

## **CIVIL AVIATION ADVISORY PUBLICATION**

### **CAAP 61**

### **AERODROME SURVEY REQUIREMENTS**

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#### ***STANDARDS, GUIDANCE AND INFORMATION FOR AERODROME OPERATORS AND SURVEYORS***

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## **CHAPTER 1 – INTRODUCTION**

### **1 GENERAL**

The Civil Aviation and Met. Authority (CAMA), as Yemen Competent Authority responsible for aviation safety, has the primary objective to protect Yemen population and travelling public. Whilst the CAMA conducts its safety oversight functions to the highest standard there are peripheral areas, which need to be coordinated with the participants in Yemen aviation system.

### **2 PURPOSE**

2.1 This Civil Aviation Advisory Publication (CAAP) details the survey requirements and plan presentation required by the Civil Aviation and Met. Authority (CAMA) to ensure Aerodrome Certificate Holders comply with their mandatory responsibilities as detailed in Civil Aviation Regulations and ICAO Annexes. Aerodrome Certificate Holders are advised to consult with their selected Surveyor on the content of this CAAP with regards to the technical detail contained within.

2.2 The purpose of aerodrome survey information is to enable Aerodrome Certificate Holders to meet their safety responsibilities to enable them to:

- a) reference aerodrome certification issues;
- b) design and develop operational flight procedures;
- c) prepare aeronautical charts; and
- d) conduct safety evaluations.

2.3 Following these processes, selected information shall be published in the Aeronautical Information Publication (AIP) and other associated documents.

### **3 STATUS OF THIS CAAP**

This is the first issue of CAAP 61 Aerodrome Survey Requirements and is dated July 2018. It will remain current unless withdrawn or superseded.

### **4 APPLICABILITY**

This CAAP is applicable to all operators of Certificated Aerodromes and those considering Certification in Yemen.

### **5 REFERENCES**

- a) YCAR Part IX (Aerodromes)
- b) ICAO DOC 9674-AN/946 (WGS-84 Manual)
- c) ICAO Annex 4 (Aeronautical Charts)
- d) ICAO Annex 5 (Units of Measurement to be Used in Air and Ground Operations)
- e) ICAO Annex 14 (Aerodromes)
- f) ICAO Annex 15 (Aeronautical Information Services)
- g) ICAO DOC 8168 - OPS/611(PANS OPS) Volume II
- h) EUROCONTROL Terrain and Obstacle Data Manual – ETOD Manual
- i) European Regulation EC 73/2010, Aeronautical Data Quality Implementing Rule (ADQIR)

### **6 GUIDANCE AND POLICY**

For guidance and policy on points that are not covered within this publication, advice should be sought from the Aerodrome Section, Air Navigation & Aerodrome Department, Aviation Safety Affairs Sector, CAMA.

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## 8 DEFINITIONS

<b>Above Mean Sea Level</b>	Orthometric Height or Elevation
<b>Accelerate-Stop Distance Available</b>	The length of the take-off run available plus the length of the stopway, if provided.
<b>Aerodrome Elevation</b>	The elevation of the highest point of the landing area.
<b>Approach Procedure with Vertical Guidance</b>	An instrument procedure which utilises lateral and vertical guidance, but does not meet the requirements established for precision approach and landing operations.
<b>Aerodrome Reference Point</b>	The designated geographical location of an aerodrome.
<b>Cyclic Redundancy Check</b>	A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.
<b>EGM96</b>	Earth Gravitational Model 1996.
<b>Ellipsoid Height</b>	The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.
<b>Geoid</b>	The equipotential surface in the gravity field of the Earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.
<b>Landing Area</b>	That part of a movement area intended for the landing or take-off of aircraft.
<b>Landing Distance Available</b>	The length of runway which is declared available and suitable for the ground run of an aeroplane landing.
<b>Obstacle</b>	All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight or stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.
<b>Orthometric Height</b>	Height of a point related to the geoid, generally presented as a MSL elevation. (Declaration of the orthometric height datum (MSL) is the responsibility of Yemen).
<b>Reference Ellipsoid</b>	A geometric figure, usually determined by rotating an ellipse about its shorter (polar) axis, used as a surface of reference for geodetic surveys. The reference ellipsoid closely approximates to the dimensions of the geoid, with certain ellipsoids fitting the geoid more closely for various areas of the earth.
<b>Survey Date</b>	The date that fieldwork was carried out to obtain data for the survey. Where fieldwork was completed over more than one day the end date of fieldwork shall be used.
<b>Take-off Distance Available</b>	The length of the take-off run available plus the length of the clear way if provided.

<b>Take off Run Available</b>	The length of the take-off run available.
<b>Threshold</b>	The beginning of that portion of the runway usable for landing.  <i>Note: The survey point for the runway threshold shall be the geometric centre of the runway at the beginning of the paved surface. For a displaced runway threshold this shall be the beginning of the upwind (runway) side of the threshold bar. (Refer to Fig 5.1)</i>

## 9 ABBREVIATIONS

<b>AGL</b>	(Height) Above Ground Level
<b>AIP</b>	Aeronautical Information Publication
<b>AMSL</b>	Above Mean Sea Level
<b>APV</b>	Approach Procedure with Vertical Guidance
<b>ARP</b>	Aerodrome Reference Point
<b>ASDA</b>	Accelerate-Stop Distance Available
<b>A-SMGCS</b>	Advanced Surface Movement Guidance and Control System
<b>CAAP</b>	Civil Aviation Advisory Publication
<b>YCAR</b>	Civil Aviation Regulation <b>CRC</b>  Cyclic Redundancy Check
<b>DCA</b>	Department of Civil Aviation
<b>eTOD</b>	Electronic Terrain and Obstacle Data
<b>FATO</b>	Final Approach and Take-off area (helicopters)
<b>ICAO</b>	International Civil Aviation Organization
<b>IFP</b>	Instrument Flight Procedure
<b>ILS</b>	Instrument Landing System
<b>LDA</b>	Landing Distance Available
<b>MSL</b>	Mean Sea Level
<b>MSAW</b>	Minimum Safe Altitude Warning
<b>NOTAM</b>	Notice to Airmen
<b>OLS</b>	Obstacle Limitation Surfaces
<b>PATC</b>	Precision Approach Terrain Chart
<b>SARPs</b>	ICAO Standards and Recommended Practices
<b>TLOF</b>	Touchdown and Lift Off area (helicopters)
<b>TMA</b>	Traffic Management Area
<b>TODA</b>	Take-off Distance Available

**TOFP** Take-Off Flight Path

**TORA** Take off Run Available

## **10 SURVEY PHILOSOPHY**

10.1 The basic survey philosophy applied in this publication is to provide reliable lists of all aerodrome facilities (i.e. runways, navigation aids, etc.) and features identified as obstacles for each aerodrome constrained by the appropriate area of interest. These lists form the basis for all charting, obstacle filtering (using obstacle identification and obstacle limitation surfaces) and analysis for Instrument Flight Procedures (IFP) design.

10.2 The challenge placed upon surveying companies is to identify appropriate features to survey in creating these lists. It will be totally impracticable and costly to survey all features. Therefore it is important for surveying companies to understand the tasks and challenges faced by the end user, i.e. for the preparation of Aeronautical Charts, for use by AIS Service Providers, IFP designers, Aerodrome Inspectors and for Aerodrome Certificate Holders in achieving physical Safeguarding. From an IFP design perspective, a reliable representation of the aerodrome and its obstacle environment forms the critical baseline for successful IFP design.

10.3 The Aerodrome Certificate Holder is accountable for assessing the significance of any existing (or proposed) obstacle within the aerodrome boundary or in the vicinity of the aerodrome in relation to the surveyed areas. Therefore the Aerodrome Certificate Holder shall determine the method of assessing the results of the survey data; a method which will identify where action should be taken to lower or remove obstacles which may otherwise limit operational activities. This process of assessment and results shall be made available to the CAMA Inspectors on request.

## **11 PUBLICATION STRUCTURE**

This publication is structured to assist the following logical steps:

- a) Choosing the relevant aerodrome survey classification.
- b) Determining the areas to be surveyed.
- c) Surveying the areas required.
- d) Populating Aerodrome Facilities and Master Obstacle data lists.
- e) Producing plans and filtering obstacle data as required.
- f) Producing a survey report which demonstrates the reliability of the data.
- g) Distributing relevant data and information.

## **12 MANDATORY REQUIREMENTS**

12.1 This publication strives to minimise the cost to aerodromes while providing the minimum prescribed safety standards and requirements. The CAMA fully recognises that each individual aerodrome governs its own operational needs and therefore the level of survey required should be appropriate to the type of operation intended for its purpose.

12.2 Aerodrome Certificate Holders shall provide accurate survey information of their aerodrome and environs according to the type of operation identified by the aerodrome survey classification and survey areas required as prescribed in **Tables 1-1** and **1-2** and shall be carried out to measure any changes at the periodic intervals as set out in **Table 1-3**.

### 13 SURVEY AREAS

The Aerodrome Survey Classification (**Table 1-1**) and the Aerodrome Survey Areas Mandatory Requirements for a particular Aerodrome Survey Classification are prescribed in **Table 1-2**.

**Table 1-1 Aerodrome Survey Classifications**

Type of Operation	Aerodrome Survey Classification
Aerodrome with no IFP	1
Aerodrome with Non-Precision IFP	2
Aerodrome with Precision ILS CAT I/APV or equivalent IFP	3
Aerodrome with Precision ILS CAT II/III or equivalent IFP	4

**Table 1-2 Aerodrome Survey Areas Mandatory Requirements**

Survey Area	Reference	Aerodrome Survey Classification			
		1	2	3	4
Aerodrome Plan	Chapter 5	✓	✓	✓	✓
YCAR Part IX, OLS	Chapter 6	✓	✓	✓	✓
Aerodrome Obstacle Chart – Type A (Aerodrome Survey Classification 2: if regularly used by international civil aviation)	Chapter 8	-	✓	✓	✓
Precision Approach Terrain Chart	Chapter 9	-	-	-	✓
eTOD Areas 2a & 2b (Initial survey 12 November 2015)	Chapter 7	-	-	✓	✓
eTOD Areas 2c, 2d*, 3* and 4 (Initial survey 12 November 2015)	Chapter 7	-	-	-	✓
<b>Notes:</b> <b>1.</b> Whilst eTOD Area 2 covers a similar geographical area to that of the YCAR Part IX OLS and the Aerodrome Obstacle Chart Type A Take Off Flight Paths, the accuracy requirements are such that the data would not be useful for safety assessments and safeguarding purposes. <b>2.</b> *eTOD Area 2d and Area 3: Optional. (Requirement determined by Aerodrome Certificate Holder in conjunction with airport users).					



## 14 SURVEY PERIODICITY

Surveys shall be undertaken for all Survey Areas required to measure any changes at the periodic intervals prescribed in **Table 1-3**

**Table 1-3 Survey Periodicity**

Survey Type	Aerodrome Survey Classification	Periodicity
Geodetic Connection	1, 2, 3 and 4	An initial mandatory survey
Mandatory Aerodrome Survey Areas (Full Survey)	1, 2, 3 and 4	a) Initial survey b) Within 5 years c) If any doubt exists as to the validity of a previous survey
Validation Assessment	1, 2, 3 and 4	Annually after the mandatory surveys

## 15 SURVEY PROCEDURES

### 15.1 Geodetic Connection

- a) The procedures for a geodetic connection are detailed in Chapter 2.
- b) The geodetic connection date shall be included on the Survey Declaration Form (see Annex A).

### 15.2 Mandatory Surveys

- a) The procedures for the mandatory surveys are detailed in Chapter 2.
- b) All mandatory surveys shall be included on the Survey Declaration Form (see Annex A).

### 15.3 eTOD Surveys

Refer to Chapter 7 of this document and ICAO Annex 15 (Amendment 36), Chapter 10, Appendix 1.

### 15.4 Validation Assessment

- a) The aim of the annual Validation Assessment is to identify any changes (including new or changes to existing obstacles) since the previous survey. If changes are suspected, then these shall be surveyed to the specifications detailed in this publication.
- b) All Validation Assessment Surveys shall be included on the Survey Declaration Form (see Annex A).

15.5 Any new survey contract between the aerodrome and a new survey company shall provide a seamless transition from that point reached in the survey life cycle with the previous contractor.

15.6 It is recommended that the aerodrome ensure provision is made within any survey contract to ensure that these requirements are complied with.

## **16 DATA MANAGEMENT**

16.1 The surveyor shall declare the new, amended and deleted records and the reason(s) for the change as part of the survey report.

16.2 If no changes were found to any of the attributes in an existing record, the record shall retain its original record number and survey date.

16.3 Strict data management is crucial during the entire survey and subsequent declaration process. Survey companies are urged to implement rigorous data handling processes and practices to eliminate erroneous data. Each surveyed entity and associated attributes shall be dealt with as a unique data record stream. Any change to an existing data record stream identified during a subsequent Validation Assessment Survey shall necessitate a re-issue of the entire data record with a new survey date while retaining the original unique identifier. A change of location to an existing feature will require a new unique identifier to be applied.

16.4 If a subsequent Validation Survey is submitted following an initial Full Survey, all previous data records shall be updated and the existing survey obstacle number retained with the new survey date.

16.5 Any new obstacle or changes to existing obstacle penetration of the aerodrome OLS may be subject to NOTAM until surveyed to the CAAP and YCAR Part IX standards, allowing entry into the AIP.

## **17 SURVEY DECLARATION FORM**

A Survey Declaration Form (see Annex A) shall accompany any Full or Validation Assessment Surveys undertaken. Completion of this Form confirms that the survey information meets the requirements and accuracies detailed in this publication and in YCAR Part IX.

## **18 QUALIFYING SURVEYING COMPANIES**

The Aerodrome Certificate Holder shall satisfy itself as to the competence of the surveyors it employs for aerodrome surveys. The following is a list of characteristics that should be considered:

- a) Accreditation to an ISO standard or operate an equivalent quality control system.
- b) Professionally qualified surveyors and project managers to oversee the survey.
- c) Field survey staff competent in aerodrome surveying techniques and experienced at working in an operational aerodrome environment.
- d) Professional indemnity cover.

## 19 ACCURACY

Appropriate survey methods shall be applied to qualify the accuracy and integrity of the data provided. Survey methodology shall be clearly demonstrated in the Survey Report and all coordinates shall be traceable to their source of production by an unbroken audit trail, as required by ICAO Annex 15, paragraph 3.2. Requirements are clearly stated in ICAO DOC 9674-AN/946 (WGS-84 Manual) and the most stringent survey accuracy shall apply for Aerodrome Survey Classification 2, 3 and 4 as prescribed in **Table 1-4**.

**Table 1-4 Minimum Survey Accuracy and Integrity Requirements**

	Horizontal Accuracy	Vertical Accuracy	Integrity Classification
<b>Aerodrome Control Network</b>	1.0 m *	1.0 m *	$1 \times 10^{-8}$
<b>Aerodrome Facilities</b>	0.5 m #	0.25 m #	$1 \times 10^{-8}$
<b>Obstacles and Off Aerodrome Facilities (Mandatory Surveys)</b>	3.0 m #	0.3 m #	$1 \times 10^{-5}$
<b>eTOD Area 2</b>	5.0m *	3.0m *	$1 \times 10^{-5}$
<b>eTOD Area 3</b>	0.5m #	0.5m #	$1 \times 10^{-5}$
<b>eTOD Area 4</b>	2.5m *	1.0m *	$1 \times 10^{-5}$
* Accuracy with respect to the appropriate geodetic reference frame			
# Accuracy relative to the aerodrome control network			

## 20 SURVEY INFORMATION TO AIS

Noted changes to aerodrome data must be routed to the AIS service provider.

## 21 CONVERSION FACTORS

**Table 1-5 ICAO Annex 5 is used as the standard for the application of all conversion factors**

Non-SI Units	SI Units
1 Nautical Mile (nm)	1.852 kilometres (km)
0.54 nm	1 km
1 Foot (ft)	0.3048 metres (m)
3.2808 ft	1 m

## **CHAPTER 2 – SURVEY PROCEDURES**

### **1 GENERAL**

1.1 The accuracy and integrity requirements for the geodetic connection and surveyed data are stated in **Table 1.4** and YCAR Part IX Appendix 5.

1.2 With the exception of those aerodromes without Instrument Flight Procedures, those with Survey Classification 2, 3 and 4 shall undertake surveys to the accuracy and quality assurance requirements stated in the ICAO DOC 9674-AN/946 (WGS-84 Manual). The Aerodrome Certificate Holder is responsible for ensuring the accuracy of information required for all survey areas.

### **2 HORIZONTAL CONTROL**

2.1 Coordinates will be required in WGS-84 format latitude and longitude (required format for published data).

2.2 Survey control points shall conform to the ICAO DOC 9674-AN/946 (WGS-84 Manual).

2.3 WGS-84 geodetic control and format requires that the methods applied must prove that the accuracy for the various surveys has been met. Survey companies undertaking these surveys shall be responsible for the accuracy of the control data and any transformation sets used. An analysis of the accumulated error, evidence confirming the required accuracies have been met and the transformation parameters used shall be included in the Survey Report.

### **3 VERTICAL CONTROL**

3.1 Orthometric and ellipsoidal elevations are required.

3.2 The variable separation between the geoid and the reference ellipsoid may give rise to inaccuracies greater than the allowable specified. For the computation to transform ellipsoidal to orthometric elevations the EGM96 geoid model shall be used.

3.3 In all cases appropriate survey checks shall be applied to prove the quality of vertical control. These checks shall be included within the survey report.

3.4 Standard survey practice shall be used to produce the elevation to the required specification accuracy and the integrity of the control points used shall be proved.

### **4 INSTRUMENTATION**

All relevant survey equipment shall have a current calibration certificate and be able to perform to the accuracy appropriate to the requirements of the surveys.

## 5 METHODOLOGY

5.1 All permanent control points shall be “monumented” in accordance with WGS-84 Manual (or equivalent).

5.2 All permanent controls that are established shall be documented and their coordinates traceable to their source.

5.3 The use of contour maps can aid in the process of defining the probable extent of the survey and the likely position of obstacles. Local scale factor adjustment to ground distances as well as the effects of curvature and refraction shall be considered.

5.4 Unvalidated or new obstacle data shall be proved by either a minimum of two independent measurements or by other suitable checks for errors. The methodology used to ensure reliable coordinates shall be documented in the Survey Report along with evidence that the resulting accuracies have met the requirements.

5.5 Existing obstacles within a validated dataset need only to be checked to confirm their height and position without the rigour afforded to unvalidated or new obstacles. Particular attention should be paid to structures i.e. trees, whose height may change. An appreciation of the effects of vertical angles over variable distances is necessary to give good height accuracies.

## 6 OBSTACLES TO BE HEIGHTED

6.1 Surveying companies should take note that when surveying a prescribed area, a situation might arise where the highest obstacle within that area might not necessarily be the dominant obstacle for that particular phase of flight. Therefore, surveyors should always declare all surveyed obstacles in the Master List.

6.2 Obstacles include terrain, vegetation and structures.

6.3 Where there are a large number of obstacles to be heighted, it will be impractical to survey all obstacles; therefore the surveyor should consult with the Aerodrome Certificate Holder and the Instrument Flight Procedure (IFP) designers where necessary. Any agreements are to be recorded in the Survey Report.

6.4 Due consideration must be taken when observing transverse and longitudinal obstacles in close proximity to the runway because their leading edge may have greater significance than the highest point. (It must be appreciated that the highest object might not be the most important for consideration, see **Figure 2-1**).

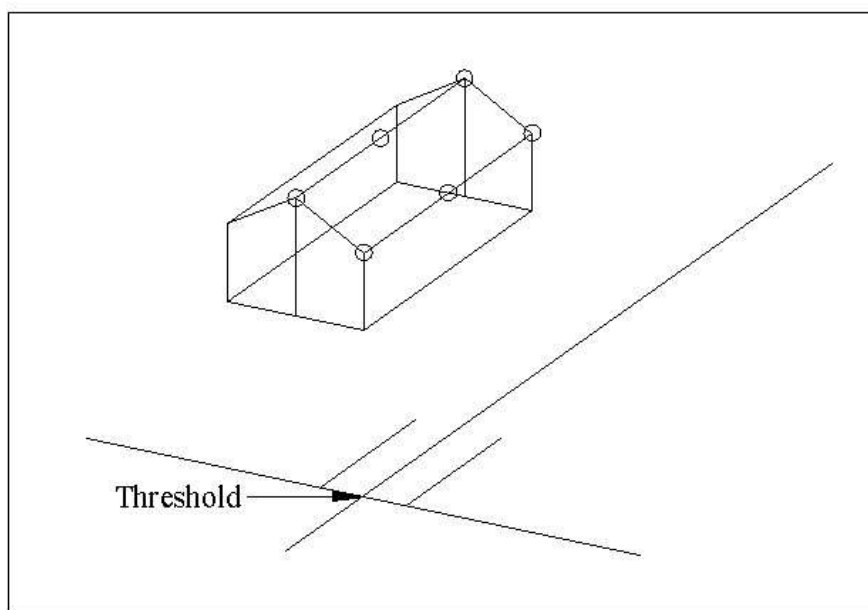
6.5 Fine obstacles such as lightning conductors or aerials that surmount the object may not be visible over a distance. Therefore care must be taken when observing distant obstacles to ensure that the highest point is heighted.

6.6 Height above ground level (AGL) should also be measured where possible or derived by comparison with the terrain data.

6.7 Temporary obstacles encountered at the time of survey should be included and identified as temporary. A statement should be included in the Survey Report stating the temporal extent of all such obstacles.

6.8 When compiling the data, the surveyor should include all features surveyed, whether they penetrate the relevant surfaces or not.

**Figure 2-1**  
**Transverse and Longitudinal Obstacles**



○ *Suggested survey points*

## **CHAPTER 3 – PRESENTATION**

### **1 PLANS**

#### **1.1 Plan Format**

The format of the base mapping for the Aerodrome Plan is at the discretion of the Aerodrome Certificate Holder. Listed below are the acceptable formats:

- a) Digital mapping
- b) Hard copy mapping compilations

#### **1.2 Surveyor Requirements**

Surveyors shall ensure the following:

- a) The most recent mapping shall be used.
- b) Geographical reference system shall be shown with grid values along the plan edge at convenient intervals.
- c) Data reference source and revision data shall be shown on the plan.

#### **1.3 Plan Content**

Each plan shall have a title panel. The information shown should consist of the following:

- a) Aerodrome name
- b) Drawing title
- c) Drawing number or reference number including current amendment status.
- d) Date of survey
- e) Scale
- f) Geographical coordinates system used
- g) Vertical/elevation reference system used
- h) Survey company name and address including telephone number
- i) Surveyed by
- j) Checked by
- k) Plan number
- l) Plan lay-out and diagram, if applicable
- m) Abbreviations used
- n) A reference to the appropriate survey report

## **2 SURVEY REPORTS**

2.1 All coordinates shall be traceable to their source of production by an unbroken audit trail, as required by ICAO Annex 15, paragraph 3.2. Therefore the Survey Report will need to contain the following elements to support the audit trail:

2.2 Geodetic Connection Report (applicable to Aerodrome Classifications 2, 3, and 4 only), shall include the following:

- a) Quality Records as per Chapter 4, paragraph 1
- b) Details of the connection of the aerodrome control network to the geodetic network
- c) Aerodrome control network plan
- d) Survey stations descriptions

2.3 An Aerodrome Facilities Survey and Aerodrome Obstacle Survey shall include the following:

- a) Quality Records as per Chapter 4, paragraph 1

2.4 Details and results of Validation Assessment Surveys carried out shall include the following:

- a) Quality Records as per Chapter 4, paragraph 1 for all facilities or obstacles added to the survey data.
- b) Schedules listing all obstacles that have been added or deleted since the last survey (see Chapter 3, paragraph 2.6)
- c) Survey Declaration Form - Annex A

2.5 For traceability purposes the complete documentation should be reissued if required on every occasion that a Validation Assessment Survey amends the preceding survey.

2.6 Format of the schedules listing changes shall be at the discretion of the surveyor or as agreed with the Aerodrome Certificate Holder. It is recommended that schedules are prepared as digital spreadsheets. To enable users to track changes each dataset should be accompanied by an 'Additions' and 'Deletions' file. Where an obstacle has been given a new feature number the old number shall be referenced against it.

## **3 DIGITAL DATA**

3.1 The following master files of all surveyed obstacles and aerodrome facilities shall be created and supplied in Annex B format:

- a) Master Obstacles File, named appropriately, e.g. "ICAO 4 letter designator"\_obst00.crc. This will include all features identified as obstacles.



- b) Aerodrome Facilities File, named appropriately, e.g. "ICAO 4 letter designator"\_ad00.crc. This will include all facilities surveyed for the purposes of the Aerodrome Plan survey area.

3.2 The integrity of the survey information supplied in digital format (see Annex B) shall be protected against third party corruption by wrapping with a Cyclic Redundancy Check (CRC). A 32 bit CRC-32Q algorithm value (CRCV format = Hexadecimal) should be utilised. CRC wrapping is mandatory for all survey data Annex B format files.

## **CHAPTER 4 – QUALITY ASSURANCE**

### **1 QUALITY RECORDS**

1.1 All data elements shall be traceable to their source of production by an unbroken audit trail. The surveying company, following guidance given in the WGS-84 Manual, shall provide information on the source of production in the form of Quality Records.

1.2 Quality Records shall include:

- a) Surveying organisation
- b) Name of surveyor(s)
- c) Date and purpose of survey
- d) Method of survey and equipment used
- e) Equipment calibration information and method of checking the survey
- f) Evidence that the accuracy requirements have been met including details of the error budget analysis.

### **2 METHODOLOGY**

The surveying company shall maintain an effective checking system to ensure that the data collected conforms to the accuracy standard and shall present a statement of that conformity within the Survey Report.

## CHAPTER 5 – AERODROME PLAN SURVEY AREA

### 1 PURPOSE

The Aerodrome Plan is part of the Aerodrome Manual which Aerodrome Certificate Holders are required to maintain for Certification and Safeguarding purposes. The Aerodrome Plan is a working document that gives an accurate picture of the aerodrome configuration and integral facilities.

### 2 SURVEY SPECIFICATION

2.1 The survey specification for the aerodrome facilities that will be included on the Aerodrome Plan is covered in ICAO DOC 9674-AN/946 (WGS-84 Manual).

2.2 The elevation AMSL, at the start of LDA, start and end of TORA, end of ASDA and end of TODA shall be included in the survey. In addition, elevation at the runway centreline at each end of the runway and at regular intervals (maximum 200m) extending along the runway, stopway, and clearway and at each significant change in slope shall also be included.

2.3 Features listed at Annex B - Section B - Aerodrome Facilities File shall be shown on the plan.

***Explanation:** Some features such as the ARP, ends of TORA/TODA/ASDA/LDA may be computed points and cannot be surveyed; therefore it is incorrect to specify that all features in Annex B shall be surveyed. These features shall be clearly indicated as calculated and not surveyed.*

### 3 PLAN CONTENT

3.1 The scale should be such that the plan fits onto a single standard ISO sheet (A0 or A1). 1:2500 scale is preferred whenever possible but 1:5000 is acceptable. The accepted format of the plan is covered in Chapter 3 paragraph 1.1.

3.2 The area of the plan shall show the limits of the aerodrome boundary and the locations of installations that are considered integral to the operational procedures of the aerodrome. Insets may be required to show off-site facilities.

3.3 All aerodrome characteristics shall be shown true to scale with the facilities labeled in such a way as to facilitate easy cross-reference to the positional information contained within the schedules.

3.4 WGS-84 and UTM coordinates with ellipsoidal heights and orthometric elevations (AMSL) and height AGL (where applicable) shall be shown on the plan for the features listed in Annex B – Aerodromes Digital Data Specification (Section B - Aerodrome Facilities File).

3.5 The coordinates and associated data should be in a schedule format within the plan.

3.6 The runway threshold should be clearly indicated on the plan. The survey point for the runway threshold shall be the geometric centre of the runway at the beginning of the paved

surface. For a displaced runway threshold, this shall be 6 metres from the threshold markings (see **Figure 5-1**).

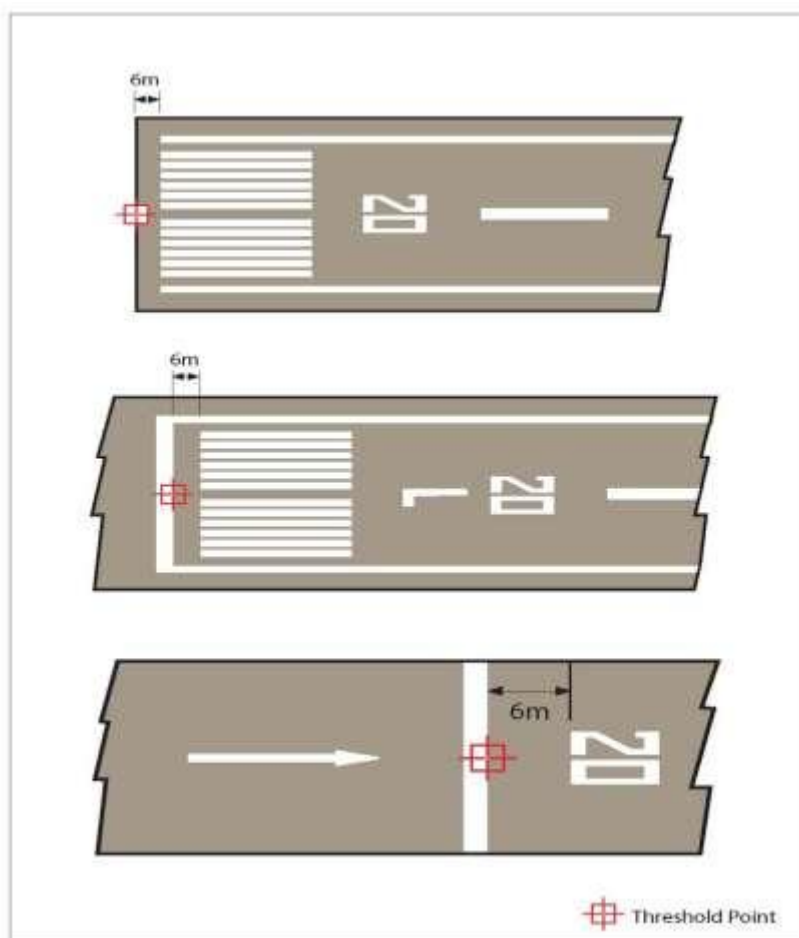
3.7 Additional information may be required; this shall be at the request of the Aerodrome Certificate Holder and may include the following:

- a) Fire service accommodation
- b) Emergency access/egress gates and routes
- c) Emergency water supply tanks
- d) Facility safeguarding (fences)
- e) Human Observed RVR Conversion Table

#### 4 DIGITAL DATA

Surveyed features shall form part of the Aerodrome Facilities File depicted in Annex B - Section B. The Aerodrome Facilities File represents a base line of aerodrome features. Additional features that the aerodrome requires to be surveyed can be added. If the feature is not listed or identified in accordance with the file then it will be considered an obstacle and added to the Master Obstacle File.

**Figure 5-1 Survey Point for Runway Threshold**



## **CHAPTER 6 – YCAR PART IX OBSTACLE LIMITATION SURFACES (OLS) SURVEY AREA**

### **1 PURPOSE**

- 1.1 The purpose of the OLS survey is to identify all obstacles that infringe the prescribed YCAR Part IX, Obstacle Limitation Surfaces appropriate to the existing or proposed runway coding.
- 1.2 Whilst ICAO Annex 15 (eTOD) Area 2 covers a similar geographical area, the accuracy requirements may not be deemed sufficient for the purposes of the YCAR Part IX, Obstacle Limitation Surfaces.
- 1.3 The survey data enables the Aerodrome Certificate Holder to make safety evaluations and assists the CAMA to make assessments for the grant, retention or modification of an Aerodrome Certificate.
- 1.4 It is the responsibility of the Aerodrome Certificate Holder to promulgate selected significant obstacles within the Obstacle Limitation Surfaces as described in YCAR Part IX: approach, take-off climb and circling areas in the Aeronautical Information Publication (AIP). To aid this selection the Aerodrome Certificate Holders shall ensure that the surveyor identifies all significant obstacles that infringe the surfaces, including extent of infringement. For guidance, identify and report the following:
  - a) First obstacles in the Take-Off Climb Surfaces
  - b) Lines of pylons close to the aerodrome surfaces
  - c) High ground that may affect the circuit height
  - d) Obstacles (chimney, mast, etc.) within the circling area that are significantly higher than the aerodrome elevation
  - e) Lit aerodrome features or large single objects that may not necessarily be infringements

### **2 SURVEY SPECIFICATION**

- 2.1 Physical Characteristics:
  - a) Runway Strip
  - b) Clearway (when applicable)
  - c) Stopway (when applicable)
- 2.2 The Obstacle Limitation Surfaces are listed below:
  - a) Inner Transitional Surface
  - b) Transitional Surface
  - c) Inner Approach Surface

- d) Approach Surface
- e) Inner Horizontal Surface
- f) Conical Surface
- g) Outer Horizontal Surface
- h) Baulked Landing Surface
- i) Take-Off Climb Surface

- 2.3 The dimensions and slopes of the various surfaces are defined and illustrated in YCAR Part IX along with the Runway Classification requirements for each surface.
- 2.4 The Aerodrome Certificate Holder before the start of work will give the origin of each surface, relative to a particular runway, to the surveyor.
- 2.5 The survey requirement is to height all obstacles within the Obstacle Limitation Surfaces area that infringe the limitation surfaces.
- 2.6 Height above ground level (AGL) should also be measured where possible or derived by comparison with terrain data.
- 2.7 Special care must be exercised in the near environs of the approach and take-off climb area to ensure complete obstacle coverage.
- 2.8 Aerodrome Certificate Holders are reminded of their accountability for assessing the obstacle data as stated in Chapter 1 paragraph 10.3.

### **3 DIGITAL DATA**

All surveyed obstacles shall form part of the Master Obstacles File depicted in Annex B.

## CHAPTER 7 – ELECTRONIC TERRAIN & OBSTACLE DATA (ETOD)

### 1 PURPOSE

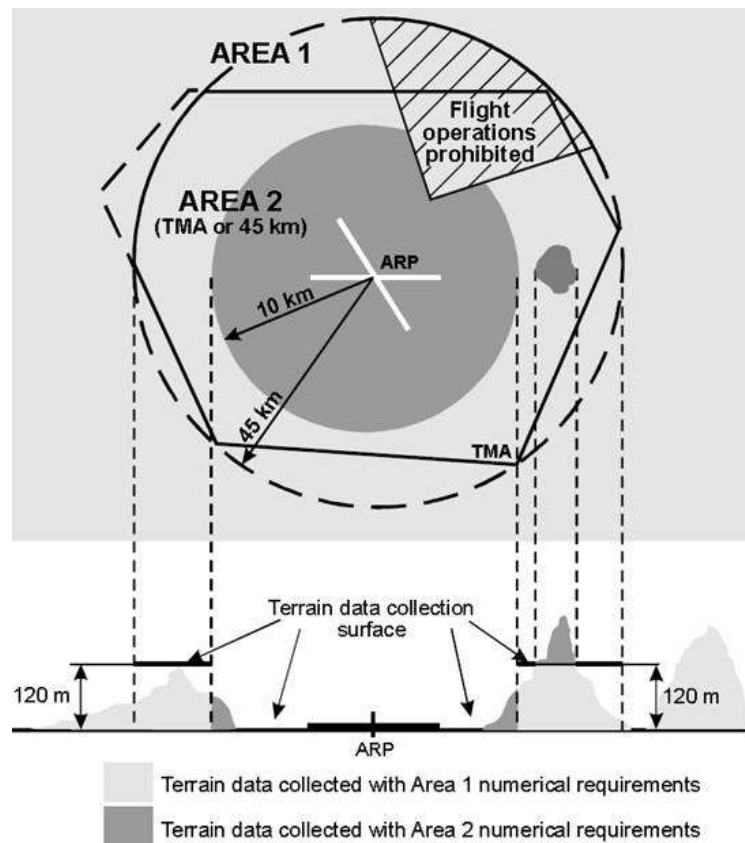
Electronic terrain and obstacle data is intended to be used in the following air navigation applications:

- a) ground proximity warning system with forward looking terrain avoidance function and minimum safe altitude warning (MSAW) system;
- b) determination of contingency procedures for use in the event of an emergency during a missed approach or take-off;
- c) aircraft operating limitations analysis;
- d) instrument procedure design;
- e) determination of en-route “drift-down” procedure and en-route emergency landing location;
- f) advanced surface movement guidance and control system (A-SMGCS); and
- g) aeronautical chart production and on-board databases.

### 2 COVERAGE AREAS

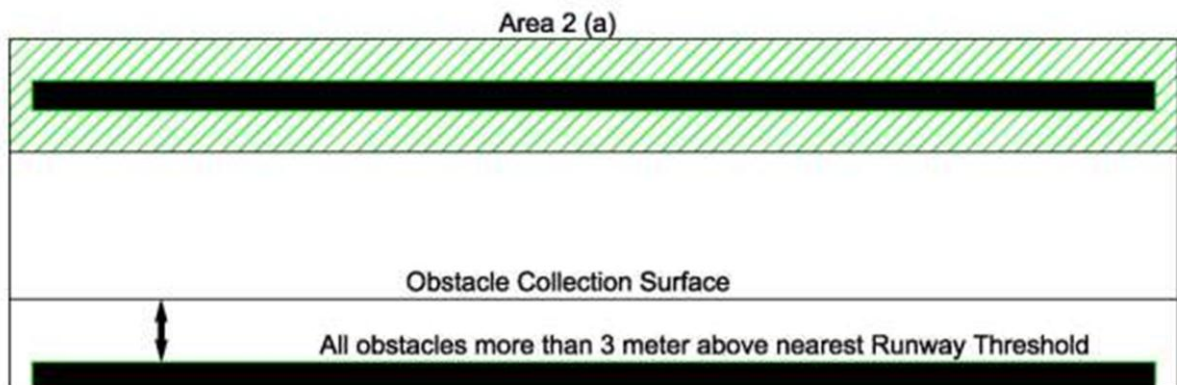
**2.1 Area 1:** the entire territory of a State. **Area 2:** terminal control area; within the vicinity of an aerodrome, sub-divided as follows:

**Figure 7-1 Area 1 and Area 2**



**2.2 Area 2a:** This area represents a rectangular area around a runway that comprises the runway strip plus any clearway that exists.

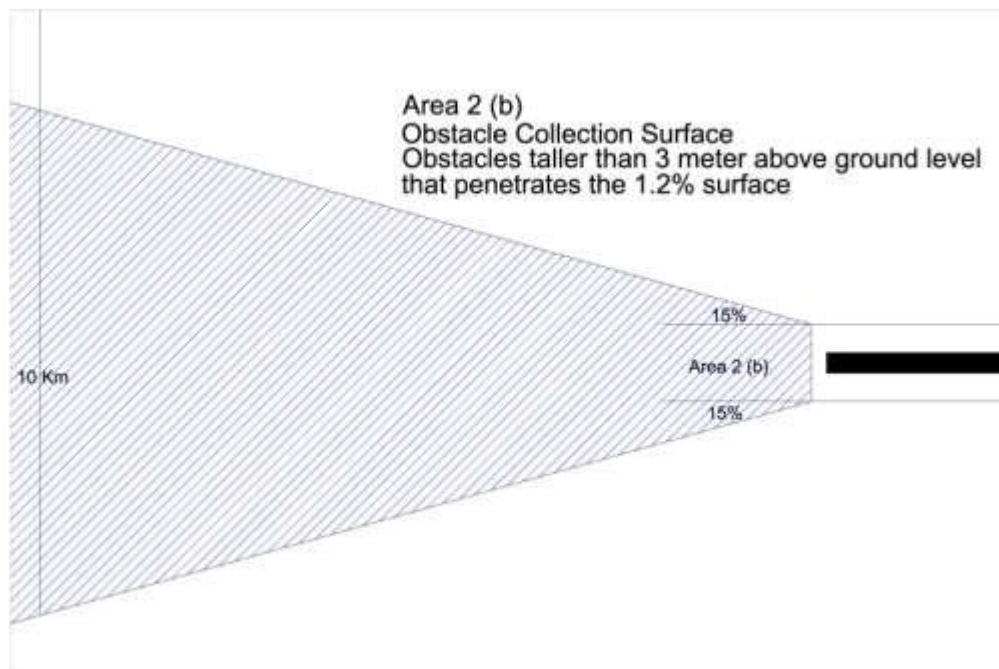
**Figure 7-2 Area 2a**



**2.3 Area 2b:** This area represents an area extending from the ends of Area 2a in the direction of departure, with a length of 10km and a splay of 15% to each side and a slope of 1.2%.



**Figure 7-3 Area 2b**



**2.4 Area 2c:** This area represents an area extending outside Area 2a and Area 2b at a distance of not more than 10km from the boundary of Area 2a with a slope of 1.2%.

**Figure 7-4 Area 2c**

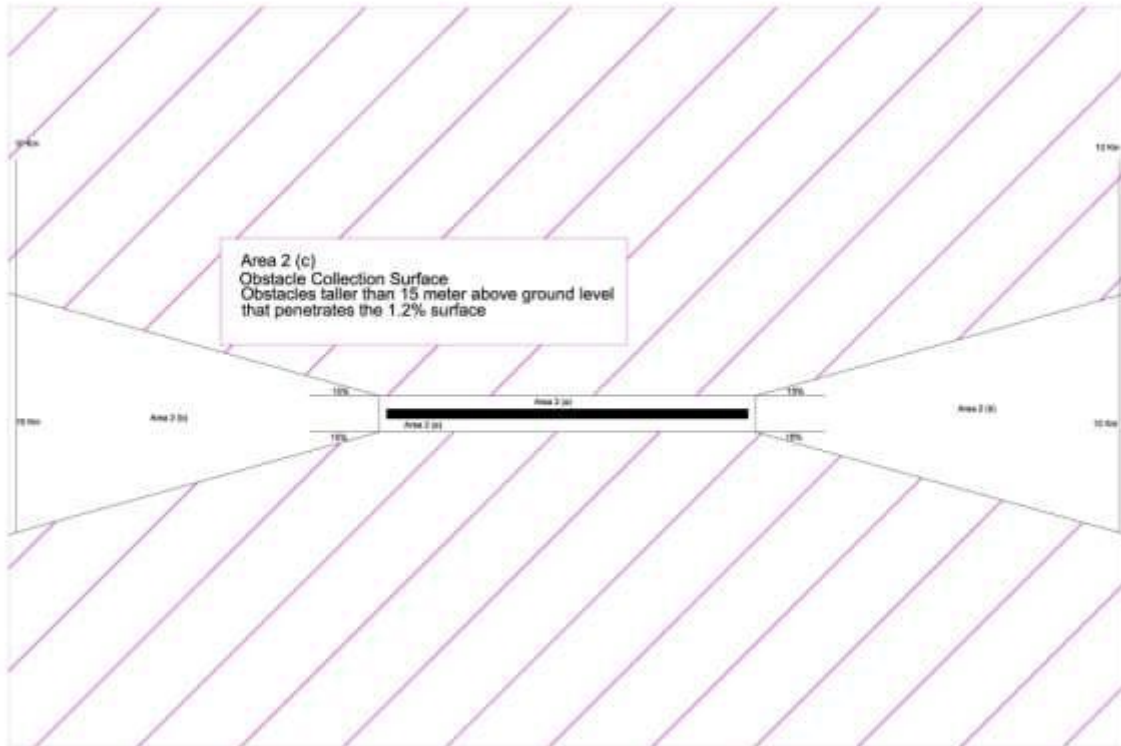
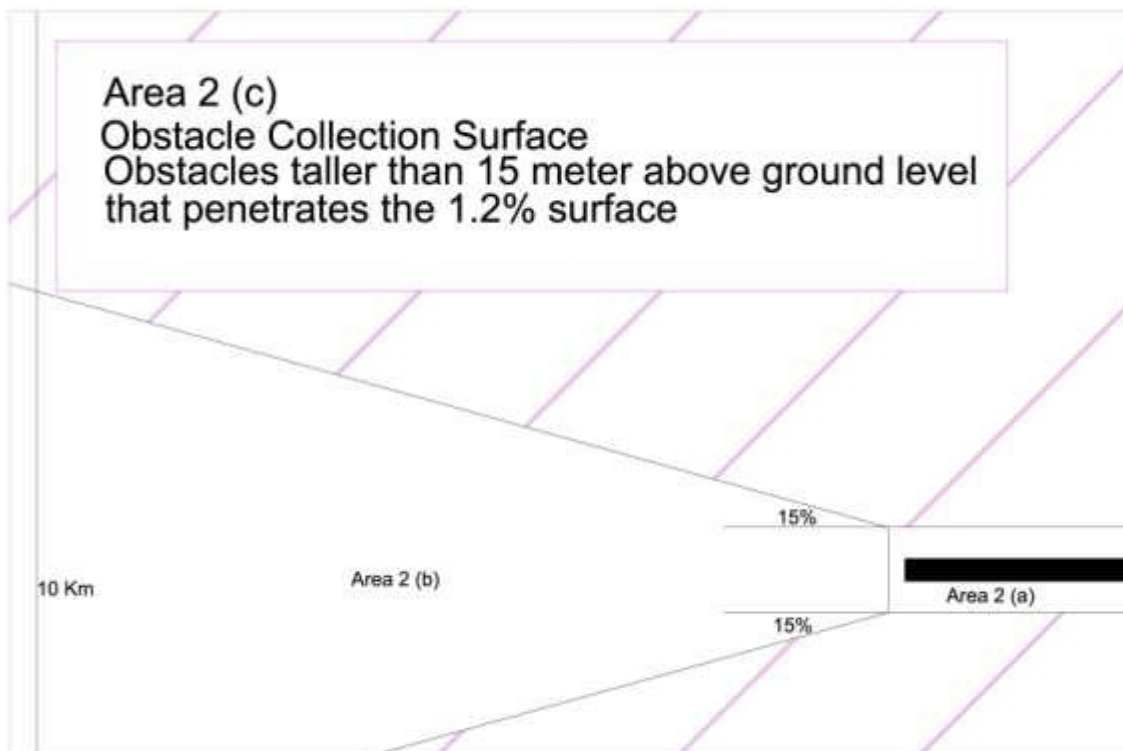
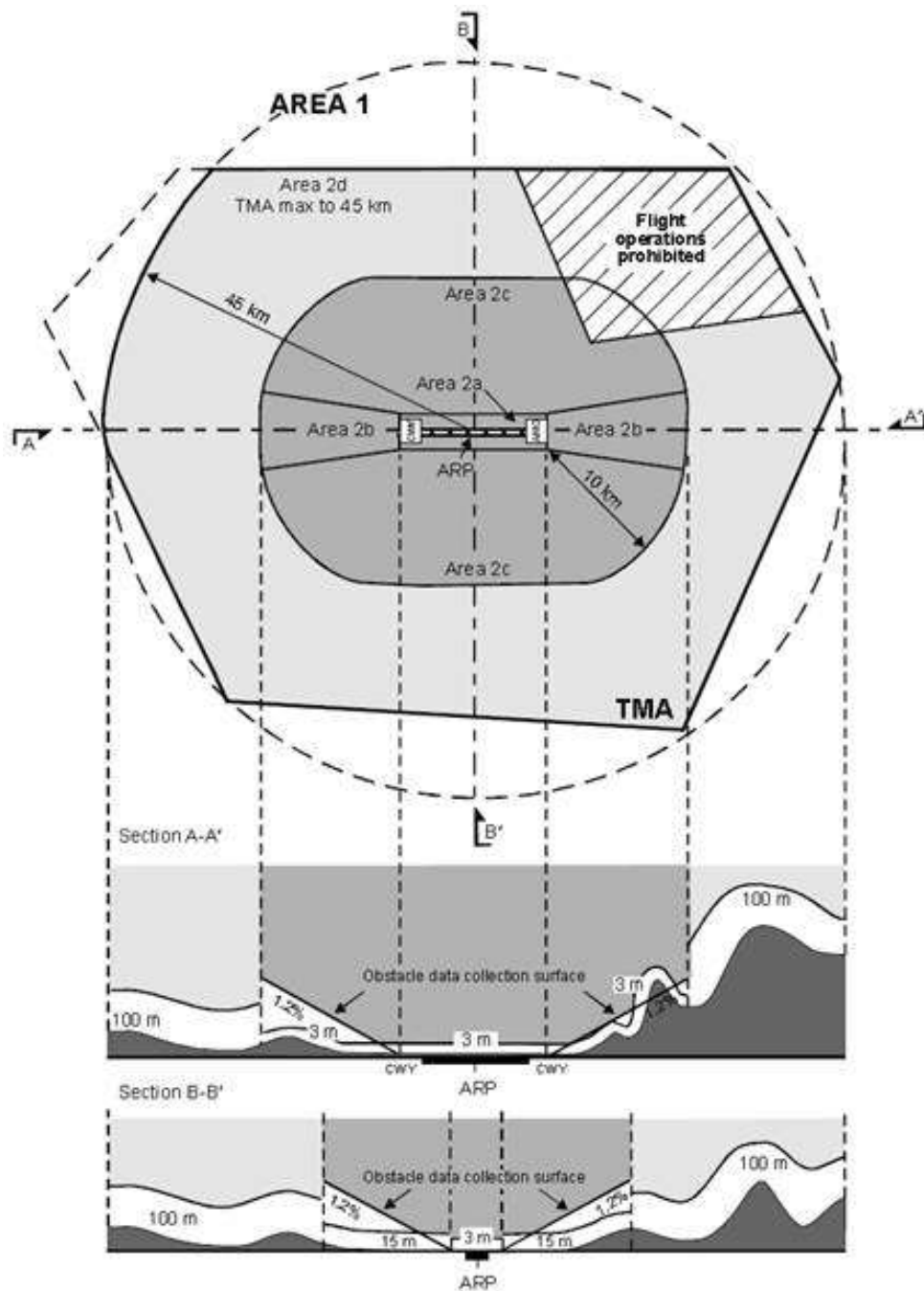


Figure 7-5 Areas 2a, 2b and 2c



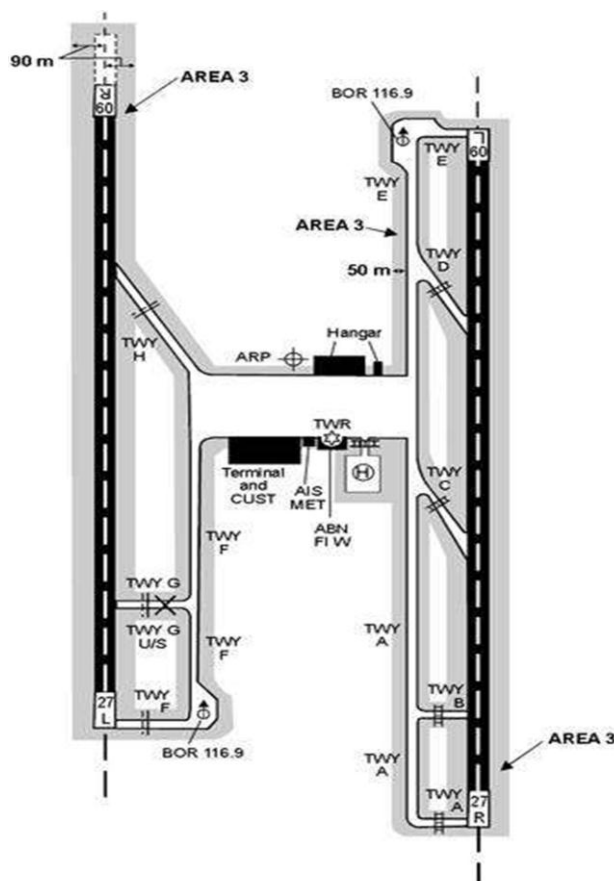
**2.5 Area 2d:** This area represents an area outside the Areas 2a, 2b and 2c up to a distance of 45km from the aerodrome reference point or to an existing TMA boundary, whichever is nearest.

**Figure 7-6 Area 2d**



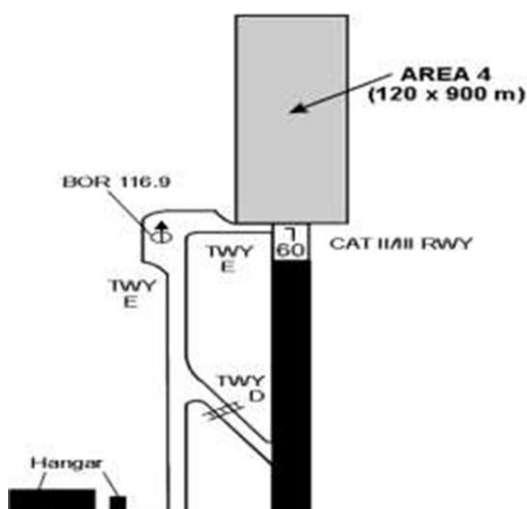
**2.6 Area 3:** This area represents an aerodrome/heliport area and the area bordering an aerodrome movement area that extends horizontally from the edge of a runway to 90m from the runway centre line and 50m from the edge of all other parts of the aerodrome movement area.

**Figure 7-7 Area 3**



**2.7 Area 4:** This includes Category II or III operations approach areas. The area extending 900m prior to the runway threshold and 60m each side of the extended runway center line in the direction of the approach on a precision approach runway, Category II or III.

**Figure 7-8 Area 4:**



### 3. TERRAIN DATA NUMERICAL REQUIREMENTS

	Area 1	Area 2	Area 3	Area 4
<b>Post Spacing</b>	3 arc seconds (approx. 90 m)	1 arc second (approx. 30 m)	0.6 arc seconds (approx. 20 m)	0.3 arc seconds (approx. 9 m)
<b>Vertical Accuracy</b>	30 m	3 m	0.5 m	1 m
<b>Vertical Resolution</b>	1 m	0.1 m	0.01 m	0.1 m
<b>Horizontal Accuracy</b>	50 m	5 m	0.5 m	2.5 m
<b>Confidence Level</b>	90%	90%	90%	90%
<b>Data Classification</b>	essential	essential	essential	essential
<b>Integrity Level</b>	$1 \times 10^{-3}$	$1 \times 10^{-5}$	$1 \times 10^{-5}$	$1 \times 10^{-5}$
<b>Maintenance Period</b>	as required	as required	as required	as required

### 4. OBSTACLE DATA NUMERICAL REQUIREMENTS

	Area 1	Area 2	Area 3	Area 4
<b>Vertical Accuracy</b>	30 m	3 m	0.5 m	1 m
<b>Vertical Resolution</b>	1 m	0.1 m	0.01 m	0.1 m
<b>Horizontal Accuracy</b>	50 m	5 m	0.5 m	2.5 m
<b>Confidence Level</b>	90%	90%	90%	90%
<b>Data Classification</b>	essential	essential	essential	essential
<b>Integrity Level</b>	$1 \times 10^{-3}$	$1 \times 10^{-5}$	$1 \times 10^{-5}$	$1 \times 10^{-5}$
<b>Maintenance Period</b>	as required	as required	as required	as required

### 5. ETOD SURVEY CLASSIFICATIONS

Refer to Chapter 1 Table 1-1

### 6. IMPLEMENTATION MATRIX

AREA	DESCRIPTION	RESPONSIBLE	IMPLEMENTATION TARGET DATE	STATUS
Area 1	Total State Territory	CAMA	20 November 2018	Mandatory Implemented
Area 2a	A rectangular area around a runway that comprises the runway strip plus any clearway that exists.  <i>(Refer to YCAR PART IX for the definition of the strip)</i>	Airport Authority Aerodrome Survey Classification 3 and 4	12 November 2018	Mandatory

AREA	DESCRIPTION	RESPONSIBLE	IMPLEMENTATION TARGET DATE	STATUS
<b>Area 2b</b>	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% to each side.	Airport Authority <b>Aerodrome Survey Classification 3 and 4</b>	<b>12 November 2015</b>	<b>Mandatory</b>
<b>Area 2c</b>	An area extending outside Area 2a and Area 2b at a distance of not more than 10 km from the boundary of Area 2a.	Airport Authority <b>Aerodrome Survey Classification 4</b>	<b>12 November 2015</b>	<b>Mandatory</b>
<b>Area 2d</b>	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 TMA boundary, whichever is nearest.	Airport Authority <b>Aerodrome Survey Classification 4</b>	N/A	<b>Optional</b>  <b>Area 1 data considered to be sufficient</b>
<b>Area 3</b>	Aerodrome/heliport area and 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.	Airport Authority <b>Aerodrome Survey Classification 4</b>	N/A	<b>Optional</b>  <b>Area 2b data considered to be sufficient</b>
<b>Area 4</b>	Category II or III operations approach areas. 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.	Airport Authority <b>Aerodrome Survey Classification 4</b>	<b>20 November 2008</b>	<b>Mandatory</b>

## 7. SURVEY PERIODICITY

Refer to Chapter 1 Table 1-3

## **CHAPTER 8 – AERODROME OBSTACLE CHART - ICAO TYPE A SURVEY**

### **1 PURPOSE**

1.1 The Aerodrome Obstacle Chart - ICAO Type A (Operating Limitations) provides data necessary to enable the aircraft operator to comply with the operating limitations of ICAO Annex 6 - Operation of Aircraft.

1.2 Aerodrome Obstacle Charts - ICAO Type A (Operating Limitations) shall be made available (as prescribed in ICAO Annex 4: Aeronautical Charts) for all runways used by Class A aeroplanes and for aerodromes used by international civil aviation. Runways that do not have obstacles in the take-off flight path (TOFP) areas shall be recorded as not requiring an “ICAO Type A” chart.

1.3 Whilst ICAO Annex 15 (eTOD) Area 2b covers a similar geographical area and obstacle selection surface (1.2%), the accuracy requirements may not be deemed sufficient for the purposes of the “ICAO Type A” chart.

### **2 SURVEY SPECIFICATION**

#### **2.1 Aerodrome Area**

2.1.1 The elevation AMSL, at the start and end of TORA, end of ASDA and end of TODA, and at regular intervals (maximum 200 metres) along the runway and clearway centreline shall be provided.

2.1.2 The type of clearway and declared distances for TORA, TODA, ASDA and LDA shall be stated in the Survey Report. If these have not already been agreed with the CAMA they must be submitted for acceptance before the Survey is started. Definitions are stated in YCAR Part IX.

#### **2.2 Take-Off Flight Path (TOFP) Area**

2.2.1 The area to be surveyed originates at the end of the TODA. It is 180m wide at origin, symmetrical about the extended centreline and increases uniformly at a rate of 0.25D to a maximum width of 1800m, where D is the distance from origin. At a distance of 6480m it extends at the maximum width to a distance of 10000m. The elevation of the origin is the elevation declared for the end of TODA (see **Figure 8-1**).

2.2.2 The flight path plane surface has an upward slope of 1.2% from the origin (see **Figure 8-1**).

2.2.3 All objects and terrain within the TOFP area shall be comprehensively analysed. All obstacles that penetrate the TOFP surface shall be surveyed except where such obstacles are in the shadow of others. The shadow of an obstacle is considered to be a plane surface originating at a horizontal line passing through the top of the obstacle at right angles to the

centreline of the TOFP, and extended to cover the complete width of the area. Frangible and mobile obstacles shall not shadow other obstacles. If the obstacle creating a shadow is likely to be removed, objects that would become dominant by its removal shall be surveyed. If the surveyor is unclear as to which obstacles are dominant then all obstacles penetrating the surface shall be surveyed.

2.2.4 For runways serving aircraft having operational limitations that do not preclude the use of a gradient less than 1.2%, the TOFP area is increased to 12000m and the slope of the plane surface is reduced to 1% or less. Where the plane of the 1% slope does not touch any objects, it is to be reduced until it touches the first object.

2.2.5 The elevation AMSL of any road, track or water feature capable of supporting mobile obstacles greater than 4.8m AGL (for waterways the high and low water marks and the height of shipping) shall be surveyed at a regular interval to its full linear extent, until shadowed by the next dominant obstacle if the combined elevation penetrates the TOFP surface. The combined elevation shall be provided.

2.2.6 Where the TOFP is at an offset angle from the runway extended centreline in order to gain an operational advantage, the area to be surveyed shall be determined by consultation between the Aerodrome Certificate Holder and aircraft operators concerned, and agreed with the CAMA and annotated in the survey report.

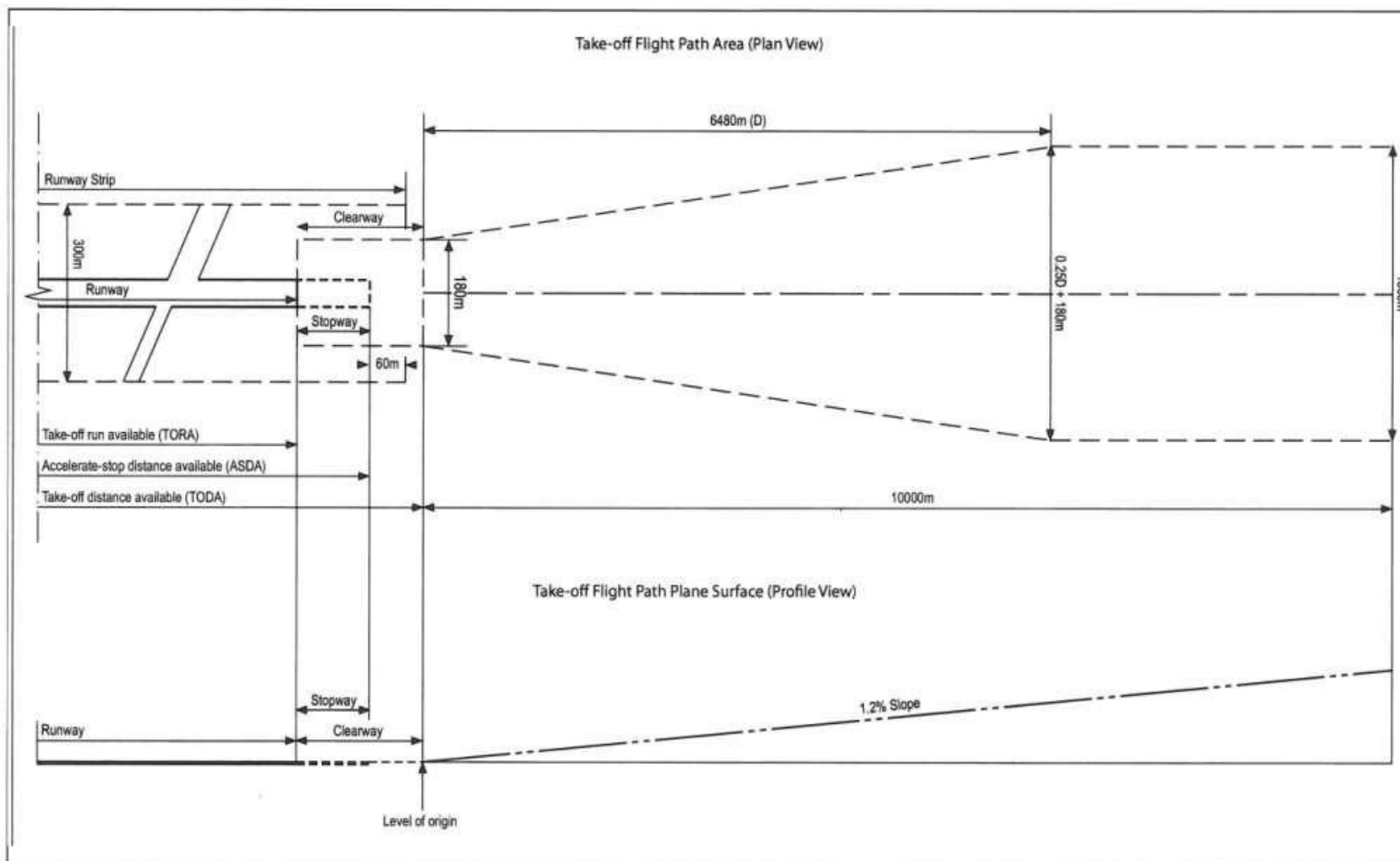
### **3 DIGITAL DATA**

All surveyed obstacles shall form part of the Master Listing depicted in Annex B. Positional data and associated elevations that determine the extent of the declared distances and runway profile shall be included in the Aerodrome Facilities File depicted in Annex B.



**Figure 8-1**

**Aerodrome Obstacle Chart - ICAO Type A (Operating Limitations): Take-off Flight Path Area and Plane Surface**



## **CHAPTER 9 - PRECISION APPROACH TERRAIN CHART SURVEY AREA**

### **1 PURPOSE**

1.1 The Precision Approach Terrain Chart (PATC) provides a detailed terrain profile of the final portion of a Precision Approach. It provides information to enable the evaluation of the effects of the terrain on decision height determination using radio altimeters.

1.2 It is a mandatory requirement for aerodromes that conduct Categories II and III precision approaches except where the requisite information is provided in the Aerodrome Terrain and Obstacle Chart — ICAO (Electronic) (ICAO Annex 4).

### **2 SURVEY SPECIFICATION**

2.1 The area for survey starts at the runway threshold and extends for a distance of 900m into the approach, 60m either side of the extended runway centre line (see **Figure 9-1**). A longitudinal extension of this area might be required if the terrain undulates significantly. Any such requirement will be identified by CAMA during the initial approval process for Category II, III operations.

2.2 Features to be surveyed:

- a) Runway threshold and elevation
- b) Extended runway centre line terrain profile
- c) All features including mobile features that are 3m, or greater, above or below the extended runway centre line terrain level and with a horizontal dimension of more than 15m measured parallel to the runway centre line
- d) Terrain contours at 1m contour intervals related to the runway threshold height
- e) Roads, tracks, river or water features shall have sufficient levels to show their surface elevation, (in the case of a body of water subject to tides, high and low tidal variations are required) and the height of the highest mobile feature that could be expected on them.
- f) The features shall include vegetation, hard, mobile and temporary objects

2.3 This Chart can be produced from data captured for eTOD Area 4.

### **3 SURVEY CHART PRESENTATION**

3.1 The base map shall be at a scale of 1:2500 or where the area has been extended it shall be at 1:5000. The accepted format is listed in Chapter 3, paragraph 1.

3.2 The chart will show the survey area in plan view at either of the above scales and in cross section profile at a recommended scale of 1:500. If the area is flat, a larger profile scale may be used.

3.3 The chart shall reflect the position, height and shape of all features that fall in the category as described in this chapter.

3.4 Terrain data should be made available in a digital format as per ICAO Annex 15, Chapter 10 – Area 4.

## 4 PUBLISHED CHART

The survey information shall be passed to the Aerodrome Certificate Holder for approval and publication.

## 5 CHART MAINTENANCE

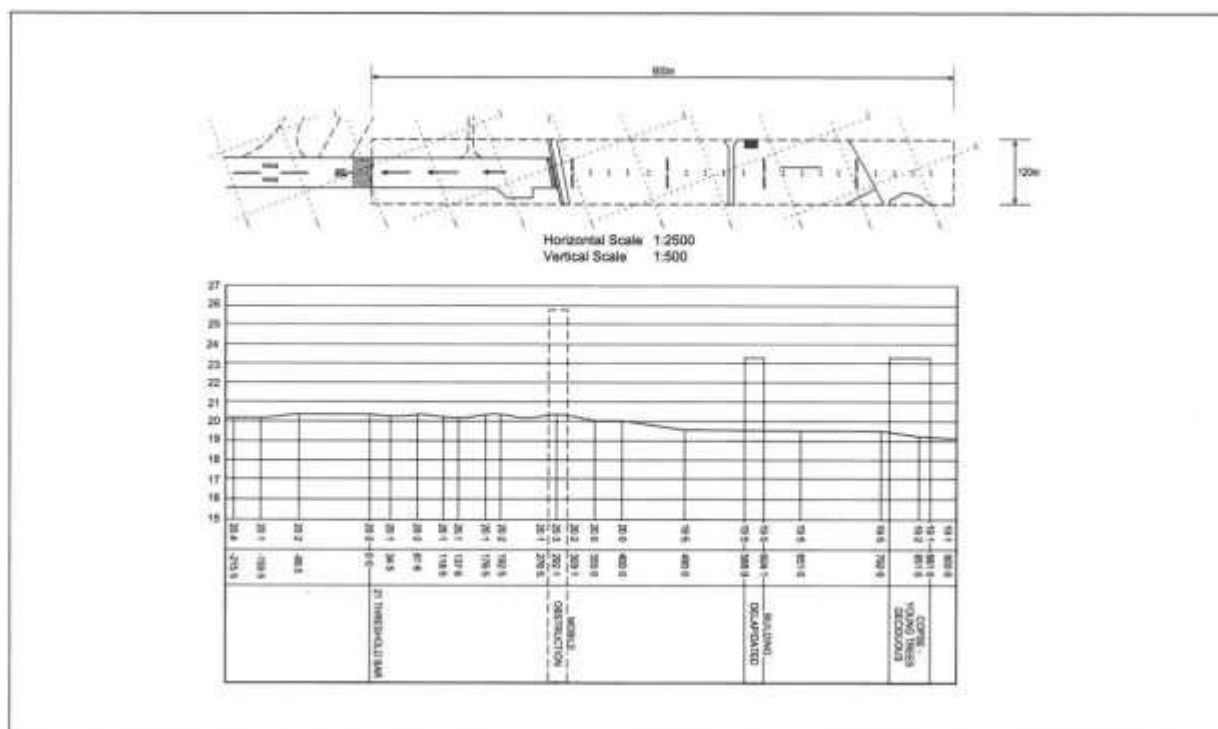
5.1 It is the responsibility of the Aerodrome Certificate Holder to monitor any changes in the approach terrain profile. If significant changes occur the Aerodrome Certificate Holder shall promulgate by NOTAM.

5.2 All changes in the profile shall be recorded:

- Changes in slope of 12.5% or more over a distance of 15m or more
- Changes in the contour height of 3m or more (increase or decrease) and over 15m to the defined approach area
- All features as stated in paragraph 2.2

*Note: It is important that both increases and decreases in elevation are significant.*

**Figure 9-1**  
**Precision Approach Terrain Chart**



## ANNEX A – SURVEY DECLARATION FORM

<b>Aerodrome:</b>	
<b>Surveying Company:</b>	

<b>Aerodrome Survey Classification:</b>		<b>Initial/Last Full Survey Date:</b>	
<b>Geodetic Connection Date:</b> (If applicable)		<b>Annual Validation Assessment Date:</b> (If applicable)	

<b>Survey Area Required</b> (Tick boxes as appropriate)		<b>No Change to Previous Survey</b>	<b>Change to Previous Survey</b>
Aerodrome Plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
YCAR Part IX: Obstacle Limitation Surfaces	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aerodrome Obstacle Chart - ICAO Type A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Precision Approach Terrain Chart - ICAO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electronic Terrain and Obstacle Data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<b>Declaration by Aerodrome Certificate Holder's Representative:</b>			
I certify that the information supplied meets the Aerodrome's Operational requirements in accordance with CAMA Regulations. I also certify that the information supplied is complete and conforms to CAAP 61 (Aerodrome Survey Requirements).			
<b>Name:</b>			
<b>Position:</b>			
<b>Signature:</b>		<b>Date:</b>	

This form shall be made available to CAMA Inspectors on request.

## ANNEX B – AERODROME DIGITAL DATA SPECIFICATION

### SECTION A

The following fields describe the data format layout and should be used as a guideline to report data. Fields not applicable should be left blank.

Master files of all surveyed facilities and obstacles shall be created and supplied. Files of survey information shall be in the form of a comma delimited ASCII text file containing all fields plus CRCV field as listed below.

**Aerodrome Facilities File (named appropriately e.g. “ICAO 4 letter designator”\_AD00.crc)**

#### To be entered in field description

Field 1	SITE NAME	XXXX	ICAO Aerodrome Location Indicator
Field 2	TYPE OF FEATURE	For allowable values refer to Section B	
Field 3	IDENTIFICATION	For allowable values refer to Section B	
Field 4	ASSOCIATION	For allowable values refer to Section B	
Field 5	LATITUDE	DDMMSS.ssssN/S	WGS-84 Latitude in DEG,MIN, SEC, 1/10000's SEC
Field 6	LONGITUDE	DDMMSS.ssssE/W	WGS-84 Longitude in DEG,MIN, SEC, 1/10000's SEC
Field 7	ELLIPSOIDAL HEIGHT (M)	000.0	Elevation in meters above WGS-84 ellipsoid to 2 decimal places
Field 8	ELLIPSOIDAL HEIGHT (FT)	000.0	Elevation in feet above WGS-84 ellipsoid to 2 decimal places
Field 9	LIT OR UNLIT	Y/N	Y To be entered if the feature is lit N To be entered if the feature is unlit
Field 10	LIGHTING DESCRIPTION	FLASHING WHITE	A textual description of the lighting used
Field 11	FRANGIBLE	Y/N	Y To be entered if the feature is frangible N To be entered if the feature is not frangible
Field 12	EASTING	000000.00	Six figure easting grid reference to 2 decimal places for the UTM Grid declared in the Report
Field 13	NORTHING	000000.00	Six figure northing grid reference to 2 decimal places for the UTM Grid declared in the Report
Field 14	ORTHOMETRIC HEIGHT (M)	0000.00	Elevation in meters AMSL to 2 decimal places
Field 15	ORTHOMETRIC HEIGHT (FT)	0000.00	Elevation in feet AMSL to 2 decimal places
Field 16	HEIGHT ABOVE GROUND LEVEL (M)	0000.00	Height above ground level in meters to 2 decimal places
Field 17	HEIGHT ABOVE GROUND LEVEL (FT)	0000.00	Height above ground level in feet to 2 decimal places
Field 18	AERODROME CONTROL NETWORK HORIZONTAL	00.000	Horizontal accuracy in meters relative to the

	ACCURACY (M)		datum to 3 decimal places
Field 19	AERODROME CONTROL NETWORK VERTICAL ACCURACY (M)	00.000	Vertical accuracy in meters relative to the datum to 3 decimal places
Field 20	HORIZONTAL EXTENT (M)	000.00	Horizontal extent (radius) of the surveyed entity in meters to 2 decimal places. (Obstacles only)
Field 21	HORIZONTAL ACCURACY (M)	00.000	Horizontal Accuracy in meters relative to the aerodrome control network to 3 decimal places at a 95% confidence level
Field 22	VERTICAL ACCURACY (M)	00.000	Vertical Accuracy in meters relative to the aerodrome control network to 3 decimal places at a 95% confidence level
Field 23	RECORD IDENTIFIER	0000	Unique integer number
Field 24	SURVEY DATE	dd/mm/yy	Date of field survey of record
Field 25	CRCV		32 bit CRC-32Q algorithm value (CRCV format = Hexadecimal)

**Master Obstacle File (named appropriately e.g. “ICAO 4 letter designator”\_obst00.crc)**

**To be entered in field description**

Field 1	SITE NAME	XXXX	ICAO Aerodrome Location Indicator
Field 2	TYPE OF FEATURE	For allowable values refer to Section B	
Field 3	IDENTIFICATION	CRASH BARRIER 3	A full textual description of the type of obstacle to supplement Field 2
Field 4	ASSOCIATION	For required formatting refer to Section B	
Field 5	LATITUDE	DDMMSS.ssssN/S	WGS-84 Latitude in DEG,MIN, SEC, 1/10000's SEC (i.e. 3mm)
Field 6	LONGITUDE	DDMMSS.ssssE/W	WGS-84 Latitude in DEG,MIN, SEC, 1/10000's SEC
Field 7	ELLIPSOIDAL HEIGHT (M)	000.00	Elevation in meters above WGS-84 ellipsoid to 2 decimal places
Field 8	ELLIPSOIDAL HEIGHT (FT)	000.00	Elevation in feet above WGS-84 ellipsoid to 2 decimal places
Field 9	LIT OR UNLIT	Y/N	Y To be entered if the feature is lit N To be entered if the feature is unlit
Field 10	MOBILE	Y/N	Y To be entered if the feature is mobile N To be entered if the feature is not mobile
Field 11	FRANGIBLE	Y/N	Y To be entered if the feature is frangible N To be entered if the feature is not frangible
Field 12	EASTING	000000.00	Six figure easting grid reference to 2 decimal places for the UTM Grid declared in the Report

Field 13	NORTHING	000000.00	Six figure northing grid reference to 2 decimal places for the UTM Grid declared in the Report
Field 14	ORTHOMETRIC HEIGHT (M)	0000.00	Elevation in meters AMSL to 2 decimal places
Field 15	ORTHOMETRIC HEIGHT (FT)	0000.00	Elevation in feet AMSL to 2 decimal places
Field 16	HEIGHT ABOVE GROUND LEVEL (M)	0000.00	Height above ground level in meters to 2 decimal places
Field 17	HEIGHT ABOVE GROUND LEVEL (FT)	0000.00	Height above ground level in feet to 2 decimal places
Field 18	AERODROME CONTROL NETWORK HORIZONTAL ACCURACY (M)	00.000	Horizontal accuracy in meters relative to the datum to 3 decimal places
Field 19	AERODROME CONTROL NETWORK VERTICAL ACCURACY (M)	00.000	Vertical accuracy in meters relative to the datum to 3 decimal places
Field 20	HORIZONTAL EXTENT (M)	000.00	Horizontal extent (radius) of the surveyed entity in meters to 2 decimal places
Field 21	HORIZONTAL ACCURACY (M)	00.000	Horizontal Accuracy in meters relative to the aerodrome control network to 3 decimal places at a 95% confidence level
Field 22	VERTICAL ACCURACY (M)	00.000	Vertical Accuracy in meters relative to the aerodrome control network to 3 decimal places at a 95% confidence level
Field 23	RECORD IDENTIFIER	0000	Unique integer number
Field 24	SURVEY DATE	dd/mm/yy	Date of field survey of record
Field 25	CRCV		32 bit CRC-32Q algorithm value (CRCV format = Hexadecimal)

**Special Notes:**

- a) Decimal places shall not be rounded.
- b) Only decimal places, underscores and forward slashes shall be used within fields (no hyphens, word spaces, commas or backslashes, etc.).
- c) All text shall be upper case.
- d) All fields shall be populated with the exception of the Aerodrome Facilities File Field 3, Field 4 and Field 10, which must be blank if there is no identification, association or description. (Duplicate data in a record is not acceptable).

**SECTION B**

**Aerodrome Facilities File**

Field 2	Field 3	Example	Rule	Field 4	Example	Rule
TYPE OF FEATURE	IDENTIFICATION			ASSOCIATION		
ARP						

AEP						
ABN						
ANEMOMETER						
ASDA_END				(RWY DIR)	05	1
ATC						
CADF						
CENTRE_PT_TWY	IDENT	ABC	3	(TAXIWAY)	W	5
CENTRE_PT_RWY	IDENT	ABC	3	(RWY) Alphanumeric	05/23	2
DME	IDENT	ABC	3			
DME ILS	IDENT	ABC	3	(LLZ IDENT)	IABC	3
DME MLS	IDENT	ABC	3	(MSL AZM IDENT)	ABC	3
DRDF						
FATO				(FATO DIR)	05	1
GP	IDENT	IABC	3	(RWY DIR)	05	1
GP_MON				(RWY DIR)	05	1
HOLD	Alphanumeric	123A	4	(TAXIWAY)	W	5
HOLD_STOP_BAR	Alphanumeric	123A	4	(TAXIWAY)	W	5
IBN						
IRVR						
L	IDENT	ABC	3			
LDA_END				(RWY DIR)	05	1
LLZ	IDENT	IABC	3	(RWY DIR)	05	1
LLZ_MON				(RWY DIR)	05	1
MLS_AZM	IDENT		3	(RWY DIR)	05	1
MLS_ELEV	IDENT		3	(RWY DIR)	05	1
MM	IDENT		7			
NDB	IDENT		3			
OM	IDENT		7			
PAPI				(RWY DIR)	05	1
RADAR						
RADAR_MSSR						
RADAR_PAR						
RADAR_SSR						
RADAR_WATCH MAN						
ROP						
STAND	Alphanumeric	123A	4	(APRON)	MAIN	6
TACAN	IDENT	ABC	3			



TDZE				(RWY DIR)	05	1
THR				(RWY DIR)	05	1
TLOF	Alphanumeric	123A	4			
TODA_END				(RWY DIR)	05	1
TORA_END				(RWY DIR)	05	1
TORA_START						
VDF						
VHF_RX						
VHF_TX						
VOR	IDENT	ABC	3			
VOR/DME	IDENT	ABC	3			
WINDSLEEVE						

## Obstacles File

Field 2 – TYPE OF FEATURE VALUE (Example)		
AG_EQUIP	FENCE	STACK
ANTENNA	FUEL_SYSTEM	STADIUM
ARCH	GATE	STORM_SYSTEM
BUILDING	HEAT_COOL_SYSTEM	TANK
BRIDGE	MAST	TETHERED_BALLOON
CABLE_YCAR	MONUMENT	TOWER
COMPRESSED_AIR_SYSTEM	NATURAL_HIGH_POINT	TRANSMISSION_LINE
CONTROL_MONITORING_SYSTEM	NAVAID	VEGETATION
CONTROL_TOWER	POLE	WALL
COOLING_TOWER	POWER PLANT	WASTEWATER_SYSTEM
CRANE	REFINERY	WATER_SYSTEM
DOME	RIG	WIND_FARM
ELECTRICAL_EXIST_LIGHT	SALTWATER_SYSTEM	OTHER
ELECTRICAL_SYSTEM	SIGN	
ELEVATOR	SPIRE	

Field 4 - ASSOCIATION	
VALUES	DESCRIPTION
OLS	ICAO Annex 14 Obstacle Limitation Surfaces
OIDS	Obstacle Identification Surface
MANAGED	A “virtual” area containing the Vertical Structures included in the data collection exercise, which do not qualify yet as Obstacles in any specific area
OTHER	Other