CAP 1732 (formerly CAP1668) CONSOLIDATED RESPONSE DOCUMENT

This document includes comments to the draft CAP 1668 Aerodrome Survey Guidance received from external experts and the CAA's responses to them. The document also includes comments received following publication of CAP1732 (CAP1668 was used as a working title during the drafting phase and this title was replaced by the publication of CAP1732 on 3rd December 2018) The list of external stakeholders involved in the consultation process is available in Annex 1. In responding to comments, a standard terminology has been applied to attest the CAA's position. This terminology is as follows:

(a) Accepted — the CAA agrees with the comment and any proposed amendment is wholly transferred to the revised text.

(b) Partially accepted — the CAA either agrees partially with the comment or agrees with it but the proposed amendment is only partially transferred to the revised text.

(c) Noted — CAA acknowledges the comment but no change to the existing text is considered necessary.

(d) Not accepted — The comment or proposed amendment is not shared by the CAA.

The relevant version* of the document can be found here: draft CAP 1668

*Please note that the above version does not reflect any changes to the document included as a result of the consultations. A link to the final version of the document (published as CAP1732 on the 3rd December'18) is available on the last page of this Consolidated Response Document.

COMMENTS RECEIVED TO THE DRAFT AERODROME SURVEY GUIDANCE AT THE CONSULTATION STAGE (2018)					
No	Chapter	Relevant paragraph	Comment	Comment by	Response
1.	Chapter 2 – Minimum content of the aerodrome survey	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).	ICAO specifies ITRF2000 as an appropriate reference for WGS-84, but in EURCONTROL Specification for the Origination of Aeronautical Data Volume 2: Guidance Material it is stated that it is acceptable to use the ETRF89 reference frame for surveys within Europe. As all data provided by OS is referenced to ETRF89 this would ensure that aerodrome survey data can be accurately plotted on OS mapping. On the assumption	SLC	**Partially accepted.** Eurocontrol recognises ETRF as a precise geodetic reference frame. Since access to WGS-84 is difficult to realise with centimetre precision (limited number of reference stations), and because the WGS-84 coordinate system is aligned with ITRS, surveying in ITRF can be regarded as identical. Where access to a local frame whose relationship to ITRF is well defined, or can be easily derived, is easier than surveying directly to ITRF, the survey

			that most aerodromes will procure Area 2 terrain data from OS this will also ensure that all data is in the same reference system. The difference between IRF2000 and ETRF89 is much less than 1m. It would be useful if it could be stated here that ETRF89 should be considered as that would lead to consistency across all surveys and surveyors.		may be referenced to this frame and the WGS-84 values derived from simple transformation to the ITRF2000 epoch. Eurocontrol recommends all co-ordinates published in any aviation data set to be referenced to ITRF2000. When the geodetic body responsible for publishing the regional reference frame provides accurate transformation to ITRF at any epoch, the co-ordinates determined by the indirect connection method (as mentioned above) should be transformed to ITRF2000. At the same time, combining different versions of a reference frame within the same data set should be avoided. The CAA recognises the fact that all the geographical positions that have been supplied in the past were ETRF89 and the consistency across all surveys should be maintained. Therefore, in the short/medium term it is acceptable to use ETRF89 reference frame and Newlyn Datum for vertical reference. This position statement may be revised when the difference between ETRF89 and ITRF2008 becomes intolerable. The CAA will seek ICAO and Eurocontrol recommendation on what is the maximum tolerable difference. Draft CAP 1668 amended.
2.	Chapter 2 – Content of the	EASA certificated aerodromes or aerodromes with Precision IFPs	It was stated at the Data Originators workshop that terrain	SLC	**Accepted.**

	survey package	CAT II and III should provide to AIS a full survey package that includes: (…) III. Area 2 terrain dataset (…) V. Area 3 terrain dataset (…) VII. Area 4 terrain dataset (for CAT II and III)	data is to be provided as a GeoTIFF. Assuming that is AIS's preferred format it should be stated here, or if AIS prefers any other format that should be stated instead.		It is recommended to provide terrain data in GeoTIFF. Draft CAP 1668 amended.
3.	Chapter 2 – 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: (…) III. Area 2 terrain dataset (…) V. Area 3 terrain dataset (…) VII. Area 4 terrain dataset (for CAT II and III)	There should also be a file for terrain data metadata. The format of this file should be defined as with the obstacle files.	SLC	**Noted.** The CAA does not plan to define terrain dataset specification at this stage. The CAA recognises the fact that some terrain data will be provided by the aerodrome surveyor and some will be obtained from commercial entities that are providing data for the broader industry sector. Therefore, it may be unrealistic to recommend a specific file specification for aerodromes. Terrain data should meet all relevant requirements (including metadata) and it is recommended to provide it in GeoTIFF format.
4.	Chapter 2 – 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: (…) XV. Draft Type A chart (in Adobe PDF) – or declaration that there is no change to the Type A chart published in the AIP.	NATS currently draft all Type A charts for publication in the AIP. I assume this policy won't change, so there should be no need for the aerodrome to submit a draft chart. All the necessary information for NATS to produce the charts will be in the datasets.	SLC	**Accepted.** It has been identified at early stage of the ADQ IR Project as a potential for improvements as surveyors are capable to deliver Draft Type A and that could be with benefit to AIS. The CAA revised this approach and considering comments received at this stage, draft Type A chart is no longer included in the Survey Package described in draft CAP 1668. Draft CAP 1668 amended.

5.	Chapter 2 – Content of the survey package	Note: Non-EASA certificated aerodromes in the scope of this guidance and aerodromes using non-precision or precision CAT I IFPs 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:	Am I reading correctly that only EASA certificated aerodromes with CAT II/III approaches are required to carry out an Area 3 survey? I agree that is sensible, but if not please clarify.	SLC	**Noted.** The CAA recognises that this statement may have been misleading as all EASA certificated aerodromes should deliver Area 3 obstacle dataset to AIS. Considering comments received at this stage the CAA decided to add more guidance for aerodrome operators. 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 will need to be approved by the CAA Aerodromes Team. Draft CAP 1668 amended.
6.	Chapter 3 – List of dominant obstacles	The optimum requirement is to record the height of the three highest obstacles in each tile, thus allowing the IFP designer to calculate the most advantageous Minimum Descent Altitude/Height (MDA/H).	Further to our initial comments about this, we do think that some form of minima should be applied. If not the 1.2% slope, then at least a minimum height above ground level. Up to the current time, with no terrain data included in the survey package, it could be considered	SLC	**Not accepted.** The CAA recognises that this task may sometimes result in surveying “relatively short obstacles” but applying minimum slope/height have a direct impact on the OCA/H. Procedure designers would need to treat this minimum slope/height as a virtual obstacle in Areas 2b and 2c.

			appropriate to survey relatively short obstacles on high ground if it helped the IFP designers to establish the MDA/H. However, now that terrain data will be available at all aerodromes, I do not see that relatively short obstacles are necessary. CS-ADR-DSN, GM1 ADR-DSN.H.410 already defines a height of 30m to be significant in the outer horizontal. Could that value be used here to define the minimum height of a dominant obstacle?		Applying minimum slope/height has a direct impact on the OCA/H, therefore: 1. If it is an aerodrome operator's decision to apply a minimum obstacle collection height different to those defined for eTOD PLUS, it should be annotated in the survey report part "any differences to CAP 1732". This height will need to be included in IFP designs. An AltMoC submission would not be required if applied values are the same as required by EASA/ICAO for eTOD. 2. If it is an aerodrome operator's decision to apply an additional obstacle filtering process, it should be annotated in the survey report part "any differences to CAP 1732" and it would require an assessment as per Chapter 7 CAP 1732. An AltMoC submission would be required if applied values are not compliant with those required by EASA/ICAO for eTOD.
7.	Appendix 2 – eTOD and eTOD PLUS comparison table – Area 2b	All objects which extend to a height of 0.5 m or more above ground in the Area 2b which project above a plane surface having a 1.2 % slope will be collected.	This height of 0.5m is much less than the EASA/ICAO requirement of 3m for obstacles in Area 2b. The diagram in Appendix 4 shows a filter of 3m. Is this value in the table an error?	SLC	**Noted.** All objects which extend to a height of 0.5 m or more above ground in the Area 2b which project above a plane surface having a 1.2 % slope should be collected. Information included on one of the diagrams in Appendix 4 has been updated to describe both eTOD and eTOD PLUS minimum obstacle height. Draft CAP 1668 amended.
8.	Appendix 2 – eTOD and eTOD PLUS	The obstacle collection surface should be horizontal beyond the point at which the 1.2% slope	We are pleased to see the simplification of the horizontal part. However, the slope between	SLC	**Accepted.**

	comparison table – Area 2b	intersects the horizontal plane of the approach surface (area where OLS is more demanding than eTOD Plus obstacle collection surface).	10km at 120m above AD and 12.5km at 150m above AD is still in addition to any EASA or ICAO requirement or recommendation. We would prefer to see a step from 120m to 150m above AD at the edge of Area 2b at 10km, so that we only need to consider a horizontal surface beyond that.		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). Please note that eTOD PLUS Area 2b includes a step from 120 m to 150 m above THR elevation 10 km from the edge of Area 2a. In addition to that, all objects of a height of 100 m AGL or more should be collected. Draft CAP 1668 amended.
9.	Appendix 2 – eTOD and eTOD PLUS comparison table – Area 2c	The initial elevation of Area 2c shall be the elevation of the point of Area 2a at which it commences. Obstacles less than 3 m in height above ground need not be collected.	Is this an error, which should state 15m as shown on the diagram in Appendix 4?	SLC	**Noted.** Obstacles less than 3 m in height above ground need not be collected. Information included on one of the diagrams in Appendix 4 has been updated to describe both eTOD and eTOD PLUS minimum obstacle height. Draft CAP 1668 amended.
10.	Appendix 3 – When OLS is more demanding than eTOD Area 2c.	Table.	I find this table somewhat confusing. I am not sure it provides any benefit over the diagrams below.	SLC	**Accepted.** Considering comments received at this stage, the CAA decided to remove this table from the aerodrome survey guidance. Any issues or questions that the aerodrome operator or surveyor may have regarding identification of the most demanding surfaces should be sent to ifp.policy@caa.co.uk. Draft CAP 1668 amended.
11.	Appendix 4 – eTOD & eTOD PLUS graphical representation	TOD AREA 2b diagram	As stated in the comment in Appendix 2, we would prefer to see only a horizontal surface beyond 10km because a 1.2%	SLC	**Accepted.** 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

			slope beyond that is in excess of ICAO and EASA requirements.		Surface (OLS). Please note that eTOD PLUS Area 2b includes a step from 120 m to 150 m above THR elevation 10 km from the edge of Area 2a. In addition to that, all objects of a height of 100 m AGL or more should be collected. Draft CAP 1668 amended.
12.	Appendix 4 – eTOD & eTOD PLUS graphical representation	TOD AREA 2c diagram	The text in Appendix 2 does not refer to extending the Area 2c surface beyond 10km. The slope in this diagram beyond 10km is confusing. We would prefer to see only a horizontal surface beyond 10km.	SLC	**Accepted.** For aerodrome reference codes 3 and 4, the extent of the Area 2c should be increased to 15.0 km (8 NM) to support the application of OLS. The eTOD PLUS Area 2c obstacle collection surface should be horizontal beyond a distance of 10 km to cover the Outer Horizontal Surface. The survey should always cover the most demanding (lower) surfaces. In addition to that, all objects of a height of 100 m AGL or more should be collected. Draft CAP 1668 amended.
13.	Appendix 5 – Digital Data Specification	Common File Header	The general complication for the file header is that the files will evolve over a number of years and data will be contributed by a number of people. We think that some of this metadata should be included within the main data file.	SLC	**Partially accepted.** The location of selected metadata items has been changed and each file in the Survey Package shall contain metadata on the first rows of the file as detailed in the Common File Header table found in Appendix 5 (Each row shall contain an attribute name as listed in the table followed by a colon and a populated value). Draft CAP 1668 amended.

14.	Appendix 5 – Digital Data Specification – Common File Header	DataOriginator - Name of the person responsible for data origination	Different people may be responsible during different update surveys.	SLC	**Accepted.** This should be the name of the person responsible for the submitted version of the file. Draft CAP 1668 amended.
15.	Appendix 5 – Digital Data Specification – Common File Header	SurveyFieldWorkDate - The date on which the data was surveyed/observed in the field	The data will be surveyed on a number of different days. This information is already in Field 28 of the data files.	SLC	**Accepted.** Metadata item included in Aerodrome facilities file, Master Obstacles File and Runway and Declared Distances File. Draft CAP 1668 amended.
16.	Appendix 5 – Digital Data Specification – Common File Header	SurveyProcessDate - The date on which the data was processed	The data will be processed across a period of days.	SLC	**Accepted.** This should be the date when the submitted version of the file was created. Draft CAP 1668 amended.
17.	Appendix 5 – Digital Data Specification – Common File Header	StatisticalAccuracy - Expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.	Accuracies are contained in fields of the data. That is a more appropriate place as the horizontal and vertical accuracies are different depending on survey method used. We have a table in our survey reports detailing five different survey methods with associated accuracies.	SLC	**Accepted.** Metadata item included in Aerodrome facilities file, Master Obstacles File and Runway and Declared Distances File. Draft CAP 1668 amended.
18.	Appendix 5 – Digital Data Specification – Common File Header	Resolution - The number of digits to which a value is expressed [m].	Different resolutions are required in different fields.	SLC	**Accepted.** Removed from the Common File Header. Draft CAP 1668 amended.
19.	Appendix 5 – Digital Data Specification –	HORIZONTAL GRID REFERENCE SYSTEM - For allowable values refer to Table 2 below.	This value should be the same for all data items. Coordinate System	SLC	**Accepted.**

	Aerodrome facilities file		is included in the header so we do not see that it is necessary here.		HGRS, EASTING and NORTHING removed from Aerodrome Facilities File and Master Obstacles File. Draft CAP 1668 amended.
20.	Appendix 5 – Digital Data Specification – Aerodrome facilities file	Field 22 - AERODROME CONTROL NETWORK HORIZONTAL ACCURACY (M)	We do not understand how this is useful information at this level. The accuracy of the control network is taken into account for the overall accuracy of survey points. Not all points in the aerodrome control network will have the same accuracy e.g. primary and secondary points.	SLC	**Accepted.** Considering comments received at this stage, the CAA decided to remove ACN Horizontal and Vertical Accuracy from Aerodrome Facilities file. Geodetic Connection Report should include the relevant metadata items. Removing the ACN accuracy values means the definition of other accuracy fields needs to be amended to reflect the total observed accuracy as the definitions are currently accuracy relative to the ACN. Draft CAP 1668 amended.
21.	Appendix 5 – Digital Data Specification – Aerodrome facilities file	AERODROME CONTROL NETWORK HORIZONTAL ACCURACY (M) - Horizontal Accuracy in Meters relative to the datum to 4 decimal places.	This is an unrealistic resolution to provide.	SLC	**Noted.** Considering comments received at this stage, the CAA decided to remove ACN Horizontal and Vertical Accuracy from Aerodrome Facilities file. Geodetic Connection Report should include the relevant metadata items. Removing the ACN accuracy values means the definition of other accuracy fields needs to be amended to reflect the total observed accuracy as the definitions are currently accuracy relative to the ACN. Draft CAP 1668 amended.

22.	Appendix 5 – Digital Data Specification – Aerodrome facilities file	HORIZONTAL EXTENT - Horizontal Extent (radius) of the surveyed entity in meters to 2 decimal places.	We do not think a radial extent is applicable to all data items and without further guidance of what should have one it would be preferable to treat all data as points. In the examples below, a stand isn't a circle centred in the head of stand point, a hold is not a circle and the value of 10m applied to the DME is unrealistic.	SLC	**Not accepted.** Horizontal extent is a mandatory attribute of an obstacle. Currently IFP designers are applying an unrealistic horizontal extent for every obstacle. This has a negative effect on all other datasets based on the survey data and may even generate a risk to air navigation in the case of large or irregular obstacles. Horizontal extent should be applied to objects that have height AGL. The CAA recognises that the proposed resolution is not achievable. Therefore, the resolution was updated – horizontal extent should be provided to the nearest metre. 1 m is the minimum horizontal extent that can be recorded in survey files. Draft CAP 1668 amended.
23.	Appendix 5 – Digital Data Specification – Aerodrome facilities file – Field 25 and 26	HORIZONTAL ACCURACY (M) 0.0000 VERTICAL ACCURACY (M) 00.0000	Both fields 25 and 26 are unrealistic resolutions to provide.	SLC	**Accepted.** Considering comments received at this stage, the CAA revised the recommended resolution of horizontal and vertical accuracy (2 dp in the final proposal). Draft CAP 1668 amended.
24.	Appendix 5 – Digital Data Specification – Table 1	CENTRE_PT_TWY	The inclusion of taxiway centreline points in the data specification will allow some of the points detailed in GM2 ADR.OPS.A.005 (b) and (c) to be provided. However, to survey all taxiway centrelines may incur a significant one-off cost at some airports, with additional costs involved in maintaining the data. As the coordinates of these	SLC	**Partially accepted.** The geographical coordinates of appropriate taxiway centre line points should be delivered to AIS. In data-centric environment AIS products will be created using automated or semi-automated processes. The geographical coordinates of appropriate taxiway centre line points can be included in the

			points are not published, I'm sure the aerodrome operators would like to know that AIS would use this data in a way that justified the costs, i.e. would this data be used to create the AIP Aerodrome Charts or any other charts? If the data will not be used now I believe it would be appropriate to delay the detailed survey of taxiway markings until such time that AIS implements the use of AMDB. Therefore, some clear information about the expected use of this data would allow AOs and surveyors to agree suitable formal arrangements regarding the survey of these points.		Aerodrome Manual (AMC3 ADR.OR.E.005 Aerodrome manual Part D) and made available to users on request. There is a number of aircraft manufacturers, airlines and data services providers that are currently able to include taxiway centreline points in their databases. Aerodrome operators can provide an assessment [as described in CAP 1732 Chapter 7] confirming that the lack of taxiway centreline data will not compromise the safety of aerodrome operations if the regular aerodrome users are not ready to use taxiway centreline data onboard. Such an assessment should also include plan to introduce this data in the future. All of the above should be documented and agreed with aerodrome users. Please note that the lack of taxiway centreline may still be raised as a non-compliance and the aerodrome operator will be required to deliver a corrective action plan to the CAA (supported by the assessment above).
25.	Appendix 5 – Digital Data Specification – Table 1	HOLD_STOP_BAR	Currently stop bar lights are not surveyed in addition to painted hold markings, so similarly to taxiway centreline points we would appreciate clarification on the purpose of surveying these points.	SLC	**Noted.** Holding Point Stop Bar Lights should be included on the ICAO Aerodrome/Heliport Chart, Aerodrome Ground Movement Chart and Parking/Docking Chart. Surveying them should be considered as optional however it needs to be indicated which runway holding position or intermediate holding position is equipped with lights (and what type or lights).

26.	Appendix 5 – Digital Data Specification – Table 2	Field 4 - ASSOCIATION	Why is this table included when it is stated below that Field 4 is to be left blank?	SLC	**Noted.** eTOD coverage areas and obstacle collection surfaces have been developed to capture obstacles and terrain data. If there is no association (no penetration of the obstacle collection surface, please leave the field blank). Draft CAP 1668 amended.
27.	Appendix 5 – Digital Data Specification – Table 2 - Field 4 - ASSOCIATION	MANAGED - A 'virtual' area containing the Vertical Structures included in the data collection exercise, which do not qualify yet as Obstacles in any specific Area.	We do not understand what this means, but we assume this does not matter if Field 4 is to be left blank.	SLC	**Noted.** eTOD coverage areas and obstacle collection surfaces have been developed to capture obstacles and terrain data. If there is no association (no penetration of the obstacle collection surface, please leave the field blank). Draft CAP 1668 amended.
28.	Appendix 5 – Digital Data Specification – Table 2 - Field 14 - Horizontal Grid Reference System	OSGB36	This is a datum not a grid reference system. The grid system is National Grid which is defined by the UKTM projection and the OSGB36 datum.	SLC	**Partially accepted.** Horizontal Grid Reference System was removed from the Aerodrome Facilities file. The Common File Header includes Earth Reference Model, Co-ordinate System, Local Horizontal and Vertical Datum and Transformation Model. In accordance with **OS Guide to Systems in GB:** The OS Net (modern 3-D TRF) uses the European Terrestrial Reference System 1989 (ETRS89) as its datum and is a densification of the ETRF89 TRF. All mapping in Great Britain is in the OSGB36 National Grid coordinate reference system - The latitudes and longitudes of all features shown on OS maps are determined with respect to a TRF

					called OSGB36 (Ordnance Survey Great Britain 1936). This is what land surveyors would call a 'traditional triangulation datum' but OSGB36 consists of a datum and a TRF. Sometimes a simple equation can be used to transform coordinates from one system to another system, but more often than not the difference varies from place to place, so the transformation has to be more complex. This is the case in Britain and OS have a transformation model between ETRS89 and OSGB36 called OSTN15 and a separate model for ETRS89 height to ODN called OSGM15. Using transformation techniques, precise positions can be determined by GPS in ETRS89 using OS Net and then converted to National Grid and ODN coordinates. When features on the curved surface of the Earth are represented on a plane surface, distortions of distances, angles or both are inevitable. Originally the 'plane surface' was a map sheet; now it is often the plane coordinate system of GIS software. A map projection is any function that converts ellipsoidal latitude and longitude coordinates to plane easting and northing coordinates. OS maps use a type of projection known as the Transverse Mercator (TM). The same type of projection is used in a worldwide mapping standard known as Universal Transverse Mercator (UTM). The TM projection can be thought of as a sheet of paper carrying the mapping grid (of eastings and northings), which is curved so as to touch the ellipsoid along a certain line. Draft CAP 1668 amended.

29.	Appendix 5 – Digital Data Specification – Master obstacles file	Master obstacles file	Comments made about the Aerodrome Facilities file also apply here.	SLC	**Noted.** See replies provided to comments about Aerodrome Facilities file. Draft CAP 1668 amended.
30.	Appendix 5 – Digital Data Specification – Master obstacles file	Horizontal Extent (radius) of the surveyed entity in meters to 2 decimal places	As with the aerodrome facilities, a radial extent is not appropriate for all obstacles, for example buildings where the most critical corner has been surveyed. A survey that accurately measured the extent of all obstacles would be significantly more expensive than the current practice of surveying single points. It would be possible to estimate the extents but that could not be done to a resolution of 2dp, and would often be outside the required accuracy.	SLC	**Not accepted.** Horizontal extent is a mandatory attribute of an obstacle. Currently IFP designers are applying unreal horizontal extent of every obstacle. That has got a negative effect on all other datasets based on survey data and may even generate a risk to air navigation in the case of large or irregular obstacles. Horizontal extent should be applied to objects that have height AGL. The CAA recognises that the proposed resolution is not achievable. Therefore, the resolution was updated – horizontal extend should be provided to the nearest metre. 1 m is the minimum horizontal extent that can be recorded in survey files. Draft CAP 1668 amended.
31.	Appendix 5 – Digital Data Specification – Runway and Declared Distance file	Runway and Declared Distance file – Distance - The value of the declared distance in meters.	Should these distances be measured in WGS-84 (on the spheroid) or on the Projection (National Grid UKTM). They can sometimes differ by up to about a metre.	SLC	**Noted.** RWY declared distances are classed by ICAO as “surveyed” data. Therefore, RWY declared distances should be measured along the centre line of the runway and of any associated stopway and clearway (e.g. using tacheometer or rangefinder). In practice RWY declared distances are often calculated - e.g. GPS RTK (real time kinematic) method is a calculation done by the GPS receiver.

					It is noted that some surveyors are also calculating (or recalculating) declared distances in a straight line on the Projection. Although the accuracy of this calculation may exceed the accuracy required for these data items, it is also acceptable (as the shortest distance). The methods(s) employed to survey or calculate declared distances shall be recorded in the survey report.
32.	Appendix 5 – Digital Data Specification – Runway and Declared Distance file	Runway and Declared Distance file – Distance - The value of the declared distance in meters.	The published declared distances of a runway are often metres different to the surveyed distances because they were not accurately surveyed before they were published. There has subsequently been a reluctance to change the published distances even when accurate information is available. I assume this distances included in this table should be the actual surveyed distances where not the same as the published distance.	SLC	**Noted.** Distances included in this table should be the actual surveyed distances. See also response to the Comment 31. The information on declared distances should be provided to AIS according to the table included in GM1 ADR.OPS.A.005 Aerodrome data. GM2 ADR.OPS.A.005(a) Aerodrome data specifies surveying requirements for runway thresholds. Distance and length data included by surveyor in this file should be delivered to AIS and published in AD 2.13.
33.	ALL		Would anyone will be offering training or guidance for aerodrome staff involved in this process?	Durham Tees Valley Airport	**Noted.** The CAA has provided two workshops and a series of ADQ sessions regarding ADQ implementation in the UK and NATS AIM has provided a few Data Originators Portal sessions for aerodrome operators in the past 5 months.

					The CAA is not currently planning to provide any Aerodrome data-activities Training for aerodrome staff. However, the CAA believes that there are commercial training organisations that can provide a training in Obstacle Assessment, ADQ Implementation or Aeronautical Information Management. Additionally, the CAA is aware that Eurocontrol provide an 'Implementing Aeronautical Data Quality (ADQ) Course' in Luxembourg. The scope of the training covers many aspects of the new aerodrome survey guidance. As described by Eurocontrol: *The course will interest all actors involved in the aeronautical data chain, from data originators to regulators involved in overseeing the rule implementation. It covers the rule, the means of compliance, metadata, data sets, data exchange and distribution, data quality as well as formal arrangements, automation, and many other topics like conformity assessment and institutional aspects. It concludes with the latest developments and the ADQ implementation plan.*
34.	Appendix 5, Aerodrome Facilities & Master Obstacle files		Fields 22, 23, 25 & 26 are required to be quoted to 4 decimal places i.e 1/10th of a mm! This is high spec surveying to achieve sub millimetre. The accuracy required is only 0.25m (CAP1054) so why publish to 0.0001m? One second of arc of Latitude = 30.87m. The Lat / Long value is required to 4 decimal places then this = 0.0003087 or 3mm.	Pell Frischmann	**Accepted.** Considering comments received at this stage, the CAA decided to remove ACN Horizontal and Vertical Accuracy from the Aerodrome Facilities file. Geodetic Connection Report should include the relevant metadata items. The CAA also revised the recommended resolution of horizontal and vertical accuracy (2 dp in the final proposal). Removing the ACN accuracy values means the definition of other accuracy fields needs to be

					amended to reflect the total observed accuracy as the definitions are currently accuracy relative to the ACN. Draft CAP 1668 amended.
35.	Appendix 5, Aerodrome Facilities & Master Obstacle files		The second is that the Horizontal Extent (Field 24) is required to 2 decimal places which = 1cm! Is the tree diameter (spread) really required to that precise value?	Pell Frischmann	**Accepted.** The CAA recognises that the proposed resolution is not achievable. Therefore, the resolution was updated – horizontal extend should be provided to the nearest metre. 1 m is the minimum horizontal extent that can be recorded in survey files. Draft CAP 1668 amended.
36.	Appendix 5, Aerodrome Facilities & Master Obstacle files		What is the accuracy required for these new fields (22, 23, 24, 25 & 26)?	Pell Frischmann	**Noted.** Field 22, 23, 24, 25 & 26 are: - ACN Horizontal Accuracy - ACN Vertical Accuracy - Horizontal Extent - Horizontal Accuracy - Vertical Accuracy Considering comments received at this stage, the CAA decided to remove ACN Horizontal and Vertical Accuracy from the Aerodrome Facilities file. Geodetic Connection Report should include the relevant metadata items. The CAA also revised the recommended resolution of horizontal and vertical accuracy (2 dp in the final proposal). Removing the ACN accuracy values means the definition of other accuracy fields needs to be amended to reflect the total observed accuracy as

					the definitions are currently accuracy relative to the ACN. Draft CAP 1668 amended.
37.	ALL		I think the document is OK even though it is a bit more difficult to understand than the old CAP232.	Belfast International Airport	**Noted.** Thank you for your feedback. The CAA's intention is always to deliver user-friendly documents. The regulatory environment has changed and the application of eTOD PLUS may seem to be slightly more complex than CAP 232 survey.
38.	ALL		I was wondering has a decision been made yet on the output format as I believe that is one important issue that could affect all airports and their surveyors, the sooner we know this the better.	Belfast International Airport	Noted. Chapter 2 – EXCHANGE FORMAT and Appendix 5 Digital Data Specification describes the way that data should be reported to AIS. As a transitional arrangement until all stakeholders are able to adopt the Eurocontrol AIXM harmonised coding specification, NATS AIM will accept a single zip file containing all files required to be included in the survey package. This zip file should be submitted to AIM via the Data Originators Portal, attached to the AIP Change Request. Within the zip file all Appendix 5 Files shall presented as individual files in the form of a comma delimited ASCII text file containing all fields.
39.	Chapter 1	Ultimate responsibility for aerodrome data provided by a contracted organisation always remains with the aerodrome operator.	Of course an aerodrome is responsible but given the expertise required that most airports do not possess, an aerodrome relies on the technical	Humberside Airport	**Noted.** Aerodrome Operators need to assure themselves and the CAA that any contracted activity is compliant and delivers data in accordance with the signed Formal Arrangement.

			expertise of the employed consultant.		Formal Arrangements should include all requirements that should be met by the survey company and the methods for demonstrating that the data provided is compliant. The contracting aerodrome operator is responsible for ensuring that all contracted activities are subject to hazard identification, safety (risk) assessment and mitigation, as well as compliance monitoring. For all contracted activities the aerodrome operator should define relevant management responsibilities within its own organisation.
40.	Chapter 1	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 .	Is this based on date of survey, date of acceptance by the aerodrome, or date of approval by the CAA or AIS?	Humberside Airport	**Noted.** It should be based on the date when the aerodrome receives the full aerodrome survey package from the survey company, or the date of acceptance by the aerodrome (if later).
41.	Chapter 1	UK AIS Provider will comply with the regulation by 5 October 2018 with the introduction of the new AIS system and subsequent production of an ADQ AIP by 3 January 2019 (AIRAC 01/2019).	I have not seen the final approved process yet.	Humberside Airport	**Noted.** The Transition Plan was approved by the CAA. Aurora (the new AIM system) is already working as the primary AIM System. From the 5th October 2018 (cut-off date for AIRAC 01/2019) all AIP Change Requests will be processed by NATS AIS in Aurora. The first fully ADQ complaint AIP will become visible to external users with AIRAC 01/2019 and effective 03/01/2019. The Data Originators Portal is expected to be open on the

					same day. All Authorised Sources that signed Formal Arrangements with AIS and all AIP Sponsors acting on behalf of Authorised Sponsors will receive log-in details ahead of that date and will be asked to log-in in due course.
42.	Chapter 1	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 AIP that are within the scope of the ADQ requirements are expected to be ADQ compliant.	This is a welcome pragmatic approach.	Humberside Airport	**Noted.** Thank you for your feedback.
43.	Chapter 6 – Terrain data	An assessment of the OS Terrain Datasets has been conducted by the CAA and evidence have been obtained to achieve the level of assurance that these products meet the data quality requirements for Terrain data.	It is not clear what this paragraph intended to say.	Humberside Airport.	**Noted.** Aerodrome Operators can obtain data from any commercial provider which meets the requirements of ICAO Annex 15 and EU 139/2014 but are still responsible for assuring themselves and the CAA that this contracted activity is compliant with the regulation. However, once the CAA is satisfied that the OS and OS Terrain Datasets meet the relevant data quality requirements it will be confirmed in the Aerodrome Survey Guidance. Aerodrome Operators would not then need to conduct an individual assessment to ensure that the OS and OS Terrain Dataset is compliant. A Formal Arrangement between the aerodrome operator and the party delivering electronic terrain dataset will always be required.

					The contracting aerodrome operator is responsible for ensuring that all contracted activities are subject to hazard identification, safety (risk) assessment and mitigation, as well as compliance monitoring.
44.	Chapter 8 – Submission of survey report	Flowchart 1	The flow chart is not showing for some reason?	Humberside Airport	**Noted.** It has been noted by a few reviewers that the flowchart is not showing at all, or occasionally not showing (when using different MS Office versions). This will be corrected in the final version of the document.
45.	Chapter 9 – Bibliography	EASA	Add Reference to EU 2017/373 as this Regulation is referenced within CAP 1668 on Page 9, Chapter 1, and Page 10, Chapter 2.	Humberside Airport	**Accepted.** Draft CAP 1668 has been amended.
46.	All		There seems to be some clarity required as to what format the surveyor will supply the to the aerodrome operator in. Will it be a requirement that we need an AXIM reader to decipher the data received from our Surveyor.	Glasgow Prestwick Airport	**Noted.** Chapter 2 – EXCHANGE FORMAT and Appendix 5 Digital Data Specification describes the way that data should be reported to AIS. As a transitional arrangement until all stakeholders are able to adopt the Eurocontrol AIXM harmonised coding specification, NATS AIM will accept a single zip file containing all files required to be included in the survey package. This zip file should be submitted to AIM via the Data Originators Portal, attached to the AIP Change Request. Within the zip file all Appendix 5 Files shall presented as individual files in the form of a comma delimited ASCII text file containing all fields.

					Surveyors can deliver data to aerodrome operators in the same format – also as a single zip sent using electronic means (direct electronic connection, Data Originators Portal, email etc.). Sending data on DVD is not recommended and will be accepted only within the Transition Period (5 years). Currently only AIS is required to provide AIXM files. The CAA recognises that the full transition to AIXM in the data chain from data origination to AIS will be a long process. Once the Eurocontrol AIXM harmonised coding specification is ready, the CAA will consult the next steps with all Stakeholders.
47.	Appendix 5 – Digital Data Specification	Data Delivery Format	We have no comments regarding the guidance other than the problems with reporting terrain data in the current Annex B format. I assume this will be addressed when we have a recognised AIXM 5.1 format for the data. We can generate AIXM data but until this format is provided there can be no conformity.	Paul Fassam Geomatics	**Noted.** Terrain data can be exchanged in the current GeoTIFF format which amongst other survey files will be delivered to AIS in a single zip file. This zip file should be submitted to AIM via Data Originators Portal, attached to the AIP Change Request. The need for harmonisation of AIXM implementations is fully supported, but the concerns should be limited to vertical structures/obstacle data only, since the AIXM does not address terrain data.
48.	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	We are awaiting the publication of a new EU regulation to replace 73/2010. HAL, NATS and CAA have been heavily involved in the development of the new regulation which is expected to make amendments to the rigour of some current requirements of	Heathrow Airport	**Noted.** The structure of regulations proposed in Opinion 02/2018 is different to EU 73/2010 but the principals remain the same and compliance with EU 73/2010 will mean compliance with amended EU 139/2014 and 2017/373.

		ICAO Annex 4, Annex 11 and Annex 14.	73/2010. We would like to see a pragmatic approach to the current regulatory requirement as some of the details are likely to change.		Tables comparing ADQ IR and Opinion 02/2018 requirements on data origination, dataset and data exchange have been delivered by Eurocontrol and are available at the link: Data Origination & Data Exchange The CAA recognises that it will be somewhat more onerous to produce compliant surveys than it did to produce surveys which were compliant with the requirements in CAP232. However, this is because CAP 232 hasn't been updated for over 10 years and therefore some changes were inevitable, plus more data is now required for compliance with applicable regulations. In developing CAP1668, where possible, a pragmatic approach has been taken to endeavour to keep the impacts arising from any new requirements to a minimum. For example, the CAA has accepted (or partially accepted) the majority of responses received from stakeholders and CAP1668 has been updated accordingly.
49.	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	We still think there are a number of parts of the document that should be revised. For example, the requirements of 'eTOD Plus' seem to be significantly more onerous than is required by ICAO and EASA, but there does appear to be inconsistency between the text and diagrams.	Heathrow Airport	**Noted.** Proposed document has been revised as part of the consultation stage, all provided comments have been assessed. In developing CAP1668, where possible, a pragmatic approach has been taken to endeavour to keep the impacts arising from any new requirements to a minimum. For example, the CAA has accepted (or partially accepted) the majority of responses received from stakeholders and CAP1668 has been updated accordingly.

		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 survey and effectively support implementation of data quality requirements. The guidance contained in CAP 1668 applies to aerodromes that are certificated by the CAA under the EASA Common Requirements (EC REG 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. CAP 1668 is based on CAP 232 principles and created to address the current requirements noted above. This guidance maintains the proportionate approach included previously in CAP 232 (i.e. 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.			

50.	Purpose	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: (…) f) geofencing; and other purposes.	Is this a regulatory requirement? Are we providing obstacle data for the purposes of geofencing?	Heathrow Airport	**Noted.** Aerodrome survey data can be used for the purposes of geofencing. ICAO Document 9881, Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information notes that significant safety benefits for international civil aviation will be provided by in-flight and ground-based applications that rely on quality electronic terrain and obstacle data. Many other personnel involved with operations will also benefit from the use of quality terrain and obstacle data. One such benefit could be the use of eTOD for geofencing purposes. Geofencing is still at its early stages but it is expected to play an important role in assuring safety of aerodrome operations. CAA statement on Government drone consultation response – including CAA's position about geofencing can be found here.
51.	Chapter 1 Aerodrome Operator - Obligations	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.	Does this mean 5 months or 5 years? For many aerodromes the IFP review cycle is five-yearly. Also, is it correct to say that all of the elements detailed in this CAP are 'required' to be surveyed by the EASA regulation? Please confirm that the CAP only contains elements to be surveyed which are required under the EASA regulation.	Heathrow Airport	**Noted.** Aerodrome operators are expected to deliver fully ADQ-compliant survey to AIS within the next 5 years and t is recommended to deliver a fully ADQ-compliant survey ahead of the next 5-year IFP review. IFPs should be reviewed (using ADQ-compliant survey data) not later than 5 months after receipt of the fully ADQ-compliant survey data. Every time aerodrome survey identifies changes to the obstacle environment, IFPs may need to be

					assessed (approach should be agreed with chosen APDO and described in aerodrome safeguarding procedures). CAP 1668 includes elements required by EASA regulations, ICAO standards and recommended practices (i.e. charting requirements, AIS provisions) and UK-specific practice (i.e. dominant obstacles survey).
52.	Chapter 1 Aerodrome Operator - Obligations	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.	So are CAA saying that we have to do a 5 year IFP review after every annual survey?? Presumably it was 5 years previously for a reason??	Heathrow Airport	**Noted.** Aerodrome operators are expected to deliver fully ADQ-compliant survey to AIS within the next 5 years and t is recommended to deliver a fully ADQ-compliant survey ahead of the next 5-year IFP review. IFPs should be reviewed (using ADQ-compliant survey data) not later than 5 months after receipt of the fully ADQ-compliant survey data. Every time aerodrome survey identifies changes to the obstacle environment, IFPs may need to be assessed (approach should be agreed with chosen APDO and described in aerodrome safeguarding procedures).
53.	Chapter 1 Aerodrome Operator - Obligations	UK AIS Provider will comply with the regulation by 5 October 2018 with the introduction of the new AIS system and subsequent production of an ADQ AIP by 3 January 2019 (AIRAC 01/2019).	Considering that part of our requirement to comply is a formal arrangement with the AIS provider and for our data to be compatible with the AIS system, it seems a little difficult for aerodromes to prove compliance from September 2018 if the AIS system	Heathrow Airport	**Noted.** The CAA is applying a pragmatic approach to operator's compliance with ADQ requirements and it is understood that for some operators transition to full compliance will take a period of time. However, it is expected that aerodrome operators will be fully ADQ-compliant within the next five years.

			is not confirmed as in place and fully compliant until January 2019.		AIS compliance is essential to achieve compliance of the AIS products and the whole Member State. Aerodrome Operator will be required to demonstrate compliance with requirements relevant to data activities conducted by the aerodrome: origination, production, storage, handling, processing, transfer, distribution exchange and storage of data. Aerodrome operator may decide to contract some data-activities to external organisations.
54.	Chapter 2 – Minimum Content of the aerodrome survey – Numerical data quality requirements	All EASA certificated aerodromes and aerodromes with Instrument Flight Procedures (IFP) shall 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 and cannot be used for IFP designs.	We would prefer it if CAA made reference only to EASA requirements in terms of compliance. ICAO SARPs are not legally binding whereas EASA IRs are.	Heathrow Airport	**Noted.** The guidance contained in CAP 1668 applies to aerodromes that are certificated by the CAA under the EASA Common Requirements (EC REG 139/2014) and to aerodromes that have instrument approach procedures (IFP), which may not be EASA aerodromes. Therefore, not all aerodromes that fall within the scope of CAP1668 are EASA certificated, and as such it is important to reference both the EU and ICAO relevant regulations.
55.	Chapter 2 – Minimum Content of the aerodrome	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	Does this mean OLS or IFP or both? Obstacle Assessment Surface is a term we first saw used in the ICAO taskforce proposals,	Heathrow Airport	**Noted.** Obstacle assessment surfaces described in this guidance are eTOD PLUS data collection surfaces.

	survey – Obstacles	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.*	we don't believe it's in EASA regulation?		IFP Protection Areas can be individually prepared for the aerodrome by chosen APDO as contracted activity.
56.	Chapter 2 – Minimum Content of the aerodrome survey – eTOD	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.	Does 139/2014 include requirements for eTOD areas 1-4 to be required to achieve compliance?	Heathrow Airport	**Noted.** In accordance with AMC1 ADR.OPS.A.005 Aerodrome data, the Aerodrome Operator is responsible for the provision of obstacle and terrain data within the aerodrome boundary and establishment of arrangements with the Air Traffic Services providers and the Competent Authority for the provision of obstacles and terrain data outside of the aerodrome boundary. However, compliance with AMC1 ADR.OPS.A.005 (f) can be achieved through a national policy and this approach was clarified with the CAA EASA Standardisation Lead in the early stages of the ADQ IR Project. As such, it is the CAA's goal to achieve a harmonized approach in the UK, and one of the purposes of CAP1668 is to describe how the various relevant requirements are applied in the UK including those arising from the ANO and from previous CAP232 practices. In summary, Aerodrome Operators should provide obstacle and terrain data in Areas 2-4 (as described in CAP 1668) but, where appropriate, aerodrome operators can seek individual

					arrangements with ATS and the CAA with regard to the provision of data. For example, an operator could provide an assessment detailing whether the lack of a particular TOD data area (or its part), or any other differences to requirements, would not compromise the safety of operations, but would remain compliant with EU 139/2014.
57.	Chapter 2 – Minimum Content of the aerodrome survey – Content of the survey package	(…) Draft Type A chart (in Adobe PDF) – or declaration that there is no change to the Type A chart published in the AIP.	NATS currently draft all Type A charts for publication in the AIP. I assume this policy won't change, so there should be no need for the aerodrome to submit a draft chart. All the necessary information for NATS to produce the charts will be in the datasets.	Heathrow Airport	**Accepted.** The CAA revised this approach and in consideration of the comments received at this stage, draft Type A chart is no longer included in the Survey Package described in draft CAP 1668. Draft CAP 1668 amended.
58.	Chapter 2 – Minimum Content of the aerodrome survey – Content of the survey package	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.	What exactly is to be published? Does this mean all of the area 2 and 3 obstacles? We have had disagreements with AIS and CAA about which ones to publish. AIS/CAA didn't want them all published but didn't provide guidance on which ones should be included and which should not.	Heathrow Airport	**Noted.** Area 2 and Area 3 obstacle datasets should be delivered to AIS. It has been agreed with AIS that aerodromes within the scope of this guidance will be able to publish full Area 2 and Area 3 obstacle datasets in the AIP (as separate files imbedded in the AIP – similar to ENR 5.4). AIS will also provide guidance on which obstacles should be published for aerodromes outside the scope of this guidance or not fully transitioned (5-year transition period).
59.	Chapter 2 – Minimum Content of the aerodrome survey – Content of the	Note: Non-EASA certificated aerodromes in the scope of this guidance and aerodromes using non-precision or precision CAT I IFPs can indicate in AD 2.10 that information on obstacles in Area	Is this stating that only EASA certificated aerodromes with CAT II/III approaches are required to carry out an Area 3 survey? We agree that is sensible, but if not please clarify.	Heathrow Airport.	**Noted.** The CAA recognises that this statement may have been misleading as all EASA certificated aerodromes should deliver Area 3 obstacle dataset to AIS.

	survey package	3 is not available and the obstacle data are to be provided for:			Considering comments received at this stage the CAA decided to add more guidance for aerodrome operators. 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 will need to be approved by the CAA Aerodromes Team. Draft CAP 1668 amended.
60.	Chapter 2 – Minimum Content of the aerodrome survey – Content of the survey package	Files need to be provided with required metadata (as detailed in CAP 1054).	As detailed in EC reg xxxx?	Heathrow Airport	**Accepted.** Draft CAP 1668 amended.
61.	Chapter 2 – Minimum Content of the aerodrome survey – Content of the survey package	The Formal Arrangement between the aerodrome operator and the survey company should describe which of these files are to be provided by the surveyor to the aerodrome operator and whether the surveyor will be nominated by the aerodrome	Does our FA contain a list of which files will be provided by SLC?	Heathrow Airport	**Noted.** Formal Arrangements between the aerodrome operator and the survey company should describe which files are to be provided by the surveyor to the aerodrome operator.

		operator (authorised source) to be an AIP Sponsor of this data.			CAP1668, 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.
62.	Chapter 2 – Minimum Content of the aerodrome survey – Exchange Format	In the future, all aerodrome survey data will be exchanged in AIXM 5.1.	Not necessarily an accurate statement. There are some who would like this to be the case but there is already some doubt as to whether 5.1 will be achievable for all member states and who knows what will change in the near and distant future.	Heathrow Airport	**Accepted.** Currently only AIS is required to provide AIXM files. The CAA recognises that the full transition to AIXM in the data chain from data origination to AIS will be a long process. Once the Eurocontrol AIXM harmonised coding specification is ready, the CAA will consult the next steps with all Stakeholders. Draft CAP 1668 amended.
63.	Chapter 2 – Minimum Content of the aerodrome survey – Exchange Format	In the future, all aerodrome survey data will be exchanged in AIXM 5.1.	We would prefer it if CAA didn't put possible 'future' scenarios in this CAP.	Heathrow Airport	**Accepted.** Currently only AIS is required to provide AIXM files. The CAA recognises that the full transition to AIXM in the data chain from data origination to AIS will be a long process. Once the Eurocontrol AIXM harmonised coding specification is ready, the CAA will consult the next steps with all Stakeholders. Draft CAP 1668 amended.
64.	Chapter 3 – List of dominant obstacles.	If it is apparent that there are significant obstacles beyond the 10 km/15 km limit, the survey area should be extended longitudinally to 30 km to take account of such obstacles. A significant obstacle is one that is not shielded by an obstacle closer to the runway.	It is not clear why an aerodrome operator should extend their obstacle survey beyond the OHS. With the proposal to remove the OHS in the future, this is even more incongruous.	Heathrow Airport	**Noted.** This guidance is equivalent to the one included in the current CAP 232 point 2.1.3. As a broad specification for the outer horizontal surface, tall structures can be considered to be of possible significance if they are both higher than 30 m above local ground level, and higher than 150 m above aerodrome elevation within a radius

					of 15 km m of the centre of the airport where the runway code number is 3 or 4. The survey area should be extended longitudinally to 30 km if it apparent that there are significant obstacles outside Area 2b/2c that would not be included in the Area 2d dataset. That has been clarified in the final version of draft CAP 1668. Draft CAP 1668 amended.
65.	Chapter 3 – List of dominant obstacles.	If it is apparent that there are significant obstacles beyond the 10 km/15 km limit, the survey area should be extended longitudinally to 30 km to take account of such obstacles. A significant obstacle is one that is not shielded by an obstacle closer to the runway.	If no OHS is established (it is guidance material (GM) in CS-ADR-DSN) then how can an obstacle penetrate it?	Heathrow Airport.	**Noted.** This guidance is equivalent to the one included in the current CAP 232 point 2.1.3 and it should be used to determine dominant obstacles. The survey area should be extended longitudinally to 30 km if it apparent that there are significant obstacles outside Area 2b/2c that would not be included in the Area 2d dataset. That has been clarified in the final version of draft CAP 1668. Draft CAP 1668 amended.
66.	Chapter 5 – Aerodrome data in AIP	The aerodrome operator is responsible for assessing changes in their aerodrome survey for impact on their published AIP data. Impact on the IFPs can only be conducted by an Approved Procedure Designer (APD). For more information see CAP 785.	It is not clear why IFP assessments have recently become so important. Are other member states assessing obstacles against IFPs? We think not, we doubt that many member states conduct assessments against the OLS. We respectfully request that UK CAA clarify this point of interpretation with EASA.	Heathrow Airport	**Not accepted.** As required by EU 139/2014, the aerodrome operator is responsible for aerodrome safeguarding which includes obstacle limitation and protection surfaces as established in accordance with the certification basis, and other surfaces and areas associated with the aerodrome, in order to take, within its competence, appropriate action to mitigate the risks associated with the penetration of those surfaces and areas. The aerodrome operator shall have procedures in place for mitigating the risks associated with

					obstacles, developments and other activities within the monitored areas that could impact safe operations of aircraft operating at, to or from the aerodrome (Aerodrome operators should agree their individual IFP Safeguarding expectations and procedures with their chosen APDO). IFP Safeguarding is essential for the safety of air navigation. It is the CAA position and it does not require clarification with EASA. The UK Policy clarifying responsibilities regarding the development of, or changes to, Instrument Flight Procedures can be found here, and the new version of CAP 738 Aerodrome Safeguarding will also include more guidance material on IFP Safeguarding. Arrangements in other Member States may be different (for example in some MS IFP Safeguarding is conducted by the CAA or ANSP). It is expected that in the future a new concept for the revision of Annex 14 OLS will simplify and clarify the purpose of surfaces, will allow consistency with operations, will be easier in application, and will be more efficient. The UK CAA believes that a revision of Annex 14 OLS will be a positive development and as such is fully supporting ICAO's work on this topic. Once the new concept is introduced, CAP1668 and other relevant UK guidance will be updated accordingly.
67.	Chapter 5 – Aerodrome data in AIP	The aerodrome operator is responsible for assessing changes in their aerodrome survey for	It is important for CAA to recognise that APD's are few and far between, and expensive!!	Heathrow Airport	**Noted.**

		impact on their published AIP data. Impact on the IFPs can only be conducted by an Approved Procedure Designer (APD). For more information see CAP 785.			The CAA recognises the fact that there is a limited number of APDs and that this has an impact on the costs incurred by aerodromes for this contracted activity. Aerodrome operators should agree their individual IFP Safeguarding expectations and procedures with their APDO.
68.	Chapter 6 – Terrain data	It is essential that the data set describes terrain using the terrain attributes listed in ICAO Annex 15 Table A8-3/PANS-AIM Appendix 6 and that the terrain data meets the numerical requirements detailed in ICAO Annex 15 Table A8-1/Aeronautical Data Catalogue (PANS-AIM Appendix 1). Equivalent tables can be found in EU 139/2014: GM4 ADR.OPS.A.005(a) Aerodrome data Table 1 and AMC1 ADR.OPS.A.010 Data quality requirements.	We would prefer that requirement references feature EASA legally binding regulation.	Heathrow Airport	**Noted.** The guidance contained in CAP 1668 applies to aerodromes that are certificated by the CAA under the EASA Common Requirements (EC REG 139/2014) and to aerodromes that have instrument approach procedures (IFP), which may not be EASA aerodromes. Therefore, not all aerodromes that fall within the scope of CAP1668 are EASA certificated, and as such it is important to reference both the EU and ICAO relevant regulations. Please note that EASA in Opinion 02/2018 also proposed transposition of Data Catalogue originally included in PANS-AIM to Appendix 1 to Annex III (Part-ATM/ANS.OR) to Regulation (EU) 2017/373. CAP1668 will be updated as soon as this amendment to EU 2017/373 and 139/2014 is effective.
69.	Chapter 8 – Submission of survey report	The completed submission to AIS should consist of files specified in Chapter 2 and a Copy of the Formal Arrangement between the operator and the survey company.	It is not clear why the FA should be passed to AISp?	Heathrow Airport	**Accepted.** Aerodrome compliance including contracted activities and any Formal Arrangements concerning data-activities (not only between aerodrome operator and surveyor) will be

					demonstrated/verified as part of the CAA's oversight. Therefore, the CAA has revised its approach and Formal Arrangements between the aerodrome operator and surveyors will not be required to be provided to AIS. Draft CAP 1668 amended.
70.	Chapter 8 – Submission of survey report	The completed submission to AIS should consist of files specified in Chapter 2 and a Copy of the Formal Arrangement between the operator and the survey company.	Agree – it's a commercial agreement.	Heathrow Airport	**Accepted.** Aerodrome compliance including contracted activities and any Formal Arrangements concerning data-activities (not only between aerodrome operator and surveyor) will be demonstrated/verified as part of the CAA's oversight. Therefore, the CAA has revised its approach and Formal Arrangements between the aerodrome operator and surveyor will not be required to be provided to AIS. Draft CAP 1668 amended.
71.	Chapter 8 – Submission of survey report	Surveys that fail to conform with the applicable requirements will be rejected and returned to the aerodrome operator.	Applicable EASA requirements? Will NATS AIS be conducting compliance assessments?	Heathrow Airport	**Noted.** Until now the Authorised Source was submitting a survey to AIS, waiting for checks and then submitting an ACR. Now AIS will start conducting verification and validation of aerodrome surveys received via the Aurora Portal (direct electronic connection) as opposed to the previous practice of pre-processing surveys posted to AIS and subsequently submitted as an AIP change.

					The verification, processing and validation tasks remain the same but shifts from upfront to inline, the sponsor simply submits their survey as a zip file in an ACR. All files are held on the ACR and can be accessed by the Authorised Source and all nominated Sponsors. AIS conducts Zip validation, obstacle update and cross check with ACR statement, Aerodrome Infrastructure and facilities cross check with ACR statement.
72.	Chapter 2 – 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]. (…) - Enroute chart (for FIR).	Please clarify whether the aerodrome would be responsible for this or does it remain with NERL, as at present.	Highlands and Islands Airports	**Noted.** This is a list of charts required by ICAO Annex 4. It does not mean that all those charts will be required for all aerodromes and it does not mean that aerodrome operators will be responsible for the creation of the chart. The Aerodrome Operator is responsible for delivering to AIS all required data items including those necessary to create the relevant charts.
73.	Chapter 2 – 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]. (…) - Area Chart (where ATS routes are complex and cannot be adequately shown on the Enroute Chart).	Please clarify whether the aerodrome would be responsible for this or does it remain with NERL, as at present.	Highlands and Islands Airports	**Noted.** This is a list of charts required by ICAO Annex 4. It does not mean that all those charts will be required for all aerodromes and it does not mean that aerodrome operators will be responsible for the creation of the chart. Aerodrome Operator is responsible for delivering to AIS all required data items including those necessary to create the relevant charts.

74.	Chapter 2 – 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: (…) III. Area 2 terrain dataset (…) V. Area 3 terrain dataset (…) VII. Area 4 terrain dataset (for CAT II and III)	Will there be a file for terrain data as defined for obstacle data?	Highlands and Islands Airports	**Noted.** The CAA does not plan to define terrain dataset specification at this stage. The CAA recognises the fact that some terrain data will be provided by the aerodrome surveyor and some will be obtained from commercial entities that are providing data for the broader industry sector. Therefore, it may be unrealistic to recommend a specific file specification for aerodromes. Terrain data should meet all relevant requirements (including metadata) and it is recommended to provide it in GeoTIFF format.
75.	Chapter 2 – 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: (…) III. Area 2 terrain dataset (…) V. Area 3 terrain dataset (…) VII. Area 4 terrain dataset (for CAT II and III)	The workshop(s) indicated that data is to be provided as GeoTIFF. Would any other format be acceptable to AIS	Highlands and Islands Airports	**Accepted.** It is recommended to provide terrain data in GeoTIFF. Draft CAP 1668 amended.
76.	Chapter 2 – 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: (…) XV. Draft Type A chart (in Adobe PDF) – or declaration that there is no change to the Type A chart published in the AIP.	NATS currently draft all Type A charts from the survey data & send them to the aerodromes for approval & submission for publication. Please clarify if this process will still be retained as The HIAL airports do not have the capacity to produce Type A charts.	Highlands and Islands Airports	**Accepted.** The CAA revised this approach and in consideration of the comments received at this stage, draft Type A chart is no longer included in the Survey Package described in draft CAP 1668. Draft CAP 1668 amended.

77.	Chapter 2 – Content of the survey package	Note: Non-EASA certificated aerodromes in the scope of this guidance and aerodromes using non-precision or precision CAT I IFPs 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:	Please clarify that the requirement for Area 3 is only applicable for Cat II/III approaches.	Highlands and Islands Airports	**Noted.** The CAA recognises that this statement may have been misleading as all EASA certificated aerodromes should deliver Area 3 obstacle dataset to AIS. Considering comments received at this stage the CAA decided to add more guidance for aerodrome operators. 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 should be accepted by the CAA Aerodromes Team. Draft CAP 1668 amended.
78.	Chapter 3 – List of dominant obstacles	The optimum requirement is to record the height of the three highest obstacles in each tile, thus allowing the IFP designer to calculate the most advantageous Minimum Descent Altitude/Height (MDA/H).	In the case of high terrain, with an obstacle of 15m or less above ground is not currently recorded. Please could you provide or define what would be considered a reasonable height for an obstacle to be considered dominant.	Highlands and Islands Airports	**Noted.** Draft CAP 1668 does not define any minimum slope or height of a dominant obstacle. The CAA recognises that this task may sometimes result in surveying “relatively short obstacles” but applying minimum slope/height have a direct impact on the OCA/H. Procedure designers would

					need to treat this minimum slope/height as a virtual obstacle in Areas 2b and 2c. Applying minimum slope/height has a direct impact on the OCA/H, therefore: 1. If it is an aerodrome operator's decision to apply a minimum obstacle collection height different to those defined for eTOD PLUS, it should be annotated in the survey report part "any differences to CAP 1732". This height will need to be included in IFP designs. An AltMoC submission would not be required if applied values are the same as required by EASA/ICAO for eTOD. 2. If it is an aerodrome operator's decision to apply an additional obstacle filtering process, it should be annotated in the survey report part "any differences to CAP 1732" and it would require an assessment as per Chapter 7 CAP 1732. An AltMoC submission would be required if applied values are not compliant with those required by EASA/ICAO for eTOD.
79.	Chapter 3 – List of dominant obstacles	For example, if there are three chimneys adjacent to each other near the outer edge of the tile furthest from the nominal flight path and an office building located within the same tile closer to the nominal flight path but marginally lower than the three chimneys, then all four obstacles should be declared. Situations may exist where more	In the case of high terrain, with an obstacle of 15m or less above ground is not currently recorded. Please could you provide or define what would be considered a reasonable height for an obstacle to be considered dominant.	Highlands and Islands Airports	**Noted.** Draft CAP 1668 does not define any minimum slope or height of a dominant obstacle. The CAA recognises that this task may sometimes result in surveying "relatively short obstacles" but applying minimum slope/height have a direct impact on the OCA/H. Procedure designers would need to treat this minimum slope/height as a virtual obstacle in Areas 2b and 2c.

		than three obstacles are declared within any one tile.			Therefore, the application of a minimum capture slope or minimum height is not acceptable for IFP design. Applying minimum slope/height has a direct impact on the OCA/H, therefore: 1. If it is an aerodrome operator's decision to apply a minimum obstacle collection height different to those defined for eTOD PLUS, it should be annotated in the survey report part "any differences to CAP 1732". This height will need to be included in IFP designs. An AltMoC submission would not be required if applied values are the same as required by EASA/ICAO for eTOD. 2. If it is an aerodrome operator's decision to apply an additional obstacle filtering process, it should be annotated in the survey report part "any differences to CAP 1732" and it would require an assessment as per Chapter 7 CAP 1732. An AltMoC submission would be required if applied values are not compliant with those required by EASA/ICAO for eTOD.
80.	Chapter 3 – List of dominant obstacles	For example, if there are three chimneys adjacent to each other near the outer edge of the tile furthest from the nominal flight path and an office building located within the same tile closer to the nominal flight path but marginally lower than the three chimneys, then all four	Further guidance required on how to deal with large areas of afforestation	Highlands and Islands Airports	**Noted.** This guidance is equivalent to the one included in the current CAP 232 point 2.1.2. Suggestion noted as a potential for future improvements.

		obstacles should be declared. Situations may exist where more than three obstacles are declared within any one tile.			
81.	Chapter 3 – List of dominant obstacles	If it is apparent that there are significant obstacles beyond the 10 km/15 km limit, the survey area should be extended longitudinally to 30 km to take account of such obstacles. A significant obstacle is one that is not shielded by an obstacle closer to the runway.	Further guidance required on how to deal with large areas of wind turbines	Highlands and Islands Airports	**Noted.** This guidance is equivalent to the one included in the current CAP 232 point 2.1.3. Suggestion noted as a potential for future improvements.
82.	Appendix 2 – eTOD & eTOD PLUS comparison table – Area 2b	All objects which extend to a height of 0.5 m or more above ground in the Area 2b which project above a plane surface having a 1.2 % slope will be collected.	Appendix 4 diagram requires 3m which is correct?. Collection of obstacles from 0.5m seems excessive.	Highlands and Islands Airports	**Noted.** Obstacles less than 0.5 m in height above ground need not be collected. Information included on one of the diagrams in Appendix 4 has been updated to describe both eTOD and eTOD PLUS minimum obstacle height. Draft CAP 1668 amended.
83.	Appendix 2 – eTOD & eTOD PLUS comparison table – Area 2b	The obstacle collection surface should be horizontal beyond the point at which the 1.2% slope intersects the horizontal plane of the approach surface (area where OLS is more demanding than eTOD Plus obstacle collection surface).	This is in addition to any EASA or ICAO requirement or recommendation. Have you considered a step from 120m to 150m above AD at the edge of Area 2b at 10km, then only a horizontal surface would need to be considered beyond that.	Highlands and Islands Airports	**Accepted.** 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). Please note that eTOD PLUS Area 2b includes a step from 120 m to 150 m above THR elevation 10 km from the edge of Area 2a. In addition to that, all objects of a height of 100 m AGL or more should be collected. Draft CAP 1668 amended.

84.	Appendix 2 – eTOD & eTOD PLUS comparison table – Area 2c	Obstacles less than 3 m in height above ground need not be collected.	Appendix 4 diagram requires 15m which is correct?	Highlands and Islands Airports	**Noted.** Obstacles less than 3 m in height above ground need not be collected. Information included on one of the diagrams in Appendix 4 has been updated to describe both eTOD and eTOD PLUS minimum obstacle height. Draft CAP 1668 amended.
85.	Appendix 2 – eTOD & eTOD PLUS comparison table – Area 3	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 a half-metre (0.5 m) above the horizontal plane passing through the nearest point on the aerodrome movement area.	It is possible for this to be illustrated in a diagram as Area 2? It is not clear what would constitute the nearest point on the movement area.	Highlands and Islands Airports	**Partially accepted.** eTOD Area 3 is depicted in Annex 15 Appendix 8, Figure A8-3 and AMC&GM to 139/2014 GM4 ADR.OPS.A.005(a) Aerodrome data. Additional guidance added to Appendix 2. Any terrain or obstacles whose elevation is 0.5m 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 this surface has been penetrated. No data is collected within the Area 3 data set for other objects or terrain which exist below this assessment surface. Draft CAP 1668 amended.
86.	Appendix 3 – When OLS is more demanding than eTOD Area 2c.	Table	The Table is not easy to read and the Appendix 4 diagrams illustrate the requirement more succinctly.	Highlands and Islands Airports	**Accepted.** Considering comments received at this stage, the CAA decided to remove this table from the aerodrome survey guidance. Any issues or questions that aerodrome operator or surveyor may have regarding identification of the most demanding surfaces should be send to ifp.policy@caa.co.uk.

					Draft CAP 1668 amended.
87.	Appendix 4 0 eTOD & eTOD PLUS graphical representation	Diagrams	These diagrams are very useful in illustrating the requirements	Highlands and Islands Airports	**Noted.** Thank you for your feedback.
88.	Appendix 4 0 eTOD & eTOD PLUS graphical representation	eTOD Area 2b Diagram	This is in addition to any EASA or ICAO requirement or recommendation. As stated in comment a18 above, have you considered a horizontal surface beyond 10km	Highlands and Islands Airports	**Accepted.** 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). Please note that eTOD PLUS Area 2b includes a step from 120 m to 150 m above THR elevation 10 km from the edge of Area 2a. In addition to that, all objects of a height of 100 m AGL or more should be collected. Draft CAP 1668 amended.
89.	Appendix 4 eTOD & eTOD PLUS graphical representation	eTOD Area 2c Diagram	Appendix 2 does not refer to extending Area 2c surface beyond 10km As stated in comments above, have you considered a horizontal surface beyond 10km?	Highlands and Islands Airports	**Accepted.** For aerodrome reference codes 3 and 4, the extent of the Area 2c should be increased to 15.0 km (8 NM) to support the application of OLS. The eTOD PLUS Area 2c obstacle collection surface should be horizontal beyond a distance of 10 km to cover the Outer Horizontal Surface. The survey should always cover the most demanding (lower) surfaces. In addition to that, all objects of a height of 100 m AGL or more should be collected. Draft CAP 1668 amended.
90.	Appendix 5 – Digital Data Specification	Common File Header	Files are likely to cover a number of year and the data is likely to be input by a number of people.	Highlands and Islands Airports	**Partially accepted.**

			Conversely a number of airports may also be submitted by one or a number of people. Could these be included in the main data file.		The location of selected metadata items has been changed and each file in the Survey Package shall contain metadata on the first rows of the file as detailed in the Common File Header table found in Appendix 5 (Each row shall contain an attribute name as listed in the table followed by a colon and a populated value). Draft CAP 1668 amended.
91.	Appendix 5 – Digital Data Specification – Common File Header	DataOriginator - Name of the person responsible for data origination	Different people may be responsible for different surveys. This may or may not apply to items 2-10 below over time.	Highlands and Islands Airports	**Accepted.** This should be the name of the person responsible for the submitted version of the file. Draft CAP 1668 amended.
92.	Appendix 5 – Digital Data Specification – Common File Header	The date on which the data was surveyed/observed in the field	Depending on the size and/or location of a an airport, a survey could be undertaken over a number of days.	Highlands and Islands Airports	**Accepted.** Metadata item included in Aerodrome facilities file, Master Obstacles File and Runway and Declared Distances File. Draft CAP 1668 amended.
93.	Appendix 5 – Digital Data Specification – Common File Header	SurveyProcessDate - The date on which the data was processed	Data may be processed over a number of days and not necessarily over a continuous period of days.	Highlands and Islands Airports	**Accepted.** This should be the date when the submitted version of the file was created. Draft CAP 1668 amended.
94.	Appendix 5 – Digital Data Specification – Common File Header	StatisticalAccuracy - Expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.	This recorded in Fields 25 and 26. Is this duplication?	Highlands and Islands Airports	**Accepted.** Metadata item included in Aerodrome facilities file, Master Obstacles File and Runway and Declared Distances File. Draft CAP 1668 amended.

95.	Appendix 5 – Digital Data Specification – Common File Header	Resolution - The number of digits to which a value is expressed [m].	Different resolutions apply to different fields	Highlands and Islands Airports	**Accepted.** Removed from the Common File Header. Draft CAP 1668 amended.
96.	Appendix 5 – Digital Data Specification – Aerodrome facilities file	HORIZONTAL GRID REFERENCE SYSTEM - For allowable values refer to Table 2 below.	This value should be the same for all data items. The Coordinate System is included in the header. Is this not duplication?	Highlands and Islands Airports	**Accepted.** HGRS, EASTING and NORTHING removed from Aerodrome Facilities File and Master Obstacles File. Draft CAP 1668 amended.
97.	Appendix 5 – Digital Data Specification – Aerodrome facilities file	Horizontal Accuracy in Meters relative to the datum to 4 decimal places.	The control network should take account of the accuracy. Not all points will have the same accuracy. The control network should take account of the accuracy. Is this realistic to plot on the ground?	Highlands and Islands Airports	**Noted.** Considering comments received at this stage, the CAA decided to remove ACN Horizontal and Vertical Accuracy from Aerodrome Facilities file. Geodetic Connection Report should include the relevant metadata items. Removing the ACN accuracy values means the definition of other accuracy fields needs to be amended to reflect the total observed accuracy as the definitions are currently accuracy relative to the ACN. Draft CAP 1668 amended.
98.	Appendix 5 – Digital Data Specification – Aerodrome facilities file	Vertical Accuracy in Meters relative to the datum to 4 decimal places.	The control network should take account of the accuracy. Not all points will have the same accuracy. The control network should take account of the accuracy. Is this realistic to plot on the ground?	Highlands and Islands Airports	**Noted.** Considering comments received at this stage, the CAA decided to remove ACN Horizontal and Vertical Accuracy from Aerodrome Facilities file. Geodetic Connection Report should include the relevant metadata items.

					Removing the ACN accuracy values means the definition of other accuracy fields needs to be amended to reflect the total observed accuracy as the definitions are currently accuracy relative to the ACN. Draft CAP 1668 amended.
99.	Appendix 5 – Digital Data Specification – Aerodrome facilities file	Horizontal Extent (radius) of the surveyed entity in meters to 2 decimal places.	A radial extent may be applicable to navigation aids and wind turbines but is not applicable to all data. What is the rationale behind this requirement?	Highlands and Islands Airports	**Not accepted.** Horizontal extent is a mandatory attribute of an obstacle. Currently IFP designers are applying unreal horizontal extent of every obstacle. That has got a negative effect on all other datasets based on survey data and may even generate a risk to air navigation in the case of large or irregular obstacles. Horizontal extent should be applied to objects that have height AGL. The CAA recognises that the proposed resolution is not achievable. Therefore, the resolution was updated – horizontal extend should be provided to the nearest metre. 1 m is the minimum horizontal extent that can be recorded in survey files. Draft CAP 1668 amended.
100.	Appendix 5 – Digital Data Specification – Aerodrome facilities file – Field 25	Horizontal Accuracy in Meters relative to the aerodrome control network to 4 decimal places at a 95% confidence level.	What is the rationale behind this requirement?	Highlands and Islands Airports	**Accepted.** Considering comments received at this stage, the CAA revised the recommended resolution of horizontal and vertical accuracy (2 dp in the final proposal). Draft CAP 1668 amended.
101.	Appendix 5 – Digital Data Specification – Aerodrome	Vertical Accuracy in Meters relative to the aerodrome control network to 4 decimal places at a 95% confidence level.	What is the rationale behind this requirement?	Highlands and Islands Airports	**Accepted.** Considering comments received at this stage, the CAA revised the recommended resolution of

	facilities file – Field 26				horizontal and vertical accuracy (2 dp in the final proposal). Draft CAP 1668 amended.
102.	Appendix 5 – Digital Data Specification – Aerodrome facilities file – Field 28	Date of field survey of record.	Depending on the size and/or location of a an airport, a survey could be undertaken over a number of days.	Highlands and Islands Airports	**Noted.** This is the date when this particular data item was surveyed. This metadata item was removed from the Common Header and left only in Aerodrome facilities file, Master Obstacles File and Runway and Declared Distances File to reflect that.
103.	Appendix 5 – Digital Data Specification - Table 1	CENTRE_PT_TWY	These are not currently detailed. To survey all taxiway centrelines will incur a significant cost to aerodromes together with the additional costs in maintaining the data. What is the intended use and purpose of this data?	Highlands and Islands Airports	**Partially accepted.** The geographical coordinates of appropriate taxiway centre line points should be delivered to AIS. In data-centric environment AIS products will be created using automated or semi-automated processes. The geographical coordinates of appropriate taxiway centre line points can be included in the Aerodrome Manual (AMC3 ADR.OR.E.005 Aerodrome manual Part D) and made available to users on request. There is a number of aircraft manufacturers, airlines and data services providers that are currently able to include taxiway centreline points in their databases. Aerodrome operators can provide an assessment [as described in CAP 1732 Chapter 7] confirming that the lack of taxiway centreline data will not compromise the safety of aerodrome operations if the regular aerodrome users are not ready to use taxiway centreline data onboard. Such an

					assessment should also include plan to introduce this data in the future. All of the above should be documented and agreed with aerodrome users. Please note that the lack of taxiway centreline may still be raised as a non-compliance and the aerodrome operator will be required to deliver a corrective action plan to the CAA (supported by the assessment above).
104.	Appendix 5 – Digital Data Specification - Table 1	Taxiway Holding Point Stop Bar Lights	These are not currently detailed. What is the intended use and purpose of this data?	Highlands and Islands Airports	**Noted.** Holding Point Stop Bar Lights should be included on the ICAO Aerodrome/Heliport Chart, Aerodrome Ground Movement Chart and Parking/Docking Chart. Surveying them should be considered as optional however it needs to be indicated which runway holding position or intermediate holding position is equipped with lights (and what type or lights).
105.	Appendix 5 – Digital Data Specification - Table 2	Field 4 - ASSOCIATION	Does this refer to Field 4 under Aerodrome Facilities File or Field 4 Master Obstacles file? If the latter, this field is to be left blank, and these descriptions would be irrelevant.	Highlands and Islands Airports	**Noted.** eTOD coverage areas and obstacle collection surfaces have been developed to capture obstacles and terrain data. If there is no association (no penetration of the obstacle collection surface, please leave the field blank). Draft CAP 1668 amended.
106.	Appendix 5 - Digital Data Specification - Runway and Declared Distance file	The value of the declared distance in meters.	Published or surveyed distances? These may vary due to the changes made previously on the origin being changed from one side or the other of the paint markings.	Highlands and Islands Airports	**Noted.** Distances included in this table should be the actual surveyed distances.

					Distance and length data included by surveyor in this file should be delivered to AIS and published in AD 2.13.
COMMENTS RECEIVED BY THE CAA AFTER THE FIRST PUBLICATION OF CAP1732 (DEC 2018)					
107.	Appendix 2 Appendix 4	Applied height filter. Additional obstacle filtering process.	We noted in our comments during the consultation that the table in Appendix 2 and the diagrams in Appendix 4 specified different values for a height filter AGL. We expected that the final version would reflect the ICAO and EASA values instead of the CAA eTOD Plus values that have been stated. The first diagram in Appendix 4 describes the rationale for reducing the height AGL in Area 2a, but we are still unsure of the rationale for reducing the height filter AGL in the other areas. Reducing the height filter for Area 2b to 0.5m AGL and for Area 2c to 3m AGL will significantly increase the number of obstacles and therefore cost of the survey at some airports. We assume that the Aerodrome Operators will be able to opt to apply the ICAO/EASA height filers rather than the CAA eTOD Plus height filter without producing an AltMoC document. Please could you confirm that this is correct?	SLC	Appendix 2 and Appendix 4 represent both EASA/ICAO requirement and eTOD PLUS values. Applying minimum slope/height has a direct impact on the OCA/H, therefore: 1. If it is an aerodrome operator's decision to apply a minimum obstacle collection height different to those defined for eTOD PLUS, it should be annotated in the survey report part "any differences to CAP 1732". This height will need to be included in IFP designs. An AltMoC submission would not be required if applied values are the same as required by EASA/ICAO for eTOD. 2. If it is an aerodrome operator's decision to apply an additional obstacle filtering process, it should be annotated in the survey report part "any differences to CAP 1732" and it would require an assessment as per Chapter 7 CAP 1732. An AltMoC submission would be required if applied values are not compliant with those required by EASA/ICAO for eTOD.

			At some airports, where Area 2b is penetrated by the terrain and therefore every object in that area, there will be a very large number of obstacles in excess of 3m, let alone 0.5m, which penetrate the 1.2% surface. Examples of this are Aberdeen and Southampton airports. It cannot surely be the intention to that obstacle data is acquired for every fence post, hedge, road sign, mobile obstacle on roads etc, when they are surrounded by much taller buildings and trees. Therefore we will be advising the Aerodrome Operators to produce further AltMoC documents establishing additional filtering practices to keep the level of reported obstacles to manageable numbers, i.e. thousands instead of tens of thousands. Please could you confirm that this is acceptable?		
108.	Chapter 2	Required data items – ICAO Type A.	We have now realised that the detailed guidance of how to survey Type A obstacles is not included in CAP1732 in the same way as it is in CAP232. We intend to refer back to the guidance given in CAP232 or suggest it is used as the basis for an AltMoC regarding Type A filtering. Otherwise the number of	SLC	Aerodrome Operators are required to deliver to AIS data necessary to create Type A chart compliant with ICAO Annex 4 Chapter 3. No further reference to CAP 232 will be accepted after the CAP 1732 5-year transition period. The lack of fully ICAO Annex 4 compliant Type A will be raised as a non-compliance during the aerodrome audit.

			obstacles and cost of the Type A surveys could increase significantly. Please could you confirm that this will be acceptable?		
109.	Appendix 2	Area 2d	Can you confirm that the CAA considers the Area 1 data list to be of sufficient quality that Area 2d obstacles can be extracted from it without additional verification of quality?	SLC	As DGC is demonstrating continuous improvement of data processes and procedures used to deliver en-route obstacle data, aerodrome operators are able to filter obstacle data from Area 1 dataset and add it to Area 2 dataset (AD 2.10) and any other relevant dataset with unique identifiers for the records and an annotation to indicate what is the source of this data and what was the effective date of the dataset (AIRAC date if using ENR 5.4 electronic data file). If necessary, this approach may be revised in the future (i.e. when other data sources are available).
110.	Appendix 5	Digital Dataset specification	The fields for eastings and northings have been removed from the both the aerodrome facilities and master obstacles files. Please confirm if this is correct. We realise that there is no ICAO or EASA requirement to provide coordinates in a local grid system, but it is stated in section 2.4 on page 9 that coordinates are required in National Grid. This can be very useful for people viewing and using data, particularly is using a CAD system. We expect that most Aerodrome Operators will want to see the grid coordinates. We see that the Field numbering jumps from 13 to 17,	SLC	Horizontal Grid Reference System, Easting and Northing fields have been removed (Coordinate System is included in the header). Although the jump in numbering should be considered as a typo, it is acceptable to add easting and northing back to the file. Files should be delivered without gaps (continue numbering), as per below. Field 14 Easting Field 15 Northing Field 16 VERTICAL REFERENCE SYSTEM Field 17 ORTHOMETRIC HEIGHT (M) Field 18 ORTHOMETRIC HEIGHT (FT) Field 19 HEIGHT ABOVE GROUND LEVEL (M) Field 20 HEIGHT ABOVE GROUND LEVEL (FT) Field 21 HORIZONTAL EXTENT (M) Field 22 HORIZONTAL ACCURACY (M) Field 23 VERTICAL ACCURACY (M) Field 24 RECORD IDENTIFIER

			so does that mean that Fields 15 and 16 are still available to add eastings and northings as an option?		Field 25 SURVEY DATE Field 26 CRVC The gap in numbering will be corrected in CAP 1732 Version 1.1. The CAA is also considering adding fields easting and northing back to the dataset specification to maintain consistency between data sets provided by different survey companies.
111.	Appendix 5	Digital Dataset specification	Similarly, in both the aerodrome facilities and master obstacles files, there are other fields that have been removed, leaving gaps in the field numbering. Is it expected that empty fields will be provided in the data, or should the files be produced without gaps, as though all fields had been renumbered consecutively.	SLC	Files should be delivered without gaps (continue numbering). Gaps in numbering will be corrected in CAP 1732 Version 1.1.
112.	Appendix 5	Digital Dataset specification	Field 4 'Association' in the aerodrome facilities file template states 'For required formatting refer to Table 1 below'. But in Table 1 for many features the information for 'Association' states ' for allowable values refer to Table 2' But the only associations listed in Table 2 are the four eTOD areas, which does not really make sense in the context of aerodrome facilities. Please confirm if this is an error in Table 1.	SLC	eTOD coverage areas and obstacle collection surfaces have been developed to capture obstacles and terrain data. If there is no association (no penetration of the obstacle collection surface, please leave the field blank). CAP 1732 Version 1.1. will include this clarification. The CAA will add new associations in CAP 1732 Version 1.1: • OLS (to allow aerodromes that haven't completed their transition to eTOD or are required to provide Area 2a only to deliver survey in CAP 1732 format); • MANAGED – objects that are included in the data set but do not qualify yet as obstacles in the specific area;

					• OTHER – other hazard to air navigation; • -blank field- leave the field association blank if it is not an obstacle and there is no association with eTOD data collection areas.
113.	Appendix 5	Digital Dataset specification	I have had a look at the new CAP1732 and the following are now omitted from Appendix 5 – Digital Data Specification. • Field 14 HORIZONTAL GRID REFERENCE SYSTEM • Field 15 EASTING • Field 16 NORTHING • Field 22 AERODROME CONTROL NETWORK HORIZONTAL ACCURACY • Field 23 AERODROME CONTROL NETWORK VERTICAL ACCURACY Have they been withdrawn? The Field numbering has not been redone to reflect their omission.	P e l l F r i s c h m a n n	Horizontal Grid Reference System, Easting and Northing fields have been removed (Coordinate System is included in the header). Although the jump in numbering should be considered as a typo, it is acceptable to add easting and northing back to the file (as requested in Comment 110). Files should be delivered without gaps (continue numbering), as per below. Field 14 Easting Field 15 Northing Field 16 VERTICAL REFERENCE SYSTEM Field 17 ORTHOMETRIC HEIGHT (M) Field 18 ORTHOMETRIC HEIGHT (FT) Field 19 HEIGHT ABOVE GROUND LEVEL (M) Field 20 HEIGHT ABOVE GROUND LEVEL (FT) Field 21 HORIZONTAL EXTENT (M) Field 22 HORIZONTAL ACCURACY (M) Field 23 VERTICAL ACCURACY (M) Field 24 RECORD IDENTIFIER Field 25 SURVEY DATE Field 26 CRVC The gap in numbering will be corrected in CAP 1732 Version 1.1. The CAA is also considering adding fields easting and northing back to the dataset specification to maintain consistency between data sets provided by different survey companies.

ANNEX 1 – ENTITIES INVOLVED IN THE CREATION OF THE NEW AERODROME SURVEY GUIDANCE.

EXTERNAL RESPONSES PROVIDED		
ORGANISATION	ROLE IN THE DATA CHAIN	RESPONSE PROVIDED
SLC	Survey Company	Yes, with comments
Durham Tees Valley Airport	Aerodrome Operator	Yes, with comments
P e l l F r i s c h m a n n	Survey Company	Yes, with comments
Belfast International Airport	Aerodrome Operator	Yes, with comments
HUMBERSIDE AIRPORT	Aerodrome Operator	Yes, with comments
Glasgow Prestwick Airport	Aerodrome Operator	Yes, with comments
Paul Fassam Geomatics	Survey Company	Yes, with comments
Heathrow Airport	Aerodrome Operator	Yes, with comments
Highlands and Islands Airports Limited	Aerodrome Operator	Yes, with comments

ADQ IR PROJECT - TEAMS INVOLVED		
ORGANISATION	ROLE IN THE DATA CHAIN	INVOLVEMENT
CAA AIMR	Regulator AIM	Leading the work on new aerodrome survey guidance.
CAA AERODROMES POLICY	Regulator Aerodromes	Team supporting AIMR Team, highly involved in the creation of the new aerodrome survey guidance.
CAA AERODROMES TEAM	Regulator Aerodromes (Capability)	Team highly involved in the creation of the new aerodrome survey guidance and its implementation in the UK.
CAA FLIGHT OPS POLICY	Regulator Air Ops	Comments provided at initial stage of the project.
CAA AIRSPACE REGULATION	Regulator Airspace	Team supporting AIMR Team, highly involved in the creation of the new aerodrome survey guidance, provided input at every stage of the project.
NATS-AIM	AISP	Entity highly involved in the creation of the new aerodrome survey guidance, provided input at every stage of the project.

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