

Aerodrome Survey Guidance Draft

CAP 1732

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Table of Contents

Table of Contents	3
Revision History	5
Foreword	6
Introduction	8
Purpose	8
Applicability	9
Related documents	9
Definitions	10
Aerodrome Operators' obligations regarding aerodrome surveys	15
Aeronautical data requirements	15
Formal Arrangements	15
Conducting the aerodrome survey	17
Numerical data quality requirements	17
Horizontal control	17
Vertical control	18
Runway length and areas adjacent to the runway, and declared distances	18
Lighting	21
Terrain and obstacle data (TOD) collection areas	22
Take-off flight path area (TOFP)	24
Precision Approach survey area	26
Obstacle limitation surfaces	26
Producing survey files and reports	28
Survey data files	28
Reports	30
Drawings	32
Submitting survey information	35
UK AIS change requests	35
Exchange format	35

Survey approvals checklist	36
Queries or errors with submitted survey data	36
Maintenance and review of survey data	37
Keeping surveys up to date	37
Annual review of survey data	38
Changes to features within tolerance of their required resolution	38
Review of instrument flight procedures	39
Guidance on the content of Formal Arrangements	40
eTOD and eTOD PLUS comparison	44
Area 1	44
Area 2a	44
Area 2b	45
Area 2c	46
Area 2d	48
Area 3	48
Area 4	49
Digital data specification	50
Aerodrome plan example	51

Revision History

Edition 1 December 2018

CAP 1732 was created to provide additional aerodrome survey guidance to that contained in CAP 232, for certified aerodromes and aerodromes with Instrument Flight Procedures.

Edition 2 August 2026

The chapter layout of the document has been significantly revised to improve readability, and the digital data specification appendix has been moved to a separate file. Additional detail has been provided in areas where stakeholders identified that a lack of guidance was resulting in inconsistent survey data being provided to UK AIS. EU regulatory references have been replaced with the appropriate UK regulatory references.

Note about how changes are depicted in Edition 2 of this document: As the layout of this document has been substantially changed and moved to an updated template, tracked changes would not be helpful in comparing this document to Edition 1. Text that is new or substantially changed is formatted with a red underline as shown here. In the digital data specification spreadsheet in Appendix C, cells containing new/changed information are highlighted in yellow.

Foreword

Civil Aviation Authority (CAA) Civil Aviation Publications (CAPs) are based upon national legislation and non-legislative regulatory material, such as ICAO Standards and Recommended Practices. They are published in order to provide UK industry with:

- a) guidance and clarification on the means of achieving compliance with global, and UK regulatory requirements, and where applicable:
- b) details of any additional UK national requirements, and
- c) Additional details regarding procedures and administrative processes to complement the applicable UK Regulations (and the Acceptable Means of Compliance and Guidance Material to the Regulations).

In publishing CAPs, the CAA satisfies the obligations placed upon it by the Transport Act 2000¹, Chapter 1 Article 2 'CAA's general duty', which in paragraph 2(a) requires the CAA to exercise its functions under the Act in the manner it thinks best calculated, to further the interests of operators and owners of aircraft, owners and managers of aerodromes, persons travelling in aircraft and persons with rights in property carried in them. The only interests to be considered under subsection (2)(a) are interests regarding the range, availability, continuity, cost, and quality of air traffic services.

Publication of CAPs additionally satisfies the requirements set out by the Civil Aviation Authority (Chicago Convention) Directions 2007 to ensure that it acts consistently with the obligations placed on the UK under the Chicago Convention. The CAA is obliged to consider whether it is necessary to amend United Kingdom aviation legislation to ensure appropriate implementation of an ICAO provision.

Where (a) the CAA considers it inappropriate to transpose an ICAO provision into domestic legislation and (b) the CAA has discretionary power to enforce the requirements of such a provision through a certificate, licence, or other means of approval, the Civil Aviation Authority (Chicago Convention) Directions 2007 obliges the CAA to develop and publish such requirements as are necessary to implement the ICAO provision and shall ensure that it is able to verify adherence to those requirements.

CAPs are subject to periodic revision to take account of changes to source regulatory material, feedback from industry, and recognised best practice. CAP 1732 provides applicable guidance and clarification relating to – and is to be read in conjunction with – the regulatory material referenced below. Non-inclusion of source regulatory material within this CAP does not preclude the end user from either the need to be aware of, or the

¹ <http://www.legislation.gov.uk/ukpga/2000/38/contents> or <http://www.legislation.gov.uk/ukpga/2000/38/data.pdf>

need to comply with, the requirements contained within the source regulatory materials unless otherwise exempted from those requirements.

It is the policy of the UK government that, unless a Difference (from an ICAO requirement) has been established, compliance with relevant international (i.e., ICAO and applicable equivalents such as International Telecommunications Union) regulatory material is required to the extent mandated in law. Additionally, compliance with national requirements that are not addressed by international regulations is also required.

The words 'must', 'shall' and 'will' indicate that compliance with applicable regulatory requirements is necessary. In the case of Acceptable Means of Compliance, the word 'should' indicates that compliance is required, unless complying with a CAA approved alternative means of compliance.

Introduction

Purpose

The main purpose of this document is to achieve a harmonised approach to aerodrome surveys and effectively support the implementation of data quality requirements.

This document provides guidance for aerodrome operators and other data originators (including contracted activities) to support compliance with Regulations UK (EU) 139/2014 and UK (EU) 2017/373 and their associated Acceptable Means of Compliance (AMC) and Guidance Material (GM), and with ICAO Annex 4, Annex 11, Annex 14 and Annex 15. This guidance also complements ICAO PANS-AIM and the Eurocontrol Terrain and Obstacle Data (TOD) Manual and should be used in conjunction with those documents to ensure that one survey can provide all mandatory data items and that all relevant requirements are met.

It is important that all those responsible for the provision of terrain and obstacle data are aware of the applications in which this data may be utilised, as these determine the data quality requirements. The purpose of the aerodrome survey is to provide the data necessary to:

- control and monitor the aerodrome obstacle environment,
- be promulgated in the AIP, on aeronautical charts and in other AIS products,
- be used in air navigation applications such as:
 - ground proximity warning systems with forward looking terrain avoidance functions and minimum safe altitude warning systems,
 - determination of contingency procedures for use in the event of an emergency during a missed approach or take-off,
 - analysis of aircraft operating limitations,
 - instrument flight procedure design (including circling procedures),
 - determination of enroute “drift-down” procedures and enroute emergency landing locations,
 - advanced surface movement guidance and control systems,
 - aeronautical chart production and on-board databases,
 - geofencing;
- and other purposes.

Applicability

The guidance contained in CAP 1732 applies to aerodromes and heliports that are certified by the UK CAA under Regulation UK (EU) 139/2014 and to aerodromes and heliports that have instrument flight procedures (IFPs). For the purposes of this document, the term instrument flight procedures includes procedures that use a mix of visual or visual flight rules (VFR) and instrument portions, such as helicopter Point-in-Space (PinS) procedures. It also includes Required Navigation Performance (RNP) procedures.

Aerodromes and heliports that are licensed by the UK CAA but which do not have IFPs should instead refer to the requirements and guidance in CAP 232 Aerodrome Survey Information. If one of these aerodromes or heliports chooses to perform a survey according to the guidance in CAP 1732 prior to establishing IFPs and/or becoming certified they may do so, but in this case it is important to note that this survey data must continue to be maintained according to CAP 1732 guidance.

Related documents

ICAO Publications

- Annex 4 to the Convention on International Civil Aviation – Aeronautical Charts.
- Annex 11 to the Convention on International Civil Aviation – Air Traffic Services.
- Annex 14 to the Convention on International Civil Aviation – Aerodrome Design and Operations.
- Annex 15 to the Convention on International Civil Aviation – Aeronautical Information Services.
- Procedures for Air Navigation Services – Aeronautical Information Management (PANS AIM, Doc 10066).
- Procedures for Air Navigation Services – Aircraft Operations (PANS OPS, Doc 8168).
- World Geodetic System-1984 (WGS-84) Manual (Doc 9674).

UK Regulations

- [UK Regulation \(EU\) No. 139/2014](#) – Requirements and administrative procedures related to aerodromes.

- [UK Regulation \(EU\) No. 2017/373](#) – Requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight.

UK Civil Aviation Authority Publications (CAPs)

- [CAA Publication CAP 168](#) – Licensing of Aerodromes.
- [CAA Publication CAP 232](#) – Aerodrome Survey Information.
- [CAA Publication CAP 738](#) – Safeguarding of Aerodromes.
- [CAA Publication CAP 785A](#) – Oversight of UK Approved Procedure Design Organisations.
- [CAA Publication CAP 785B](#) – Implementation and Safeguarding of IFPs in the UK.
- [CAA Publication CAP 1054](#) – Aeronautical Information Management.
- [CAA Publication CAP 1096](#) – Crane Notification Process
- [CAA Publication CAP 1430](#) – UK Air Traffic Management Vocabulary.

Eurocontrol Publications

- [Terrain and Obstacle Data \(TOD\) Manual](#).
- [Guidelines Supporting the Implementation of Aeronautical Information Requirements](#) (AIR Guide).
- [Formal Arrangement Template](#).
- [Specification for the Origination of Aeronautical Data](#).

Definitions

In CAP 1732, where a term is used that is defined by UK Regulations UK (EU) 2017/373 or 139/2014 or by CAP 1430 UK Air Traffic Management Vocabulary, that definition will apply unless:

- the contrary is indicated; or
- there is a different definition in the Air Navigation Order.

The terms below have been listed for convenience or have been defined to avoid ambiguity or misunderstanding, or to provide definition of words or phrases which have specific meanings within this document. In some cases, they may be slight modifications of definitions in other documents.

For definitions of terms used to describe features at an aerodrome (manoeuvring area, for example), see CAP 168 Licensing of Aerodromes.

Accuracy

A degree of conformance between the estimated or measured value and the true value.

Aerodrome mapping data (AMD)

Information that represents standardised aerodrome features for a defined area, including geospatial data and metadata.

Aeronautical data

A representation of aeronautical facts, concepts or instructions in a formalised manner suitable for communication, interpretation or processing.

Aeronautical information

Information resulting from the assembly, analysis and formatting of aeronautical data.

Aeronautical information management (AIM)

The dynamic, integrated management of aeronautical information through the provision and exchange of quality-assured digital aeronautical data in collaboration with all parties.

Aeronautical information publication (AIP)

A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

Aeronautical information service provider (AIS/AISP)

The organisation responsible for the provision of an aeronautical information service, certified in accordance with UK Regulation UK (EU) 2017/373.

Air navigation service provider (ANSP)

Any public or private entity providing air navigation services for air traffic.

AIP sponsor

A person nominated by an authorised source to provide data to the UK AIS. In some cases, the authorised source will also be the only AIP sponsor.

Authorised source

A person accountable for aeronautical information published in the integrated AIP (IAIP). The authorised source is normally the Accountable Manager, or a competent person formally appointed by the Accountable Manager, and is directly responsible for all aeronautical data activities and aeronautical information provision activities in their

organisation.

The authorised source signs a formal arrangement with the UK AIS on the provision of aeronautical data/information on behalf of the organisation. The authorised source can nominate individuals to be AIP sponsors who are responsible for submitting changes to AIS products within a clearly defined scope of authorised data items.

Critical data

ICAO integrity level equivalent to a Data Assurance Level of DAL 1: 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 a potential for catastrophe. (See also essential data and routine data.)

Cyclic redundancy check (CRC)

A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss of alteration of data.

Data chain

Describes all of the elements of the aeronautical information network, from origination through to publication and use.

Data item

A single attribute of a complete data set, which is allocated a value that defines its current status.

Data origination

The creation of a new data item with its associated value, the modification of the value of an existing data item or the deletion of an existing data item.

Data originator (DO)

A person or persons authorised to originate aeronautical information and data on behalf of an authorised source.

Data quality

A degree or level of confidence that the data provided meets the requirements of the data user in terms of accuracy, resolution and integrity.

Data validation

The process of ensuring that data meets the requirements for the specified application or intended use.

Data verification

The evaluation of the output of an aeronautical data process to ensure correctness and consistency with respect to the inputs and applicable data standards, rules and conventions used in that process.

Database (db)

One or more files of data so structured that appropriate applications may draw from the files and update them.

Derived point

A point in space not determined by survey but extrapolated from source data that has been defined in WGS-84. (See also surveyed point.)

Electronic obstacle data

A digital dataset representing the vertical and horizontal extent of an obstacle or obstacles.

Electronic terrain data

A digital dataset representing the terrain surface in the form of continuous elevation values at all intersections (points) of a defined grid, referenced to a common datum.

Ellipsoid height

The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.

Essential data

ICAO integrity level equivalent to a Data Assurance Level of DAL 2: 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. (See also critical data and routine data.)

Geoid

The equipotential surface in the gravity field of the earth, which coincides with the undisturbed mean sea level extended continuously through the continents.

Geospatial

Information that identifies where particular features are in relation to the earth's surface.

Integrated aeronautical information package (IAIP)

A package of aeronautical products that consists of the following elements:

- Aeronautical information publication (AIP) including amendments.
- Supplements to the AIP.
- NOTAM and pre-flight bulletins.

- Aeronautical information circulars (AICs).
- Checklists of valid Supplements, AICs, and NOTAMs.

Integrity

A degree of assurance that a data item and its value have not been lost or altered since the data origination or authorised amendment.

Metadata

A set of data that describes and gives information about other data.

Obstacle

All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that penetrate the identified obstacle assessment surfaces or whose height about ground level exceeds a defined minima.

Resolution

The number of digits to which a measured or calculated value is expressed and used.

Routine data

ICAO integrity level equivalent to a Data Assurance Level of DAL 3: 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. (See also critical data and essential data.)

Survey data

Geospatial data that is determined by measurement or survey.

Surveyed point

A defined physical point, specified by latitude and longitude, that has been determined by a survey. (See also derived point.)

Terrain

The surface of the earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, and permanent ice and snow.

CHAPTER 1

Aerodrome Operators' obligations regarding aerodrome surveys

Aeronautical data requirements

- 1.1 The aerodrome operator shall implement and maintain a quality management system covering its aeronautical data activities and aeronautical information provision activities, including its defined procedures for meeting safety and security management objectives with respect to aeronautical data activities and aeronautical information provision activities ([ADR.OR.D.007](#)).
- 1.2 Aerodrome operator requirements regarding aeronautical data are to be found in Annex III (Part-ADR.OR) and Annex IV (Part-ADR.OPS) to Regulation UK (EU) 139/2014, ICAO Annexes 14 and 15 and ICAO PANS AIM, and CAP 1054 Aeronautical Information Management.
- 1.3 In the case of contracted activities to external organisations for the origination of aeronautical data and aeronautical information, data origination requirements for such organisations are to be found in Annex III ([ATM/ANS.OR.085](#)) of Regulation UK (EU) 2017/373.
- 1.4 When the aerodrome operator contracts any part of its data origination activity to another organisation, the contracted organisation works under the oversight of the aerodrome operator ([ADR.OR.D.010](#)). The aerodrome operator is required to ensure that any contracted activity, such as an aerodrome survey, is performed by a party that is competent to undertake the contracted tasks ([AMC1 ADR.OR.D.010](#)). The ultimate responsibility for aerodrome data provided by a contracted organisation always remains with the aerodrome operator.
- 1.5 In order for the UK to publish data that is compliant with aeronautical data quality (ADQ) requirements, aerodrome operators should provide the UK AIS with aerodrome surveys that include all of the elements detailed in this document.

Formal Arrangements

- 1.6 The aerodrome operator is required to have Formal Arrangements with organisations with which it exchanges aeronautical data and/or aeronautical information ([ADR.OPS.A.10](#)), and with organisations which exchange data and/or information on behalf of the aerodrome operator.
- 1.7 The establishment of a Formal Arrangement between the aerodrome operator and an external organisation providing aeronautical data is essential in achieving compliance with the international and UK requirements on aeronautical data.

- 1.8 The Formal Arrangement between the aerodrome operator and the contracted survey company should list the survey files (described in Chapter 3) that are to be provided to the aerodrome operator.
- 1.9 The Formal Arrangement between the contracted survey company and the aerodrome operator should describe whether the surveyor is nominated by the aerodrome operator (Authorised Source) to be an AIP Sponsor of the surveyed data. If so, the aerodrome operator must provide the list of AIP Sponsors to the UK AIS. Authorised sources will also have a Formal Arrangement with UK AIS regarding the provision of aeronautical data to UK AIS using the data originators' portal (see Chapter 4). AIS provides the template for this Formal Arrangement.
- 1.10 Additional guidance on Formal Arrangements between aerodrome operators and data originators is given in Appendix A.
- 1.11 The Eurocontrol AIR Guide also contains more guidance on formal arrangements, such as details of the activities to be conducted when establishing formal arrangements between an aerodrome operator and a data originator such as a surveyor. Eurocontrol also publishes a suggested template to be used for documenting the Formal Arrangement (see related documents).

CHAPTER 2

Conducting the aerodrome survey

- 2.1 This chapter describes various elements to be considered when undertaking a CAP 1732-compliant aerodrome survey. The items described are based on those areas where greater guidance was requested; if an item or way of working is not mentioned here, it does not imply that the feature or data element should not be included in the survey. Additional technical guidance may be found in the Eurocontrol Specification for the Origination of Aeronautical Data.

Numerical data quality requirements

- 2.2 All aerodromes in the scope of this guidance are required to provide numerical data and information with accuracy according to the integrity levels classified by ICAO as “critical”, “essential”, or “routine”. The required integrity levels of aeronautical features are defined in the ICAO PANS AIM data catalogue and in Regulations UK (EU) 2017/373 and 139/2014. CAP 1054 Aeronautical Information Management describes how the ICAO data catalogue is implemented in the UK, and CAP 1054 Annex A identifies all data items which are in scope of the ICAO data catalogue when originating, processing, or providing data for publication in UK aeronautical information products.
- 2.3 Surveyed data must be described using the attributes in the ICAO PANS AIM data catalogue. The Acceptable Means of Compliance (AMC) and Guidance Material (GM) to Annex IV Subpart A (Aerodrome Data) of Regulation UK (EU) 139/2014 provide comprehensive guidance on measuring and reporting aerodrome data.
- 2.4 When submitting data to AIS, the sponsor must declare whether the data is compliant with the accuracy and integrity requirements. Non-compliant data will be flagged as such when published in the AIP (see UK AIP section GEN 1.7.3). See CAP 1054 Aeronautical Information Management for more information.

Horizontal control

- 2.5 Coordinates for surveyed features are required to be expressed in terms of the World Geodetic System 1984 (WGS-84) reference datum. The British National Grid reference should also be provided, for plotting and design on topographical charts. The data specification in Appendix C gives more information about coordinate requirements for particular feature types.
- 2.6 Survey control points should conform to the ICAO WGS-84 Manual (ICAO Doc 9674).

- 2.7 WGS-84 geodetic control and format requires that the methods deployed must prove that the accuracy for the various surveys has been met. Data originators undertaking these surveys are responsible for the accuracy of the control data and any transformation sets used. An analysis of the accumulated error, evidence confirming that the required accuracies have been met, and the transformation parameters used should be included in the survey report (described in Chapter 3).
- 2.8 The CAA recognises the fact that all geographical positions supplied in the UK in the past were in ETRF89 format, and the consistency across all surveys should be maintained. Therefore, it is acceptable to use ETRF89 reference frame for horizontal reference and Newlyn Datum for vertical reference in the UK. This position statement may be revised when the difference between ETRF89 and ITRF2008 becomes intolerable.

Vertical control

- 2.9 Orthometric and ellipsoidal elevations, and the transformation that was used, are required.
- 2.10 The variable separation between the geoid and the reference ellipsoid may give rise to inaccuracies greater than the allowable specified level. For the computation to transform ellipsoidal to orthometric elevations, a geoid model should be used. OSGM15 is the national geoid model used in the UK for determining elevations above mean sea level (AMSL). If a geoid model is not available then extra care must be taken to ensure good geometry of the initial control points.
- 2.11 In all cases, appropriate survey checks should be applied to prove the quality of vertical control. These checks should be included in the survey report.
- 2.12 Standard survey practice should be used to produce the elevation to the required specification. The method by which the accuracy and integrity of the control points used is ensured must be described in the survey report.

Runway length and areas adjacent to the runway, and declared distances

- 2.13 It has been reported that there is sometimes confusion over the measurement of the runway, runway strip, and other paved areas such as stopways that are adjacent to the runway.
- 2.14 The presence or absence of these paved areas also impacts the length of the declared distances: Take-off Run Available (TORA), Take-off Distance Available (TODA), Accelerate-Stop Distance Available, and Landing Distance Available (LDA).

- 2.15 The **runway length** is defined as the distance between the two runway thresholds, measured from the inner edge of the threshold markings. If there is a displaced threshold, the length of the displacement is included in the runway length. The runway length does not include other areas such as stopways; this means that the length of some of the declared distances, if they include stopways or clearways, will be longer than the runway length.
- 2.16 The **runway width** is defined as the distance between the outer edges of the runway side stripe markings. If marking is not present then the width is the distance between the two edges of the runway. Runway shoulders are not included in the runway width.
- 2.17 The **runway strip** is defined as an area enclosing a runway and any associated stopway. The strip extends beyond the length and width of the runway/stopway, and the required size of this area is based on the runway code number. See CAP 168 Licensing of Aerodromes for more information on the strip length and width requirements for runways with different reference codes. When providing the runway strip as part of an aerodrome survey, the length and width should include this extension. For example, when surveying the strip length for a runway with reference code 2, a Runway Centreline Point would be surveyed at the place where an imaginary runway centreline meets the end of the 60 m extension. Areas such as runway starter extensions and clearways are not included when calculating the extended size of the runway strip.
- 2.18 A **stopway** is an area beyond the end of the TORA that gives an aircraft room to stop safely in case of an aborted take-off. It is not intended to be used for normal manoeuvring outside of this circumstance. If a stopway is present, it is included in the runway strip calculations, but not within the runway length. A stopway must have the same width as the runway.
A stopway is included in the ASDA, but not in the TORA, TODA, or LDA.
- 2.19 A **runway end safety area (RESA)** is an area beyond the end of the runway strip that is designed to minimise harm if an aircraft overruns or undershoots the runway. A RESA is wider than the runway. A RESA is not included within the runway strip or runway length.
- 2.20 A **runway starter extension** is an area prior to the runway that gives an aircraft additional room to begin acceleration before take-off. A starter extension is narrower than the runway, and therefore does not serve dual purpose as a stopway for the opposite runway direction. A starter extension is not included within the runway strip or runway length.
A starter extension is included in the TORA, TODA, and ASDA, but not in the LDA.
- 2.21 A **displaced area** is an area of the runway prior to a displaced threshold. A displaced area is not used for landing, but may or may not be used for takeoff

depending on the reason for the displacement. If the displaced area cannot be used for takeoff, for example if the threshold is displaced because the pavement is not suitable for movement, it should be marked as closed.

A displaced area, when it is not marked as closed, is included in the TORA, TODA, and ASDA, but not in the LDA.

- 2.22 A **clearway** is an area beyond the end of the TORA that is free from obstacles to allow an aircraft to safely gain height after take-off. If a stopway exists, the clearway will encompass the stopway (and extend beyond it). A clearway extends beyond the runway strip, but will also be partially within it. A clearway is not included in the runway length. A clearway is wider than the runway, and is intended to become wider as it progresses away from the end of the runway. A clearway may extend beyond the boundary of the aerodrome. A clearway is included in the TODA, but not in the TORA, ASDA, or LDA.

- 2.23 For more information about the physical requirements for these features, see Regulation UK (EU) 139/2014 Certification Specification [Chapter B](#) and [Chapter C](#).

- 2.24 Although many of these areas are used to determine declared distances, they have physical definitions and therefore their dimensions must be based on surveyed points. They should not be defined by performing reverse calculations from the declared distance values. For example, although the ASDA declared distance is defined as TORA plus the stopway length, the length of a stopway must be measured in a survey and not calculated by subtracting the TORA from the ASDA.

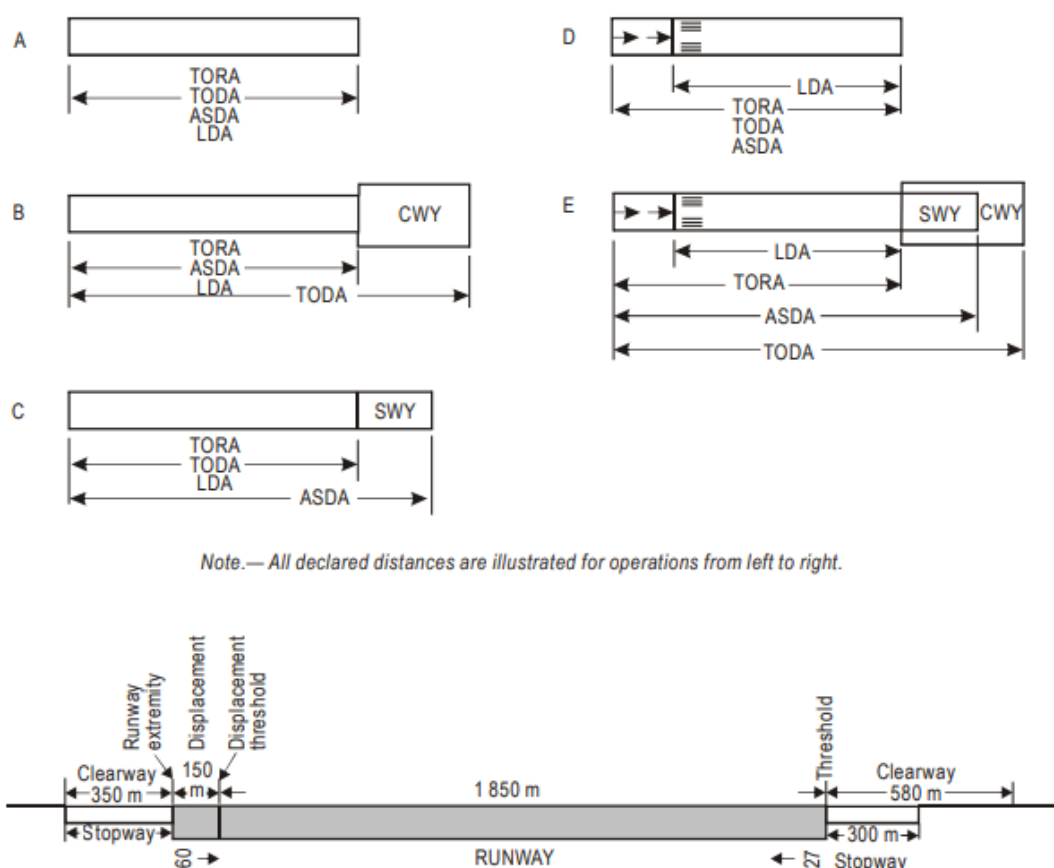


Figure 2.1: Declared distance measurements (ICAO Annex 14 Volume I)

- 2.25 If intersection take-offs are performed on a runway, the point from which the reduced runway declared distances for take-off begins needs to be determined and surveyed. The ICAO WGS-84 manual and Regulation UK (EU) 139/2014 Annex A provide guidance on how to determine the intersection point between the runway and the taxiway.

In the survey data files, this surveyed intersection point will be a CENTRE_PT_RWY feature that is used as the Start Point Association for the declared distance in the Runway Declared Distances (RDD) file, and this declared distance will be associated with both the runway and the taxiway. For example, if there is a reduced TORA that begins at the intersection of taxiway W1 on runway 09L, in the aerodrome facilities file the point at which this TORA begins will be a CENTRE_PT_RWY feature with the role of TORA_START. In the RDD file, this TORA will be associated with RWY 09L and TWY W1, and use the same CENTRE_PT_RWY for the Start Point Association.

Lighting

- 2.26 All aerodrome ground lighting, and approach lighting, should be included when surveying. This excludes, however, lights marking obstacles as this lighting is described in the attributes of the obstacle itself.

- 2.27 As lighting installations are not always spaced in a regular pattern, their true positions should be provided in the survey data rather than an approximation.
- 2.28 This lighting is also depicted on the Aerodrome Plan (see Chapter 3).
- 2.29 If a light is LED, this information should be included in the Lighting Description field in the survey data file. This information is important for all-weather operations and the use of enhanced flight vision systems (EFVS) on approach. An EFVS may not “see” an LED light unless it also emits infrared.

Terrain and obstacle data (TOD) collection areas

- 2.30 To achieve compliance with Regulation UK (EU) 139/2014 and the standards included in ICAO Annex 4, Annex 11, Annex 14, and Annex 15, the ICAO obstacle collection areas 1 to 4 (see PANS-AIM Appendix 8) should always be used as a reference in the survey report.
- 2.31 A specific UK policy on obstacle data collection surfaces has been created based on the ICAO electronic terrain and obstacle (eTOD) areas, to ensure that one aerodrome survey will deliver all of the data necessary to generate obstacle limitation surfaces, design instrument flight procedures, and produce the necessary charts. This policy is referred to as eTOD PLUS. A comparison of ICAO eTOD and UK eTOD PLUS can be found in Appendix B.
- 2.32 All certified aerodromes and any licensed aerodromes with precision IFPs of Category II or III must have survey coverage of the following areas at a minimum:
- the terrain and obstacles in Area 2 (including all sub areas 2a to 2d),
 - the terrain and obstacles in Area 3,
 - the terrain and obstacles in Area 4 for any runways with Category II or III operations,
 - the terrain and obstacles in the take-off flight path area,
 - and the obstacles penetrating the obstacle limitation surfaces described [below](#).
- 2.33 Licensed aerodromes with non-precision or precision Category I IFPs must have survey coverage of the following areas at a minimum:
- the terrain and obstacles in Area 2a,
 - the terrain and obstacles in the take-off flight path area,
 - and the obstacles penetrating the obstacle limitation surfaces described [below](#).

The aerodrome should ensure that any other obstacles that are assessed as being a hazard to air navigation are also surveyed, regardless of which obstacle area they are in.

- 2.34 It is essential that the aerodrome's terrain survey describes terrain using the terrain coverage areas and attributes listed in ICAO PANS-AIM Appendices 6 and 8, and that the terrain data meets the numerical requirements detailed in the ICAO Aeronautical Data Catalogue (PANS-AIM Appendix 1, transposed in CAP 1054 Annex A). Additional information can be found in Regulation UK (EU) 139/2014: [GM4 ADR.OPS.A.005\(a\)](#).
- 2.35 Further guidance on terrain and obstacle data can be found in the Eurocontrol Terrain and Obstacle (TOD) Data Manual.

Ordnance Survey terrain data

- 2.36 The aerodrome operator may choose to obtain their terrain data from commercial providers, such as the Ordnance Survey (OS) Terrain 5 and lower, or an equivalent provider which meets the requirements of ICAO Annex 15, PANS-AIM, and Regulation UK (EU) 139/2014. An assessment of OS Terrain Datasets has been conducted by the CAA and evidence has been obtained to achieve the level of assurance that these products meet the data quality requirements for terrain data. The publicly available OS Terrain 50 dataset is considered as the UK Area 1 terrain dataset.
- 2.37 Due to OS conditions of use and copyright terms on their terrain data, UK AIS is not currently permitted to store or redistribute OS terrain data if it is provided in a survey package. Users wishing to obtain OS terrain data must request it from the OS, or from the aerodrome concerned. Therefore, if an aerodrome operator chooses to submit OS terrain data to UK AIS as part of the survey package, they must ensure that it is purchased under terms that allow it to be processed and used for charting purposes.
- 2.38 The [digital dataset page on the UK AIS website](#) includes a note indicating those aerodromes for which terrain data is known to be available.
- 2.39 Discussions between the OS, UK AIS, and the CAA are ongoing to determine whether there is a more efficient means of making terrain data for UK aerodromes available to users. The paragraphs above will be updated when a solution is implemented.

Defence Geographic Centre (DGC) survey data

- 2.40 To aid the Defence Geographic Centre (DGC) in the preparation of topographical charts and the Area 1 obstacle database, all aerodrome survey data will be shared with DGC.

- 2.41 Data for obstacles in Area 2d is included in the Area 1 obstacle dataset provided by the DGC and published in AIP ENR 5.4. As DGC is demonstrating continuous improvement of data processes and procedures to deliver enroute obstacle data, aerodrome operators may filter obstacle data from this Area 1 dataset and use it in their Area 2 dataset(s), and any other relevant dataset. An annotation to indicate the source of the data must be provided in this case.
- 2.42 When using DGC data for an obstacle, a surveyor may need to record additional attributes for that obstacle that are not included in the DGC dataset, or re-survey it if the resolution of the data is not sufficient for the needs of the aerodrome survey. The surveyor may also need to record that an obstacle in the DGC dataset has changed since its last DGC survey. By “updating” the DGC data in these ways, the DGC data is enhanced by the aerodrome surveys.

TOD collection area ‘overlap’ between neighbouring aerodromes

- 2.43 Where two or more aerodromes are located in close proximity, their TOD collection areas may overlap. To avoid duplicated survey data being submitted to UK AIS and the potential for discrepancies that results from such duplication, these neighbouring aerodromes should coordinate with each other to define which aerodrome will be responsible for surveying the overlapping area.
- 2.44 As part of this coordination, the aerodromes should determine their respective data requirements for the overlapping area and ensure that the aerodrome which takes responsibility for it collects data that is suitable for both parties. For example, the overlapping area may be in Area 2d for one aerodrome but Area 4 for the other. The data must be surveyed according to the more stringent requirements.
- 2.45 When the designated responsible aerodrome produces new or updated survey data for the overlapping area, they must share it with the other aerodrome(s) as well as with UK AIS.
- 2.46 This coordination should be documented in a Formal Arrangement between the aerodromes concerned, and in the Formal Arrangements between the aerodromes and UK AIS.

Take-off flight path area (TOFP)

- 2.47 The take-off flight path area (TOFP) identifies terrain and obstacles that project above the take-off flight path for a specific runway direction, such as terrain and obstacles in the take-off path for RWY 09L.
- 2.48 The TOFP area to be surveyed originates at the end of the Take-off Distance Available (TODA). The area is symmetrical on either side of the extended runway centreline, 180 m wide at origin and increasing uniformly at a rate of 0.25D to a maximum width of 1800 m, where D is the distance from origin. At a distance of 6480 m from origin the TOFP width remains static and the area

continues to a distance of 10000 m. The elevation of the origin is the elevation declared for the end of TODA. See Figure 2.2.

- 2.49 The TOFP plane surface has an upward slope of 1.2% from origin (see Figure 2.2). For runways serving aircraft having operational limitations that do not preclude the use of a gradient less than 1.2%, the area is increased to 12000 m 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.
- 2.50 If the TOFP area is at an offset angle from the extended runway centreline in order to gain an operational advantage, the area to be surveyed should be determined through consultation between the aerodrome operator and the aircraft operators concerned. This amended area should be agreed with the CAA. The amended TOFP area should be described in the survey report.
- 2.51 Obstacles that penetrate this TOFP surface should be surveyed and recorded in the master obstacles survey data file.
- 2.52 If there is any road, railway track or water feature within the TOFP area that is capable of supporting mobile obstacles greater than 4.8 m in height, then the elevation above mean sea level (AMSL) for these features should be surveyed at regular intervals along their linear extent until their combined elevation (feature plus mobile obstacle) is longer penetrating the TOFP surface. The combined elevation should be provided in the survey data. For waterways, the high and low water marks should be considered.

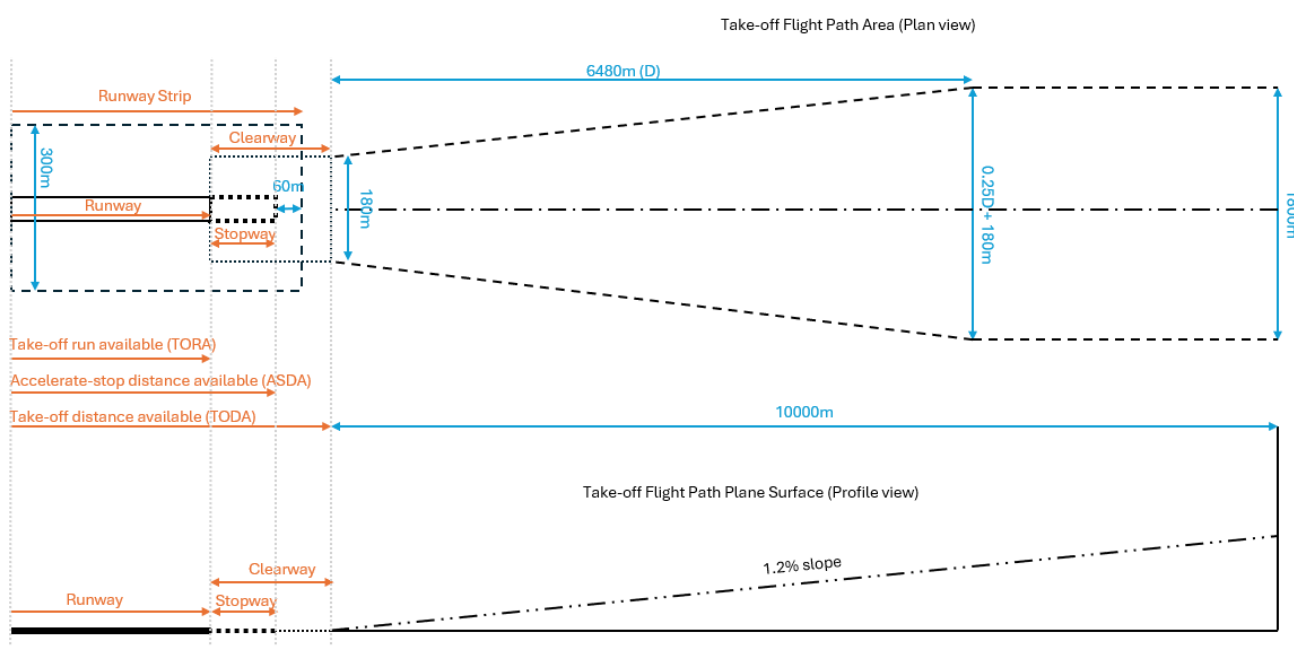


Figure 2.2: The take-off flight path area

Precision Approach survey area

- 2.53 Terrain and obstacles for Precision Approach Terrain Charts (PATC) are required only for aerodromes with precision approach runways of category II or III.
- 2.54 The survey area for PATC begins at the runway threshold and extends for a distance of 900 m into the approach. Its width of 60 m either side of the extended runway centre line. A longitudinal extension of this area may be required if the terrain undulates significantly; this requirement will be identified during the CAA approval process for category II or III operations.
- 2.55 The features to be included in the PATC survey are:
- Runway threshold location and elevation.
 - Terrain profile of the extended runway centre line.
 - All objects (fixed and mobile) that both:
 - penetrate 3 m or more above or below the extended centre line terrain level, and
 - have a horizontal dimension of more than 15 m as measured parallel to the runway centre line.
 - Terrain contours at 1 m contour intervals related to the runway threshold height.
 - Roads, railways, rivers or canals with sufficient levels to show their surface elevation, and the height of the highest mobile object that could be expected on them. In the case of a body of water subject to tides, high and low tidal variations are required.

Obstacle limitation surfaces

- 2.56 Every survey conducted in the scope of this guidance should identify features that penetrate the following obstacle limitation surfaces:
- Approach surface
 - Transitional surface
 - Take-off climb surface
 - Inner horizontal surface
 - Outer horizontal surface
 - Conical surface
 - Visual segment surface

- Obstacle free zone surface, comprising the inner approach, inner transitional and balked landing surfaces (these surfaces apply to runways with precision approaches only).

2.57 Explanations of the above listed surfaces can be found in Regulation UK (EU) 139/2014 Certification Specification [Chapter H](#) and [Chapter J](#) and in CAP 738 Safeguarding of Aerodromes.

CHAPTER 3

Producing survey files and reports

- 3.1 This chapter describes the files in which survey data is recorded and described. These files are based on the needs of UK AIS so that they may process the data for publication in the AIP; other stakeholders may have additional requirements.
- 3.2 Unless otherwise indicated, all the files and reports are mandatory elements of the survey package that is submitted to UK AIS as described in the next chapter. If the survey being performed is an update of a previously-conducted full survey of the aerodrome environment (for example to survey only obstacles in Area 2c as it is known that changes have occurred in this area), then not all of the files may require changes from the files produced during the previous full survey. However, the submitted survey package should still include all of the files, for traceability purposes.

Survey data files

- 3.3 The surveyed data is organised into several files, according to content. Each of those files is described here.

Aerodrome facilities file

- 3.4 The aerodrome facilities file includes data for features at the aerodrome, such as navigation aids and parking stands, but does not include obstacles as these are recorded separately. Surveyed points relating to runways (such as the start point from which the TORA is measured) are included in the aerodrome facilities file, but the distances such as lengths that relate to these points are recorded in the runway declared distances file.
- 3.5 This list of aerodrome features should be formatted as described in the Aerodrome Facilities tab of the specification in Appendix C. The file should be named egxx_ad00, where egxx is the ICAO location indicator of the aerodrome and 00 is the year of the survey.

Runway declared distances file

- 3.6 The runway declared distances file includes data relating to lengths and widths of the runway(s) and/or FATO(s) at the aerodrome, as well as lengths and widths of paved areas that are adjacent to the runway such as starter extensions.
- 3.7 This list of runway distances should be formatted as described in the Runway Declared Distances tab of the specification in Appendix C. The file should be named egxx_rdd00, where egxx is the ICAO location indicator of the aerodrome and 00 is the year of the survey.

Master obstacles file

- 3.8 The master obstacles file includes data for all obstacles that affect the aerodrome, both within and outside of the aerodrome boundary. The master file is designed to remove the need for separate data files for different obstacle collection areas or for obstacles that penetrate obstacle limitation surfaces (including the take-off flight path area).
- 3.9 This list of obstacles should be formatted as described in the Obstacles tab of the specification in Appendix C. The file should be named egxx_obst00, where egxx is the ICAO location indicator of the aerodrome and 00 is the year of the survey.
- 3.10 Each obstacle that has been surveyed should be allocated an identifier. This identifier should be unique. The identifier should not be based upon the dataset or obstacle collection area within which the obstacle is included (for example, avoid identifying obstacles as “Area2_obst1”, “Area 2_obst2”). This is so that the same obstacle identifier can be used if the obstacle is included in more than one dataset. The identifier should not be changed from one survey to the next, even if some of the obstacle’s attributes, such as height, have changed.
- 3.11 The specification of the obstacle survey data file includes a “Show on Aerodrome Ground Chart” field that the aerodrome sponsor should use to mark those obstacles that they wish UK AIS to depict on the Aerodrome Chart (and Aerodrome Ground Movement/Parking Chart if provided for that aerodrome). This field exists because depicting all of the features in the obstacle file on the chart would cause the chart to become unreadable, and so only a selection will be depicted. This selection may include those obstacles close to the runway extremities which pose a hazard to approach or take-off, or obstacles in proximity to the movement areas which pose a hazard to aircraft taxiing. The aerodrome operator should use the “Show on Aerodrome Ground Chart” field to identify those obstacles for which it is beneficial to users to depict them on the Aerodrome Chart.
- 3.12 When determining which obstacles to mark for inclusion on the Aerodrome Chart, the sponsor should keep the following in mind:
- To avoid causing clutter on the chart and reducing its readability, only the obstacles that pose a significant risk to operations should be marked for depiction on the chart. The full dataset of obstacles will be published by UK AIS regardless of whether or not they are shown on the chart and so omitting the obstacle from the chart does not mean it will not be published.
 - The features listed in the Aerodrome Facilities File of the survey data will be shown on the chart, so there is no need to mark these items for depiction if they also appear in the Obstacles file.

- Although obstacles outside of the boundaries of the airport may be depicted if they are close enough to be included on the Aerodrome Chart, it will not be possible to depict obstacles that are far from the boundaries, while maintaining the size and scale of the Aerodrome Charts. These obstacles are likely better suited to be shown on obstacle and/or instrument procedure charts.
- The obstacles selected for depiction should also be marked on the Aerodrome Plan produced as part of the survey package. Doing so will help to indicate whether depicting the chosen obstacles will reduce the readability of all or part of the chart.

Terrain datasets

- 3.13 The survey package should provide terrain datasets for each of the areas required according to the aerodrome's license/certification and operations (as described in the section on [terrain and obstacle collection areas](#) above).
- 3.14 A terrain dataset should be provided that covers the same survey area as the area described for obstacles in the take-off flight path area above.
- 3.15 These terrain datasets should be provided to UK AIS in GeoTIFF or GML format.

Reports

Survey report

- 3.16 The survey report provides information that gives context to the data provided in the survey data files. The survey report is mandatory.
- 3.17 The survey report should include:
- Schedules listing all features that have been added, changed or deleted since the previous survey.
 - Metadata records:
 - The data originator (surveying organisation).
 - The date of the survey.
 - Name of the person(s) or organisations that have interacted with the data, and when.
 - The effective start date and time of the data.
 - Information about how the survey was conducted:
 - Method of survey and equipment used.
 - Equipment calibration information and method of checking the survey.

- The earth reference model used.
- The coordinate system used.
- Data quality assurance:
 - Evidence that the accuracy requirements have been met, including details of the error budget analysis.
 - Details of any validation and verification of the data that has been performed.
 - The statistical accuracy of the measurement or calculation technique used.
 - The resolution of the data.
 - The confidence level.
 - Details of any functions applied, if data has been subject to conversion or transformation.
- Details of any limitations on the use of the data.
- Any differences to the requirements described in this document.

3.18 The format of the schedule listing changes from the previous survey should be agreed with the aerodrome operator and recorded in the Formal Arrangement.

Geodetic connection report

3.19 The geodetic connection report describes how the positions of the aerodrome control network points were determined and their accuracy relative to WGS-84.

3.20 The geodetic connection report may be provided as a section of the overall survey report described above, or as a separate document.

3.21 The geodetic connection report is mandatory.

3.22 The report should include:

- The details of the connection of the aerodrome control network to the geodetic network.
- The aerodrome control network plan.
- Survey station descriptions.
- Transformation parameters.

3.23 The geodetic connection report should include a description of any changes to the control network since the last survey, if applicable.

Drawings

Aerodrome plan

- 3.24 The aerodrome plan is part of the Aerodrome Manual. The aerodrome operator is required to maintain an up-to-date aerodrome plan for licensing and safeguarding purposes. The intention of the aerodrome plan is to provide an accurate picture of the aerodrome's configuration and integral facilities.
- 3.25 The scale of the plan should be 1:2500, although 1:5000 is also acceptable for large locations. If printed, the plan should be legible at a paper size no larger than A0. If this is not possible or practical due to the extent of the surveyed area, then multiple adjoining sheets may be used. When using an adjoining sheet system, it should be capable of being abutted and oriented to give the most economical coverage.
- 3.26 The plan should have a title panel that includes the following:
- Aerodrome ICAO location indicator and name.
 - Drawing title.
 - Drawing number or reference.
 - Date of survey.
 - Scale.
 - Survey company name and address, including telephone number.
 - Surveyed by.
 - Checked by.
 - Sheet number.
 - Multi-sheet layout diagram, if applicable.
 - Abbreviations used, if applicable.
 - Reference to the appropriate survey report.
 - Copyright statement.
- 3.27 In case of multiple sheets, each sheet should have a sheet number that references the total number of sheets (for example, sheet 2/3). Each sheet should display the title panel.
- 3.28 The area depicted in the plan should show the limits of the aerodrome boundary and the locations of any off-site locations that are considered integral to the operational procedures of the aerodrome. Off-site facilities may be shown in insets if needed.

- 3.29 All aerodrome features and buildings should be shown on the plan. Drawn features, including runway markings, should be drawn to scale. Surveyed points that do not have a visual feature to draw, such as the start points of declared distances, should be represented by a symbol. Symbols may also be used for features for which there is no benefit in a visual depiction, such as anemometers or navigation aids.
- 3.30 Non-surveyed items or locations that need to be depicted on an aerodrome or ground movement chart, such as areas where aircraft with folding wingtips can operate with wingtips extended, may also be shown or annotated on the aerodrome plan as needed.
- 3.31 Surveyed features and points should be labelled with their survey identification number, to allow them to be cross-referenced with the survey data.
- 3.32 The aerodrome plan is also submitted to UK AIS with survey data files, as it assists UK AIS to visualise the data that is being submitted. The aerodrome plan should be submitted to UK AIS in PDF format.
- 3.33 An example aerodrome plan created by UK AIS with explanatory notes is provided in Appendix D as a separate PDF attachment. Note that aerodrome operators may require additional objects to be depicted, beyond those shown on the AIS example. The ICAO WGS-84 Manual also provides further guidance and survey specifications for aerodrome plans.

Type A chart

- 3.34 The Type A chart depicts the obstacles that were surveyed for the take-off flight path area for both ends of a runway.
- 3.35 The chart shall include a plan and profile view. The plan view shall depict the position of the obstacles relative to the runway centreline, with their spot heights labelled. The profile view shall depict the position and height of the obstacles relative to their distance from the runway and the TOFP plane surface.
- 3.36 Shadowing principles (when an obstacle of a lower height is 'shielded' by a higher obstacle that appears earlier in the flight path) may be applied for the obstacles depicted on the chart.

Precision approach terrain chart (PATC)

- 3.37 Precision approach terrain charts (PATC) provide a detailed terrain profile of the final portion of a precision approach. They are used to provide information to enable to the evaluation of the effects of the terrain on decision height determination using radio altimeters.
- 3.38 PATC are required only for aerodromes with precision approach runways of category II or III.

- 3.39 The chart shall include a plan and profile view. The plan view shall depict the position and shape of the features recorded in the survey described above. The profile view shall depict the position and height of the same features.
- 3.40 The scale of the chart plan view should be 1:2500, although 1:15000 may be used if the survey area has been extended. The scale of the profile view should be 1:500, although if the area is very flat a larger scale may be used to better depict the variations in elevation.
- 3.41 The format for title panels and sheet labels is the same as that described for the aerodrome plan above.
- 3.42 As terrain does not change frequently, it is not expected that the PATC will require updates with every survey. Only “significant” terrain changes require the PATC to be reissued. It is the responsibility of the aerodrome operator to monitor changes in the approach terrain profile and maintain the terrain survey and PATC as needed. The following terrain profile changes are considered significant enough to update the PATC:
- Changes in slope of 12.5% over a distance of 15 m or more.
 - Increase or decrease in the contour height of 3 m or more and over 15 m to the defined approach area.
- 3.43 However, note that changes to other non-terrain items depicted on the chart (such as the position of the runway threshold, for example) will also trigger an update to the chart.

CHAPTER 4

Submitting survey information

- 4.1 This chapter describes elements to be considered when submitting survey data files and reports to UK AIS. See also CAP 1054 Aeronautical Information Management for submission information that applies to all data types.

UK AIS change requests

- 4.2 The aerodrome operator is responsible for ensuring that every new survey or update to existing aerodrome survey data is submitted to UK AIS, with copies of all survey documents, as a change request (CR). This CR is created in the data originators' portal, known as Aurora.
- 4.3 Surveys that do not conform to the applicable requirements will be rejected by UK AIS and returned to the sponsor. (See the [workflow diagrams on the portal help pages](#) for more information on how a CR progresses from submission to publication.)
- 4.4 The ownership and copyright of the survey data resides with the aerodrome operator.

Exchange format

- 4.5 The survey files and reports described above should be submitted to UK AIS in a single zipped file attached to a change request (CR) in the data originators' portal.
- 4.6 UK AIS uses the aeronautical information exchange model (AIXM) to enable the management and distribution of aeronautical information in a digital format. The datasets in the zipped file will be imported by UK AIS into AIXM format, removing the need for manual data entry.
- 4.7 Survey organisations are encouraged to record their survey results in AIXM format as well as in the .csv files as described in the previous chapter, and submit both to UK AIS.
- 4.8 AIXM format datasets may be submitted to UK AIS as a replacement for one or more of the .csv files (and thereby omitting the .csv) only by arrangement with AIS: AIXM datasets will need to be provided to and accepted by AIS prior to these files replacing .csv files in CRs. This testing and agreement to use AIXM datasets needs to be carried out for each .csv file that is being replaced. For example, if there is an agreement to provide obstacles in AIXM and then later the surveyor wishes to provide the aerodrome facilities file in AIXM, then a new test file must be sent and a new agreement made.

- 4.9 More information about AIXM and coding guidelines can be found at <https://aixm.aero>.

Survey approvals checklist

- 4.10 The UK AIS has created an Aeronautical Survey Approvals Checklist to support aerodrome operators and their nominated Sponsors when submitting a survey dataset change request (CR) to the data originators' portal. The document provides a list of survey features that require CAA regulatory approval before the CR is submitted. It is the aerodrome operator's responsibility to liaise with the relevant CAA regulatory departments to obtain the necessary approval(s).
- 4.11 The sponsor should complete the checklist and obtain copies of the approval correspondence between the aerodrome operator and the CAA regulatory departments. The completed checklist and approval correspondence should be included with the change request for the survey data.
- 4.12 Change requests without evidence of required approvals will be sent back to the sponsor.
- 4.13 The template for the checklist is located on the [FAQ page](#) on the data originators' portal.
- 4.14 A full list of data changes that require regulatory approval can be found in CAP 1054 Annex A.

Queries or errors with submitted survey data

- 4.15 Ideally, all changes in a survey submitted to UK AIS will be processed for the same date and included in the same publication. However, if an element of a submitted survey package is subject to query by UK AIS, or its approval is outstanding or has been rejected, UK AIS may process and publish separately any remaining elements of the survey package that do not have a dependency with the blocked element. This is in the interests of the timely promulgation of aeronautical information.
- 4.16 If an element of a survey is blocked from publication for a significant period of time, when the block is removed UK AIS has the prerogative to ask the sponsor to confirm that the previously-submitted information is still valid, before processing it.

CHAPTER 5

Maintenance and review of survey data

- 5.1 It is the intention of CAP 1732 that the first full survey conducted at an aerodrome establishes a baseline, and that subsequent surveys can be targeted to update this baseline with any changes. This removes the need to undertake another complete survey of the entire aerodrome every time a change occurs or at a pre-set interval, unless the aerodrome operator decides it is beneficial to do so.

Keeping surveys up to date

- 5.2 After the full survey baseline has been established, it is the responsibility of the aerodrome operator to determine the extent of any surveys that are performed to keep the information in that baseline up to date.
- 5.3 Aerodrome operators are required ([ADR.OPS.B.075](#)) to establish procedures for continuous monitoring of the obstacle environment of their aerodrome, both within and outside of the aerodrome boundaries. These procedures must be included in the Aerodrome Manual.
- 5.4 The impact of any new obstacle on the aerodrome's operation should be assessed and documented, including necessary notifications and impact on AIS publications. (This assessment is known as safeguarding; for more information see CAP 738 Safeguarding of Aerodromes.)
- 5.5 After the identification of a new permanent or long-term obstacle that penetrates data collection surfaces, the new obstacle should be surveyed and added to the aerodrome obstacle datasets as soon as possible. If the new obstacle affects aerodrome operations, then appropriate notification (NOTAM and/or AIP Supplement) must be raised for users to cover any time period before the updated obstacle dataset is published.
- 5.6 If a new obstacle is temporary and will exist for fewer than 90 days, then notification must be raised but the obstacle will not be added to the obstacle dataset. It is recommended to survey the temporary obstacle, so that the information in the notification is assured, but it is not mandatory to do so. The aerodrome operator should consider the criticality of the obstacle to the aerodrome's operations when making the decision of whether or not to survey the temporary obstacle.
- 5.7 If the obstacle is mobile (such as a crane), then multiple notifications regarding its position may be required. See CAP 1096 for more guidance regarding cranes and other tall equipment.

- 5.8 Where drawings are produced to accompany survey data (such as Type A or Precision Approach Terrain Charts), these should be revised when there is a significant change to surveyed information depicted on the drawing. These significant changes may include information relating to the runway on which the chart is based, as well as the obstacles or terrain that the chart is designed to depict. For terrain depicted on PATC and Type A charts, it is important to keep in mind that both decreases and increases in the elevation of terrain can be considered significant. The ICAO integrity levels of different features (critical, essential, and routine) can also be used to help determine whether a change is significant.

Annual review of survey data

- 5.9 Aerodrome operators should conduct an annual review of their aerodrome survey data and obstacle data. The annual review is in addition to continuous monitoring of changes and is intended to ensure that all needs for new survey activities are captured. For this reason the review must be detailed enough to identify all potential changes to any of the features that are included in the surveyed data.
- 5.10 Where changes are known to have occurred, the aerodrome operator does not need to (and indeed should not) wait for the next annual review to authorise a new survey (see paragraphs 5.2 to 5.4 above). The annual review should be used as a check that no changes have been missed, and not as the sole method of identifying changes.
- 5.11 The aerodrome operator should be able to provide evidence that the annual review has been conducted. This evidence may be requested by the UK CAA during its oversight activities of the aerodrome.
- 5.12 The Aerodrome Manual should include a procedure that describes the annual review of the aerodrome survey data and define the evidence that is used to demonstrate that the annual review has been conducted. For more information on the content of the Aerodrome Manual, see Regulation UK (EU) 139/2014 [ADR.OR.E.005](#) and its associated AMC and GM.

Changes to features within tolerance of their required resolution

- 5.13 When features are being surveyed to a high resolution it is possible that a second survey will record a change that is functionally insignificant. For example, the surveyed coordinates of a parking stand may be 3 mm different from its previous surveyed coordinates, or a tree blowing in the wind may be slightly different in height from one moment to the next. If a change to a feature is only visible at a resolution that is greater than the required resolution of the item in the data specification, then this does not have to be reported to UK AIS as a change to that feature.

- 5.14 The date at which a feature was surveyed should be recorded in the survey data file, regardless of whether a change to that feature will be reported to UK AIS or not:
- If a feature has been added to the survey data for the first time, or if an existing feature has changed to an amount that is visible in the resolution required in the data specification, then the “**survey date**” field should be used to record the date of the current survey activity.
 - If the feature was surveyed and found to be identical to its previous survey, or the change was so small as to be within tolerance, then the “**resurvey (verification) date**” field of the data file should be used to record the survey date. The existing “survey date” for the feature will stay as it was recorded from the previous survey when the feature was added/updated.

Review of instrument flight procedures

- 5.15 The data in survey files and reports is used to design instrument flight procedures (IFPs). Any new or changed obstacles may also impact the safeguarding surfaces for the IFPs. Therefore, when a new survey is conducted, the impact on IFP surfaces must be assessed. (For more information on IFP safeguarding see CAP 785B Implementation and Safeguarding of IFPs in the UK.)
- 5.16 Reviewing the impact of a survey on IFPs and/or IFP surfaces can only be performed by an Approved Procedure Design Organisation (APDO). Like the survey itself, the IFP review by an APDO is a contracted activity and should be described in a Formal Arrangement with the aerodrome operator. For more information on the role of APDOs see CAP 785A Oversight of UK Approved Procedure Design Organisations.
- 5.17 An IFP review should be conducted within five months of a full aerodrome survey being completed.

APPENDIX A

Guidance on the content of Formal Arrangements

To comply with Regulation UK (EU) 139/2014 [ADR.OPS.A.010](#), Regulation UK (EU) 2017/373 [Article 3\(5\)](#), and CAP 1054 requirements for exchanging aeronautical information and data, the parties responsible for data in the scope of aeronautical data quality requirements, and any party handling such data and information, shall establish Formal Arrangements between themselves.

Formal Arrangements can refer to other documents, such as regulations, guidance material, or local work instructions. All referenced documents should be available to both parties.

The minimum requirements of a Formal Arrangement may form part of a contract, Letter of Agreement (LoA), Service Level Agreement (SLA), Memorandum of Understanding (MoU), or they may be as a standalone Formal Arrangement covering the request and provision of an aeronautical data and information activity.

It is essential that Formal Arrangements and any referenced information, documentation, or procedures and made available to the CAA on request.

Formal Arrangements should include the following minimum content listed in Regulation 139/2014 [AMC2 ADR.OPS.A.010](#):

Item (b)(1): The scope of aeronautical data or aeronautical information to be provided

When establishing a Formal Arrangement for the provision of aeronautical data and information, it is essential that the arrangement precisely defines the scope of the aeronautical data and information that it covers. This section should also include the content of the survey package (see Chapter 3).

Item (b)(2): The quality requirements for each data item supplied according to the aeronautical data catalogue

A Formal Arrangement for the provision of aeronautical data and information must define the quality requirements for the aeronautical data and information that will be passed between the signatories to the arrangement. Such an approach ensures that all parties have a common understanding of the levels of expectation. The data quality requirements for all aeronautical data and information that is included under the scope defined in Item (b)(1) must be referenced.

Item (b)(3): The required methods for demonstrating that the data provided conforms with the specified requirements

It must be demonstrated that the aeronautical data and information meets the regulatory requirements at each stage of the process; aeronautical data and information which is not “fit for purpose” must not be passed on by any agency. The Formal Arrangement requires the documentation of all methods that shall be applied by the data provider to demonstrate this compliance.

The method applied should be mutually agreeable to both parties and hence form the standard against which aeronautical data and information may be verified by the recipient, if so desired. Additional guidance on verification and validation may be found in CAP 1054.

This section of the Formal Arrangement should also include the content of the [Survey Report](#).

Item (b)(4): The nature of action to be taken in the event of a discovery of a data error or inconsistency in any data provided

In any data process, there is the possibility of a failure occurring and the mechanisms that should be used to identify, notify and correct failures in aeronautical data and information provision should be agreed and documented. It is also important that the parties are mutually aware of the impact of errors on the recipient's processes.

It is recommended that escalation mechanisms are identified and agreed, such that if either party fails in their duties and responsibilities under the arrangement there is a common understanding of the steps that should be taken to alleviate failure, in a manner that is proportionate to the problem.

Item (b)(5): The following minimum criteria for the notification of data changes:

- criteria for determining the timeliness of data provision based on the operational or safety significance of the change
- any prior notice of expected changes
- the means to be adopted for notification

This requirement is for the establishment of dates, in advance of the effective date of the data change, for differing aeronautical data and information, and for their inclusion in the Formal Arrangement. It also establishes the need to document within the arrangement any notice of expected change, and the method by which the notification of change must be provided. This may assist those bodies further along the data chain to better plan the necessary resources to accommodate the change.

Data should be provided in advance of agreed deadlines to allow sufficient time for the distribution of AIS products or other consequential amendments to aerodrome procedures and publications.

Item (b)(6): The party responsible for documenting data changes

This ensures that where third parties are involved in aeronautical data and information provision, that those parties who are involved in the Formal Arrangement are aware of

their responsibilities. For example, it may be a surveyor that documents the changes needed but the Formal Arrangement exists between the AIS and the Aerodrome Operator.

Item (b)(7): Data exchange details such as format or format change process

If aeronautical data and information is exchanged in different formats, this can lead to confusion and possible error. Although the use of different formats is not prohibited, this requirement ensures that the different formats are at least understood, and the means by which any ambiguities are resolved is documented as part of the arrangement.

Nevertheless, it is recommended that, in so far as is possible, the use of only one single, common format is agreed. Where this is not possible, it is recommended that the use of a very limited set of formats is agreed.

Item (b)(8): Any limitations on the use of data

A data provider may wish to place limitations on the use of the provided aeronautical data and information. This could be a result of the aeronautical data being considered suspect (or unknown or inferior quality) or for commercial reasons. An example of the latter case may be the provision of topographical information which is only to be used for the preparation of charts, and not for re-sale as topographical data.

Such limitations must be documented in the arrangement, such that all parties fully understand the limitations that apply to the aeronautical data and information provided.

Item (b)(9): Requirements for the production of data origination quality reports

The Formal Arrangement should capture the need for the data provider to produce reports which can be used to verify the aeronautical data and information received. These reports could include:

- Descriptions of the process used to validate the aeronautical data and information.
- Reports of the results of the aeronautical data and information validation.
- Any information provided to the data provider that supports the data which they have, in turn, utilised in the origination or validation processes.

This section should also include the minimum content of the [Geodetic Connection Report](#).

Item (b)(10): Metadata to be provided

Metadata forms an essential element of aeronautical data quality as it is necessary to fully understand the context of the aeronautical data and information. This requirement ensures that the Formal Arrangements established between a data provider and receiver fully documents the metadata that is expected to accompany the aeronautical data and information. The metadata requested should be in compliance with the dataset definitions contained in Regulation UK (EU) 139/2014 [ADR.OPS.A.045](#) and the tables in CAP 1054 Chapter 5, paragraph 5.51.

Item (b)(11): Contingency requirements concerning the continuity of data provision

The Formal Arrangements must include the execution plan to ensure the continued provision of aeronautical data and information in the event of a failing in the normal methodology for aeronautical data and information provision. This contingency planning should address both institutional and technical aspects, for example:

- The assignment of a deputy to approve aeronautical data and information in the event of the non-availability of the defined approval authority, or
- Secondary means for the delivery of aeronautical data and information when the planned means cannot be used as a result of a technical failure.

APPENDIX B

eTOD and eTOD PLUS comparison

This appendix provides a comparison of the ICAO definition of electronic terrain and obstacle data collection areas, and the UK-specific definition known as eTOD PLUS.

For both the ICAO and UK collection areas, terrain and obstacle data in Areas 2 to 4 shall comply with the numerical requirements specified in the ICAO Data Catalogue (PANS-AIM Appendix 1).

Area 1

ICAO definition

The entire territory of a State. The obstacle data shall be provided for obstacles in Area 1 higher than 100 m above ground.

UK eTOD PLUS definition

The entire territory of a State. The obstacle data shall be provided for obstacles in Area 1 higher than 100 m above ground.

Comparison

The ICAO and UK definitions of Area 1 are identical.

The UK En-route obstacle dataset is available in the UK AIP ENR 5.4. Details of how electronic terrain and obstacle data may be obtained are published in UK AIP GEN 3.1.6.

Area 2a

ICAO definition

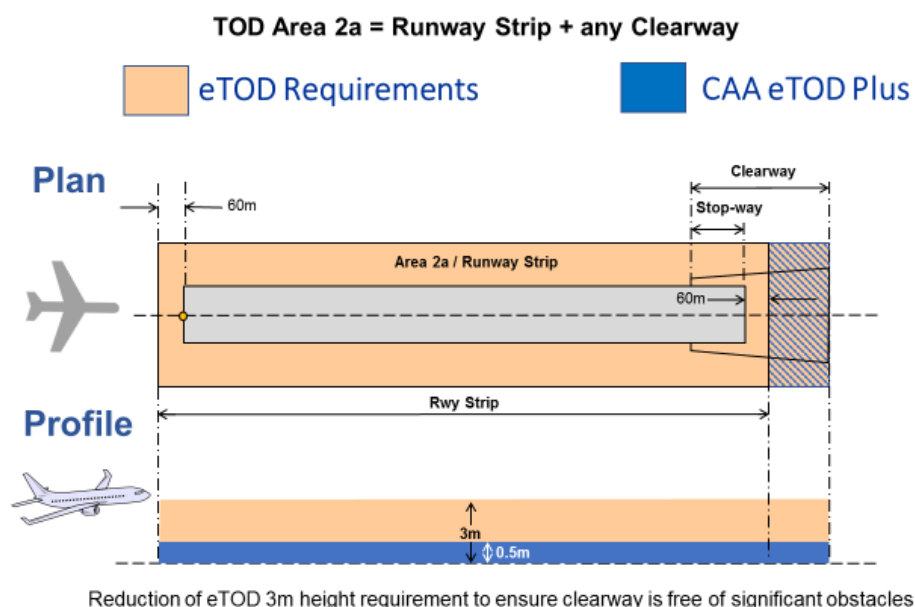
The rectangular area around a runway that comprises of the runway strip plus any clearway that exists. Area 2a obstacle collection surfaces shall have height of **3 m** above the nearest runway elevation measured along the runway centre line, and for those portions related to a clearway, if one exists, at the elevation of the nearest runway end.

UK eTOD PLUS definition

The rectangular area around a runway that comprises of the runway strip plus any clearway that exists. Area 2a obstacle collection surfaces shall have height of **0.5 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.

Comparison

The UK definition of Area 2a is more exacting than ICAO when defining the height of obstacles to be collected. The UK lowers the collection height of obstacles from 3 m above runway elevation, as defined in ICAO, to 0.5 m above runway elevation.



Area 2b

ICAO definition

The 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.

The Area 2b obstacle collection surface has a 1.2% 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% to each side. Obstacles **less than 3 m** in height above ground need not be collected.

UK eTOD PLUS definition

The 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.

The Area 2b obstacle collection surface has a 1.2% 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% to each side. Obstacles **less than 0.5 m** in height above ground need not be collected.

For [aerodrome reference codes 3 and 4](#), the extent of area 2b should be increased to 15 km (8 NM) to support the application of OLS. The obstacle collection surface should be

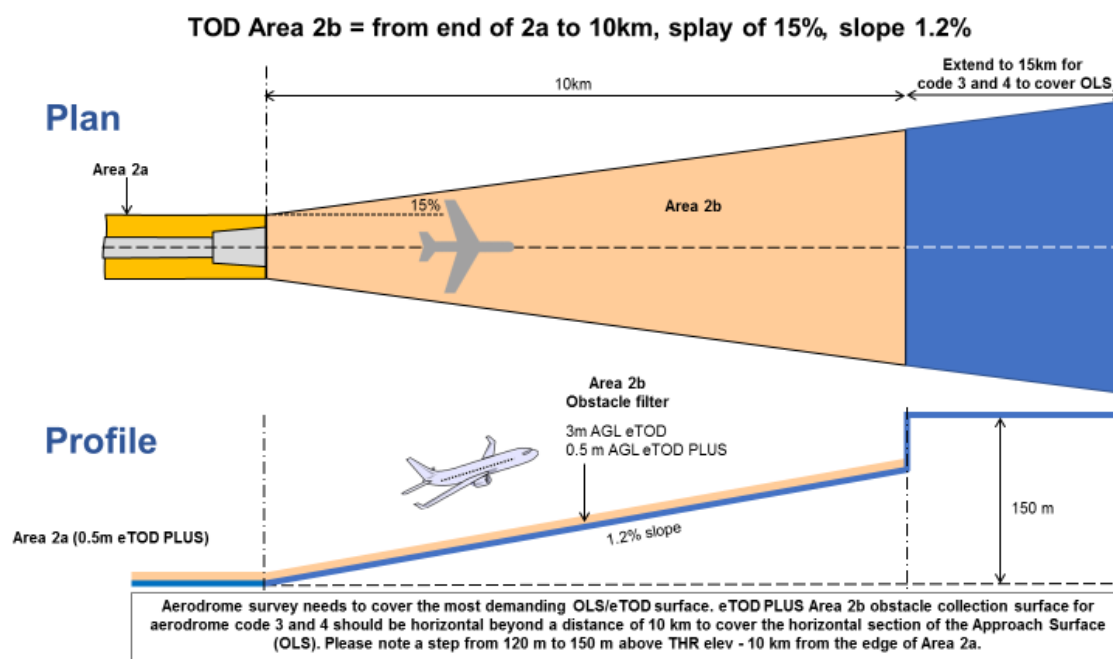
horizontal beyond a distance of 10 km to cover the horizontal section of the approach surface (OLS).

All objects of a height of 100 m or more above ground level should be collected.

Comparison

The UK definition of Area 2b is more exacting than ICAO when defining the height of obstacles to be collected. The UK lowers the collection height of obstacles from 3 m above runway elevation, as defined in ICAO, to 0.5 m above runway elevation. The UK also specifies that any obstacle in the area that has a height of 100 m or more should be collected, regardless of whether it penetrates the slope of the collection surface.

The UK extends the size of Area 2b for aerodromes with reference codes 3 or 4: the eTOD PLUS Area 2b obstacle collection surface should be horizontal beyond a distance of 10 km to cover the horizontal section of the Approach Surface (OLS). Therefore, 10 km from the edge of Area 2a, eTOD PLUS Area 2b includes a step from 120 m to 150 m above the threshold elevation.



Area 2c

ICAO definition

The 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% 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 shall be the elevation of the point of Area 2a at which it commences. Obstacles less than 15 m in height above ground need not be collected.

UK eTOD PLUS definition

The 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% slope extending outside Area 2a and Area 2b at a distance of not more than 10 km from the boundary of Area 2a.

For parts of Area 2c where the inner horizontal and conical obstacle limitation surfaces are more demanding (the outer edge of the inner horizontal surface and the inner edge of the conical surface) the survey should cover the most demanding (lower) surfaces.

For [aerodrome reference codes 3 and 4](#), the extent of Area 2c should be increased to 15 km (8 NM) to support the application of OLS. The obstacle collection surface should be horizontal beyond a distance of 10 km to cover the horizontal section of the outer horizontal surface (OLS).

All objects of a height of 100 m or more above ground level should be collected.

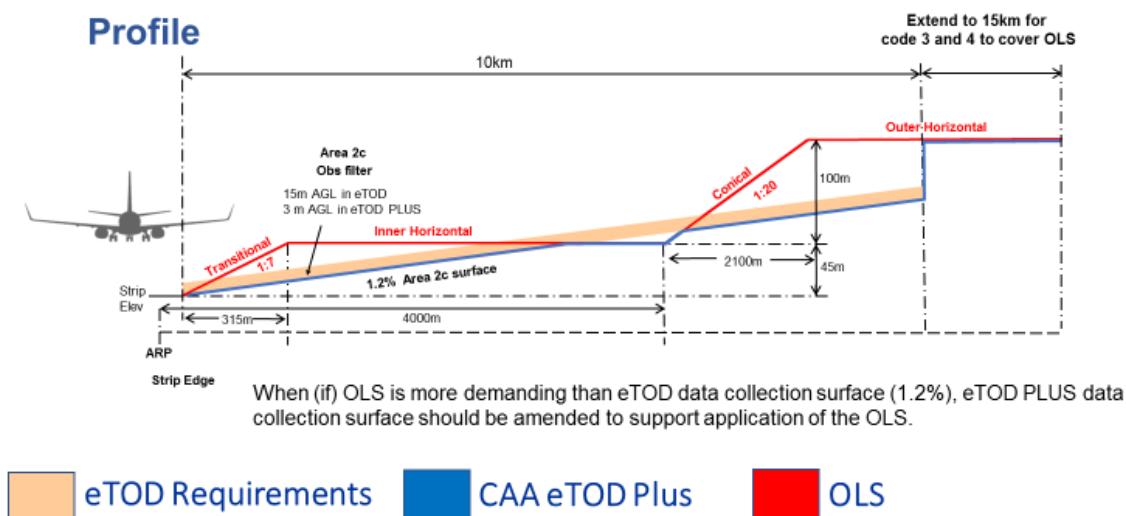
Comparison

The UK increases the size of Area 2c to incorporate obstacle limitation surfaces. All aerodromes with reference code 3 and 4 and all aerodromes with precision approaches have areas where OLS are more demanding than Area 2c.

The aerodrome operator/surveyor will need to identify the areas where the inner horizontal and conical obstacle limitation surfaces are more demanding than Area 2c and collect the relevant obstacles to support the application of OLS. The survey should always cover the most demanding (lower) surfaces.

Any issues with application of the most demanding surfaces may be consulted with the UK CAA's Airspace Regulation team.

TOD Area 2c = 10km at 1.2% slope from 2a (15km for code 3 & 4).



Area 2d

ICAO definition

The 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 level.

UK eTOD PLUS definition

The 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 level.

Comparison

The ICAO and UK definitions of Area 2d are identical.

Area 3

ICAO definition

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.

The data collection surface for terrain and obstacles extends 0.5 m above the horizontal plane passing through the nearest point on the aerodrome movement area.

UK eTOD PLUS definition

The area bordering an aerodrome movement area that **comprises the runway strip plus any clearway that exists (identical to Area 2a)** and extends 50 m from the edge of all other parts of the aerodrome movement area.

The data collection surface for terrain and obstacles extends 0.5 m above the horizontal plane passing through the nearest point on the aerodrome movement area.

Comparison

The UK has a different definition of Area 3 as it relates to runways, but the definitions are the same for other parts of the movement area.

Any terrain or obstacles whose elevation is 0.5 m or greater than the elevation of the nearest point on the movement area should be collected. This results in data being collected for only those “islands” where the surface has been penetrated. No data is collected within the Area 3 dataset for other objects or terrain which exist below this assessment surface.

Area 4

ICAO definition

The area extending 900 m prior to the runway threshold and 60 m to each side of the extended runway centre line in the direction of the approach on a precision approach runway, Category II or III.

UK eTOD PLUS definition

The area extending 900 m prior to the runway threshold and 60 m to each side of the extended runway centre line in the direction of the approach on a precision approach runway, Category II or III.

Comparison

The ICAO and UK definitions of Area 4 are identical.

The ICAO definition does not provide a minimum data collection surface height for obstacles in Area 4. The geographic scope of Area 4 matches that of Precision Approach Terrain Charts (PATC). As identified by ICAO Annex 4 for PATC, all objects of a height of 3 m and more above the centre line profile should be collected and included in obstacle datasets as a minimum.

APPENDIX C

Digital data specification

Rules and examples for the layout and required fields of the Aerodrome Facility, Obstacle, and Runway Declared Distances survey files are described in a separate attachment.

The following general rules apply to all submitted survey data files and the data within them:

- The file shall be submitted in the form of a comma delimited (.csv) file. Other formats (such as .xlsx or AIXM) may be provided in addition to the .csv file.
- The file shall be accompanied by a CRCV.
- A surveyed feature (such as a particular obstacle) shall not be duplicated within a file.
- Numerical values shall be provided to the resolutions described in the attachment.
- Leading zeros for numerical values are not required.
- Characters are restricted to the ISO 8859-17 character set; no commas or backslashes may be used.
- All text other than Remarks shall be in upper case.

APPENDIX D

Aerodrome plan example

An example aerodrome plan, produced by UK AIS, is provided as a separate PDF attachment.