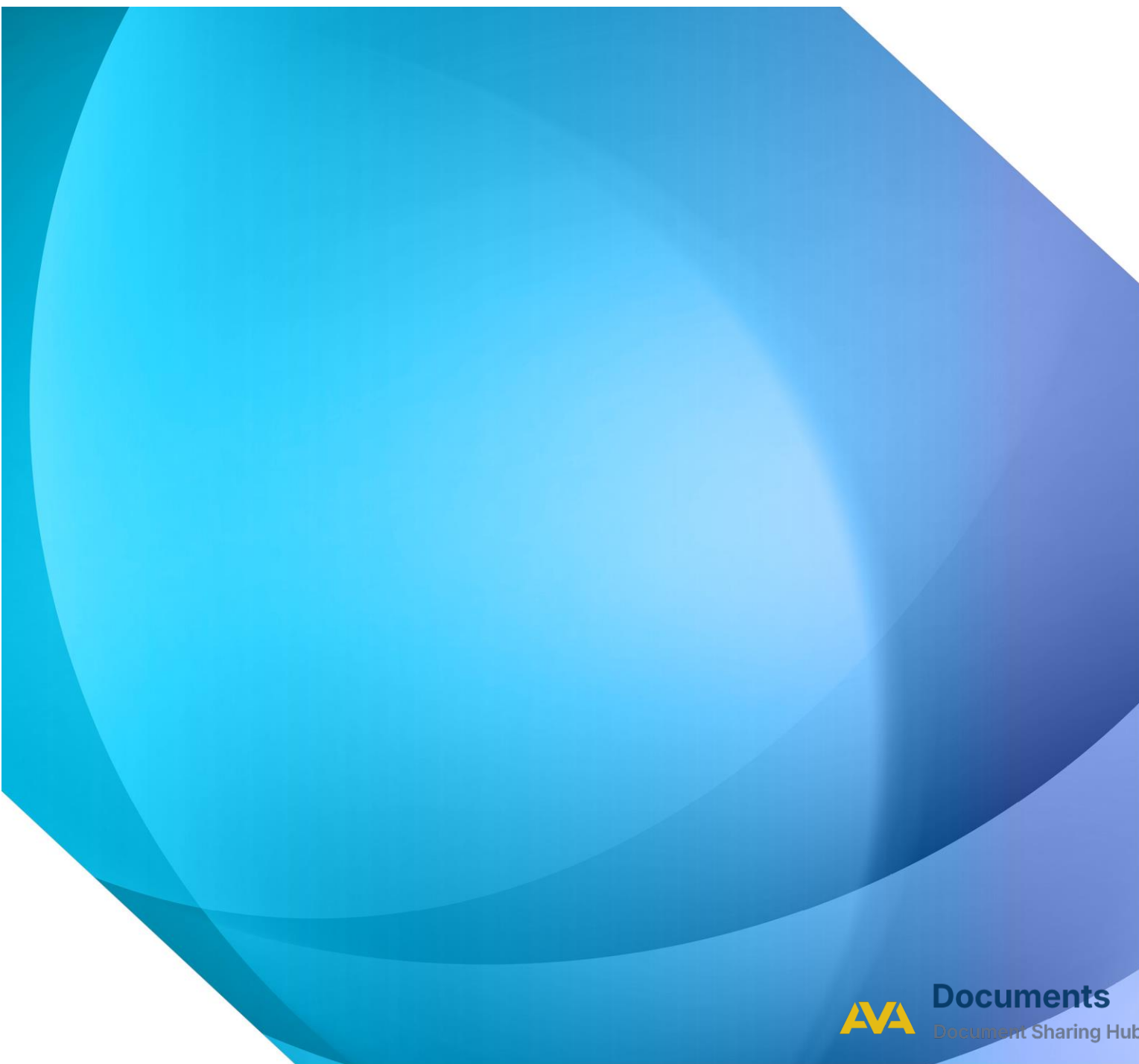


Aerodrome Survey Guidance

CAP 1732



Published by CAA Aeronautical Information Management Regulation

Edition 1

December 2018

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Introduction

This document provides additional guidance for aerodrome operators and other data originators (including contracted activities) to support compliance with the Regulation EU [139/2014](#), EU [73/2010](#) and ICAO Annex 4, Annex 11 and Annex 14. This guidance also complements [AMC and GM to the EU 139/2014](#), ICAO PANS-AIM and [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 all relevant requirements are being met. The main purpose of this document is to achieve a harmonized approach to aerodrome surveys and effectively support the implementation of data quality requirements.

The guidance contained in CAP 1732 applies to aerodromes that are certificated by the CAA under the EASA Common Requirements (EU 139/2014) and to aerodromes that have instrument approach procedures (IFP). This guidance therefore replaces the applicable information provided in [CAP 232](#) for those aerodromes.

All other aerodromes (VFR aerodromes), should continue to comply with the requirements and guidance in CAP232 as applicable.

CAP 1732 is based on CAP 232 principles and has been created to address the current requirements noted above. CAP 1732 maintains the proportionate approach included previously in CAP 232 (e.g. list of dominant obstacles, .crc file format etc.). It also introduces both a new way of presenting aerodrome data in electronic TOD (eTOD) datasets and describes the submission of the data to AIS.

Purpose

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 eTOD necessary to:

- control and monitor the aerodrome obstacle environment;
 - be promulgated in the AIP, on aeronautical charts and other AIS products;
 - be used in air navigation applications such as:
 - a) ground proximity warning systems with forward looking terrain avoidance functions and minimum safe altitude warning systems;
 - 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 flight procedure design (including circling procedure);
 - e) determination of en-route “drift-down” procedures and en-route emergency landing locations;
 - f) advanced surface movement guidance and control systems;
 - g) aeronautical chart production and on-board databases;
 - f) geofencing;
- and other purposes.

For more information, see [EUROCONTROL-Terrain and Obstacle Data Manual](#).

Definitions

Accuracy	A degree of conformance between the estimated or measured value and the true value.
Aeronautical Data Quality Implementing Rule (ADQ IR)	European Regulation (EU) No 73/2010 & 1029/2014 laying down the requirements for the Quality of Aeronautical Data and Aeronautical Information for the Single European Sky.
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 (AI)	Information resulting from the assembly, analysis and formatting of aeronautical data.
Aeronautical Information Management (AIM)	The dynamic, integrated management of aeronautical information services – safely, economically and efficiently – through the provision and exchange of quality-assured digital aeronautical data 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 (AISP/AIS)	The organisation responsible for the provision of an aeronautical information service, certified in accordance with European Commission Regulation No 2096/2005.
Air Navigation Service Provider (ANSP)	Any public or private entity providing air navigation services for general air traffic.
AIP Sponsor	Person nominated by the Authorised Source to provide data to AIS. In some cases Authorised Source will be the only Sponsor.
Authorised Source	Person ultimately accountable for aeronautical information published in the IAIIP. Normally Accountable Manager or a competent person formally appointed by the Accountable Manager to be directly responsible for all aeronautical data activities and aeronautical information provision activities in the organisation. Authorised source can sign a formal arrangement with AIS on provision of aeronautical data/information on behalf of the organization. Authorised source can nominate individuals (“AIP Sponsors”), who are responsible for submitting changes to AIS products within a clearly defined scope of authorised changes (data items).
Cyclic Redundancy Check (CRC)	A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.
Database (db)	One or more files of data so structured that appropriate applications may draw from the files and update them.
Data Chain	Describes all the elements of the Controlled and Harmonised Aeronautical Information Network from origination through to publication.

Data Item	A single attribute of a complete data set, which is allocated a value that defines its current status.
Data Origination (DO)	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	Person or persons authorised to originate aeronautical information and data on behalf of the 'Authorised Source'.
Data Quality (DQ)	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.
Derived Point	A point in space not determined by survey but derived from source data that has been defined in WGS-84.
Electronic Obstacle	A digital data-set representing the vertical and horizontal extent of the obstacle
Electronic Terrain	A digital data-set 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.
Extensible Mark-up Language (XML)	A version of SGML that allows design of a customized mark-up language, used to allow for easy interchange of documents and data on the World Wide Web or between software components.
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 that consists of the following elements: a) Aeronautical Information publications (AIP) inc amendments. b) Supplements to the AIP. c) NOTAM and pre-flight bulletins. d) Aeronautical information circulars. e) Checklists and valid 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 data	All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that penetrate the identified obstacle assessment surfaces or whose height above ground level exceeds a defined minima.
Resolution	A number of units or 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.
Survey Data	Geospatial data that is determined by measurement or survey.
Surveyed Point	A clearly defined physical point, specified by latitude and longitude, that has been determined by a survey in accordance with CAP 1732.
Take-off flight path area	
Terrain Data	Data about the surface of the earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow obstacles;
Unified Modelling Language (UML)	UML is an ISO Standard for modeling objects and a refinement of earlier Oriented Design and Object-Oriented Analysis methodologies.

Chapter 1 – Aerodrome Operator - Obligations

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](#)). 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 have formal arrangements with organisations with which it exchanges aeronautical data and/or aeronautical information ([ADR.OPS.A.010](#)) and which exchange data and/or information on behalf of the aerodrome operator.

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 European requirements on aeronautical data. Appendix 1 includes guidance on the content of Formal Arrangements between the aerodrome operator and an external organisation providing surveyed aeronautical data for the aerodrome.

Ultimate responsibility for aerodrome data provided by a contracted organisation always remains with the aerodrome operator.

All aerodrome operator requirements regarding aeronautical data are to be found in Annex III (Part-ADR.OR) and Annex IV (Part-ADR.OPS) to regulation EU 139/2014, ICAO Annex 14 and 15 and ICAO PANS-AIM. 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 ATM/ANS.OR.085 of Annex III of Commission Implementing Regulation (EU) 2017/373.

To provide data compliant with the aeronautical data quality requirements, Aerodrome Operators should deliver a full ADQ compliant survey including all of the elements detailed in this CAP. Aerodrome operators should review their IFPs within 5 months following the ADQ compliant survey.

As advised, in the Information Notice IN-2017/019 (11 May 2017), the CAA has updated the oversight programme to include verification of the compliance of Aerodrome Operators with the data requirements. Audits are aligned with scheduled 5-year Instrument Flight Procedure Reviews (provided by Aerodrome Operators).

To assist Aerodrome Operators prepare the necessary evidence in order to demonstrate their compliance with EU 139/2014 and EU 73/2010 during audits, the CAA has created a 5-year Transition Plan. The UK AIS Provider will comply with the regulation from 5 October 2018 with the introduction of the new AIM system and subsequent production of the first ADQ AIP (AIRAC 01/2019). In early 2019 the new AIM system will be opened to Authorised Sources to enable ADQIR compliant data to be submitted via a new web-based interface (the Data Originator Portal) directly into the system.

Aerodromes will, from September 2018 be required to complete Oversight Question Banks relating to ADQ IR. Aerodrome operators will be required to deliver an ADQ-compliant survey before the date of their next scheduled 5-year Instrument Flight Procedure (IFP) review at the latest. December 2023 is the date when all data items in the AIP that are within the scope of the ADQ requirements are expected to be ADQ compliant.

Chapter 2 – Minimum content of the aerodrome survey

2.1 NUMERICAL DATA QUALITY REQUIREMENTS

All EASA certificated aerodromes and aerodromes with Instrument Flight Procedures (IFP) are required to provide numerical data and information classified by ICAO as “critical”, “essential” or “routine” (integrity level) in accordance with the requirements on the quality of aeronautical data and aeronautical information specified in the relevant ICAO Annexes, ICAO Data Catalogue and European Regulations (EU) No 73/2010, 2017/373 and 139/2014. Any surveyed data that does not meet the accuracy and integrity requirements will be indicated in the AIP as non-compliant.

2.2 OBSTACLES

There are at least two officially recognised definitions of an obstacle used in aviation (ICAO Annex 15 and Eurocontrol TOD Manual). For the purpose of this guidance the Eurocontrol definition has been used as it reflects the wider AIM context of obstacle data:

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

2.3 eTOD

Specific UK guidance on data collection surfaces (eTOD *PLUS*) was created on the basis of data collection areas and surfaces defined by ICAO Annex 15 and EU 139/2014 as Electronic Terrain and Obstacle Data Areas (eTOD) 1-4. These surfaces are amended in this guidance, to ensure that one aerodrome survey will deliver all the data necessary to generate Obstacle Limitation Surfaces, design Instrument Flight Procedures and produce the required charts. **A full description of the eTOD *PLUS* policy, including the comparison between eTOD (as required by Annex 15 and EU 139/2014) and eTOD *PLUS* can be found in Appendix 2.**

A graphical representation of the amendments to the defined eTOD surfaces can be found in Appendix 4.

To achieve compliance with EU 139/2014 and requirements included in ICAO Annex 4, Annex 11 and Annex 14, eTOD Areas 1-4 should always be used as a reference in the Aerodrome Survey Report.

Further guidance on Terrain and Obstacle Data can be found in *EUROCONTROL - Terrain and Obstacle Data Manual*.

2.4 HORIZONTAL CONTROL

Co-ordinates will be required in WGS-84 format (required format for published data) and appropriate National Grid (for plotting and design on topographical charts).

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

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 the required accuracies have been met and the transformation parameters used should be included in the Survey Report.

Note: The CAA recognises the fact that all the geographical positions in the UK that have been supplied in the past were ETRF89 and the consistency across all surveys should be maintained. Therefore, it is acceptable to use ETRF89 reference frame and Newlyn Datum for vertical reference in the UK. This position statement may be revised when the difference between ETRF89 and ITRF2008 becomes intolerable.

2.5 VERTICAL CONTROL

Orthometric and ellipsoidal elevations are required.

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 a geoid model should be used. If a geoid model is not available extra care must be taken to ensure good geometry of the initial control points. In all cases appropriate survey checks should be applied to prove the quality of vertical control. These checks should be included within the survey report.

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

2.6 REQUIRED DATA ITEMS

The aerodrome survey should cover all data items required by ICAO Annex 14 and 15 and EU 139/2014 as well as all the data items necessary to be included on the charts required by ICAO Annex 4 and relevant for that aerodrome [referenced below].

- Aerodrome/Heliport Chart
- Type A – Aerodrome Obstacle Chart or Aerodrome Terrain and Obstacle Chart (electronic).
Note: this is not the Aerodrome Ground Movement Chart (recommendation).
- Precision Approach Terrain Chart (for all precision approach runways II and III) or Aerodrome Terrain and Obstacle Chart (electronic).
- Enroute chart (for FIR).
- Visual Approach Chart (if established).
- Area Chart (where ATS routes are complex and cannot be adequately shown on the Enroute Chart).
- SID (if established).
- STAR (if established).
- IAP (if established).

The applicable data items and numerical requirements can be found in the ICAO Data Catalogue (PANS-AIM Appendix 1). It is essential that the data set describes the obstacles using the attributes listed in ICAO PANS-AIM APPENDIX 6 and/or the equivalent tables in EU 139/2014: GM4 ADR.OPS.A.005(a) Aerodrome data Table 2 and AMC1 ADR.OPS.A.010 Data quality requirements. Metadata should be provided for every data set.

Note 1: AMC and GM to EU 139/2014, ANNEX IV SUBPART A — AERODROME DATA (ADR.OPS.A) provides comprehensive guidance on measuring and reporting aerodrome data.

Note 2: When intersection take-offs are performed, the datum line from which the reduced runway declared distances for take-off needs to be determined.

Note 3: Each obstacle that has been collected should be allocated a unique identifier which will remain the primary means of identifying the obstacle throughout its life and should not be changed as a result of a resurvey or reissue of a data set. The identifier should be independent of any data set within which it is contained, such that if it were to appear in more than one area or delivered data

set, it should retain the same identifier. If it is possible to identify the obstacle while resurveying, the UID should be maintained even if some data items (like height) have changed. For more information see EUROCONTROL-Terrain and Obstacle Data Manual.

Note 4: Data originators should provide and maintain identification references for all obstacles. In addition to the identification references provided by data originators, AIS will generate UUIDs for all data received in non AIXM format.

UUIDs are mandatory in AIXM files and therefore prior to transitioning to submission of AIXM to AIS, AIS will be able to provide existing UUID's for all AIS stored obstacles. AIS will also publish the mechanism for generating UUIDs consistently.

Once an Authorised Source has transitioned to AIXM and is generating UUIDs for new features, AIS will retain all UUIDs provided by Authorised Source as the UUID of the feature.

2.7 OBSTACLE LIMITATION SURFACES

Every survey in the scope of this guidance should identify penetrations of the obstacle limitation surfaces listed below:

- Transitional Surface
- Take-Off Climb Surface
- Approach Surface
- Inner Horizontal Surface
- Conical Surface
- Outer Horizontal Surface
- Obstacle Free Zone Surface, comprising the inner approach, inner transitional and landing surfaces (precision approach only).

2.8 CONTENT OF THE SURVEY PACKAGE

EASA certificated aerodromes or aerodromes with Precision IFPs CAT II and III should provide to AIS a full survey package that includes:

- I. Survey Report.
- II. Area 2 obstacle dataset [Appendix 5 .crc file named egxx_2etod00.crc]
- III. Area 2 terrain dataset [GeoTIFF or GML]
- IV. Area 3 obstacle dataset [Appendix 5 .crc file named egxx_3etod00.crc]
- V. Area 3 terrain dataset [GeoTIFF or GML]
- VI. Area 4 obstacle dataset (for CAT II and III) [Appendix 5 .crc file named egxx_4etod00.crc]
- VII. Area 4 terrain dataset - for CAT II and III [GeoTIFF or GML]
- VIII. Penetrations of the aerodrome obstacle limitation surfaces [Appendix 5 .crc file named Annex B crc named egxx_ols00.crc]
- IX. All features identified as obstacles including dominant obstacles - MASTER OBSTACLES FILE [Appendix 5 .crc file named egxx_obst00.crc]
- X. Aerodrome Plan in digital format (in Adobe PDF) and Aerodrome Facilities file with all facilities surveyed for the purposes of the Aerodrome Plan [PDF + Appendix 5 .crc file named egxx_ad00.crc]
- XI. Runway and declared distance file [Appendix 5 .crc file named egxx_Rdd00.crc]
- XII. A list of the dominant obstacles [Appendix 5 .crc file or.xls spreadsheet]
- XIII. A list of AIP AD 2.10 obstacles [.xls spreadsheet]

- XIV. Type A dataset - Objects in the take-off flight path area which project above a plane surface having a 1.2 per cent slope and having a common origin with the take-off flight path area (take-off flight path obstacle dataset) [Appendix 5 .crc file named `egxx_tofp00.crc`]

For all file names "egxx" is the ICAO indicator code for the surveyed aerodrome and "00" is the year of the survey.

EASA certificated aerodromes or aerodromes with Precision IFPs CAT II and III should deliver an Area 2 and 3 obstacle data set to AIS to be published in their AIP section AD 2.10.

All other aerodromes published in the UK AIP (civil) should provide to AIS a full survey package that includes as a minimum:

- I. Survey Report
- II. Area 2a obstacle dataset [Appendix 5 .crc file named `egxx_2etod00.crc`]
- III. Area 2a terrain dataset [GeoTIFF or GML]
- IV. Take-off flight path area terrain dataset
- V. Penetrations of the aerodrome obstacle limitation surfaces [Appendix 5 .crc file named `egxx_ols00.crc`]
- VI. All features identified as obstacles including dominant obstacles - MASTER OBSTACLES FILE [Appendix 5 .crc file named `egxx_obst00.crc`]
- VII. Aerodrome Plan in digital format (in Adobe PDF) and Aerodrome Facilities file with all facilities surveyed for the purposes of the Aerodrome Plan [PDF + Appendix 5 .crc file named `egxx_ad00.crc`]
- VIII. Runway and declared distance file [Appendix 5 .crc file named `egxx_Rdd00.crc`]
- IX. A list of the dominant obstacles [Appendix 5 .crc file or.xls spreadsheet]
- X. A list of AIP AD 2.10 obstacles [.xls format]

Note 1: Non-EASA certificated aerodromes in the scope of this guidance can indicate in AD 2.10 that information on obstacles in Area 3 is not available and the obstacle data are to be provided for:

- a) Area 2a
- a) obstacles that penetrate the obstacle limitation surfaces;
- b) obstacles that penetrate the take-off flight path area obstacle identification surface; and
- c) other obstacles assessed as being hazardous to air navigation.

Note 2: The lack of Area 3 datasets will not be considered as a non-compliance at an EASA certificated CAT I aerodrome only if:

- There is an assessment [as described in Chapter 7] presenting evidence as to whether the lack of Area 3 obstacle/terrain dataset does compromise safety of operations and it has been accepted by regular aerodrome users.
- There is a plan for providing this data in the future (with a timescale).

The above documents need to be accepted by the CAA Aerodromes Team.

- XI. Type A dataset - Objects in the take-off flight path area which project above a plane surface having a 1.2 per cent slope and having a common origin with the take-off flight path area (take-off flight path obstacle dataset) [Appendix 5 .crc file named `egxx_tofp00.crc`]

All files need to be provided with required metadata (as detailed in CAP 1054, EU 73/2010 and ICAO Annex 15).