



Agenda Item 2: Air Navigation Matters
2.3.2 Aeronautical Information Management (AIM)

e-TOD Developments for Areas 1 to 4

(Presented by the Secretariat)

SUMMARY	
This paper proposes to the E/CAR States/Territories to prepare a draft plan for the implementation of the e-TOD for Areas 1 to 4 according to the Amendment 36 to ICAO Annex 15.	
References:	
Adoption of Amendment 36 to Annex 15, ICAO State Letter Ref: AN 2/2-10/18 1 April 2010.	
Strategic Objectives	<i>This working paper is related to Strategic Objectives A and D.</i>

1. Introduction

1.1 This paper presents information on the need for a draft plan for the implementation of the e-TOD and related activities according to the proposal for Amendment 36 to ICAO Annex 15. The Secretariat proposes November 2011 as the deadline for States to develop their plan for the implementation of e-TOD for Areas 1 to 4. States/Territories should give importance and priority to the implementation of e-TOD which has a direct link with mitigating the risk of Controlled Flight Into Terrain (CFIT), emphasizing that the implementation of e-TOD requires knowledgeable and skilled personnel and that this can be achieved only with appropriate training.

2. Review of updated e-TOD requirements

2.1 E/CAR States and Territories should consider significant benefits for international civil aviation safety that will be provided by in- flight and ground-based applications that rely on quality electronic terrain and obstacle data (GPWS, MSAW, procedure design, PBN, etc.). In this regard, it is highlighted that e-TOD will be useful and critical in emergency situations, i.e.: emergency landing or missed approach, SAR activity in a mountainous area, etc.

2.2 States have raised concern on the e-TOD requirements from both technical and institutional perspectives. Although there are a number of reasons for these concerns, the primary issue is related to the implementation and maintenance costs for the data sets, in particular, those relating to the provision of data for Area 2.

2.3 A review of the e-TOD SARPs and guidance material has been carried out within the framework of ICAO to determine if refinement of SARPs or development of additional guidance material is necessary. The Study Group in Montreal noted that an agreement was initially reached regarding the required changes/minor refinements for Area 1, Area 3 and Area 4, as well as some general changes affecting all areas.

2.4 In addition the Air Navigation Commission on 12 March 2009, carried out a preliminary review of draft Amendment 36 to Annex 15 and consequential amendments to Annexes 4, 11 and 14 and the PANS-ABC (Doc 8400) and that State Letter Ref.: AN 2/2.2-09/13 dated 23 April 2009 has been issued and specifically State Letter Ref: AN 2/2-10/18 dated 1 April 2010. It is highlighted that comments on the proposal for Amendment 36 to Annex 15 should be in conformity with the Resolution of Adoption to reach Montreal by November 18 2010. States are urged to study the proposal for amendment and send their comments to ICAO Headquarters before the deadline. For easy reference the proposed Amendment 36 to Annex 15 that includes the part related to e-TOD (Chapter 10 and Appendix 8) is attached as **Appendix** to this paper.

2.5 Some of the most important changes which would be introduced to Annex 15, Chapter 10 on e-TOD consist of the following:

1. The term “dataset” will be used instead of “database”, since it was concluded that the use of the word “database” was misleading as this is often interpreted as having the specific meaning of a relational database. With this interpretation in mind, it could be said that the term “database” is in conflict with the open approach taken by the ISO 19100 series of standards which are mandated by ICAO Annex 15 for the provision of e-TOD. Furthermore, ICAO Annex 15, when referring to the ISO 19100 series, refers to datasets in 10.5.2, compounding the inconsistency.
2. No validation is found for the provision of Area 3 data other than to support synthetic vision operations in the future. In considering the provision of Area 3 data, no business case could be determined for the provision of such data by a State. Instead, it is concluded that the provision of such data should be at the discretion of the aerodrome operator and presumably would be based on a business case. It is assumed that some States may wish to provide Area 3 data and it is, therefore, submitted that the Area 3 requirements be amended from a Standard to a Recommendation.
3. The current provisions in Chapter 10 require only terrain data for Area 4. It is stated that this data is used for height determination during CAT II/III operations. Today, this information is provided through the Precision Approach Terrain Chart (PATC). As this chart contains more than just terrain information, it is concluded that terrain data alone is insufficient to provide an electronic dataset which may replace the PATC. Consequently, it is agreed that an obstacle dataset should also be provided for Area 4. The dataset shall contain all the features which may impact height determination and which are not contained within the

terrain dataset. The numerical requirements proposed for Area 4 obstacles are based upon those existing for terrain. With regard to physical size of Area 4, it is recommended that area of coverage should be extended along the extended centreline of the runway in areas where the terrain “*is mountainous or otherwise significant to users of the chart*”.

4. The list of terrain attributes in ICAO Annex 15 includes “*Surface Type*” which has proven to be a major concern for States as this information is not typically available within existing datasets and, furthermore, is costly to determine. Nonetheless, the longer-term value of having this data was understood. As a result, it was agreed that this attribute should be a Recommendation.
5. In connection with the above, the list of obstacle attributes in ICAO Annex 15 did not include “*Height*” which is concluded as being a deficiency. As a result, it is proposed that this attribute is added.

2.6 The meeting should take note of the revised Area 2 proposal has been developed based on the following principles:

- Area 2 remains as the area extending to 45km from the ARP or the TMA boundary whichever is the less;
- a small (10km) omnidirectional area;
- a minimum obstacle height of 3m is applied within the extended runway strip;
- a minimum obstacle height of 3m within the take-off and approach areas;
- a minimum obstacle height of 15m elsewhere in the area within 10km unless safety or operational reasons dictate otherwise;
- in the remaining region from 10km to 45km or the TMA boundary obstacles higher than 100m above ground level are sufficient unless operational or safety reasons require data to be collected for obstacles above 30m; and
- a dataset is provided for the entire 45km (or TMA) region around an aerodrome.

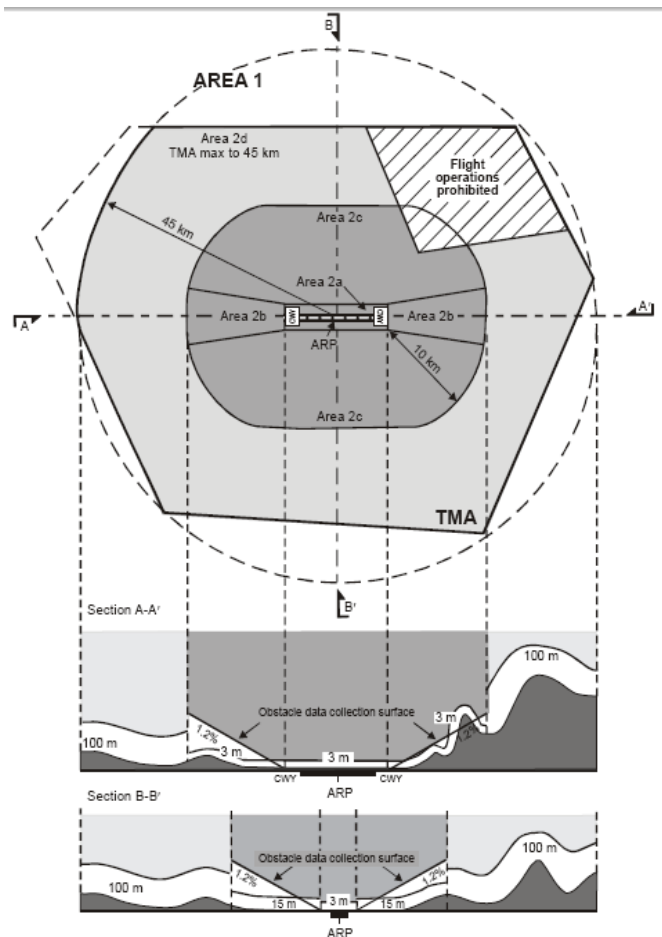


Figure AS-2. Obstacle data collection surfaces — Area 1 and Area 2

2.7 The basis behind the proposal for Area 2 is as follows:

- data with a high degree of accuracy and resolution is only needed where flight operations warrant it. This may typically be described as the area within 10km of the aerodrome and where planned operations bring aircraft close to terrain;
- outside of these regions obstacles above 100m above ground are considered to be sufficient;
- it is seen as not being pragmatic to capture every obstacle as, especially where terrain rises, many small obstacles may penetrate the surface whilst the terrain itself is the constraining factor in flight operations;
- within the approach and take-off areas and aerodrome area, a minimum obstacle height of 3m is considered to be safe. This has been derived from the accuracy requirements of Area 2 obstacles where a vertical accuracy of 3m is specified;
- outside of these areas, but within 10km of the aerodrome, a minimum obstacle height of 15m is set. This is considered to provide a reasonable minimum and makes use of the vegetation buffers that are normally applied within procedure design;
- where it is deemed necessary that obstacles over 3m are provided within this area but outside of the approach and take-off areas, then they shall be collected;
- in the area between 10km and 45km, obstacles with a height greater than 100m are considered to provide a sufficient dataset unless safety or operational reasons necessitate data for obstacles above 30m; and
- where it is deemed necessary that obstacles over 30m are provided within the area between 10km to 45km, they shall be collected.

2.8 Based on the above, the meeting should take note that in the proposed Draft Amendment 36 to Annex 15, Area 2 has been divided into four sub-areas as follows:

- Area 2a is described as a rectangular area around the runway extending to 255m each side of the runway centre line with the length of the runway strip plus any clearway(s) that exist;
- Area 2b is described as a surface with a 1.2% slope extending from the ends of Area 2a with a length of 10km and a splay of 15% to each side;
- Area 2c is described as an Area with a 1.2% slope extending outside Area 2a and Area 2b at a distance of not more than 10 km to the boundary of Area 2a; and
- Area 2d is described as the remainder of Area 2 outside the Areas 2a, 2b and 2c up to a distance of 45km from the ARP, or the TMA boundary, whichever is smaller.

2.9 Consequently, obstacles shall be surveyed and collected if they:

- are located within Area 2a and their height exceeds 3m above ground level;
- penetrate the surface in Area 2b and their height exceeds 3m above ground level;
- penetrate the surface in Area 2c and their height exceeds 15m above ground level;
- And are located within Area 2d and their height exceeds 100m above ground level.

3. Discussion

3.1 The above proposal will offer some benefits when the geographic footprint is considered, with consequent reduction in data collection requirements and cost.

3.2 The users' organizations (IATA and IFALPA) highlighted the importance of the involvement of the end users (pilots) in order to consider their requirements, taking into consideration the fleet capabilities in the CAR Region, and accordingly avoid investing in something which will not be used by the airlines. In this respect, reference is made to Annex 15 para. 10.2.5, Note 2 where it's stated that *"It is recognized that some applications listed in 10.1 could be adequately accommodated with terrain and obstacle data sets that are of lower requirements than those specified in Appendix 8, Table A8-1 and Table A8-2, respectively. Consequently, careful evaluation of available data sets by data users is necessary in order to determine if the products are fit for their intended use"*.

4. Conclusion

4.1 The importance of the quality of the e-TOD datasets is to *"make an inventory and evaluate the quality of existing terrain and obstacle data sources and in the case of data collection, consider carefully the required level of details of collected terrain and obstacle data with particular emphasis on obstacle data and associated cost"*. Reference is also made to Annex 15 para. 10.5.6 where it is stated that both terrain data product specifications and obstacle data product specifications shall identify the data quality requirements for each data product. This shall include a statement on acceptable conformance quality levels and corresponding data quality measures.

5. Suggested action

5.1 E/CAR States and Territories are invited to:

- a) develop their State plan for the implementation of the e-TOD by November 2011, according to the proposal for Amendment 36 to ICAO Annex 15 that must include legal and institutional regulations related to e-TOD which are not yet published by States;
- b) encourage coordination and cooperation among E/CAR States, in order to reach the implementation of e-TOD according to the proposal for Amendment 36 to ICAO Annex 15 with the objective of improving the overall safety and efficiency of air navigation; and
- c) inform the ICAO NACC Regional Office on the progress of the above activities no later than **31 December 2010**.



International
Civil Aviation
Organization

Organisation
de l'aviation civile
internationale

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de Aviación Civil
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Международная
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авиации

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航空组织

Tel.: +1 (514) 954-8194

Ref.: AN 2/2-10/18

1 April 2010

Subject: Adoption of Amendment 36 to Annex 15

Action Required: a) Notify any disapproval before 12 July 2010; b) Notify any differences and compliance before 18 October 2010 and 12 October 2015

Sir/Madam,

1. I have the honour to inform you that Amendment 36 to the *International Standards and Recommended Practices — Aeronautical Information Services* (Annex 15 to the Convention on International Civil Aviation) was adopted by the Council at the fifth meeting of its 189th Session on 22 February 2010. Copies of the Amendment and the Resolution of Adoption are available as attachments to the electronic version of this State letter on the ICAO-NET (www.icao.int/icaonet).

2. When adopting the amendment, the Council prescribed 12 July 2010 as the date on which it will become effective, except for any part concerning which a majority of Contracting States have registered their disapproval before that date. In addition, the Council resolved that Amendment 36, to the extent it becomes effective, will become applicable on 18 November 2010, except for paragraphs 10.1.4 and 10.1.5 regarding electronic terrain and obstacle data (eTOD) which will become applicable on 12 November 2015.

3. Amendment 36 arises from:

- a) the Secretariat, with the assistance of the Aviation Use of the Public Internet Study Group (AUPISG), to introduce new provisions relating to the operational use of the public Internet;
- b) the Secretariat, with the assistance of the International Airways Volcano Watch Operations Group (IAVWOPSG), to revise provisions relating to the reporting of volcanic ash deposition;
- c) the Secretariat, with the assistance of the Aeronautical Information Services-Aeronautical Information Management Study Group (AIS-AIMSG), to update provisions relating to quality management systems (QMS), the use of automation

enabling digital data exchange, electronic aeronautical information publications (eAIP), the NOTAM Format and electronic terrain and obstacle data (eTOD); and

- d) editorial changes proposed by the Secretariat aimed at eliminating some inconsistencies.

The subjects are given in the amendment to the Foreword of Annex 15, Twelfth Edition, a copy of which is in Attachment A.

4. The amendment proposal introduces new or revised provisions relating to the use of the public Internet, the reporting of volcanic ash deposition, quality management systems (QMS), the use of automation enabling digital data exchange, electronic aeronautical information publications (eAIP), the NOTAM Format and an extended applicability date and reduced requirements for electronic terrain and obstacle data (eTOD).

5. In accordance with the decision of the 26th Session of the Assembly, I would like to bring to your attention the Organization's long-standing practice of providing documentation to States upon request. In this regard, I wish to refer you to the ICAO-NET website (www.icao.int/icaonet) where you can access all relevant documentation. The practice of dispatching printed copies of such documentation has now been discontinued.

6. In conformity with the Resolution of Adoption, may I request:

- a) that before 12 July 2010 you inform me if there is any part of the adopted Standards and Recommended Practices (SARPs) amendments in Amendment 36 concerning which your Government wishes to register disapproval, using the form in Attachment B for this purpose. Please note that only statements of disapproval need be registered and if you do not reply it will be assumed that you do not disapprove of the amendment;
- b) that before 18 October 2010¹ you inform me of the following, using the form in Attachment C:
 - 1) any differences that will exist on 18 November 2010² between the national regulations or practices of your Government and the provisions of the whole of Annex 15, as amended by all amendments up to and including Amendment 36, and thereafter of any further differences that may arise;
 - 2) the date or dates by which your Government will have complied with the provisions of the whole of Annex 15 as amended by all amendments up to and including Amendment 36.

7. With reference to the request in paragraph 6 a) above, it should be noted that a registration of disapproval of Amendment 36 or any part of it in accordance with Article 90 of the Convention does not constitute a notification of differences under Article 38 of the Convention. To comply with the latter provision, a separate statement is necessary if any differences do exist, as requested in paragraph 6 b) 1). It is recalled in this respect that international Standards in Annexes have a

¹ 12 October 2015 for proposed paragraphs 10.1.4 and 10.1.5 related to electronic terrain and obstacle data.

² 12 November 2015 for proposed paragraphs 10.1.4 and 10.1.5 related to electronic terrain and obstacle data.

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conditional binding force, to the extent that the State or States concerned have not notified any difference thereto under Article 38 of the Convention.

8. Guidance on the determination and reporting of differences is given in the Note on the Notification of Differences in Attachment D.

9. Please note that a detailed repetition of previously notified differences, if they continue to apply, may be avoided by stating the current validity of such differences.

10. I would appreciate it if you would also send a copy of your notifications, referred to in paragraph 6 b) above, to the ICAO Regional Director accredited to your Government.

11. As soon as practicable after the amendment becomes effective, on 12 July 2010, replacement pages incorporating Amendment 36 will be forwarded to you.

Accept, Sir/Madam, the assurances of my highest consideration.

A handwritten signature in black ink, appearing to read 'R. Benjamin', is written over a vertical line.

Raymond Benjamin
Secretary General

Enclosures:

- A — Amendment to the Foreword of Annex 15
- B — Form on notification of disapproval of all or part of Amendment 36 to Annex 15
- C — Form on notification of compliance with or differences from Annex 15
- D — Note on the Notification of Differences

ATTACHMENT A to State letter AN 2/2-10/18**AMENDMENT TO THE FOREWORD OF ANNEX 15**

Add the following at the end of Table A:

<i>Amendment</i>	<i>Source(s)</i>	<i>Subject</i>	<i>Adopted/Approved Effective Applicable</i>
36	The Secretariat with the assistance of the Aviation Use of the Public Internet Study Group (AUPISG) and the Aeronautical Information Services-Aeronautical Information Management Study Group (AIS-AIMSG); recommendations of the fourth meeting of the International Airways Volcano Watch Operations Group (IAVWOPSG/4).	New provisions relating to the operational use of the public Internet; the reporting of volcanic ash deposition; quality management systems; the use of automation enabling digital data exchange; electronic aeronautical information publications; the NOTAM Format; and an extended applicability date and reduced requirements for electronic terrain and obstacle data.	22 February 2010 12 July 2010 18 November 2010 12 November 2015 (for paragraphs 10.1.4 and 10.1.5)

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ATTACHMENT B to State letter AN 2/2-10/18

**NOTIFICATION OF DISAPPROVAL OF ALL OR PART OF
AMENDMENT 36 TO ANNEX 15**

To: The Secretary General
International Civil Aviation Organization
999 University Street
Montreal, Quebec
Canada H3C 5H7

(State) _____ hereby wishes to disapprove the following parts of
Amendment 36 to Annex 15:

Signature _____

Date _____

NOTES

- 1) If you wish to disapprove all or part of Amendment 36 to Annex 15, please dispatch this notification of disapproval to reach ICAO Headquarters by 12 July 2010. If it has not been received by that date it will be assumed that you do not disapprove of the amendment. **If you approve of all parts of Amendment 36, it is not necessary to return this notification of disapproval.**
- 2) This notification should not be considered a notification of compliance with or differences from Annex 15. Separate notifications on this are necessary (See Attachment C).
- 3) Please use extra sheets as required.

ATTACHMENT C to State letter AN 2/2-10/18**NOTIFICATION OF COMPLIANCE WITH OR DIFFERENCES
FROM ANNEX 15
(Including all amendments up to and including Amendment 36)**

To: The Secretary General
International Civil Aviation Organization
999 University Street
Montreal, Quebec
Canada H3C 5H7

1. No differences will exist on _____ between the national regulations and/or practices of **(State)** _____ and the provisions of Annex 15, including all amendments up to and including Amendment 36.

2. The following differences will exist on _____ between the regulations and/or practices of **(State)** _____ and the provisions of Annex 15, including Amendment 36 (Please see Note 3 below.)

a) Annex Provision (Please give exact paragraph reference)	b) Difference Category (Please indicate A, B, or C)	c) Details of Difference (Please describe the difference clearly and concisely)	d) Remarks (Please indicate reasons for the difference)
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(Please use extra sheets as required)

C-2

By the dates indicated below, **(State)** _____ will have complied with the provisions of Annex 15 including all amendments up to and including Amendment 36 for which differences have been notified in 2 above.

a)	Annex Provision (Please give exact paragraph reference)	b)	Date	c)	Comments
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(Please use extra sheets as required)

Signature _____

Date _____

NOTES

- 1) If paragraph 1 above is applicable to you, please complete paragraph 1 and return this form to ICAO Headquarters. If paragraph 2 is applicable to you, please complete paragraphs 2 and 3 and return the form to ICAO Headquarters.
- 2) Please dispatch the form to reach ICAO Headquarters by 18 October 2010 and 12 October 2015 for proposed paragraphs 10.1.4 and 10.1.5 related to electronic terrain and obstacle data.
- 3) A detailed repetition of previously notified differences, if they continue to apply, may be avoided by stating the current validity of such differences.
- 4) Guidance on the notification of differences from Annex 15 is provided in the Note on the Notification of Differences at Attachment D.
- 5) Please send a copy of this notification to the ICAO Regional Office accredited to your Government.

ATTACHMENT D to State letter AN 2/2-10/18**NOTE ON THE NOTIFICATION OF DIFFERENCES TO ANNEX 15 AND
FORM OF NOTIFICATION**

(Prepared and issued in accordance with instructions of the Council)

1. Introduction

1.1 The Assembly and the Council, when reviewing the notification of differences by States in compliance with Article 38 of the Convention, have repeatedly noted that the state of such reporting is not entirely satisfactory.

1.2 With a view to achieving a more comprehensive coverage, this note is issued to facilitate the determination and reporting of such differences and to state the primary purpose of such reporting.

1.3 The primary purpose of reporting of differences is to promote safety and efficiency in air navigation by ensuring that governmental and other agencies, including operators and service providers, concerned with international civil aviation are made aware of all national regulations and practices in so far as they differ from those prescribed in the ICAO Standards.

1.4 Contracting States are, therefore, requested to give particular attention to the notification before 18 October 2010¹ of differences with respect to Standards in Annex 15. The Council has also urged Contracting States to extend the above considerations to Recommended Practices.

1.5 Contracting States are asked to note further that it is necessary to make an explicit statement of intent to comply where such intent exists, or where such is not the intent, of the difference or differences that will exist. This statement should be made not only to the latest amendment but to the whole Annex, including the amendment.

1.6 If previous notifications have been made in respect of this Annex, detailed repetition may be avoided, if appropriate, by stating the current validity of the earlier notification. States are requested to provide updates of the differences previously notified after each amendment, as appropriate, until the difference no longer exists.

2. Notification of differences to Annex 15, including Amendment 36

2.1 Past experience has indicated that the reporting of differences to Annex 15 has in some instances been too extensive since some appear merely to be a different manner of expressing the same intent.

2.2 Guidance to Contracting States in the reporting of differences to Annex 15 can only be given in very general terms. Where the national regulations of States call for compliance with procedures that are not identical but essentially similar to those contained in the Annex, no difference should be reported since the details of the procedures existing are the subject of notification through the medium of aeronautical information publications. Although differences to Recommended Practices are not notifiable under Article 38 of the Convention, Contracting States are urged to notify the Organization of the differences between their national regulations and practices and any corresponding Recommended Practices contained in an Annex. States should categorize each difference notified on the basis of whether the corresponding national regulation is:

¹12 October 2015 for proposed paragraphs 10.1.4 and 10.1.5 related to electronic terrain and obstacle data.

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- a) ***More exacting or exceeds the ICAO Standard or Recommended Practice (SARP) (Category A).*** This category applies when the national regulation is more demanding than the corresponding SARP, or imposes an obligation within the scope of the Annex which is not covered by a SARP. This is of particular importance where a State requires a higher standard which affects the operation of aircraft of other Contracting States in and above its territory;
- b) ***Different in character or other means of compliance (Category B)*.*** This category applies when the national regulation is different in character from the corresponding ICAO SARP, or when the national regulation differs in principle, type or system from the corresponding SARP, without necessarily imposing an additional obligation; and
- c) ***Less protective or partially implemented/not implemented (Category C).*** This category applies when the national regulation is less protective than the corresponding SARP; or when no national regulation has been promulgated to address the corresponding SARP, in whole or in part.

2.3 When a Contracting State deems an ICAO Standard concerning aircraft, operations, equipment, personnel, or air navigation facilities or services to be not applicable to the existing aviation activities of the State, notification of a difference is not required. For example, a Contracting State that is not a State of Design or Manufacture and that does not have any national regulations on the subject, would not be required to notify differences to Annex 8 provisions related to the design and construction of an aircraft.

2.4 For States that have already fully reported differences from Annex 15 or have reported that no differences exist, the reporting of any further differences occasioned by the amendment should be relatively straightforward; however, attention is called to paragraph 1.5 wherein it is indicated that this statement should be not only to the latest amendment but to the whole Annex, including the amendment.

3. *Form of notification of differences*

3.1 Differences should be notified in the following form:

- a) *Reference:* The number of the paragraph or subparagraph in Annex 15 as amended which contains the Standard or Recommended Practice to which the difference relates;
- b) *Category:* Indicate the category of the difference as A, B or C in accordance with paragraph 2.2 above.
- c) *Description of the difference:* Clearly and concisely describe the difference and its effect;
- d) *Remarks:* Under “Remarks” indicate reasons for the difference and intentions including any planned date for implementation.

* The expression “different in character or other means of compliance” in b) would be applied to a national regulation which achieves, by other means, the same objective as that of the corresponding ICAO SARPs and so cannot be classified under a) or c).

D-3

3.2 The differences notified will be recorded in a Supplement to the Annex, normally in the terms used by the Contracting State when making the notification. In the interest of making the supplement as useful as possible, please make statements as clear and concise as possible and confine remarks to essential points. Comments on implementation, in accordance with paragraph 4 b) 2) of the Resolution of Adoption, should not be combined with those concerning differences. The provision of extracts from national regulations cannot be considered as sufficient to satisfy the obligation to notify differences. General comments that do not relate to specific differences will not be published in Supplements.

— END —

AMENDMENT No. 36

TO THE

**INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES**

**AERONAUTICAL INFORMATION
SERVICES**

ANNEX 15

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

The amendment to Annex 15 contained in this document was adopted by the Council of ICAO on **22 February 2010**. Such parts of this amendment as have not been disapproved by more than half of the total number of Contracting States on or before **12 July 2010** will become effective on that date and will become applicable on **18 November 2010** and **12 November 2015** as specified in the Resolution of Adoption. (State letter AN 2/2.2-10/18 refers.)

FEBRUARY 2010

INTERNATIONAL CIVIL AVIATION ORGANIZATION

**AMENDMENT 36 TO THE INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES**

AERONAUTICAL INFORMATION SERVICES

RESOLUTION OF ADOPTION

The Council

Acting in accordance with the Convention on International Civil Aviation, and particularly with the provisions of Articles 37, 54 and 90 thereof,

1. *Hereby adopts* on 22 February 2010 Amendment 36 to the International Standards and Recommended Practices contained in the document entitled International Standards and Recommended Practices, Annex 15 — *Aeronautical Information Services* which for convenience is designated Annex 15 to the Convention;

2. *Prescribes* 12 July 2010 as the date upon which the said amendment shall become effective, except for any part thereof in respect of which a majority of the Contracting States have registered their disapproval with the Council before that date;

3. *Resolves* that the said amendment or such parts thereof as have become effective shall become applicable on 18 November 2010¹;

4. *Requests the Secretary General:*

a) to notify each Contracting State immediately of the above action and immediately after 12 July 2010 of those parts of the amendment which have become effective;

b) to request each Contracting State:

1) to notify the Organization (in accordance with the obligation imposed by Article 38 of the Convention) of the differences that will exist on 18 November 2010¹ between its national regulations or practices and the provisions of the Standards in the Annex as hereby amended, such notification to be made before 18 October 2010², and thereafter to notify the Organization of any further differences that arise;

2) to notify the Organization before 18 October 2010² of the date or dates by which it will have complied with the provisions of the Standards in the Annex as hereby amended;

c) to invite each Contracting State to notify additionally any differences between its own practices and those established by the Recommended Practices, when the notification of such differences is important for the safety of air navigation, following the procedure specified in subparagraph b) above with respect to differences from Standards.

¹ 12 November 2015 for proposed paragraphs 10.1.4 and 10.1.5 related to electronic terrain and obstacle data.

² 12 October 2015 for proposed paragraphs 10.1.4 and 10.1.5 related to electronic terrain and obstacle data.

NOTES ON THE PRESENTATION OF THE PROPOSED AMENDMENT

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

1. ~~Text to be deleted is shown with a line through it.~~ text to be deleted
2. **New text to be inserted is highlighted with grey shading.** new text to be inserted
3. ~~Text to be deleted is shown with a line through it~~ followed by
the replacement text which is highlighted with grey shading. new text to replace existing text

TEXT OF AMENDMENT 36 TO THE
INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES
AERONAUTICAL INFORMATION SERVICES
ANNEX 15

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

...

CHAPTER 2. DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for aeronautical information services, they have the following meanings:

...

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

...

CHAPTER 3. GENERAL

...

3.2 Quality management system

3.2.1 ~~Each Contracting State shall take all necessary measures to introduce a properly organized quality system containing procedures, processes and resources necessary to implement quality management at each function stage~~ Quality management systems shall be implemented and maintained encompassing all functions of an aeronautical information service, as outlined in 3.1.7 above. The execution of such quality management systems shall be made demonstrable for each function stage, when required.

3.2.2 Recommendation.— *Quality management should be applicable to the whole aeronautical information data chain from data origination to distribution to the next intended user, taking into consideration the intended use of data.*

Note 1.— Quality management may be provided by a single quality management system or serial quality management systems.

Note 2.— Letters of agreement concerning data quality between originator and distributor and between distributor and next intended user may be used to manage the aeronautical information data chain.

~~3.2.2~~ **3.2.3 Recommendation.**— The quality management system established in accordance with 3.2.1 ~~should be in conformity with~~ follow the International Organization for Standardization (ISO) 9000 series of quality assurance standards, and ~~be~~ certified by an approved organization.

Note 1.— An ISO 9000 certificate issued by an accredited certification body would be considered an acceptable means of compliance.

Note 2.— International Organization for Standardization (ISO) 9000 series of quality assurance standards provide a basic framework for the development of a quality assurance programme and define the term “accredited certification body”. The details of a successful programme are to be formulated by each State and in most cases are unique to the State organization.

Note 3.— Supporting material in respect of the processing of aeronautical data is contained in RTCA Document DO-200A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-76 — Standards for Processing Aeronautical Data. These standards support the development and application of aeronautical databases.

~~3.2.3~~ **3.2.4** Within the context of a the established quality management system, the skills and knowledge required for each function shall be identified, and personnel assigned to perform those functions shall be appropriately trained. States shall ensure that personnel possess the skills and competencies required to perform specific assigned functions, and appropriate records shall be maintained so that the qualifications of personnel can be confirmed. Initial and periodic assessments shall be established that require personnel to demonstrate the required skills and competencies. Periodic assessments of personnel shall be used as a means to detect and correct shortfalls.

~~3.2.4~~ **3.2.5** ~~States shall ensure that established procedures exist in order that aeronautical data at any moment is traceable to its origin~~ Each quality management system shall include the necessary policies, processes and procedures, including those for the use of metadata, to ensure and verify that aeronautical data is traceable throughout the aeronautical information data chain so as to allow any data anomalies or errors, detected in use to be identified by root cause, corrected and communicated to affected users. ~~during the production/maintenance phases or in operational use, to be corrected.~~

~~3.2.5~~ **3.2.6** The established quality management system shall provide users with the necessary assurance and confidence that distributed aeronautical information/data satisfy ~~stated requirements for data quality~~ the aeronautical data quality requirements (for accuracy, resolution and integrity) and for data traceability by the use of appropriate procedures in every stage of data production or data modification process as specified in Appendix 7, and the data traceability requirements through the provision of appropriate metadata as specified in 3.8.1. The system shall also provide assurance of the applicability period of intended use of aeronautical data as well as that the agreed distribution dates will be met.

3.2.7 All necessary measures shall be taken to monitor compliance with the quality management system in place.

~~3.2.6~~ **3.2.8** The order of accuracy for aeronautical data, based upon a 95 per cent confidence level, shall be as specified in Annex 11, Chapter 2, and Annex 14, Volumes I and II, Chapter 2. In that respect, three types of positional data shall be identified: surveyed points (runway thresholds, navigation aid positions, etc.), calculated points (mathematical calculations from the known surveyed points of points in space/fixes) and declared points (e.g. flight information region boundary points).

~~3.2.7~~ **3.2.9** ~~States shall ensure that the~~The order of publication resolution of aeronautical data shall be that as specified in Appendices 1 and 7.

~~3.2.8~~ ~~3.2.10~~ ~~Contracting States shall ensure that the~~ The integrity of aeronautical data is shall be maintained throughout the data process from survey/origin to distribution to the next intended user (the entity that receives the aeronautical information from the aeronautical information service provider). Aeronautical data integrity requirements shall be based upon the potential risk resulting from the corruption of data and upon the use to which the data item is put. Consequently, the following classifications and data integrity levels shall apply:

- a) critical data, integrity level 1×10^{-8} : there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;
- b) essential data, integrity level 1×10^{-5} : there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and
- c) routine data, integrity level 1×10^{-3} : there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

Note 1.— Distribution to the next intended user will differ in the delivery method applied which may either be:

Physical distribution. The means by which aeronautical information/data distribution is achieved through the delivery of a physical package, such as postal services.

or

Direct electronic distribution. The means by which aeronautical information/data distribution is achieved automatically through the use of a direct electronic connection between the AIS and the next intended user.

Note 2.— Different delivery methods and data media may require different procedures to ensure the required data quality.

~~3.2.9~~ ~~3.2.11~~ Aeronautical data quality requirements related to classification and data integrity shall be as provided in Tables A7-1 to A7-5 of Appendix 7.

~~3.2.10~~ ~~3.2.12~~ ~~Protection of electronic~~ Electronic aeronautical data sets while stored or in transit shall be ~~totally monitored~~ protected by the inclusion in the data sets of the a 32-bit cyclic redundancy check (CRC) implemented by the application dealing with the data sets. This shall apply to the protection of all integrity levels of data sets as specified in 3.2.10. ~~To achieve protection of the integrity level of critical and essential aeronautical data as classified in 3.2.8, a 32- or 24 bit CRC algorithm shall apply respectively.~~

Note 1.— This requirement does not apply to the communications systems used for the transfer of data sets.

Note 2.— Guidance material on the use of a 32-bit CRC algorithm to implement a protection of electronic aeronautical data sets is contained in the Aeronautical Information Services Manual (Doc 8126).

~~3.2.11 **Recommendation.**— To achieve protection of the integrity level of routine aeronautical data as classified in 3.2.8, a 16-bit CRC algorithm should apply.~~

~~3.2.12~~ **3.2.13** Material to be issued as part of the Integrated Aeronautical Information Package shall be thoroughly checked and coordinated with the **services** responsible ~~services~~ before it is submitted to the aeronautical information service, in order to make certain that all necessary information has been included and that it is correct in detail prior to distribution. Validation and verification procedures shall be established which ensure that quality requirements (accuracy, resolution, integrity) and traceability of aeronautical data are met.

Note.— Guidance material on the liaison with other related services is contained in ~~the Aeronautical Information Services Manual (Doc 8126).~~

~~3.2.13~~ **3.2.14** Demonstration of compliance of the quality **management** system applied shall be by audit. If nonconformity is identified, initiating action to correct its cause shall be determined and taken. All audit observations and remedial actions shall be evidenced and properly documented.

...

3.6 General specifications

...

3.6.5 Use of automation

Recommendation.— Automation ~~in AIS~~ **enabling digital data exchange** should be introduced with the objective of improving the speed, ~~accuracy,~~ **quality,** efficiency and cost-effectiveness of aeronautical information services.

Note.— Guidance material on an aeronautical conceptual and data exchange model for the development of databases and the establishment of data exchange services is contained in Doc 8126.

...

3.6.7 Human Factors considerations

3.6.7.1 The organization of the aeronautical information services as well as the design, contents, processing and distribution of aeronautical information/data shall take into consideration Human Factors principles which facilitate their optimum utilization.

3.6.7.2 Due consideration shall be given to the integrity of information where human interaction is required and mitigating steps taken where risks are identified.

Note.— This may be accomplished through the design of systems, through operating procedures or through improvements in the operating environment.

...

3.8 Metadata

3.8.1 Metadata shall be collected for aeronautical data processes and exchange points. This metadata collection shall be applied throughout the aeronautical information data chain, from survey/origin to distribution to the next intended user.

3.8.2 The metadata to be collected shall include, as a minimum:

- a) the name of the organization or entity performing the function;
- b) the function performed; and
- c) the date and time of operation.

Note.— The function performed indicates any action of originating, transmitting or manipulating the data.

CHAPTER 4. AERONAUTICAL INFORMATION PUBLICATIONS (AIP)

...

4.3 Specifications for AIP Amendments

...

4.3.4 Each AIRAC AIP Amendment page, including the cover sheet, shall display an effective date. When an effective time other than 0000 UTC is used, the effective time shall also be displayed on the cover sheet.

...

4.4 Specifications for AIP Supplements

...

4.4.4 When an error occurs in an AIP Supplement or when the period of validity of an AIP Supplement is changed, a new AIP Supplement shall be published as a replacement.

Note.— The requirements for NOTAM apply when time constraints do not allow sufficient time for the distribution of an AIP Supplement.

Editorial Note.— Renumber subsequent paragraphs accordingly.

...

4.6 Electronic AIP (eAIP)

4.6.1 **Recommendation.**— *The AIP, AIP Amendment, AIP Supplement and AIC should also be published in a format that allows for displaying on a computer screen and printing on paper.*

Note 1.— This composite electronic document is named “Electronic AIP” (eAIP) and may be based on a format that allows for digital data exchange.

Note 2.— Guidance material for the production and provision of the eAIP is contained in Doc 8126.

4.6.2 When provided, the information content of the eAIP and the structure of chapters, sections and sub-sections shall follow the content and structure of the paper AIP. The eAIP shall include files that allow for printing a paper AIP.

4.6.3 Recommendation.— *When provided, the eAIP should be available on a physical distribution medium (CD, DVD, etc.) and/or online on the Internet.*

Note.— *Guidance material on the use of the Internet is contained in Guidelines on the Use of the Public Internet for Aeronautical Applications (Doc 9855).*

CHAPTER 5. NOTAM

5.1 Origination

...

5.1.1.1 A NOTAM shall be originated and issued concerning the following information:

- a) establishment, closure or significant changes in operation of aerodrome(s)/heliport(s) or runways;
- b) establishment, withdrawal and significant changes in operation of aeronautical services (AGA, AIS, ATS, COMCNS, MET, SAR, etc.);

...

- q) significant changes in the level of protection normally available at an aerodrome/heliport for rescue and firefighting purposes. NOTAM shall be originated only when a change of category is involved and such change of category shall be clearly stated (see Annex 14, Volume I, Chapter 9, and Attachment A, Section 17);
- r) presence or removal of, or significant changes in, hazardous conditions due to snow, slush, ice, radioactive material, toxic chemicals, volcanic ash deposition or water on the movement area;

...

5.1.1.6 When an AIP Amendment or an AIP Supplement is published in accordance with AIRAC procedures, a NOTAM shall be originated giving a brief description of the contents, the effective date and time, and the reference number ~~to~~ of the amendment or supplement. This NOTAM shall come into force on the same effective date and time as the amendment or supplement and shall remain valid in the pre-flight information bulletin for a period of fourteen days.

...

5.2 General specifications

...

5.2.2 Text of NOTAM shall be composed of the significations/uniform abbreviated phraseology assigned to the ICAO NOTAM Code complemented by ICAO abbreviations, indicators, identifiers, designators, call signs, frequencies, figures and plain language.

Note.— *Detailed guidance material covering NOTAM, SNOWTAM, ASHTAM and PIB production is contained in Doc 8126.*

...

5.2.6 When errors occur in a NOTAM, a NOTAM with a new number to replace the erroneous NOTAM shall be issued or the erroneous NOTAM shall be cancelled and a new NOTAM issued.

...

5.2.13 A checklist of valid NOTAM shall be issued as a NOTAM over the Aeronautical Fixed Service (AFS) at intervals of not more than one month using the NOTAM Format specified in Appendix 6. One NOTAM shall be issued for each series.

Note.— Omitting a NOTAM from the checklist does not serve to cancel a NOTAM.

...

CHAPTER 6. AERONAUTICAL INFORMATION REGULATION AND CONTROL (AIRAC)

6.1 General specifications

6.1.1 Information concerning the circumstances listed in Appendix 4, Part 1, shall be distributed under the regulated system (AIRAC), i.e. basing establishment, withdrawal or significant changes upon a series of common effective dates at intervals of 28 days, including ~~29 January 1998~~ 14 January 2010. The information notified therein shall not be changed further for at least another 28 days after the effective date, unless the circumstance notified is of a temporary nature and would not persist for the full period.

...

6.2 Provision of information in paper copy form

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6.2.2 **Recommendation.**— *Whenever major changes are planned and where advance notice is desirable and practicable, information published in paper copy form should be distributed by the AIS unit at least 56 days in advance of the effective date. This should be applied to the establishment of, and premeditated major changes in, the circumstances listed in Appendix 4, Part 3, and other major changes if deemed necessary.*

...

6.3 Provision of information in electronic form

...

6.3.3 **Recommendation.**— *Whenever major changes are planned and where advance notice is desirable and practicable, information provided in electronic form should be distributed/made available at least 56 days in advance of the effective date. This should be applied to the establishment of, and premeditated major changes in, the circumstances listed in Appendix 4, Part 3, and other major changes if deemed necessary.*

...

CHAPTER 8. PRE-FLIGHT AND POST-FLIGHT INFORMATION/DATA

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8.2 Automated aeronautical information systems

8.2.1 ~~Where the~~The civil aviation authority or the agency to which the authority to provide service has been delegated in accordance with 3.1.1 c) ~~uses~~ shall use automated pre-flight information systems to make aeronautical information/data available to operations personnel including flight crew members for self-briefing, flight planning and flight information service purposes, ~~the~~The information/data made available shall comply with the provisions of 8.1.2 and 8.1.3.

~~8.2.4~~ 8.2.2 Self-briefing facilities of an automated pre-flight information system shall provide ~~for access by to~~ operations personnel, including flight crew members and other aeronautical personnel concerned, ~~to~~ for consultation as necessary with the aeronautical information service by telephone or other suitable telecommunications means. The human/machine interface of such facilities shall ensure easy access in a guided manner to all relevant information/data.

~~8.2.5~~ 8.2.3 **Recommendation.**— Automated pre-flight information systems for the supply of aeronautical information/data for self-briefing, flight planning and flight information service ~~should~~ shall:

- a) provide for continuous and timely updating of the system database and monitoring of the validity and quality of the aeronautical ~~information~~ data stored;

...

~~8.2.2~~ 8.2.4 **Recommendation.**— *Automated pre-flight information systems providing a harmonized, common point of access by operations personnel, including flight crew members and other aeronautical personnel concerned, to aeronautical information in accordance with 8.2.1 and meteorological information in accordance with 9.5.1 of Annex 3 — Meteorological Service for International Air Navigation, should be established by an agreement between the civil aviation authority or the agency to which the authority to provide service has been delegated in accordance with 3.1.1 c) and the relevant meteorological authority.*

~~8.2.3~~ 8.2.5 Where automated pre-flight information systems are used to provide the harmonized, common point of access by operations personnel, including flight crew members and other aeronautical personnel concerned, to aeronautical information/ data and meteorological information, the civil aviation authority or the agency to which the authority to provide service has been delegated in accordance with 3.1.1 c) shall remain responsible for the quality and timeliness of the aeronautical information/ data provided by means of such a system.

Note.— *The meteorological authority concerned remains responsible for the quality of the meteorological information provided by means of such a system in accordance with 9.5.1 of Annex 3.*

...

CHAPTER 9. TELECOMMUNICATION REQUIREMENTS

...

9.3 Recommendation.— *Subject to availability, satisfactory operation and bilateral/multilateral and/or regional air navigation agreements, the use of public Internet should be permitted for exchange of non-time critical types of aeronautical information.*

Note.— *Guidance material on non-time critical types of aeronautical information and relevant aspects of the public Internet is provided in the Guidelines on the Use of the Public Internet for Aeronautical Applications (Doc 9855).*

CHAPTER 10. ELECTRONIC TERRAIN AND OBSTACLE DATA

10.1—Function

~~Sets of electronic terrain and obstacle data used in combination with aeronautical data, as appropriate, shall satisfy user requirements necessary to support the following air navigation applications:~~

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

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

The data may also be used in other applications such as flight simulator and synthetic vision systems, and may assist in determining the height restriction or removal of obstacles that pose a hazard to air navigation.

10.210.1 Coverage areas and requirements for data provision terrain and obstacle data numerical requirements

~~10.2.1~~10.1.1 — To satisfy requirements necessary to accommodate air navigation systems or functions specified in 10.1, sets of electronic terrain and obstacle data shall be specified as collected and recorded in databases in accordance with the following coverage areas:

- Area 1: the entire territory of a State;
- Area 2: terminal control area; within the vicinity of an aerodrome, sub-divided as follows:
 - Area 2a: a rectangular area around a runway that comprises the runway strip plus any clearway that exists.
- Note.— See Annex 14, Volume I, Chapter 3 for dimensions for runway strip.*
- Area 2b: an area extending from the ends of Area 2a in the direction of departure, with a length of 10 km and a splay of 15% to each side;
- Area 2c: an area extending outside Area 2a and Area 2b at a distance of not more than 10 km from the boundary of Area 2a; and
- Area 2d: an area outside the Areas 2a, 2b and 2c up to a distance of 45 km from the aerodrome reference point, or to an existing TMA boundary, whichever is nearest;
- Area 3: aerodrome/heliport area; and the area bordering an aerodrome movement area that extends horizontally from the edge of a runway to 90 m from the runway centre line and 50 m from the edge of all other parts of the aerodrome movement area.
- Area 4: Category II or III operations approach areas. The area extending 900 m prior to the runway threshold and 60 m each side of the extended runway centre line in the direction of the approach on a precision approach runway, Category II or III.

Note.— See Appendix 8 for descriptions and graphical illustrations of the defined coverage areas.

10.1.2 Recommendation. — Where the terrain at a distance greater than 900 m (3 000 ft) from the runway threshold is mountainous or otherwise significant, the length of Area 4 should be extended to a distance not exceeding 2 000 m (6 500 ft) from the runway threshold.

~~10.2.2~~ — Area 1 shall cover the entire territory of a State, including aerodromes/heliports. Area 2 shall be the terminal control area as published in a State's aeronautical information publication (AIP) or limited to a 45 km radius from the aerodrome/heliport reference point (whichever is smaller). At IFR aerodromes/heliports where a terminal control area has not been established, Area 2 shall be the area within a 45 km radius of the aerodrome/heliport reference point.

~~10.2.3~~ — At IFR aerodromes/heliports, Area 3 shall cover the area that extends from the edge(s) of the runway(s) to 90 m from the runway centre line(s) and for all other parts of aerodrome/heliport movement area(s), 50 m from the edge(s) of the defined area(s).

~~10.2.4~~ — Area 4 shall be restricted to those runways where precision approach Category II or III operations have been established and where detailed terrain information is required by operators to enable

them to assess, by use of radio altimeters, the effect of terrain on decision height determination. The width of the area shall be 60 m on either side of the extended runway centre line while the length shall be 900 m from the runway threshold measured along the extended runway centre line.

~~10.2.5 According to the air navigation applications listed in 10.1 and areas of coverage, sets of electronic terrain data shall satisfy the numerical requirements specified in Appendix 8, Table A8-1 while obstacle data shall satisfy the numerical requirements specified in Appendix 8, Table A8-2.~~

~~Note 1. — Numerical terrain and obstacle data requirements for Area 2 provided in Appendix 8, Table A8-1 and Table A8-2, respectively, are defined on the basis of the most stringent application requirement (application listed under 10.1 b)).~~

~~Note 2. — It is recognized that some applications listed in 10.1 could be adequately accommodated with terrain and obstacle data sets that are of lower requirements than those specified in Appendix 8, Table A8-1 and Table A8-2, respectively. Consequently, careful evaluation of available data sets by data users is necessary in order to determine if the products are fit for their intended use.~~

10.1.3 Electronic terrain data shall be provided for Area 1. The obstacle data shall be provided for obstacles in Area 1 higher than 100 m above ground.

10.1.4 From 12 November 2015, at aerodromes regularly used by international civil aviation, electronic obstacle data shall be provided for all obstacles within Area 2 that are assessed as being a hazard to air navigation.

10.1.5 From 12 November 2015, at aerodromes regularly used by international civil aviation electronic terrain and obstacle data shall be provided for:

- a) Area 2a, for those obstacles that penetrate the relevant obstacle data collection surface specified in Appendix 8;
- b) penetrations of the take-off flight path area obstacle identification surfaces; and
- c) penetrations of the aerodrome obstacle limitation surfaces.

Note.— Take-off flight path area obstacle identification surfaces are specified in Annex 4, 3.8.2.1. Aerodrome obstacle limitation surfaces are specified in Annex 14, Volume 1, Chapter 4.

10.1.6 **Recommendation.**— At aerodromes regularly used by international civil aviation, electronic terrain and obstacle data should be provided for Areas 2b, 2c and 2d for obstacles and terrain that penetrate the relevant obstacle data collection surface specified in Appendix 8.

10.1.7 **Recommendation.**— At aerodromes regularly used by international civil aviation, electronic terrain and obstacle data should be provided for Area 3 for terrain and obstacles that penetrate the relevant obstacle data collection surface specified in Appendix 8.

10.1.8 At aerodromes regularly used by international civil aviation, electronic terrain and obstacle data shall be provided for Area 4 for terrain and obstacles that penetrate the relevant obstacle data collection surface specified in Appendix 8, for all runways where precision approach Category II or III operations have been established and where detailed terrain information is required by operators to enable them to assess, the effect of terrain on decision height determination by use of radio altimeters.

Note.— Area 4 terrain data and Area 2 obstacle data are normally sufficient to support the production of the Precision Approach Terrain Chart — ICAO. When more detailed obstacle data is required for Area 4, this may be provided in accordance with the Area 4 obstacle data requirements specified in Appendix 8, Table A8-2. Guidance on appropriate obstacles for this chart is given in the Aeronautical Chart Manual (Doc 8697).

10.1.9 Recommendation.— *Where additional electronic obstacle or terrain data is collected to meet other aeronautical requirements, the obstacle and terrain data sets should be expanded to include these additional data.*

10.1.10 Recommendation.— *Arrangements should be made for the coordination of providing Area 2 electronic terrain and obstacle data for adjacent aerodromes where their respective coverage Areas overlap to assure that the data for the same obstacle or terrain is correct.*

10.1.11 Recommendation.— *At those aerodromes located near territorial boundaries, arrangements should be made among States concerned to share Area 2 electronic terrain and obstacle data.*

10.3 10.2 Terrain database data set — content, numerical specification and structure

~~10.3.1~~ **10.2.1** A terrain database data set shall contain digital sets of data representing terrain surface in the form of continuous elevation values at all intersections (points) of a defined grid, referenced to common datum. A terrain grid shall be angular or linear and shall be of regular or irregular shape.

Note.— In regions of higher latitudes, latitude grid spacing may be adjusted to maintain a constant linear density of measurement points.

~~10.3.2~~ **10.2.2** Sets of electronic terrain data shall include spatial (position and elevation), thematic and temporal aspects for the surface of the Earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles. In practical terms, depending on the acquisition method used, this shall represent the continuous surface that exists at the bare Earth, the top of the canopy or something in-between, also known as “first reflective surface”.

~~10.3.3~~ **10.2.3** ~~Terrain data shall be collected according to the areas specified in 10.2, terrain data collection surfaces and criteria specified in Appendix 8, Figure A8-1, and in accordance with the terrain data numerical requirements provided in Table A8-1 of Appendix 8. In terrain databases, only one feature type, i.e. terrain, shall be recorded. Feature attributes describing terrain shall be those listed in Appendix 8, Table A8-3. In terrain data sets, only one feature type, i.e. terrain, shall be provided. Feature attributes describing terrain shall be those listed in Table A8-3. The terrain feature attributes listed in Table A8-3 represent the minimum set of terrain attributes, and those annotated as mandatory shall be recorded in the terrain database data set.~~

10.2.4 Electronic terrain data for each area shall conform to the applicable numerical requirements in Appendix 8, Table 8A-1.

10.4 10.3 Obstacle database data set — content, numerical specification and structure

~~10.4.1~~ **10.3.1** ~~One obstacle database shall contain a digital set of obstacle data and shall include those features having vertical significance in relation to adjacent and surrounding features that are considered hazardous to air navigation. Obstacle data shall comprise the digital representation of the~~

vertical and horizontal extent of ~~man-made objects~~ the obstacle. Obstacles shall not be included in terrain databases ~~data sets~~. Obstacle data elements are features that shall be represented in the databases ~~data sets~~ by points, lines or polygons.

~~10.4.2~~ 10.3.2 Obstacles, which in accordance with the definition, can be fixed (permanent or temporary) or mobile shall be identified within the areas defined in 10.2, on the basis of the obstacle data collection surfaces and criteria specified in Appendix 8, Figure A8-2, and collected in accordance with obstacle data numerical requirements provided in Table A8-2 of Appendix 8. In an obstacle database ~~data set~~, all defined obstacle feature types shall be recorded ~~provided~~ and each of them shall be described according to the list of mandatory attributes provided in ~~Table A8-4 of Appendix 8~~, Table A8-4.

Note.— By definition, obstacles can be fixed (permanent or temporary) or mobile. Specific attributes associated with mobile (feature operations) and temporary types of obstacles are annotated in Appendix 8, Table A8-4, as optional attributes. If these types of obstacles are to be recorded ~~provided~~ in the database ~~data set~~, appropriate attributes describing such obstacles are also required.

10.3.3 Electronic obstacle data for each area shall conform to the applicable numerical requirements in Appendix 8, Table 8A-2.

~~10.5~~10.4 Terrain and obstacle data product specifications

Editorial Note.— Renumber subsequent paragraphs accordingly.

...

10.4.10 The obstacle data product specification, supported by geographical coordinates for each aerodrome included within the dataset, shall describe the following areas:

- Areas 2a, 2b, 2c, 2d;
- the take-off flight path area; and
- the obstacle limitation surfaces.

~~10.6~~—Availability

~~10.6.1~~—States shall ensure that electronic terrain and obstacle data related to their entire territory are made available in the manner specified in 10.2, 10.3 and 10.4 for use by international civil aviation.

~~10.6.1.1~~—States shall ensure that as of 20 November 2008, electronic terrain and obstacle data are made available in accordance with Area 1 specifications and terrain data in accordance with Area 4 specifications.

~~10.6.1.2~~—States shall ensure that as of 18 November 2010, electronic terrain and obstacle data are made available in accordance with Area 2 and Area 3 specifications.

~~10.6.1.3~~—**Recommendation.**—States should ensure that electronic terrain and obstacle data are made available in accordance with Area 1, Area 2 and Area 3 specifications and terrain data in accordance with Area 4 specifications.

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~~10.6.2 **Recommendation.** At those aerodromes located near territorial boundaries, arrangements should be made among States concerned to share terrain and obstacle data for the entire Area 2.~~

...

**APPENDIX 1. CONTENTS OF
AERONAUTICAL INFORMATION PUBLICATION (AIP)**
(see Chapter 4)

...

**GEN 1. NATIONAL REGULATIONS
AND REQUIREMENTS**

GEN 1.1 Designated authorities

The addresses of designated authorities concerned with the facilitation of international air navigation (civil aviation, meteorology, customs, immigration, health, en-route and aerodrome/heliport charges, agricultural quarantine and aircraft accident investigation) containing, for each authority:

...

- 6) ~~telex number;~~ and e-mail address;
- 7) aeronautical fixed service (AFS) address; and;
- 8) website address, if available.

...

GEN 3. SERVICES

GEN 3.1 Aeronautical information services

GEN 3.1.1 Responsible service

Description of the Aeronautical Information Service (AIS) provided and its major components, including:

...

- 5) ~~telex number;~~ e-mail address;
- 6) AFS address;
- 7) website address, if available;

Editorial Note.— Renumber subsequent subparagraphs accordingly.

...

GEN 3.2 Aeronautical charts

GEN 3.2.1 Responsible service(s)

Description of service(s) responsible for the production of aeronautical charts, including:

...

- 5) ~~telex number~~ e-mail address;
- 6) AFS address;
- 7) website address, if available;

Editorial Note.— Renumber subsequent subparagraphs accordingly.

...

GEN 3.2.3 Purchase arrangements

Details of how charts may be obtained, containing:

...

- 5) ~~telex number~~; and e-mail address;
- 6) AFS address; and
- 7) website address, if available.

...

GEN 3.2.7 Topographical charts

Details of how topographical charts may be obtained, containing:

...

- 5) ~~telex number~~; and e-mail address;
- 6) AFS address; and
- 7) website address, if available.

...

GEN 3.3 Air traffic services

GEN 3.3.1 Responsible service

Description of the air traffic service and its major components, including:

...

- 5) ~~telex number~~ e-mail address;
- 6) AFS address;
- 7) website address, if available;

Editorial Note.— Renumber subsequent subparagraphs accordingly.

...

GEN 3.3.6 ATS units address list

A list of ATS units and their addresses arranged alphabetically, containing:

...

- 5) ~~telex number~~; and e-mail address;
- 6) AFS address; and
- 7) website address, if available.

GEN 3.4 Communication services

GEN 3.4.1 Responsible service

Description of the service responsible for the provision of telecommunication and navigation facilities, including:

...

- 5) ~~telex number~~ e-mail address;
- 6) AFS address;
- 7) website address, if available;

Editorial Note.— Renumber subsequent subparagraphs accordingly.

...

GEN 3.5 Meteorological services**GEN 3.5.1 Responsible service**

Brief description of the meteorological service responsible for the provision of meteorological information, including:

...

- 5) ~~telex number~~ e-mail address;
- 6) AFS address;
- 7) website address, if available;

Editorial Note.— Renumber subsequent subparagraphs accordingly.

...

GEN 3.5.9 Other automated meteorological services

Description of available automated services for the provision of meteorological information (e.g. automated pre-flight information service accessible by telephone and/or computer modem) including:

...

- 4) telephone, ~~telex~~ and telefax number(s), e-mail address, and, if available, website address.

GEN 3.6 Search and rescue**GEN 3.6.1 Responsible service(s)**

Brief description of service(s) responsible for the provision of search and rescue (SAR), including:

...

- 5) ~~telex number~~ e-mail address;
- 6) AFS address; and
- 7) website address, if available; and
- 7) a statement concerning the ICAO documents on which the service is based and a reference to the AIP location where differences, if any, are listed.

...

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PART 3 — AERODROMES (AD)

...

AD 2. AERODROMES

<i>Note.</i> — **** is to be replaced by the relevant ICAO location indicator.
--

...

**** AD 2.2 Aerodrome geographical and administrative data

The requirement is for aerodrome geographical and administrative data including:

...

- 6) name of aerodrome administration operator, address, telephone, telefax, e-mail address and telex numbers and AFS address and, if available, website address;

...

**** AD 2.3 Operational hours

Detailed description of the hours of operation of services at the aerodrome, including:

- 1) aerodrome administration operator;

...

**** AD 2.10 Aerodrome obstacles

Detailed description of obstacles, including:

- 1) obstacles in Area 2:

...

- g) NIL indication, if appropriate.

Note 1.— Chapter 10, ~~10.2.2~~ 10.1.1, provides a description of Area 2 while Appendix 8, Figure A8-2, contains graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in Area 2.

...

- 2) the absence of an Area 2 data set for the aerodrome is to be clearly stated and obstacle data are to be provided for:

- a) obstacles that penetrate the obstacle limitation surfaces;

- b) obstacles that penetrate the take-off flight path area obstacle identification surface; and

c) other obstacles assessed as being hazardous to air navigation.

23) indication that information on obstacles in Area 3 is not provided, or if provided:

...

g) NIL indication, if appropriate.

Note 1.— Chapter 10, ~~10.2.3~~ 10.1.1, provides a description of Area 3 while Appendix 8, Figure A8-3, contains graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in Area 3.

Note 2.— Specifications governing the determination and reporting (accuracy of field work and data integrity) of positions (latitude and longitude) and elevations for obstacles in Area 3 are given in Annex 14, Volume I, Appendix 5, Tables A5-1 and A5- 2, respectively.

...

**** AD 2.12 Runway physical characteristics

Detailed description of runway physical characteristics, for each runway, including:

...

5) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for each threshold and runway end, and geoid undulation to the nearest one-half metre or foot for each threshold; of:

— thresholds of a non-precision approach runway to the nearest metre or foot; and

— thresholds of a precision approach runway to the nearest tenth of a metre or tenth of a foot;

6) elevations of:

— thresholds of a non-precision approach runway to the nearest metre or foot; and

— thresholds and the highest elevation of the touchdown zone of a precision approach runway to the nearest one-half tenth of a metre or tenth of a foot;

...

**** AD 2.16 Helicopter landing area

Detailed description of helicopter landing area provided at the aerodrome, including:

1) geographical coordinates in degrees, minutes, seconds and hundredths of seconds and geoid undulation to the nearest one-half metre or foot of the geometric centre of touch-down and lift-off (TLOF) or of each threshold of final approach and take-off (FATO) area (where appropriate);

— for non-precision approaches, to the nearest metre or foot; and

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— for precision approaches, to the nearest tenth of a metre or tenth of a foot;

2) TLOF and/or FATO area elevation:

— for non-precision approaches, to the nearest metre or foot; and

— for precision approaches, to the nearest ~~one-half~~ tenth of a metre or tenth of a foot;

...

AD 3. HELIPORTS

...

Note.— **** is to be replaced by the relevant ICAO location indicator.

...

**** AD 3.2 Heliport geographical and administrative data

The requirement is for heliport geographical and administrative data, including:

...

6) name of heliport ~~administration~~operator, address, telephone, telefax, e-mail address, ~~and telex numbers and~~ AFS address and, if available, website address;

...

**** AD 3.3 Operational hours

Detailed description of the hours of operation of services at the heliport, including:

1) heliport ~~administration~~operator;

...

**** AD 3.10 Heliport obstacles

Detailed description of obstacles, including:

~~1) obstacles in Area 2:~~

~~a) obstacle identification or designation;~~

~~b) type of obstacle;~~

~~c) obstacle position, represented by geographical coordinates in degrees, minutes, seconds and tenths of seconds;~~

~~d) obstacle elevation and height to the nearest metre or foot;~~

- ~~e) obstacle marking, and type and colour of obstacle lighting (if any);~~
- ~~f) if appropriate, an indication that the list of obstacles is available in electronic form, and a reference to GEN 3.1.6; and~~
- ~~g) NIL indication, if appropriate.~~

~~Note 1. — Chapter 10, 10.2.2, provides a description of Area 2 while Appendix 8, Figure A8-2, contains graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in Area 2.~~

~~Note 2. — Specifications governing the determination and reporting (accuracy of field work and data integrity) of positions (latitude and longitude) and elevations for obstacles in Area 2 are given in Annex 11, Appendix 5, Tables 1 and 2, and in Annex 14, Volume II, Appendix 1, Tables 1 and 2, respectively.~~

~~2) obstacles in Area 3:~~

- ~~a) obstacle identification or designation;~~
- ~~b) type of obstacle;~~
- ~~c) obstacle position, represented by geographical coordinates in degrees, minutes, seconds and tenths of seconds;~~
- ~~d) obstacle elevation and height to the nearest metre or foot;~~
- ~~e) obstacle marking, and type and colour of obstacle lighting (if any);~~
- ~~f) if appropriate, an indication that the list of obstacles is available in electronic form, and a reference to GEN 3.1.6; and~~
- ~~g) NIL indication, if appropriate.~~

~~Note 1. — Chapter 10, 10.2.3, provides a description of Area 3 while Appendix 8, Figure A8-3, contains graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in Area 3.~~

~~Note 2. — Specifications governing the determination and reporting (accuracy of field work and data integrity) of positions (latitude and longitude) and elevations for obstacles in Area 3 are given in Annex 14, Volume II, Appendix 1, Tables 1 and 2, respectively.~~

...

****** AD 3.12 Heliport data**

Detailed description of heliport dimensions and related information, including:

...

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- 6) geographical coordinates in degrees, minutes, seconds and hundredths of seconds and geoid undulation ~~to the nearest one half metre or foot~~ of the geometric centre of TLOF or of each threshold of FATO (where appropriate);

— for non-precision approaches, to the nearest metre or foot; and

— for precision approaches, to the nearest tenth of a metre or tenth of a foot;

- 7) TLOF and/or FATO slope and elevation:

— for non-precision approaches, to the nearest metre or foot; and

— for precision approaches, to the nearest ~~one half~~ tenth of a metre or tenth of a foot;

...

APPENDIX 4. INFORMATION TO BE NOTIFIED BY AIRAC

(see Chapter 6, 6.1.1)

PART 1

1. The establishment, ~~and~~ withdrawal of, and premeditated significant changes (including operational trials) to:

- 1.1 Limits (horizontal and vertical), regulations and procedures applicable to:

...

- 1.2 Positions, frequencies, call signs, ~~identifiers~~, known irregularities and maintenance periods of radio navigation aids, ~~and~~ communication ~~and surveillance~~ facilities.

- 1.3 Holding and approach procedures, arrival and departure procedures, noise abatement procedures and any other pertinent ATS procedures.

1.4 Transition levels, transition altitudes and minimum sector altitudes.

~~1.4~~ 1.5 Meteorological facilities (including broadcasts) and procedures.

~~1.5~~ 1.6 Runways and stopways.

1.7 Taxiways and aprons.

1.8 Aerodrome ground operating procedures (including low visibility procedures).

1.9 Approach and runway lighting.

1.10 Aerodrome operating minima if published by a State.

PART 2

2. The establishment and withdrawal of, and premeditated significant changes to:

2.1 Position, height and lighting of navigational obstacles.

~~2.2 Taxiways and aprons.~~

~~2.3~~ 2.2 Hours of service of aerodromes, facilities and services.

~~2.4~~ 2.3 Customs, immigration and health services.

2.5 2.4 Temporary danger, prohibited and restricted areas and navigational hazards, military exercises and mass movements of aircraft.

~~2.6~~ 2.5 Temporary areas or routes or portions thereof where the possibility of interception exists.

PART 3

3. The establishment of, and premeditated major changes to:

3.1 New aerodromes for international IFR operations.

3.2 New runways for IFR operations at international aerodromes.

3.3 Design and structure of the air traffic services route network.

3.4 Design and structure of a set of terminal procedures (including change of procedure bearings due to magnetic variation change).

3.5 Circumstances listed in Part 1 if the entire State or any significant portion thereof is affected or if cross-border coordination is required.

...

APPENDIX 6. NOTAM FORMAT

(see Chapter 5, 5.2.1)

...

INSTRUCTIONS FOR THE COMPLETION OF THE NOTAM FORMAT

...

2. NOTAM numbering

Each NOTAM shall be allocated a series identified by a letter and a four-digit number followed by a stroke and a two-digit number for the year (e.g. A0023/03). Each series shall start on 1 January with number 0001.

3. Qualifiers (Item Q)

Item Q) is divided in eight fields, each separated by a stroke. ~~An entry shall be made in each field. If no entry is to be made in a field, it is not necessary to transmit blanks between the strokes.~~ Examples of how fields are to be filled are shown in the *Aeronautical Information Services Manual* (Doc 8126). The definition of the field is as follows:

1) FIR

- a) If the subject of the information is located geographically within one FIR, the ICAO location indicator shall be that of the affected FIR concerned. When an aerodrome is situated within the overlying FIR of another State, the first field of Item Q) shall contain the code for that overlying FIR (e.g. Q) LFRR/...A) EGJJ);

or,

if the subject of the information is located geographically within more than one FIR within a State, the FIR field shall be composed of first two letters of the ICAO location indicator nationality letters of a the State originating the NOTAM plus followed by "XX". (The location indicator of the overlying UIR shall not be used). The ICAO location indicators of the FIRs concerned shall then be listed in Item A) or indicator of State or non-governmental agency which is responsible for provision of a navigation service in more than one State.

...

2) NOTAM CODE

All NOTAM Code groups contain a total of five letters and the first letter is always the letter Q. The second and third letters identify the subject, and the fourth and fifth letters denote the status or condition of the subject reported upon. The two-letter codes for subjects and conditions are those contained in the PANS-ABC (Doc 8400). For combinations of second and third, and fourth and fifth letters, insert the ICAO NOTAM codes listed in the PANS-ABC (Doc 8400) or in refer to the NOTAM Selection Criteria contained in the *Aeronautical Information Services Manual* (Doc 8126) or insert one of the following combinations, as appropriate:

...

- c) When a NOTAM containing operationally significant information is issued in accordance with Appendix 4 and Chapter 6 and when it is used to announce the existence of AIRAC AIP Amendments or Supplements, insert "TT" as the fourth and fifth letters of the NOTAM Code;

...

- e) The following fourth and fifth letters of the NOTAM Code shall be used in NOTAM cancellations:

AK: RESUMED NORMAL OPERATION
 AL: OPERATIVE (OR RE-OPERATIVE) SUBJECT TO PREVIOUSLY PUBLISHED LIMITATIONS/CONDITIONS
 AO: OPERATIONAL
 CC: COMPLETED
 CN: CANCELLED
 HV: WORK COMPLETED
 XX: PLAIN LANGUAGE

3) TRAFFIC

- I = IFR
- V = VFR
- K = NOTAM is a checklist

Note.— Depending on the NOTAM subject and content, the qualifier field TRAFFIC may contain combined qualifiers. ~~For possible combinations refer to~~ Guidance concerning the combination of TRAFFIC qualifiers with subject and conditions in accordance with the NOTAM Selection Criteria ~~is contained in the Aeronautical Information Services Manual (Doc 8126).~~

4) PURPOSE

- N = NOTAM selected for the immediate attention of aircraft operators
- B = NOTAM selected for PIB entry
- O = NOTAM concerning flight operations
- M = Miscellaneous NOTAM; not subject for a briefing, but it is available on request
- K = NOTAM is a checklist

Note.— Depending on the NOTAM subject and content, the qualifier field PURPOSE may contain the combined qualifiers BO or NBO. ~~For possible combinations refer to~~ Guidance concerning the combination of PURPOSE qualifiers with subject and conditions in accordance with the NOTAM Selection Criteria ~~is contained in the Aeronautical Information Services Manual (Doc 8126).~~

5) SCOPE

- A = Aerodrome
- E = En-route
- W = Nav Warning
- K = NOTAM is a checklist

Note.— Depending on the NOTAM subject and content, the qualifier field SCOPE may contain combined qualifiers. ~~For possible combinations refer to~~ Guidance concerning the combination of SCOPE qualifiers with subject and conditions in accordance with the NOTAM Selection Criteria ~~is contained in the Aeronautical Information Services Manual (Doc 8126).~~ If the subject is qualified AE, the aerodrome location indicator must be reported in Item A).

6) and 7) LOWER/UPPER

LOWER and UPPER limits ~~shall always be filled and~~ shall only be expressed in flight levels (FL) ~~and shall express the actual vertical limits of the area of influence without the addition of buffers.~~ In the case of navigation warnings and airspace restrictions, values entered shall be consistent with those provided under Items F) and G).

...

5. Item B)

For date-time group use a ten-figure group, giving year, month, day, hours and minutes in UTC. This entry is the date-time at which the NOTAMN, ~~NOTAMR OR NOTAMC~~ comes into force. ~~In the cases of~~

NOTAMR and NOTAMC, the date-time group is the actual date and time of the NOTAM origination. The start of a day shall be indicated by “0000”.

6. Item C)

With the exception of NOTAMC, a date-time group (a ten-figure group giving year, month, day, hours and minutes in UTC) indicating duration of information shall be used unless the information is of a permanent nature in which case the abbreviation “PERM” is inserted instead. The end of a day shall be indicated by “2359” (i.e. do not use “2400”). If the information on timing is uncertain, the approximate duration shall be indicated using a date-time group followed by the abbreviation “EST”. Any NOTAM which includes an “EST” shall be cancelled or replaced before the date- time specified in Item C).

...

9. Items F) and G)

These items are normally applicable to navigation warnings or airspace restrictions and are usually part of the PIB entry. Insert both lower and upper height limits of activities or restrictions, clearly indicating only one reference datum and units unit of measurement. The abbreviations GND or SFC shall be used in Item F) to designate ground and surface respectively. The abbreviation UNL shall be used in Item G) to designate unlimited.

Note.— For NOTAM examples see Doc 8126 and the PANS-ABC (Doc 8400).

APPENDIX 7. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table A7-1. Latitude and longitude

Latitude and longitude	Publication resolution	Integrity Classification
Flight information region boundary points	1 min	1×10^{-3} routine
P, R, D area boundary points (outside CTA/CTZ-CTR1 min boundaries)	1 min	1×10^{-3} routine
P, R, D area boundary points (inside CTA/CTZ-CTR1 sec boundaries)	1 sec	1×10^{-5} essential
CTA/CTZ-CTR boundary points	1 sec	1×10^{-5} essential
...		
Runway end (flight path alignment point)	1/100 sec	1×10^{-8} critical
...		

APPENDIX 8. TERRAIN AND OBSTACLE DATA REQUIREMENTS

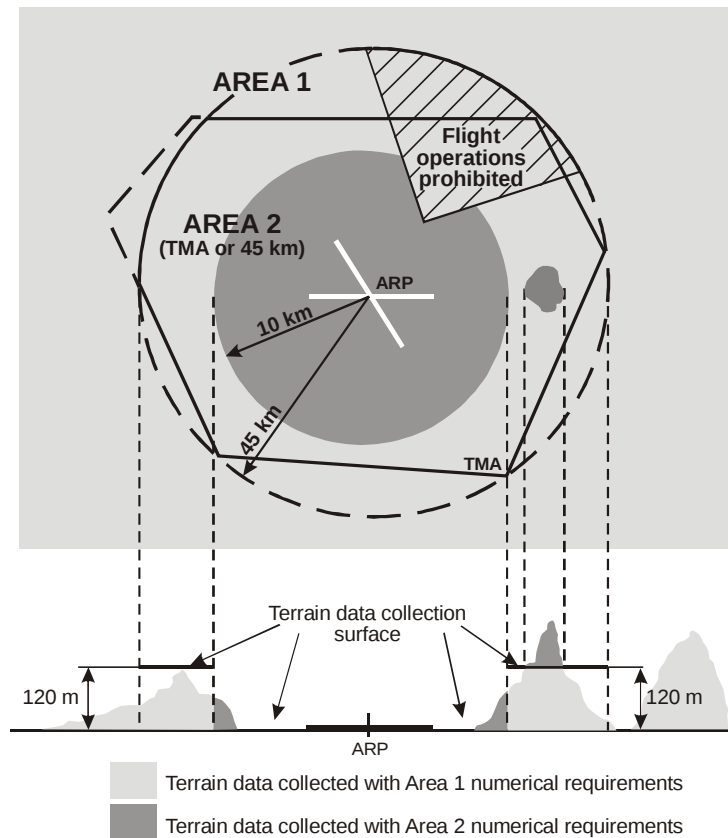


Figure A8-1. Terrain data collection surfaces — Area 1 and Area 2

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

Note.— Terrain data numerical requirements for Areas 1 and 2 are specified in Table A8-1.

Editorial Note.— Replace Figure A8-2 with the following figure.

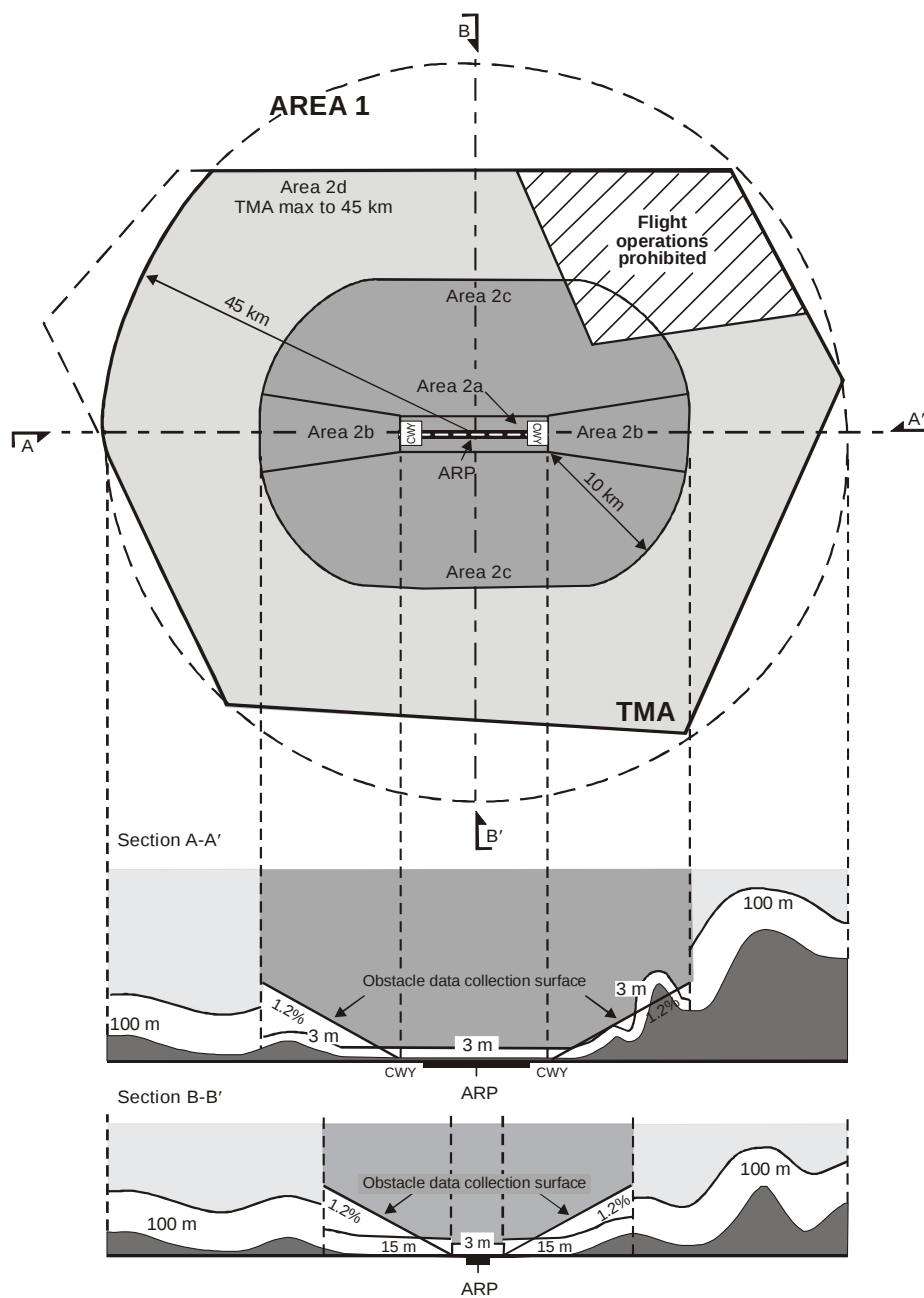


Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

1. Obstacle data shall be collected and recorded in accordance with the Area 2 numerical requirements specified in Table A8-2:
 - a) Area 2a: a rectangular area around a runway that comprises the runway strip plus any clearway that exists. The Area 2a obstacle collection surface shall have height of 3 m above any obstacle that penetrates the conical surface whose origin is at the edges of the 180-m wide rectangular area and at the nearest runway elevation measured along the runway centre line, extending at 1.2 per cent slope until it reaches 120 m above the lowest runway elevation of all operational runways at the aerodrome (1.2 per cent slope reaches 120 m at 10 km); in the remainder of Area 2 (between 10 km and the TMA boundary or 45 km radius, whichever is smaller), the horizontal surface 120 m above the lowest runway elevation; and for those portions related to a clearway, if one exists, at the elevation of the nearest runway end;
 - b) Area 2b: an area extending from the ends of Area 2a in the direction of departure, with a length of 10 km and a splay of 15% to each side. The Area 2b collection surface has a 1.2% slope extending from the ends of Area 2a at the elevation of the runway end in the direction of departure, with a length of 10 km and a splay of 15% to each side;
 - c) Area 2c: an area extending outside Area 2a and Area 2b at a distance of not more than 10 km from the boundary of Area 2a. The Area 2c collection surface has a 1.2% slope extending outside Area 2a and Area 2b at a distance of not more than 10 km from the boundary of Area 2a. The initial elevation of Area 2c shall be the elevation of the point of Area 2a at which it commences; and
 - d) Area 2d: an area outside the Areas 2a, 2b and 2c up to a distance of 45 km from the aerodrome reference point, or to an existing TMA boundary, whichever is nearest. The Area 2d obstacle collection surface has a height of 100 m above ground.
- 2) In those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, obstacle data shall be collected and recorded in accordance with the Area 1 requirements.
- 23) Data on every obstacle within Area 1 whose height above the ground is 100 m or higher shall be collected and recorded in the database in accordance with the Area 1 numerical requirements specified in Table A8-2.

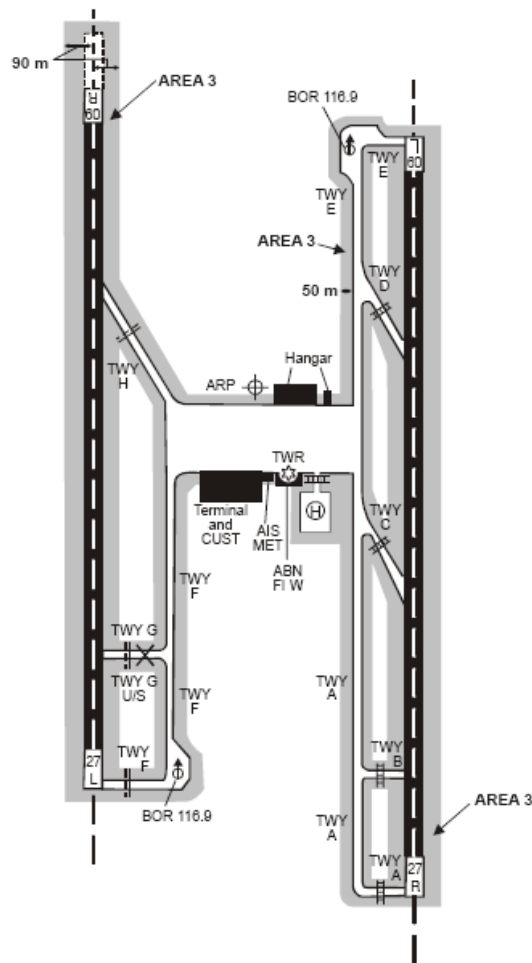


Figure A8-3. Terrain and obstacle data collection surface — Area 3

1. ~~Data on~~ The data collection surface for terrain and obstacles that extends more than a half-metre (0.5 m) above the horizontal plane passing through the nearest point on the aerodrome/heliport movement area shall be collected and recorded.
2. Terrain and obstacle data in Area 3 shall ~~be collected and recorded in accordance~~ comply with the numerical requirements specified in Table A8-1 and Table A8-2, respectively.

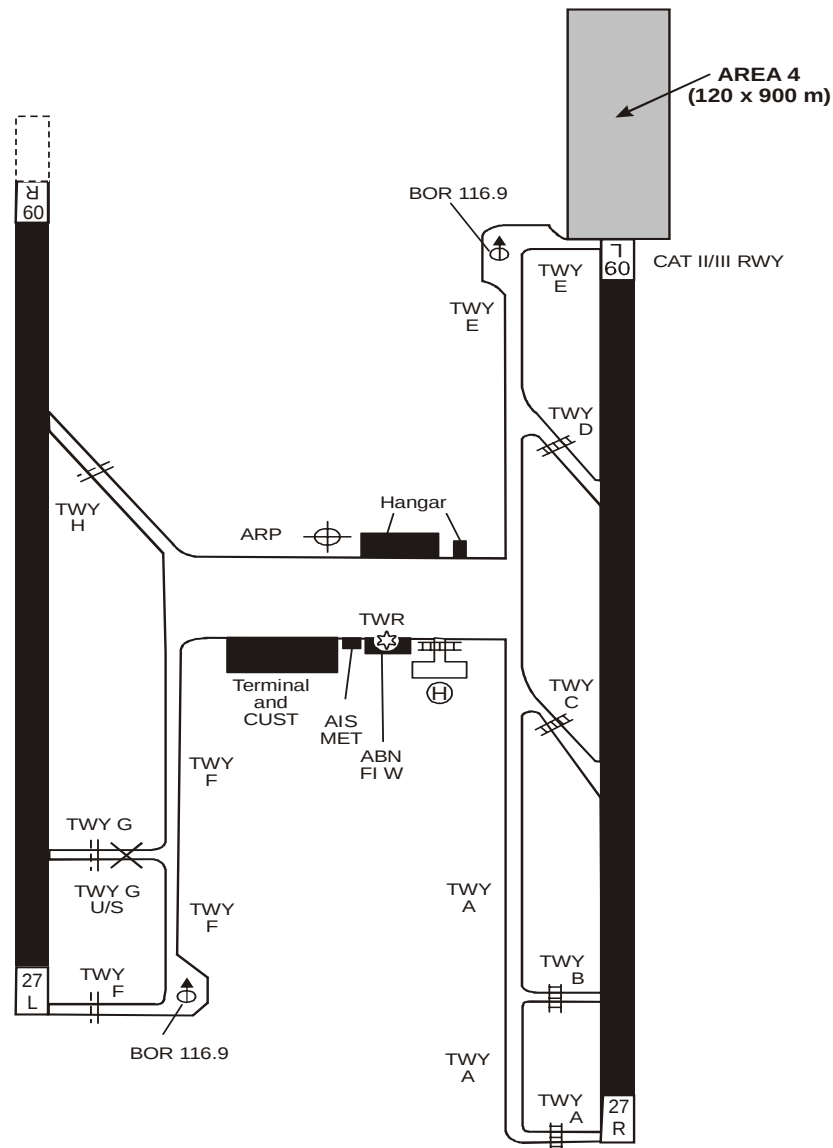


Figure A8-4. Terrain and obstacle data collection surface — Area 4

Only terrain data shall be collected and recorded in Area 4 shall comply in accordance with the numerical requirements specified in Table A8-1.

Note 1.— The horizontal extent of Area 2 covers Area 4. More detailed obstacle data may be collected in Area 4 in accordance with Area 4 numerical requirements for obstacle data specified in Table A8-2. (See 10.1.8.).

Note 2.— Area 4 may be extended in accordance with 10.1.2.

Table A8-1. Terrain data numerical requirements

	Area 1	Area 2	Area 3	Area 4
Post spacing	3 arc seconds (approx. 90 m)	1 arc second (approx. 30 m)	0.6 arc seconds (approx. 20 m)	0.3 arc seconds (approx. 9 m)
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01 m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level (1σ)	90%	90%	90%	90%
Data classification	routine	essential	essential	essential
Integrity level	1×10^{-3}	1×10^{-5}	1×10^{-5}	1×10^{-5}
Maintenance period	as required	as required	as required	as required

Table A8-2. Obstacle data numerical requirements

	Area 1	Area 2	Area 3	Area 4
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level (1σ)	90%	90%	90%	90%
Data classification	routine	essential	essential	Essential
Integrity level	1×10^{-3}	1×10^{-5}	1×10^{-5}	1×10^{-5}
Maintenance period	as required	as required	as required	as required

Table A8-3. Terrain attributes

Terrain attribute	Mandatory/Optional
...	
Vertical confidence level	Mandatory
Surface type	Mandatory Optional
Recorded surface	Mandatory
...	

Table A8-4. Obstacle attributes

Obstacle attribute	Mandatory/Optional
...	
Elevation	Mandatory
Height	Optional
Vertical accuracy	Mandatory
...	

— END —