abstraction of real world phenomena;

“feature attribute” means characteristic of a feature;

“**feature operation**” means operation that every instance of a feature type may perform ;

“**geoid**” means the equipotential surface in the gravity field of the earth which coincides with the undisturbed mean sea level extended continuously through the continents;

“**geoid undulation**” means the distance of the geoid above (positive) or below (negative) the mathematical reference

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>6 of 35</b>

ellipsoid;

**“gregorian calendar”** means calendar in general use; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar ;

**“height”** means the vertical distance of a level, point or an object considered as a point, measured from a specific datum;

**“ICAO”** means International Civil Aviation Organisation;

**“integrity classification (aeronautical data)”** means classification based upon the potential risk resulting from the use of corrupted data. Aeronautical data are classified as-

- (a) routine data: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;
- (b) essential data: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and
- (c) critical data: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

**“manoeuvring area”** means that part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons;

**“metadata”** means data about data;

**“movement area”** means that part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron;

**“obstacle”** means all fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

- (a) are located on an area intended for the surface movement of aircraft; or
- (b) extend above a defined surface intended to protect aircraft in flight; or
- (c) stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.

**“obstacle/terrain data collection surface”** means a defined surface intended for the purpose of collecting obstacle/terrain

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	7 of 35

data;

**“origination (aeronautical data or aeronautical information)”** means the creation of the value associated with new data or information or the modification of the value of existing data or information;

**“originator (aeronautical data or aeronautical information)”** means an entity that is accountable for data or information origination and/or from which the AIS organization receives aeronautical data and aeronautical information;

**“position (geographical)”** means a set of coordinates (latitude and longitude) referenced to the mathematical reference ellipsoid which define the position of a point on the surface of the earth;

**“post spacing”** means an angular or linear distance between two adjacent elevation points;

**“prohibited area”** means an airspace of defined dimensions, above the land areas or territorial waters of the [State name] , within which the flight of aircraft is prohibited;

**“quality”** means a degree to which a set of inherent characteristics fulfils requirements ;

**“quality assurance”** means part of quality management focused on providing confidence that quality requirements will be fulfilled;

**“quality control”** means part of quality management focused on fulfilling quality requirements ;

**“quality management”** means coordinated activities to direct and control an organization with regard to quality;

**“restricted area”** means an airspace of defined dimensions, above the land areas or territorial waters of the [State name], within which the flight of aircraft is restricted in accordance with certain specified conditions;

**“terrain”** means the surface of the Earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles;

**“traceability”** means ability to trace the history, application or location of that which is under consideration

**“validation”** means confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled

**“verification”** means confirmation, through the provision of objective evidence, that specified requirements have been

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>8 of 35</b>

fulfilled.

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>9 of 35</b>

- 3. Application.** (1) These regulatory framework shall apply to a terrain and obstacle data provider.

## PART II – GENERAL PROVISIONS

- 4. Provision of terrain and obstacle data.** (1) The Regulator shall certify an organization as the Terrain and Obstacle Data Provider in accordance with the *Civil Aviation National Requirements*.

(2) An organization shall not provide terrain and obstacle data unless in accordance with sub-regulation (1).

- 5. Operations Manual.** A certified Terrain and Obstacle Data Provider shall develop an operations manual demonstrating how it will comply with the requirements of these regulations.

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>10 of 35</b>

**6. Horizontal reference system.**

The Terrain and Obstacle Data Provider and all parties involved in providing terrain and obstacle data shall:

- (a) use the World Geodetic System-1984 (WGS-84) as the horizontal (geodetic) reference system for air navigation;
- (b) specified transformation parameters to WGS-84 if the horizontal reference system is not WGS-84;
- (c) express the published aeronautical geographical coordinates indicating latitude and longitude in terms of the world geodetic system — 1984 geodetic reference datum.
- (d) model and estimate in precise geodetic applications and some air navigation applications, temporal changes in the tectonic plate motion and tidal effects on the Earth’s crust

**7. Vertical reference system.**

(1) A Terrain and Obstacle data provider shall:

- (a) use the mean sea level (MSL) datum as the vertical reference system for air navigation;
- (b) use the earth gravitational model — 1996 (EGM-96) as the global gravity model for air navigation;
- (c) develop regional, national or local geoid models containing high resolution (short wavelength) gravity field data at those geographical positions where the accuracy of Earth Gravitational Model - 1996 does not meet the accuracy requirements for elevation and geoid undulation on the basis of EGM- 96
- (d) provide in the Aeronautical Information Publication (AIP) a description of the model used, including the parameters required for height transformation between the model and EGM-96, when a geoid model other than the EGM-96 is used.
- (e) conform to the specifications concerning determination and reporting (accuracy of field work and data integrity) of elevation and geoid undulation at specific positions at aerodromes and heliports are contained in the PANS-AIM (Doc 10066), Appendix 1, Table A1.1

2) Requirements on the determination and reporting (accuracy of field work and data integrity) of elevation and geoid undulation at specific positions at aerodromes/heliports are contained in the PANS-AIM (Doc 10066), Appendix 1.

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>11 of 35</b>

- 8. Temporal reference system.** A Terrain and Obstacle Data Provider shall –
- (a) use the gregorian calendar and coordinated universal time as the temporal reference system for air navigation; and
  - (b) include either a description of a system or a citation for a document that describes a temporal reference system used for some applications, the feature catalogue, the metadata associated with an application schema or a data set, as appropriate, when a different temporal reference system is used.

- 9. Miscellaneous Specifications.** A Terrain and Obstacle Data provider shall –
- (a) use the units of measurement in the origination, processing and distribution of aeronautical data and aeronautical information are consistent with the tables contained in ICAO Annex 5 Chapter 3; and
  - (b) use the International Civil Aviation Organization (ICAO) abbreviations in aeronautical information products whenever they are appropriate and their use will facilitate distribution of terrain and obstacle data.

### **PART III - RESPONSIBILITIES AND FUNCTIONS**

- 10. Role of the terrain and obstacle data Provider**
- A certificated terrain and obstacle data Provider shall-
- a. provide terrain and obstacle data;
  - b. guarantee that the provision of terrain and obstacle data covers the entire territory of a State and those areas of the its responsible for the provision of air traffic services;
  - c. remain responsible for the terrain and obstacle data provided in accordance to sub regulation (b);

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>12 of 35</b>

- d. provide terrain and obstacle data for and on behalf of the State and clearly indicate that they are provided under the Authority of the State irrespective of the format in which they are provided;
- e. provide terrain and obstacle that are in accordance with the quality requirements contained in ICAO Annex 15 and PANS-AIM (Doc 10066); and
- f. Establish formal arrangements between originators of obstacle and terrain data and the terrain and obstacle data provider in relation to the timely and complete provision of obstacles data.

**11. Terrain and Obstacle data Provider responsibilities and functions.**

A terrain and obstacle data provider shall :

- (1) avail terrain and obstacle data necessary for the safety, regularity and efficiency of air navigation in a form suitable for the operational requirements of the air traffic management community.
- (2) verify terrain and obstacle data obtained from other sources, other than other States, before distribution and if not verified, when distributed, be clearly identified as such

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>13 of 35</b>

**12. Obligation of Terrain and Obstacle data providers.**

(1) Further to the provisions contained in regulation 10(f), the formal arrangements with persons or entities in custody of terrain and obstacle data established shall:

- (a) require timely submission of new or amended terrain and obstacle data;
- (b) ensure that the terrain and obstacle data provided is accurate, complete and timely;

(2) A terrain and obstacle data provider may by a written notice request a person who owns, controls or operates objects or structures that affect aviation safety to submit the data on the objects or structures for publication.

**PART IV TERRAIN AND OBSTACLE DATA PROVIDER**

**13. Data quality specifications**

(1) A Terrain and Obstacle Data provider shall meet the following data quality specifications:

- a) data accuracy: - the order of accuracy for aeronautical data shall be in accordance with its intended use.
- b) data resolution: - the order of resolution of aeronautical data shall be commensurate with the actual data accuracy.
- c) data integrity: the integrity of aeronautical data shall be maintained throughout the data process from origination to distribution to the next intended user.
- d) A terrain and obstacle data provider shall put in place procedures based on the applicable integrity classification as follows:
  - aa). for routine data: avoid corruption throughout the processing of the data;
  - ab). for essential data: assure corruption does not occur at any stage of the entire process and include additional processes as needed to address potential risks in the overall system architecture to further assure data integrity at this level; and
  - ac). for critical data: assure corruption does not occur at any stage of the entire process and include additional integrity assurance processes to fully mitigate the effects of faults identified by thorough analysis of the overall system architecture as potential data integrity risks.
- e) data timeliness: - timeliness is ensured by including limits on the effective period of the data elements.

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>14 of 35</b>

- f) data completeness: - completeness of the aeronautical data shall be ensured in order to support the intended use.
- g) data format:- the format of delivered data is adequate to ensure that the data is interpreted in a manner that is consistent with its intended use

**14. Terrain and obstacle data validation and verification**

- (1) A terrain and obstacle data provider shall thoroughly check the data before storage, distribution or sharing with the intended user.
- (2) A terrain and obstacle provider shall establish verification and validation procedures which ensure that upon receipt of data and, quality requirements are met.

**15. Automate Terrain and obstacle data systems**

A terrain and obstacle data provider shall:

- (a) have an automated system for the processing, storing of terrain and obstacle as part of providing its functions;
- (b) update the data in the system as necessary; and
- (c) use the system–
  - (i) that allows the digital exchange and supply of terrain and Obstacle data; and
  - (ii) that can provide the terrain and obstacle dataset in a format suitable for its intended use.
- (d) used digital data error detection techniques during the transmission and/or storage of terrain and obstacle data sets.
- (e) used digital data error detection techniques in order to maintain the integrity levels as specified in 13c).

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>15 of 35</b>

**16. Quality Management System**

- (1) A terrain and Obstacle provider shall implement and maintain a quality management system that –
  - (a) encompasses all functions of an terrain and obstacle data service as outlined in these regulatory framework;
  - (b) enables its execution be made demonstrable for each function stage;
  - (c) is applicable to the whole aeronautical data chain from data origination to distribution to the next intended user, taking into consideration the intended use of data.
  - (d) follows the ISO 9000 series of quality assurance standards and be certified by an accredited certification body.
- (2) The service provider shall take necessary measures to monitor compliance with the quality management system in place
- (3) The terrain and obstacle provider shall:
  - (a) conduct audits as a demonstration of compliance of the quality management system applied;
  - (b) identify any nonconformity, initiating action to correct its cause without undue delay.
  - (c) properly document and provide evidence of all audit observations and remedial actions.
- (4) Subject to sub-regulation (1) the terrain and obstacle provider shall:
  - (a) develop a quality manual that includes the scope of a quality management system as applied to terrain and obstacle data management processes;
  - (b) define and implement a user feedback system in the framework of the quality management system.
  - (c) adhere to other quality management system requirements as specified by the regulator.

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>16 of 35</b>

## PART V – SCOPE OF TERRAIN AND OBSTACLE DATA

### 17. Scope of terrain and obstacle data

(1) A terrain and Obstacle data provider shall include at least the following sub-domains of aeronautical data received and managed:

- a) obstacles;
- b) terrain; and
- c) geographic information;

(2) the determination and reporting of terrain and obstacle data shall be in accordance with the accuracy and integrity classification required to meet the needs of the end-user.

### 18. Data exchange format requirements

(1) Obstacle data shall be formatted in accordance with a common specification, which shall:

- use the extensible mark-up language (XML) specification as defined in the ISO standard for data encoding,
- be expressed in the form of an XML schema; in addition, a schematron as defined in the ISO series,
- enable the exchange of data for both individual features and feature collections,
- enable the exchange of baseline information as a result of permanent changes,
- be structured in accordance with the features, attributes and associations of the data set definition,
- implement strictly the enumerated lists of values and range of values defined for each attribute in the data set,
- comply with the geography mark-up language (GML) specification for the encoding of geographical information

(2) Electronic terrain data shall be provided in a common format compliant with the ISO standards (ISO 19107:2003, ISO 19139:2007, ISO 19118:2011, ISO 19118:2011 and ISO 19136:2007)

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>17 of 35</b>

## 19. Metadata

A terrain and obstacle data provider shall -

- (1) collect metadata for terrain and obstacle data processes and exchange points;
- (2) apply metadata collection throughout the terrain and obstacle data chain, from origination to distribution to the next intended user
- (3) collect metadata that includes as a minimum:
  - a) the names of the organizations or entities performing any action of originating, transmitting or manipulating the data;
  - b) the action performed or amendments made to the data;
  - c) details of any validation and verification of the data that has been performed
  - d) the date and time the action was performed and when the data set was provided;
  - e) period of validity of the data set;
  - f) for geospatial data:
    - the earth reference model used,
    - the coordinate system used;
  - g) for numerical data:
    - the statistical accuracy of the measurement or calculation technique used
    - the resolution,
    - the confidence level as required by the ICAO standards
  - h) details of any functions applied if data has been subject to conversion/transformation
  - i) details of any limitations with regard to the use of the data set.

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>18 of 35</b>

## 20. Data origination requirements

- (1) TOD are originated in a manner which meets identified data quality requirements for that data item, in terms of accuracy, resolution, integrity (or equivalent assurance level), traceability, timeliness, completeness and format.
- (2) TOD shall be originated in accordance with the specifications in the Aeronautical Data Catalogue Tables A1.1, A1.6, A1.7 and A1.8, contained in Appendix 1 of PANS-AIM (Doc 10066) and AFI AIM RBIS Template of terms of references in case of terrain and obstacle data acquisition
- (3) A terrain and obstacle data shall:
  - a. collect, verify and transmit data in accordance with the accuracy requirements and integrity classification specified in these framework.
  - b. determine and report geographical coordinates indicating latitude and longitude in terms of the World Geodetic System — 1984 (WGS-84) geodetic reference datum.
  - c. identify geographical coordinates that have been transformed into WGS-84 coordinates by mathematical means and whose accuracy of original field work does not meet the applicable requirements contained in the Tables A1.1 contained in Appendix 1 of PANS-AIM (Doc 10066).
  - d. publish elevation referenced to the MSL (geoid), for the specific surveyed ground positions as well as geoid undulation (referenced to the WGS-84 ellipsoid) for those positions specified in Tables A1.1 contained in Appendix 1 of PANS-AIM (Doc 10066)

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>19 of 35</b>

## PART VI – TERRAIN AND OBSTACLE SERVICES

- 21. Data Originator requirements**      A terrain and obstacle data originator shall:
- (1) Collect, verify and transmit data in accordance with the accuracy requirements and integrity classification specified in Tables A1.1, A1.6, A1.7 and A1.8, contained in Appendix 1 of PANS-AIM (Doc 10066).
  - (2) determine and report geographical coordinates indicating latitude and longitude in terms of the World Geodetic System — 1984 (WGS-84) geodetic reference datum.
  - (3) identify geographical coordinates that have been transformed into WGS-84 coordinates by mathematical means and whose accuracy of original field work does not meet the applicable requirements contained in Tables A1.1, A1.6, A1.7 and A1.8, contained in Appendix 1 of PANS-AIM (Doc 10066)
  - (4) have verification and validation processes and procedures in place to ensure the required data quality is met when terrain and obstacle data is provided.
  - (5) determine and report elevation referenced to the MSL (geoid), for the specific surveyed ground positions as well as geoid undulation (referenced to the WGS-84 ellipsoid) for those positions specified in Tables A1.1, A1.6, A1.7 and A1.8, contained in Appendix 1 of PANS-AIM (Doc 10066)
- 22. Digital data sets in general**      (1) A terrain and Obstacle data Provider shall provide digital data be in the form of the following data sets:
- (a) terrain data sets;
  - (b) obstacle data sets;
- (2) each data set shall be provided to the next intended user together with a minimum set of metadata that ensures data traceability from the end-user to the originator.
  - (3) a checklist of valid data sets shall be regularly provided.

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>20 of 35</b>

**23. Terrain  
and  
obstacle  
data sets  
general**

- (1) A terrain and obstacle data Provider shall specify the coverage areas for sets of terrain and obstacle data as:
- a) Area 1: the entire territory of a State;
  - b) Area 2: within the vicinity of an aerodrome, subdivided as follows (see figure 2);
    - i). Area 2a: a rectangular area around a runway that comprises the runway strip plus any clearway that exists.
    - ii). Area 2b: an area extending from the ends of Area 2a in the direction of departure, with a length of 10 km and a splay of 15 per cent to each side;
    - iii). Area 2c: an area extending outside Area 2a and Area 2b at a distance of not more than 10 km from the boundary of Area 2a; and
    - iv). Area 2d: an area outside the Areas 2a, 2b and 2c up to a distance of 45 km from the aerodrome reference point, or to an existing terminal control area (TMA) boundary, whichever is nearest;
  - c) Area 3: the area bordering an aerodrome movement area that extends horizontally from the edge of a runway to 90 m from the runway centre line and 50 m from the edge of all other parts of the aerodrome movement area (see figure 3).
  - d) Area 4: The area extending 900 m prior to the runway threshold and 60 m each side of the extended runway centre line in the direction of the approach on a precision approach runway, Category II or III (see figure 4).
- (2) Where the terrain at a distance greater than 900 m (3 000 ft) from the runway threshold is mountainous or otherwise significant, the length of Area 4 shall be extended to a distance not exceeding 2 000 m (6 500 ft) from the runway threshold.

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>21 of 35</b>

**24. Terrain data sets** A terrain and Obstacle data Provider shall:

- (1) provide terrain data set that contain the digital representation of the terrain surface in the form of continuous elevation values at all intersections (points) of a defined grid, referenced to common datum.
- (2) provide terrain data for Area 1.
- (3) provide for aerodromes regularly used by international civil aviation, terrain data as follow :
  - a) Area 2a;
  - b) the take-off flight path area; and
  - c) an area bounded by the lateral extent of the aerodrome obstacle limitation surfaces.
- (4) provide an additional terrain data for aerodromes regularly used by international civil aviation within Area 2 as follows (see figure 1):
  - a) in the area extending to 10 km from the ARP; and
  - b) within the area between 10 km and the TMA boundary or 45-km radius (whichever is smaller) where terrain penetrates a horizontal terrain data collection surface specified as 120 m above the lowest runway elevation.
- (4) made arrangements for the coordination of providing terrain data for adjacent aerodromes where their respective coverage areas overlap to assure that the data for the same terrain are correct.
- (5) made arrangements among States concerned to share terrain data for those aerodromes located near territorial boundaries.
- (6) provide terrain data for Area 4 for all runways where precision approach Category II or III operations have been established and where detailed terrain information is required by operators to enable them to assess the effect of terrain on decision height determination by use of radio altimeters for aerodromes regularly used by international civil aviation
- (7) sets an angular or linear and of regular or irregular shape as terrain grid
- (8) sets of terrain data shall include spatial (position and elevation), thematic and temporal aspects for the surface of the Earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles.
- (9) Subject to sub-regulation (9), on the acquisition method used, represent the continuous surface that exists at the

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>22 of 35</b>

bare Earth, the top of the canopy or something in-between, also known as “first reflective surface”.

- (10) provide in terrain data sets, only one feature type terrain,
- (11) provide the feature attributes describing terrain listed in the Appendix 2, Table 1.
- (12) provide the feature attributes annotated as mandatory recorded in the terrain data set.
- (13) conform terrain data for each area to the applicable numerical requirements as contained in Appendix 1 of the PANS-AIM (Doc 10066).

**25. Obstacle data sets**

- (1) A terrain and obstacle data Provider shall publish or provide :-
  - a) obstacle data sets that contain the digital representation of the vertical and horizontal extent of obstacles.
  - b) no obstacle data in terrain data sets.
  - c) obstacle data for obstacles in Area 1 whose height is 100 m or higher above ground.
  - d) obstacle data for all obstacles within Area 2 that are assessed as being a hazard to air navigation, for aerodromes regularly used by international civil aviation.
- (2) for aerodromes regularly used by international civil aviation, obstacle data for:
  - (a) area 2a for those obstacles that penetrate an obstacle data collection surface outlined by a rectangular area around a runway that comprises the runway strip plus any clearway that exists and surface shall have height of 3 m above the nearest runway elevation measured along the runway centre line, and for those portions related to a clearway, if one exists, at the elevation of the nearest runway end;
  - (b) objects in the take-off flight path area which project above a plane surface having a 1.2 per cent slope and having a common origin with the take-off flight path area; and
  - (c) penetrations of the aerodrome obstacle limitation surfaces.
- (3) For aerodromes regularly used by international civil aviation, obstacle data for Areas 2b, 2c and 2d for obstacles that penetrate the relevant obstacle data collection surface specified as follows:
  - (a) Area 2b: an area extending from the ends of Area 2a in the direction of departure, with a length of 10 km and a splay of 15 per cent to each side. The Area 2b obstacle collection surface has a 1.2 per cent slope extending from the ends of Area 2a at the elevation of the runway end in the direction of departure, with a length of 10 km and a splay of 15 per cent to each side;

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>23 of 35</b>

- (b) Area 2c: an area extending outside Area 2a and Area 2b at a distance of not more than 10 km from the boundary of Area 2a. The Area 2c obstacle collection surface has a 1.2 per cent slope extending outside Area 2a and Area 2b at a distance of not more than 10 km from the boundary of Area 2a. The initial elevation of Area 2c has the elevation of the point of Area 2a at which it commences; and
  - (c) Area 2d: an area outside Areas 2a, 2b and 2c up to a distance of 45 km from the aerodrome reference point, or to an existing TMA boundary, whichever is nearest. The Area 2d obstacle collection surface has a height of 100 m above ground;
  - (d) except that data need not be collected for obstacles less than a height of 3 m above ground in Area 2b and less than a height of 15 m above ground in Area 2c.
- (4) obstacle data shall be provided for Area 4 for all runways where precision approach Category II or III operations have been established for aerodromes regularly used by international civil aviation.
  - (5) Obstacle data elements represented in the data sets by points, lines or polygons as specified in Table A1-9 of Appendix 1 of the PANS-AIM.
  - (6) all defined obstacle feature types in an obstacle data set and each of them described according to the list of mandatory attributes provided in Appendix 2, Table 2.
  - (7) Obstacle data for each area conform to the applicable numerical requirements contained in Appendix 1 of the PANS-AIM.
  - (8) The obstacle data product specification, supported by geographical coordinates for each aerodrome included within the dataset, describe the following areas:
    - (a) areas 2a, 2b, 2c, 2d;
    - (b) the take-off flight path area; and
    - (c) the obstacle limitation surfaces.
  - (9) Arrangements for coordinating the provision of obstacle data for adjacent aerodromes where their respective coverage areas overlap to assure that the data for the same obstacle is correct.
  - (10) obstacle data for Area 3 for obstacles that penetrate the relevant obstacle data collection surface extending a half-metre (0.5 m) above the horizontal plane passing through the nearest point on the aerodrome movement area in aerodromes regularly used by international civil aviation,
  - (11) obstacle data for Area 4 for all runways where precision approach Category II or III operations have been established in aerodromes regularly used by international civil aviation,

 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>24 of 35</b>

## PART VII: TERRAIN AND OBSTACLE UPDATES

- 26. Data set updates** (1) A terrain and obstacle data provider shall: -
- (a) amend or reissue data sets at such regular intervals as may be necessary to keep them up to date;
  - (b) make available as digital data permanent changes and temporary changes of long duration (three months or longer) and issue in the form of a complete data set or a sub-set that includes only the differences from the previously issued complete data set.
  - (c) indicate the differences from the previously issued complete data set when made available as a completely reissued data set

## PART VIII – ADMINISTRATIVE AND PERSONNEL REQUIREMENTS

- 27. Terrain and Obstacle Data provider facility, equipment, data and information requirements.**
- (1) A terrain and obstacle data provider/originator shall–
- (a) have the facilities and equipment that are necessary for providing its terrain and obstacle data, including appropriate premises and equipment to allow operational personnel to perform their duties; and
  - (b) provide its operational personnel with access to the terrain and obstacle data required for the publication of the aeronautical information products or sharing with intended user
  - (c) train its staff on aspects of digital data sets

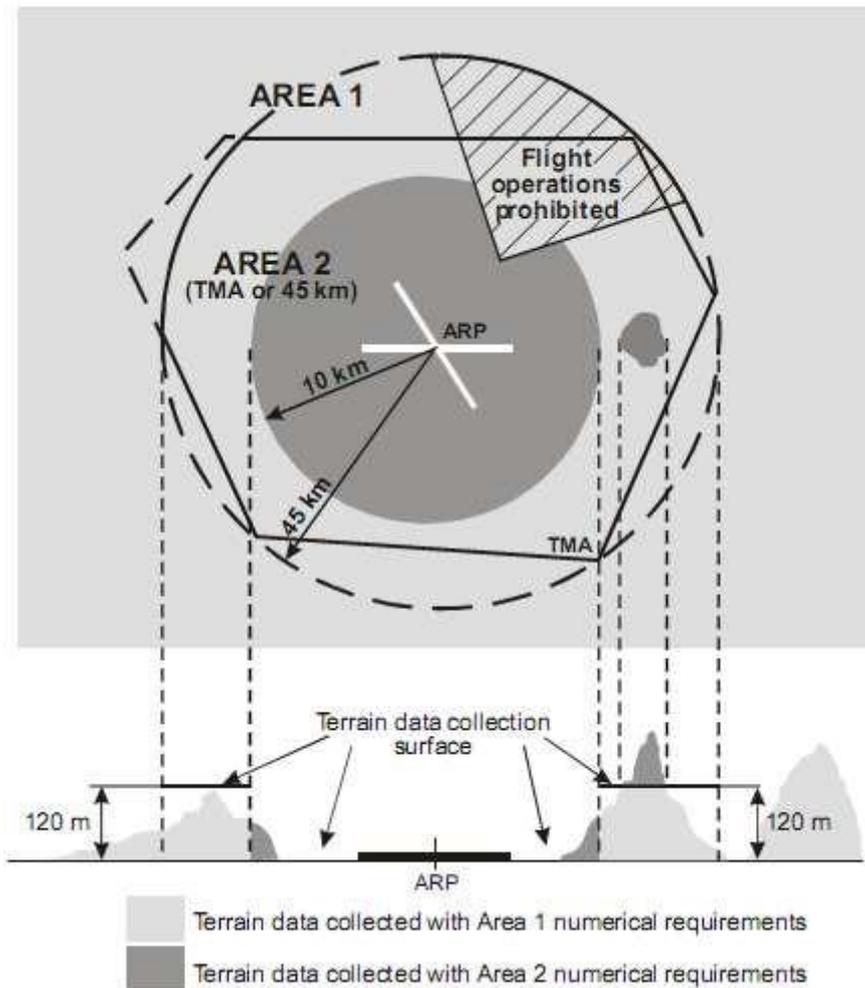
 <b>ICAO</b>	<b>TOD REGULATORY FRAMEWORK TEMPLATE</b>		
<i>Doc No. AFI_AIM_RBIS_TOD_RFT</i>	<b>Ed: 01 03/2023</b>	<b>Rev: 00 03/2023</b>	<b>25 of 35</b>

## PART IX – EXCEPTION

**28. Requirements for application for exemption.**

- (1) A person may apply to the Regulator for an exemption from any provision of these Regulations after aeronautical study.
- (2) Unless in case of emergency, a person requiring exemptions from any of these regulations shall make an application to the Regulator at least sixty days prior to the proposed effective date, giving the following information—
  - (a) name and contact address including electronic mail and fax if any;
  - (b) telephone number.

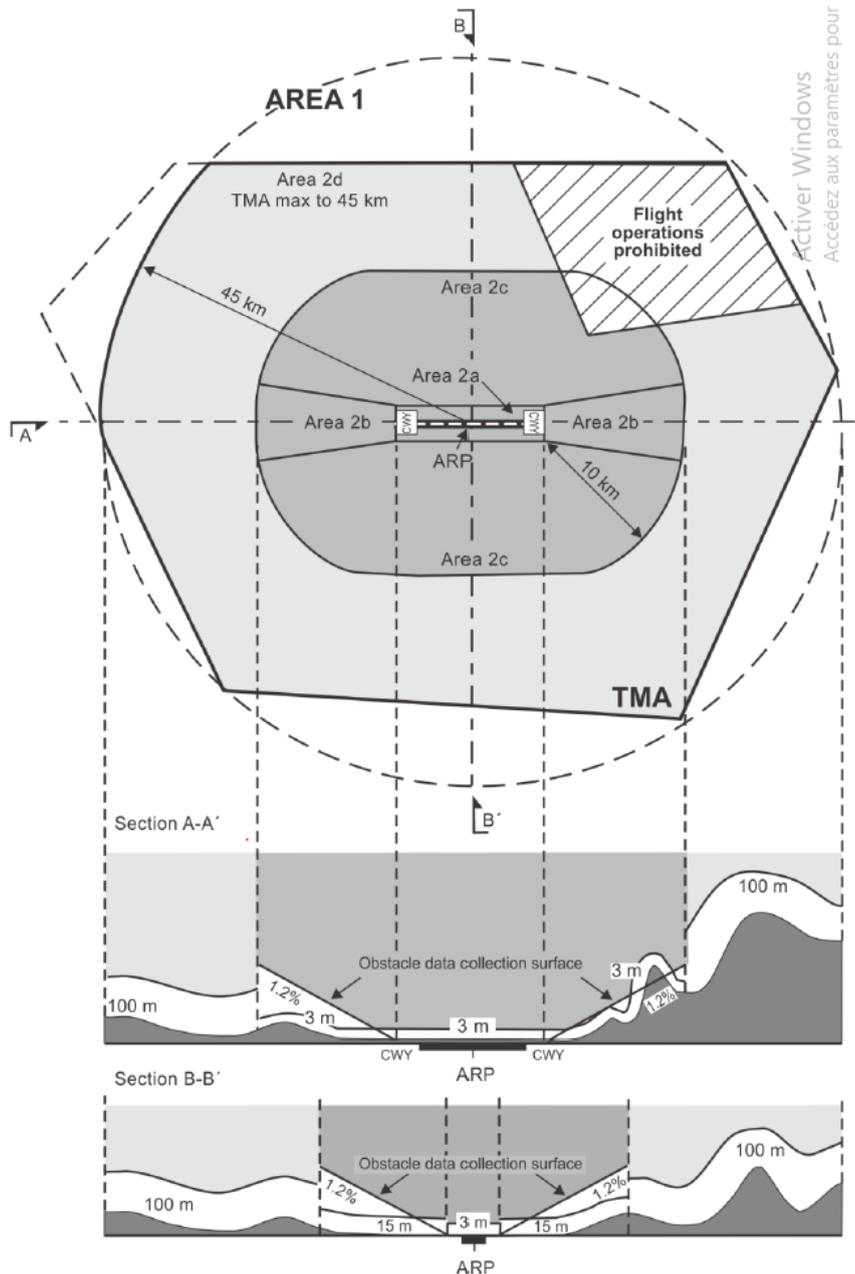
**APPENDIX 1: TERRAIN AND OBSTACLE DATA  
REQUIREMENTS**



**Figure 1. Terrain data collection surfaces — Area 1 and Area 2**

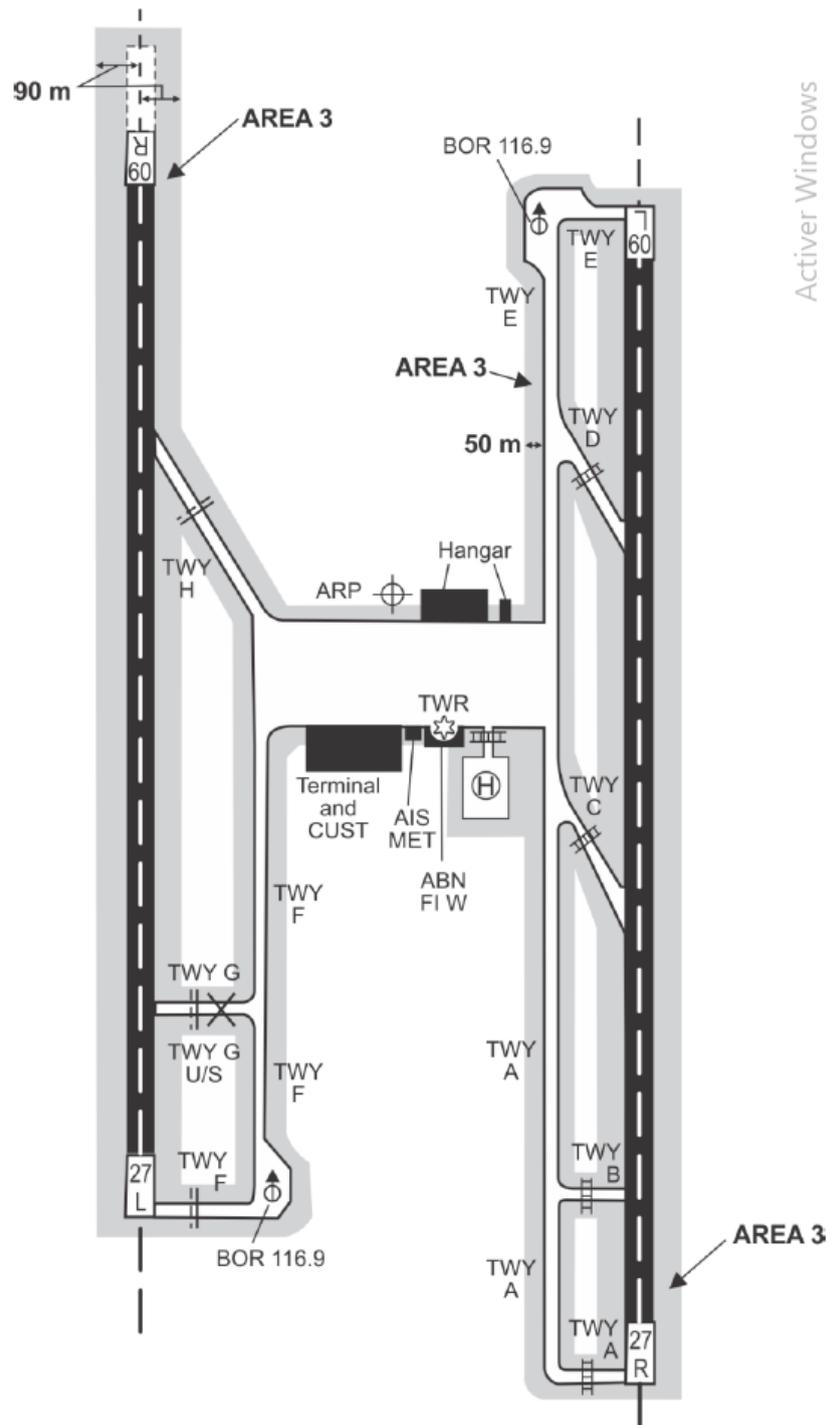
1. Within the area covered by a 10-km radius from the ARP, terrain data shall comply with the Area 2 numerical requirements.
2. In the area between 10 km and the TMA boundary or 45-km radius (whichever is smaller), data on terrain that penetrates the horizontal plane 120 m above the lowest runway elevation shall comply with the Area 2 numerical requirements.
3. In the area between 10 km and the TMA boundary or 45-km radius (whichever is smaller), data on terrain that does not penetrate the horizontal plane 120 m above the lowest runway elevation shall comply with the Area 1 numerical requirements.
4. In those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, terrain data shall comply with the Area 1 numerical requirements.

*Terrain data numerical requirements for Areas 1 and 2 are specified in Appendix 1, PANS AIM*



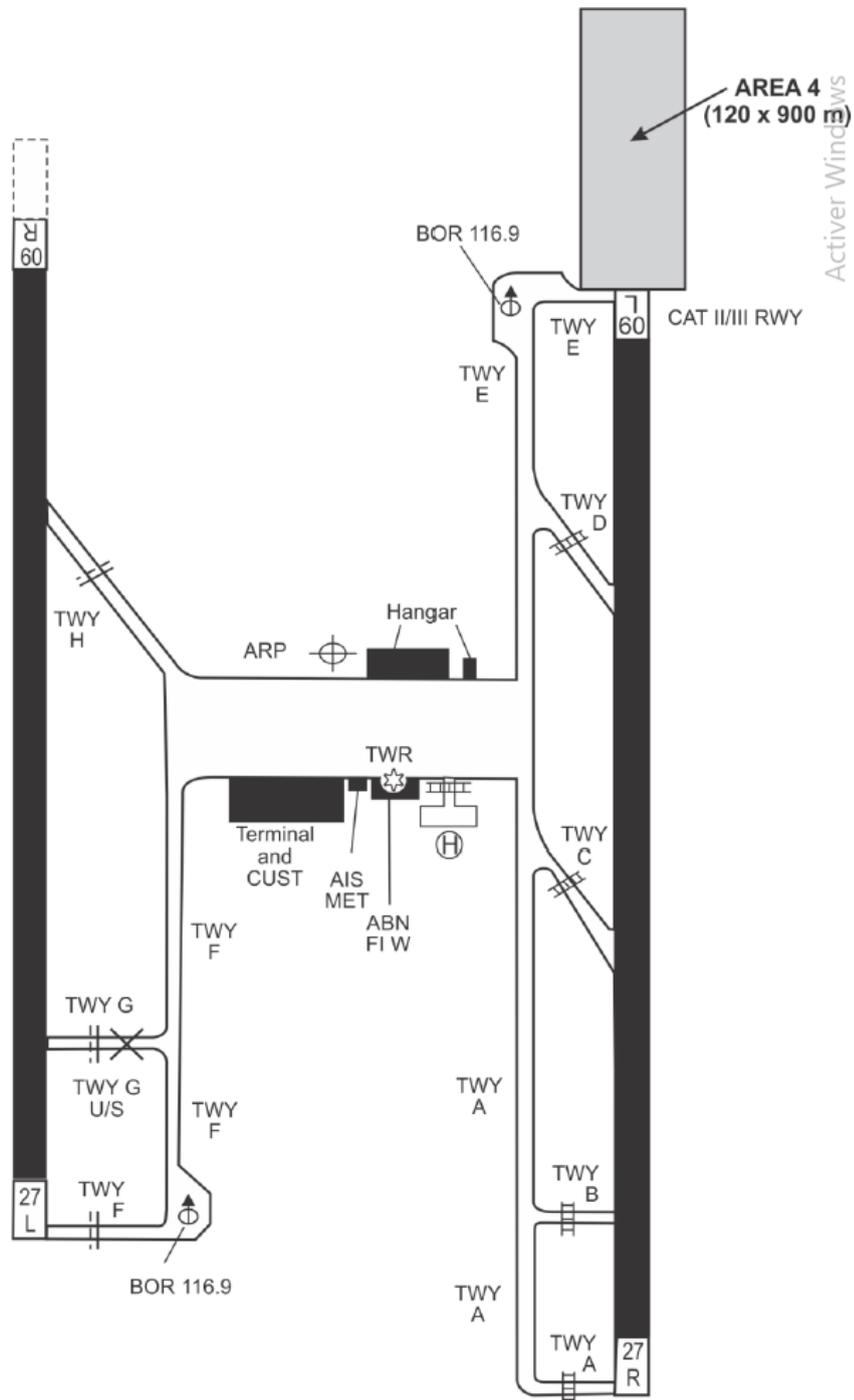
**Figure 2. Obstacle data collection surfaces — Area 1 and Area 2**

1. Obstacle data shall be collected and recorded in accordance with the Area 2 numerical requirements specified in Appendix 1, PANS AIM.
2. In those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, obstacle data shall be collected and recorded in accordance with the Area 1 requirements.
3. Data on every obstacle within Area 1 whose height above the ground is 100 m or higher shall be collected and recorded in the database in accordance with the Area 1 numerical requirements specified in Appendix 1, PANS AIM.



**Figure 3. Terrain and obstacle data collection surface — Area 3**

Terrain and obstacle data in Area 3 shall comply with the numerical requirements specified in the second schedule.



**Figure 4. Terrain and obstacle data collection surface — Area 4**

Terrain and obstacle data in Area 4 shall comply with the numerical requirements specified in the second schedule.



ICAO

**TOD REGULATORY FRAMEWORK  
TEMPLATE***Doc No. AFI\_AIM\_RBIS\_TOD\_RFT*

Ed: 01 03/2023

Rev: 00 03/2023

30 of 31

**APPENDIX 2 TERRAIN AND OBSTACLE  
ATTRIBUTES PROVISION REQUIREMENTS****Table 1. Terrain attributes**

<b>Terrain attribute</b>	<b>Mandatory/Optional</b>
Area of coverage	Mandatory
Data originator identifier	Mandatory
Data source identifier	Mandatory
Acquisition method	Mandatory
Post spacing	Mandatory
Horizontal reference system	Mandatory
Horizontal resolution	Mandatory
Horizontal accuracy	Mandatory
Horizontal confidence level	Mandatory
Horizontal position	Mandatory
Elevation	Mandatory
Elevation reference	Mandatory
Vertical reference system	Mandatory
Vertical resolution	Mandatory
Vertical accuracy	Mandatory
Vertical confidence level	Mandatory
Surface type	Optional
Recorded surface	Mandatory
Penetration level	Optional
Known variations	Optional
Integrity	Mandatory
Date and time stamp	Mandatory
Unit of measurement used	Mandatory



ICAO

**TOD REGULATORY FRAMEWORK  
TEMPLATE***Doc No. AFI\_AIM\_RBIS\_TOD\_RFT***Ed: 01 03/2023****Rev: 00 03/2023****31 of 31****Table 2. Obstacle attributes**

<b>Obstacle attribute</b>	<b>Mandatory/Optional</b>
Area of coverage	Mandatory
Data source identifier	Mandatory
Obstacle identifier	Mandatory
Horizontal accuracy	Mandatory
Horizontal confidence level	Mandatory
Horizontal position	Mandatory
Horizontal resolution	Mandatory
Horizontal extent	Mandatory
Horizontal reference system	Mandatory
Elevation	Mandatory
Height	Mandatory
Vertical accuracy	Mandatory
Vertical confidence level	Mandatory
Vertical resolution	Mandatory
Vertical reference system	Mandatory
Obstacle type	Mandatory
Geometry type	Mandatory
Integrity	Mandatory
Date and time stamp	Mandatory
Unit of measurement used	Mandatory
Operations	Optional
Effectivity	Optional
Lighting	Mandatory
Marking	Mandatory