INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE FIRST MEETING OF THE AFI REGION ELECTRONIC TERRAIN AND OBSTACLE DATA WORKING GROUP (AFI e-TOD WG/1)

(Johannesburg, South Africa, 27 June2009)

The views expressed in this Report should be taken as those of the A F I e-TOD Working Group and not of the Organization. This Report will, however, be submitted to the APIRG and any formal action taken will be published in due course as a Supplement to the Report.

Prepared by the Secretary of the AFI –e-TOD WG

Decision 10/04 : Establishment of AFI region e-TOD working group

Decision 10/04 of the ATS/AIS/SAR SG-10 Meeting States that with a view to, inter-alia, analysing the e-TOD requirements, developing a common understanding of these requirements and steering the planning and implementation process within the region, an AFI Region e-TOD Working Group be established as the way forward for the timely implementation of e-TOD through the proposed AFI Region e-TOD Implementation Strategy at **Appendix xx** with the Terms of Reference at **Appendix xx.**

AFI-e-TOD Working Group is a Working Group of the AFI Planning and Implementation Regional Group (APIRG). Its Reports are therefore submitted to APIRG for review and action.

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of ICAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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AFI e-TOD WG/1

PART I – HISTORY OF THE MEETING

1. PLACE AND DURATION

1.1   The first Meeting of the AFI Region Electronic Terrain and Obstacle Data Working Group (AFI e-TOD WG/1) was held at the South African CAA Headquarters, in Midrand, South Africa on 27 June 2009.

2. OPENING

2.1   The meeting was opened by Mr. Jeff Matshoba, General Manager Air Navigation Services on behalf of the Director General Mr. Collin Jordan. Mr. Matshoba welcomed all the participants of the eTOD Working Group to CAA Headquarters in South Africa wishing that the first meeting of the Working Group would be a successful meeting. He highlighted that the main objective of the Meeting is to assist the AFI e-TOD WG/1 in drafting an e-TOD implementation plan template to enable States to develop national e-TOD programs as per the terms of reference of the AFI-e-TOD Working Group.

2.2   Mr. Matshoba, highlighted that to cope with the new technologies and expanding operational needs, the provision of Aeronautical Information Services (AIS) had to move from a provider of traditional services in hard copy (AIP, NOTAM, etc) to a more dynamic service making quality assured and timely information available to users in a digital format. In this regard, he recalled that Amendment 33 to Annex 15 introduced new requirements for the provision of electronic Terrain and Obstacle Data (eTOD).Mr. Matshoba mentioned that South Africa has already developed its e-TOD implementation plan in compliance with ICAO provisions contained in Annex 15, as amended, and Document 9881 and will be managed by the SACAA as a national program supported by necessary resources, a high level framework and detailed planning, including priprities and timelines for the implementation of the program. He confirmed that a South African e-TOD Implementation Workgroup has been established, consisting of stakeholders in the South African Aviation Community, to manage and oversee the e-TOD implementation in South Africa. However, he enumerated the advantages associated with e-TOD confirming that all of them are safety-related and highlighted that the AFI e-TOD Working Group was established with the main objective to assist and guide States for a harmonized, timely and cost-effective implementation of eTOD. At the end of his opening remarks, Mr. Matshoba, expressed his appreciation and thanks to ICAO for the continued support and assistance provided to States and to the participants for their presence and commitment to participate actively and contribute to the outcome of the AFI e-TOD Working Group.

2.3   Mr. George Baldeh Regional Officer AIS/MAP and Secretary of the AFI e-TOD Working Group on behalf of Mr. Amadou Ousmane Guitteye, ICAO Regional Director, ICAO Western and Central African Office thanked the South African Civil Aviation Authority for hosting the meeting and for the excellent hospitality provided to all the participants. He mentioned that this constitutes another evidence of the active role, South Africa is playing in the AFI Region and its good and continuous support to the ICAO AFI Regional Offices. He welcomed all the participants to Midrand and thanked them for their presence and support to the eTOD Working Group.

2.4   Mr. Baldeh, re-iterated the benefits derived from the implementation of e-TOD and highlighted the commitment of the ICAO AFI Regional Offices to assist States in the implementation of e-TOD requirements. In this, regard, he recalled that an AFI e-TOD Seminar was successfully held in Casablanca,Morocco from 1 to 3 April 2008 whose Findings were endorsed by AFI AIS/MAP TF/5 Meeting. He emphasized that the AFI e-TOD WG/1 meeting would provide States, with updated information on the latest developments and experiences related to eTOD and would provide also a forum for open discussions where all issues related to the provision of eTOD could be addressed. He encouraged the sharing of information and exchange of experience.

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History of the Meeting

2.5   At the end of his speech, the Secretary highlighted the Terms of Reference of the e-TOD Working Group, as endorsed by ATS/AIS/SAR SG/10, and enumerated the main items of the agenda of the e-TOD WG/1 meeting.

3. ATTENDANCE

3.1   The meeting was attended by a total of 31 participants, from 7 States, 2 International Aviation Organizations (ASECNA and IATA) and 2 Aviation Companies (ITC Geomatik and SkyeGuide) . The list of participants is at **Attachment A** to the Report.

4. OFFICERS AND SECRETARIAT

4.1   Mr. Gary Newman , Manager Procedure Design and Cartography of the South African CAA , was the Rapporteur of the meeting assisted by Mr. Roland Baumann of Skyguide, Swiss Air Navigation Services and Mr. Dominik Angst of ITV Geomatik AG.

4.2   Mr. George Baldeh, RO/AIS/MAP, was the Secretary of the meeting.

5. LANGUAGE

5.1   The discussions were conducted in English. Documentation was issued in English.

6. AGENDA

6.1   The following Agenda was adopted:

Agenda Item 1:   Adoption of the provisional agenda

Agenda Item 2:   Follow-up on ATS/AIS/SAR-SG/10 Conclusions and Decisions related to eTOD

Agenda Item 3:   Review and analysis of e-TOD requirements .

Agenda Item 4:   e-TOD planning and implementation.

Agenda Item 5:   Elaboration of e-TOD implementation plan templates to   enable States to develop national e-TOD programs.

Agenda Item 6:   Future Work Programme

7. CONCLUSIONS AND DECISIONS – DEFINITION

7.1   The APIRG records its actions in the form of Conclusions and Decisions with the following significance:

   a)   **Conclusions** deal with matters that, according to the Group's terms of reference, merit directly the attention of States, or on which further action will be initiated by the Secretary in accordance with established procedures; and

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b) **Decisions** relate solely to matters dealing with the internal working arrangements of the Group and its Sub-Groups

8. LIST OF CONCLUSIONS AND DECISIONS

Draft Conclusion 1/1 : questionnaire on implementation of electronic Terrain and Obstacle Data (eTOD) in the A F I Region

That, the questionnaire on implementation of electronic Terrain and Obstacle Data (eTOD) in the A F I Region at Appendix C be distributed to States i n o r d e r to collect information regarding their Action Plan/Roadmap for the implementation of the eTOD provisions as specified in Annex 15
Draft Conclusion 1/2 : e-TOD Checklist

That, States be encouraged to use the e-TOD checklist at Appendix D in order to assist them in the process of planning and implementation of the e-TOD provisions.

Draft Conclusion 1/3 :Adoption of the e-TOD Implementation Plan Template at Appendix -A as a regional model

That, States be encouraged to use the e-TOD Implementation Plan Template at Appendix E as a regional model in order to assist them in the process of planning and implementation of the e-TOD provisions.

Draft Conclusion 1/4 :Adoption of the South African National e-TOD Implementation Plan as a Sample

That, States be encouraged to use the South African National e-TOD Implementation Plan at Appendix F as a Sample when developing their national e-TOD plans.

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Report on Agenda Item 1

PART II: REPORT ON AGENDA ITEMS

REPORT ON AGENDA ITEM 1: ADOPTION OF THE PROVISIONAL AGENDA

1.1   The meeting reviewed and adopted the provisional agenda as at paragraph 6 of the history of the meeting.

1.2   The meeting agreed unanimously that Mr. Gary Newman, Manager Procedure Design & Cartography, CAA of South Africa acts as the Rapporteur of the Working Group.

REPORT ON AGENDA ITEM 2: FOLLOW-UP ON ATS/AIS/SAR-SG/10 CONCLUSIONS AND DECISIONS RELATED TO eTOD

2.1   The meeting recalled that ATS/AIS/SAR SG/10 held in Dakar, Senegal, from 10 to 15 May, 2009, developed eight Conclusions and two Decisions related to eTOD.

2.2   The meeting reviewed an extract of the action plan developed by ATS/AIS/SAR/10, containing the relevant list of Conclusions and Decisions related to eTOD as at **Appendix B** to the Report on Agenda Item 2 and noted the follow-up action taken, so far, by the concerned parties.

2.3   The meeting endorsed the APIRG ATS/AIS/SAR SG-10 Conclusions and Decisions relevant to e-TOD implementation in the AFI Region.

Report on Agenda Item 3
REPORT ON AGENDA ITEM 3: **Review and analysis of e-TOD requirements .**

3.1   The meeting reviewed the questionnaire on implementation of electronic Terrain and Obstacle Data (eTOD) in the A F I Region i n o r d e r to collect information from States regarding their Action Plan/Roadmap for the implementation of the eTOD provisions as specified in Annex 15 whether they have been able to meet the applicability dates (20 November 2008) and if they will be able to meet that of (18 November 2010). The results of this survey could be used for the development/update of the AFI Region eTOD implementation Strategy/Action Plan.

3.2   The meeting then reviewed and endorsed the questionnaire on implementation of electronic Terrain and Obstacle Data (eTOD) in the A F I Region i n o r d e r to collect information from States regarding their Action Plan/Roadmap for the implementation of the eTOD provisions as specified in Annex 15 at **Appendix C**

3.3   The meeting then elaborated the following draft conclusion.

Draft Conclusion 1/1 : questionnaire on implementation of electronic Terrain and Obstacle Data (eTOD) in the A F I Region

That, the questionnaire on implementation of electronic Terrain and Obstacle Data (eTOD) in the A F I Region at Appendix C be distributed to States i n o r d e r to collect information regarding their Action Plan/Roadmap for the implementation of the eTOD provisions as specified in Annex 15.

REPORT ON AGENDA ITEM 4: **e-TOD planning and implementation.**

4.1   As a result of the nature of the task and the new technologies and standards that are involved , the meeting noted that stakeholders require training to enable them to perform the task for which they are responsible.

4.2   The meeting reviewed and endorsed the e-TOD checklist at **Appendix D** and elaborated the following draft conclusion in order to assist States in the process of planning and implementation of the e-TOD provisions.

Draft Conclusion 1/2 : e-TOD Checklist

*That, States be encouraged to use the e-TOD checklist at **Appendix D** in order to assist them in the process of planning and implementation of the e-TOD provisions.*

REPORT ON Agenda Item 5: Elaboration of e-TOD implementation plan templates to enable States to develop national e-TOD programs.

5.1   The meeting noted that the implementation of e-TOD provisions is a challenge for all concerned. It is also recognized that some of those who should be involved in the implementation process were not aware of the responsibilities that they might have and that only a small section of those affected were fully aware of the implications and the new responsibilities arising.

5.2   The meeting reviewed and agreed to adopt the e-TOD Implementation plan Template at **Appendix-E** as a regional model in order to assist States in the process of planning and implementation of the e-TOD provisions.

5.3   The meeting then elaborated the following draft conclusion in order to assist States in the process of planning and implementation of national e-TOD provisions.

Draft Conclusion 1/3 :Adoption of the e-TOD Implementation Plan Template at Appendix -E as a regional model

That, States be encouraged to use the e-TOD Implementation Plan Template at Appendix E- as a regional model in order to assist them in the process of planning and implementation of the e-TOD provisions.

Draft Conclusion 1/4 :Adoption of the South African National e-TOD Implementation Plan as a Sample

That, States be encouraged to use the South African National e-TOD Implementation Plan at Appendix F as a Sample when developing their national e-TOD plans.

Report on Agenda Item 6

REPORT ON AGENDA ITEM 6:   Future Work Programme

6.1   With a view to harmonize, coordinate and support e-TOD implementation activities on a regional basis, the meeting reviewed and adopted the terms of reference of the AFI e-TOD Working Group at **Appendix G.**

FIRST MEETING OF THE AFI e-TOD WORKING GROUP
(Johannesburg 27 June 2009)

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Follow-up Actions on Relevant APIRG ATS/AIS/SAR/SG-10 Conclusions/Decisions **APPENDIX-B**

Conclusions and Decisions	Follow-up	To be initiated by	Deliverable	Target Date	Remarks
Conclusion 10/07 - Implementation of WGS-84 and electronic terrain and obstacle data That: a) APIRG adopt AFI RAN Rec. 6/11 as contained in the Performance Framework Form in **Appendix xx** to this Report as its strategy for implementation. b) the proposed FASID Table at **Appendix xx** be adopted for inclusion as a requirement in the AFI FASID Document 7474 Vol.II. c) APIRG adopt the draft AFI Region e-TOD Implementation strategy as proposed under **Appendix xx**. d) the adopted terms of reference of the AFI Region e- TOD Working Group under **Appendix-xx** be proposed for adoption by APIRG.	Process Amendment Proposals for item B to AFI ANP/FASID Follow-up with APIRG on Item C and D.	ICAO ICAO	Amendment Proposal issued and processed for approval.	2010 2010	
Conclusion 10/08 **Submission of WGS-84 Implementation Survey Questionnaires** That States submit their responses to the Regional WGS-84 Implementation survey by **30 November 2009.**	Comply with Conclusion	States	Feedback from States	November 2009	
Conclusion 10/09 **Adoption of the AIS to AIM Transition Roadmap**	Comply with Conclusion	APIRG	Develop an Action Plan for e-OD implementation	2010	

That APIRG:

a) adopt the Roadmap as Guidance material to plan, manage and facilitate the global transition from AIS to AIM.

b) by using the Roadmap, assist States in planning the scope and prioritizing projects and actions for the transition to AIM.

Conclusion 10/10
e-TOD implementation awareness campaigns

Taking into consideration the adopted dates of applicability of e-TOD provisions introduced by Amendment 33 to Annex 15 and the resources required for the implementation of these new provisions, the States' AIS should take the lead and carry out awareness campaigns at national level to promote a better understanding of the planning and implementation issues related to e-TOD.

Conclusion 10/11
Development and management of a national e-TOD programme

That States, in accordance with sound management principles and procedures, should:

a) develop a framework and a detailed planning including priorities and timelines, for the implementation of a national E-TOD programme;

b) adopt/follow a collaborative approach, involving all concerned parties, in the implementation of E-TOD provisions; and

make an inventory of and evaluate the quality of existing terrain and obstacle data sources, and in the

Follow-up implementation of the Conclusion	States ICAO		Feed back from States	
Follow-up with States	ICAO States	State Letter Action Plan	2010	

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.

Conclusion 10/12 **Coordination and exchange of experience for the implementation of e-TOD requirements** That Implementation of e-TOD provisions should be considered a global matter concerning all ICAO Regions, which thereby necessitates coordination and exchange of experience between States, ICAO and other national/international organizations and industry partners involved.	Comply with the Conclusion	States ICAO	National e-TOD Programme defined and managed.	2010
Conclusion 10/13 **Responsibility for the provision of e-TOD** That States, while maintaining the responsibility for data quality and availability, should consider the extent to which provision of electronic terrain and obstacle data could be delegated to geodetic Institutes/Agencies, based on Service Level Agreement (SLA) reflecting such delegation	Comply with the Conclusion	States	Follow-up actions to be taken by States	2010
Conclusion 10/14 **ANP requirements related to e-TOD** That ICAO should develop an amendment to the basic Air Navigation Plans (ANP) for all ICAO Regions to include new E-TOD requirements and introduce a new table in the Facilities	Endorsement of the Table by APIRG	ICAO	APIRG/17 Report Amendment Proposal to APIRG/17	2010

and Services Implementation Documents (FASIDs) in which detailed planning of E-TOD implementation by States together with an indication of the implementation timelines, are reflected.

Decision 10/04: **Establishment of AFI region e-TOD working group** That with a view to, inter-alia, analysing the e-TOD requirements, developing a common understanding of these requirements and steering the planning and implementation process within the region, an AFI Region e-TOD Working Group be established as the way forward for the timely implementation of e-TOD through the proposed AFI Region e-TOD Implementation Strategy at **Appendix xx** with the Terms of Reference at **Appendix xx**.	Creation of e-TOD WG. Follow-up the work programme	ICAO States	Report of meeting	2009
Decision 10/05: **Revised TORs and Appellation of the AIS/MAP Task Force** That the Terms of Reference and name of the AIS/MAP Task Force be changed to reflect the Transition from AIS to AIM thereby amending the AIS/MAP Task Force to become the AIS-AIM Implementation TASK Force.	Follow-up the work programme	AFI AIS-AIM Task Force	Report of APIRG/17	2010

ICAO AFI REGIONAL OFFICES
SURVEY ON IMPLEMENTATION OF ELECTRONIC TERRAIN AND OBSTACLE DATA (eTOD) IN THE MID REGION

Introduction:

The purpose of this questionnaire on implementation of electronic Terrain and Obstacle Data (eTOD) in the A F I Region is to collect information from States regarding their Action Plan/Roadmap for the implementation of the eTOD provisions as specified in Annex 15 and if they have been able to meet the applicability dates (20 November 2008) and if they will be able to meet that of (18 November 2010). The results of this survey could be used for the development/update of the AFI Region eTOD implementation Strategy/Action Plan.

NAME OF STATE	DATE

Focal point: Who in your State could we contact for further clarification concerning eTOD implementation?

Name:	
Organization:	
Title:	
Telephone:	
Fax:	
e-mail:	

			YES	NO
1	Has your State established a high level framework (regulation, assignment of responsibilities, etc) for the implementation of eTOD?			
2	Has your State established a national eTOD Programme for the implementation of eTOD requirements, as per Annex 15 requirements?			
3	Has your State secured necessary resources for the implementation of eTOD? If, Yes, please give details about the estimated budget:			
4	Has your State developed an Action Plan/Roadmap with clear timelines for the implementation of eTOD?			

		YES	NO
5	Please specify the expected date of implementation of: a) Terrain data for Area 1: .... b) Terrain data for Area 2: .... c) Terrain data for Area 3: .... d) Terrain data for Area 4: .... e) Obstacle data for Area 1: .... f) Obstacle data for Area 2: .... g) Obstacle data for Area 3:		
6	Who are the different parties/Administrations in your State involved in the implementation eTOD (AIS, Aerodromes, Military, National Geographic and Topographic Administrations/Agencies, etc)?		
7	Has your State assigned the responsibility for the collection of Terrain data related to Areas 1 to 4? If Yes, please specify: a) Area 1: .... b) Area 2: .... c) Area 3: .... d) Area 4:		
8	Has your State made any assessment as to who should be responsible for the payment of Terrain data collection related to Areas 1 to 4? If Yes, please specify: a) Area 1: .... b) Area 2: .... c) Area 3: .... d) Area 4:		
9	Has your State assigned the responsibility for the collection of Obstacle data within Areas 1 to 3? If Yes, please specify: a) Area 1: .... b) Area 2: .... c) Area 3:		
10	Has your State made any assessment as to who should be responsible for the payment of Obstacle data collection related to Areas 1 to 3? If Yes, please specify: a) Area 1: .... b) Area 2: .... c) Area 3:		

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		YES	NO
11	Is there any existing Terrain database available in your State? If, Yes: a)　In which format the data is available/provided to users? b)　Does the data available meet the requirements of Annex 15 for Areas 1 to 4?		
12	Is there any existing Obstacle database available in your State? If, Yes: a)　In which format the data is available/provided to users? b)　Does the data available meet the requirements of Annex 15 for Areas 1 to 3?		
13	Has your State made any assessment of the candidate techniques that could be used for Terrain and Obstacle Data acquisition? If, Yes: a)　was that based on a cost-benefit analysis? b)　Which is/are the retained technique(s)?		
14	Has your State made any assessments as to which level of detail obstacle data should be collected? If, Yes, please give details:		
14	Has your State developed a case study for a representative aerodrome? If, Yes, please give details:		
15	Have you published in your AIP (AD 2.10) the description of obstacles separated into Area 2 and Area 3? If, No, when do you intend to revise the AIP to separate the obstacles in this manner?		
16	Any further comments (difficulties encountered, suggestions, etc):		

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eTOD Regulator Checklist to Support Implementation Planning

Awareness

> Determine the affected stakeholders in your State:

  o Ministry responsible for Transportation;
  o Civil Aviation Authority;
  o AISP; o
    ANSP; o
    Military;
  o National Geodetic, Cadastral or State Survey organisation;
  o Commercial survey companies or associations such as the Royal Institute of Chartered Surveyors (UK);
  o Military survey organisation;
  o Aerodrome operator or airport association(s);
  o National airlines;
  o General Aviation;
  • Helicopter operators or helicopter operator associations including Air Ambulance and civil SAR;
  o Local authorities or those responsible for aerodrome safeguarding / construction approval in the vicinity of the aerodrome;
  o Ministry responsible for local government, land planning and environment;
  o Power transmission companies;
  o Regulatory authority for radio and television broadcasts;
  o GSM antenna operators;
  o Local port authorities if ports exist within close proximity to an airport.

> From the foregoing, identify the Focal Point(s) in your State;

> Consider holding an eTOD awareness day or regional awareness days;

> Consider the establishment of a State Working Group to identify costs and determine an implementation plan.

The Four Areas

> Establish the State's policy with regard to implementing the current SARPS;

> Determine a State policy for what data will be made available for each of the four Areas, for which aerodromes and when;

> Determine a State policy for how and by whom the eTOD will be made available.

Regulation

> Confirm the State policy for the safeguarding of aerodromes from obstacle penetration, consider how effective the policy is and determine if available data can be demonstrated to be in compliance with eTOD requirements. In the absence of a declared or established policy, consider establishing one;

> Consider the application of National regulation to allocate responsibility for the provision of eTOD;

> Consider and map the development and implementation of an obstacle permission process *(note: there are currently several commercial tools to support this process);*

> Consider the nature, scope, content, time and processes associated with the development of legislation for any obstacle permission process;

> Determine which data sources should be regulated, how standards may be placed upon them and with whom responsibility for data and the data processes should rest.

Data Sources

> Collate a list of possible sources of terrain and obstacle data;

> Establish a meeting to discuss the appropriateness and possible use of these data sources;

> Determine where liability for each data source resides.

Survey

> Determine the common survey formats to be used by surveyors and geodetic institutes;

> Determine the survey requirements for each of the four Areas, including resurvey intervals;

> Prepare example contracts for surveyors to ensure that the data provided meets the necessary numerical requirements;

> Determine the responsibilities that may be placed upon surveyors to ensure that they use the correct standards, and how this may be confirmed.

Cross-border Harmonisation

> Consider how cross-border harmonisation could be organised, if applicable;

> Consider the establishment of agreements with neighbouring States to exchange and harmonise common data.

Oversight Monitoring

> Determine a means of providing oversight management for monitoring progress;

> Determine a policy for the audit of involved organisations.

Charging and Cost Recovery

> Identify how the costs, both initial and ongoing, are to be recovered for each
> Area;

> If there is to be a charge levied on the use of data, identify the appropriate means / mechanisms by which the revenue can be collected.

Data Validation and Verification

> Identify if means to validate data, including metadata, already exist and, if not, determine how existing data could be assessed to determine its suitability;

> Determine what existing data may be reused and how its quality can be verified and validated;

> Determine how new data will be validated and verified.

Data Provision and Maintenance

> Consider the adoption of interoperable exchange formats for eTOD;

> Determine the means/media by which each dataset shall be made available;

> Determine a policy for data maintenance.

Insert Organisation Name Here

Insert
Organisation
Logo Here

eTOD Implementation Plan Template

AFI eTODWG/1

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DOCUMENT APPROVAL

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AUTHORITY	NAME AND SIGNATURE	DATE
Author/Editor	[Insert Author details here]	
Quality Assurance	[Insert reviewer details here]	

DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Purpose and Scope

This document provides the plan for [Name of State] relating to the implementation of electronic Terrain and Obstacle Data (eTOD).

This covers the following activities:

- The Four Areas;

- Regulation;

- Data Sources;

- Survey;

- Cross-border Harmonisation;

- Oversight Mechanism;

- Charging and Cost Recovery;

- Data Validation and Verification;

- Data Provision and Maintenance.

[Supporting material may be found in ATTACHMENT A. It is intended that at an appropriate stage of its development this material is transferred to the eTOD Manual.

Text in blue is that which needs to be replaced by the developers of the implementation plan in the State. Text in green may be used as guidance in developing the implementation plan.

It should be noted that some sections of this template may not be applicable / appropriate for a State to include in its implementation plan. The sections are not intended to be mandatory and a State may select to include whichever sections it deems appropriate. Moreover the issues addressed by the template are not exhaustive and States may add to the template as required.]

2. THE FOUR AREAS

2.1 State Policy with Regard to Current SARPS

2.1.1 Purpose of this Section

This section documents the [Name of State] policy relating to the implementation of the SARPS in place on [enter date here].

2.1.2 State Policy

[Provide the State policy here.]

2.1.3 Considerations

[Discussions should take place in a State with representatives of the aviation community to help define a national policy for the implementation of Chapter 10, ICAO Annex 15. The discussions should include, as a minimum, the Regulator, Military and ANSP. Mindful that any change proposals have not yet been submitted to ICAO for consideration, it is important that the State determines as a minimum, what it intends to do with regards Areas 1 and 4 as these have an effective date of 20th November, 2008. In cases where there is data available which meets the necessary numerical requirements, no action other than making it available needs to be taken. However, should this data not be available or data that is available does not meet the numerical requirements or the requirements of quality including data validation, it is suggested that the State files a difference to ICAO.]

2.1.4 Text of ICAO Difference

[Provide the State ICAO difference text here, if applicable.]

2.2 State Policy for Scope of eTOD for Four Areas

2.2.1 Purpose of this Section

This section documents the [Name of State] policy for the scope of data provision for Areas 1, 2, 3 and 4, and for which aerodromes Areas 2 and 3 are applicable. The policy should include the quality requirements, such as accuracy, resolution, etc.

2.2.2 State Policy for Area 1

[Provide the State Policy for Area 1 here.]

2.2.3 State Policy for Area 2

[Provide the State Policy for Area 2 here.]

2.2.4 State Policy for Area 3

[Provide the State Policy for Area 3 here.]

2.2.5 State Policy for Area 4

[Provide the State Policy for Area 4 here.]

2.3   State Policy of How, When and by Whom eTOD will be Made Available

2.3.1   Purpose of this Section

This section documents the [name of State] policy of how, when and by whom eTOD will be made available.

2.3.2   State Policy

[Provide the State Policy for the availability of eTOD.]

3.   REGULATION

3.1   Applicable Regulation

3.1.1   Purpose of this Section

This section documents ICAO, AFI Region and other international and national regulations applicable to eTOD.

3.1.2   International Regulation

[List international regulation for eTOD here.]

3.1.3   National Regulation

[List any national regulation for eTOD here.]

3.1.4   Considerations

[In addition to ICAO regulation, the Aeronautical Data Quality Implementing Rule should be included.

It may be determined during State discussions that some form of national Regulation may be needed to expedite the implementation of eTOD and ensure that all actors accept their responsibilities. Any national Regulation related to eTOD should be listed in 3.1.3.

Consideration should also be given to guidance material, such as ISO 9001, ISO 19100, OGC standards, draft Doc 9881, etc.]

3.2   State Policy on Aerodrome Safeguarding

3.2.1   Purpose of this Section

This section documents the [Name of State] policy for the safeguarding of aerodromes.

3.2.2   State Policy

[Provide the State policy for aerodrome safeguarding here.]

3.3   Obstacle Permission Process

3.3.1   Purpose of this Section

This section documents the obstacle permission process of [Name of State] and any legislation that applies.

3.3.2   Process

[Provide the State obstacle permission process here and list any legislation that applies.]

3.3.3   Considerations

[It is recommended that a State considers the development of an obstacle permission process. This may take best practice from South Africa and other

States which have a declared policy. In addition States may wish to consider the development of legislation to enforce this process on those responsible for the erection and maintenance of obstacles.]

3.4   Regulation of Data Sources

3.4.1   Purpose of this Section

This section documents the [Name of State] approach to regulating data sources, to ensure that the appropriate standards and processes are applied.

3.4.2   Regulation

[Provide the state's policy for regulating data sources.]

4. DATA SOURCES

4.1 Purpose of this Section

This section lists the organisations that have been consulted to assess if the data they originate and maintain meets the appropriate requirements of eTOD. To be fully able to assess the data source, States should determine if the type of data source provider, i.e., State-owned, commercial organisation, etc, in order to be able to fully assess the impact of using its data. Where data is available and is suitable for use, this section provides information about the liability, cost/cost recovery and licence issues associated with it. Where arrangements are made for data source providers to make data available for aviation use, to the State, formal arrangements should be established between the data source providers and the receiving body. This section should list the formal arrangements in place which are related to the provision of eTOD.

The use of a Service Level Agreement is one example of a formal arrangement being established.

4.2 Data Sources Consulted

4.2.1 Data Source Provider

[For each data source provider identified, provide information about its status, state-owned, commercial organisation and list any particular areas of issue that arise from this.]

4.2.2 Liability

[For each data source identified, provide information about where the liability for the data lies.]

4.2.3 Cost Model

[For each data source identified, provide information related to the costs for the data.]

4.2.4 Licensing

[For each data source identified, provide information related to the licensing of the data.]

4.2.5 Formal Arrangements

[List the formal arrangements in place for the provision of eTOD.]

4.3 Considerations

[The owners of the following data sources or the following organisations, as an example, should be consulted:

- Geodetic institutes;
- Power / energy supply companies;
- Wind farm operators;
- Mapping agencies;

- Authority(ies) responsible for the authorisation of radio/TV and other broadcast antenna;

- Cell phone operators;

- Port authorities.

States should establish their own list of data sources which they will consult in the process of trying to identify eTOD providers. Following this, it is recommended that a meeting is held with each possible data source to discuss the appropriateness and possible use of their data and where liability lies.

States should assess the cost model and licensing of the data from a data source, taking into account whether the organisation is State-owned or a commercial organisation. Clearly commercial organisations that already provide data for a charge to its users will not be willing to loose this revenue stream, this making the cost model and licensing for these products, more complex.

Formal arrangements should be made between data source providers and the receiving party. This will clearly state the quality requirements for the data, means of provision, etc. It is recommended that where a data source provider will provide data regularly, over a period of time, a Service Level Agreement is used to capture this agreement. Where data provision is likely to be a one-off or a very infrequent occurrence, it is recommended that a contract is established between the two parties.]

5. SURVEY

5.1 Survey Formats

5.1.1 Purpose of this Section

This section documents the common survey formats to be used by surveyors and geodetic institutes.

5.1.2 Formats

[List the common survey formats to be used here.]

5.2 Survey Requirements

5.2.1 Purpose of this Section

This section documents the survey requirements for each of the four Areas.

5.2.2 Survey Requirements for Area 1

[Provide the survey requirements for Area 1 here.]

5.2.3 Survey Requirements for Area 2

[Provide the survey requirements for Area 2 here.]

5.2.4 Survey Requirements for Area 3

[Provide the survey requirements for Area 3 here.]

5.2.5 Survey Requirements for Area 4

[Provide the survey requirements for Area 4 here.]

5.3 Survey Contracts

5.3.1 Purpose of this Section

States may, if they wish, include in their implementation plans details of requirements that should be included in survey contracts. If this is the case, this section will include the requirements that should be included in survey contracts for each of the four Areas, to ensure that the data provided through the contract meets the necessary numerical and quality requirements.

5.3.2 Survey Contracts

[Provide the text to be used in survey contracts here.]

5.4 Surveyor Vetting

5.4.1 Purpose of this Section

This section documents how surveyors are vetted to ensure that they adhere to the correct standards and discharge their legal responsibilities in accordance with the contract.

5.4.2   Vetting Process

[Provide the State vetting process for surveyors here.]

5.4.3   Considerations

It should be noted that this section may not be relevant to every State. Responsibility for the vetting of surveyors may rest elsewhere and therefore this section only applies to those States that have responsibility for this.

6. CROSS-BORDER HARMONISATION

6.1 State Agreements / Arrangements

6.1.1 Purpose of this Section

This section documents the arrangements in place with other States for the exchange, provision and receipt of common eTOD.

6.1.2 Arrangements

[List the arrangements in place with neighbouring states for the exchange, provision and receipt of common eTOD.]

6.1.3 Considerations

[It is recommended that some form of harmonisation activity is undertaken with neighbouring States, perhaps through the medium of a Service Level Agreement (SLA). Further, it is recommended that, where appropriate, States could make arrangements for data within its boundary to be provided to the other State, where it is needed for the other State's aerodrome. Alternatively arrangements could be made to share the survey costs or to use one survey company, all with the intention of lowering the cost of data acquisition.

To assist with the exchange of data between States and other users, it is recommended that a common eTOD exchange format is adopted.]

7.   OVERSIGHT MECHANISM

7.1   Progress Monitoring

7.1.1   Purpose of this Section

This section details the mechanism by which the State intends to monitor the implementation of eTOD.

7.1.2   Monitoring Policy

[Detail how the State will monitor the implementation of eTOD, indicate here any obligations to meet ICAO Requirements.]

[List the State policy for monitoring eTOD implementation.]

7.2   Audit

7.2.1   Purpose of this Section

This section details the [Name of State] plan for the audit of the organisations involved in the implementation and subsequent management and maintenance of eTOD.

7.2.2   State Plan

[Provide the State's plan for the audit of organisations.]

8.   COST RECOVERY AND CHARGING

8.1   Cost Recovery

8.1.1   Purpose of this Section

This section identifies how [. . . of States] will finance eTOD. It states from whom the finance will be obtained and the cost recovery mechanisms associated with the initial and ongoing costs for eTOD, for each of the four Areas.

8.1.2   Initial Costs

8.1.2.1   Cost Recovery for Area 1

[Provide the means of cost recovery for Area 1 here.]

8.1.2.2   Cost Recovery for Area 2

[Provide the means of cost recovery for Area 2 here.]

8.1.2.3   Cost Recovery for Area 3

[Provide the means of cost recovery for Area 3 here.]

8.1.2.4   Cost Recovery for Area 4

[Provide the means of cost recovery for Area 4 here.]

8.1.3   Ongoing Costs

8.1.3.1   Cost Recovery for Area 1

[Provide the means of cost recovery for Area 1 here.]

8.1.3.2   Cost Recovery for Area 2

[Provide the means of cost recovery for Area 2 here.]

8.1.3.3   Cost Recovery for Area 3

[Provide the means of cost recovery for Area 3 here.]

8.1.3.4   Cost Recovery for Area 4

[Provide the means of cost recovery for Area 4 here.]

8.1.4   Considerations

[Consideration should be given to the need to recover costs not only at the initial implementation but as an ongoing activity including the

- Increased costs for AISPs in managing the data;
- Increased costs for regulators in monitoring and auditing those associated with eTOD implementation and provision;
- Indirect costs such as the adaptation of procedures due to new / updated obstacle data.]

8.2 Charging Mechanisms

8.2.1 Purpose of this Section

This section identifies the charging mechanisms in place in *[name of State]* to recover the costs associated with the initial and ongoing provision of eTOD.

8.2.2 Mechanisms

[Provide the charging mechanisms for eTOD here.]

9.   DATA VALIDATION AND VERIFICATION

9.1   Assessment of Existing Data

9.1.1   Purpose of this Section

This section identifies how existing data should be assessed to determine if it meets the eTOD requirements.

9.1.2   State Policy

[Provide the State Policy for assessment of existing data here.]

9.1.3   Considerations

[Consideration should be given to whether means already exist in the State to validate data, including its associated metadata, to determine its appropriateness.

Consideration should be given to the following:

* Does the data meet the ICAO numerical requirements?
* Does the data have the associated metadata?
* Does the data have full traceability?

Methods for the assessment of different data types should be determined / identified.]

9.2   Data Validation and Verification

9.2.1   Purpose of this Section

This section details the approach of [Name of State] to the validation and verification of existing and new data.

9.2.2   Approach to Data Validation and Verification of Existing Data

[Provide the State's approach to data validation and verification of existing data.]

9.2.3   Approach to Data Validation and Verification of New Data

[Provide the State's approach to data validation and verification of new data.]

9.2.4   Considerations

[Consideration should be given to whether means already exist in the State to validate data, including its associated metadata.

The approach should ensure that the data has full traceability.]

10.   DATA PROVISION AND MAINTENANCE

10.1   Data Exchange Formats

10.1.1   Purpose of this Section

This section details the data exchange formats to be used for eTOD.

10.1.2   Data Formats

[the exchange formats to be used for eTOD.]

10.2   Means / Media

10.2.1   Purpose of this Section

This section details the means / media by which each data set shall be made available.

10.2.2   Means of Provision: XXXX

[Insert explanation of how the means will be used to make the data sets available.]

10.2.3   Considerations

[It is intended that a subsection is provided for each means of provision, for example, Means of Provision: DVD, Means of Provision: Internet, etc.]

10.3   Data Maintenance

10.3.1   Purpose of this Section

This section details the State policy for the update / maintenance of data, including periodicity.

10.3.2   State Policy

[Provide the State's policy on data maintenance.]

ATTACHMENT- A   GUIDANCE FOR INCLUSION IN eTOD MANUAL

A.1   Identification of all Stakeholders

It is important that the stakeholders in the State are identified so that there is full awareness of eTOD and that there is an efficient flow of information between the parties involved. It is anticipated that the stakeholders will meet, as appropriate, to plan and implement the eTOD policies for the State.

A.2   eTOD Awareness Day

It is recommended that a national awareness day or a series of regional seminars are held to raise the awareness of stakeholders to the requirements of eTOD. This would allow all parties, especially those that do not usually attend the TOD WG or Aeronautical Information (AI) Team, to be briefed on the requirements of ICAO and the pan-European progress towards the implementation of eTOD. The attendance by personnel of the following organisations should be considered, though the list is by no means exhaustive:

- Ministry of Transport;
- Civil Aviation Authority;
- AISP;
- ANSP;
- Military;
- Aerodrome operators;
- Survey organisations – civil and military;
- Geodetic institutes;
- Airline representatives;
- General Aviation.

In the interests of economy, States may wish to co-host such workshops and to share their experiences and best practices associated with eTOD for the common good.

A.3   State Working Group

This section would include information related to the establishment of a State Working Group for TOD.

This has been demonstrated as a successful initiative in States and has, therefore, been taken as an example of best practice.

A.3.1   Considerations

It is recommended that such a working group be formed by, amongst others:

- State Regulator responsible for TOD provision;
- State AIS for publication;
- Military AIS (when applicable to data provision);
- State survey organisation;
- Military survey organisation, if applicable;

- Representative(s) of national aerodromes;

- Representation (probably at a national level) of local authorities or those with the responsibility for safeguarding and/or approving construction in the vicinity of an aerodrome;

- Authorities or organisations responsible for the authorisation or maintenance of obstacles, such as:

    ◊ Broadcast transmission antennas;

    ◊ GSM masts;

    ◊ Electricity transmission pylons;

    ◊ Wind turbine farms.

- In States, where aerodromes may be adjacent to ports, representatives of the Port Authority.

A.4   Focal Points

This section will include guidance about which organisations should be considered to establish contact points in a State. This would include:

- Ministry of Transport

- The Civil Aviation Authority;

- The Military;

- The ANSP;

- The civil AIS / AIM;

- Aerodrome authorities;

- National geodetic institutions.

A.5   Cross-border Harmonisation

Consideration should be given to means by which States may share common data. It is recommended that meetings are held with neighbouring States to discuss possible ways forward. Consideration should also be given to the use of common exchange formats.

End of Document

SOUTH AFRICAN

CIVIL AVIATION AUTHORITY

South African

Electronic Terrain and Obstacle Data (eTOD)

Implementation Plan

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EXECUTIVE SUMMARY

Amendment 33 to ICAO Annex 15 (effective 12/07/2004) introduced requirements for States to ensure that electronic sets of Terrain and Obstacle Data (TOD) are available. The data shall be provided for four distinct areas, with each having specific data collection requirements.

Implementation of these requirements has caused significant concerns, mainly as a result of the high costs associated with data collection and processing, and the lack of a clear business case to support this expenditure.

This document provides the plan for South Africa relating to the implementation of electronic Terrain and Obstacle Data (eTOD). The purpose of providing terrain and obstacle data in an electronic format is stated in ICAO Annex 15, 10.1, where a set of applications / operations is listed.

The requirements for providing electronic terrain and obstacle data can be grouped as follows:

- Data collection requirements (geographical area): Areas 1,2,3 and 4;
- Data quality requirements (data accuracy, integrity and resolution);
- Database requirements (terrain database and obstacle database);
- Availability requirements (when / how data to be made available by States).

As regards Area 1 Electronic Terrain Data, South Africa will fully comply with Chapter 10, ICAO Annex 15, and therefore does not intend to file any difference with regards the technical content requirements. However not all of Electronic Obstacle Data complies with the data integrity requirements, therefore South Africa will not fully comply with Chapter 10, ICAO Annex 15, and has filed differences (alternative method of compliance differences have been filed on 10.2.5, 10.4.2 and 10.5.6). The issue is that we are dealing with legacy data whose integrity cannot be guaranteed at present. Circular Error of Probabilities (CEPs) will be provided with all data whose positional integrity does not fully comply with Chapter 10, ICAO Annex 15. The SACAA has taken responsibility for the provision of Area 1 data. For Area 2, IFR Aerodrome with ATS Service Provider, eTOD will be provided by the ATS Service Provider in conjunction with the SACAA, and for IFR Aerodrome without an ATS Service Provider, eTOD will be the responsibility of the Aerodrome License Holder in conjunction with the SACAA. Area 3 and Area 4 will be the responsibility of the Aerodrome License Holder.

Two databases shall be provided: a terrain database and an obstacle database. Neither of the databases shall contain data belonging to the other. All the eTOD data will reside with the SACAA in a Geodatabase that will be maintained by the Procedure Design & Cartography Department, and the data will be maintained by the respective data providers for each area.

Terrain and obstacle data shall comply with ISO 19100 series requirements in terms of data modelling. The eTOD implementation shall be in compliance with ICAO provisions contained in Annex 15, as amended, and Document 9881, and

managed by the SACAA as a national programme supported by necessary resources, a high level framework and detailed planning, including priorities and timelines for the implementation of the programme.

Data validation and verification will be done to ensure that the data meets the ICAO numerical requirements, has the associated metadata and has full data source traceability. Updating of the database shall be done on a regular basis to account for errors, new or amendments to existing data sets. In that way, applications that use data continue to be trustworthy.

The SASACAA will adopt/follow a collaborative approach involving all concerned parties in the implementation of eTOD and establish a multi-disciplinary team defining clearly the responsibilities and roles of the different Administrations within and outside the SACAA in the implementation process i.e. AIS Department, Aerodrome Operators, Military, National Mapping Agency, *et cetera*.

For eTOD implementation, commercial geospatial data vendors will be used in order to acquire Area 1 terrain data, and with regard to obstacle data the SACAA's obstacle dataset will be used, together with additional data from ATNS, ACSA, ESKOM, Local Municipalities Telecommunication companies, Petroleum & Gas companies, as well as the SA National Defence Force.

Currently there are arrangements to include as part of the South African eTOD implementation the terrain data for Lesotho and Swaziland, but there no arrangements for cross-border harmonization with Namibia, Botswana, Zimbabwe and Mozambique at present. It is recommended that some form of harmonisation activity is undertaken with neighbouring States, perhaps through the medium of a Memorandum of Understanding (MoU).

A South African eTOD Implementation Workgroup has been established, consisting of stakeholders in the South African aviation community, to manage and oversee the eTOD implementation in South Africa.

1. INTRODUCTION

This document provides the plan for South Africa relating to the implementation of electronic Terrain and Obstacle Data (eTOD). This covers the following activities:

- The Four Areas;
- Regulation;
- Data Sources;
- Cross-border Harmonisation;
- Oversight Monitoring;
- Charges and Cost Recovery;
- Data Validation and Verification;
- Data Provision and Maintenance.

1.1 Geographic Information

Geographic phenomena could broadly be divided into two categories: discrete and continuous. Discrete phenomena are objects with well-defined boundaries or spatial extent (buildings, bridges, etc.), and continuous phenomena vary over space and have no specific extent (elevations, temperatures, etc.) These two categories are not mutually exclusive as many elements of the landscape could be categorized as discrete or continuous.

Geographic information is treated and presented as vector data or raster data. Vector data deals with discrete phenomena – features, which spatial characteristics are presented by a set of one or more geometric primitives (point, curve, surface). Raster data deals with geographic phenomena that vary continuously over the space and contain a set of values each associated with one of the elements in a regular arrangement of points or cells in space.

2. ICAO eTOD REQUIREMENTS

2.1 ICAO eTOD SARPS

The purpose of providing terrain and obstacle data in an electronic format is stated in ICAO Annex 15, 10.1, where a set of applications / operations is listed.

All these applications / operations should ideally be supported by relevant provisions at the ICAO level in a compliant and harmonised manner that would be easily referenced and understood.

2.2 Text of ICAO Difference

With regard to Electronic Terrain Data, South Africa will fully comply with the technical content requirements for Chapter 10, ICAO Annex 15, and therefore does not intend to file any difference. However not all of Electronic Obstacle Data complies with the data integrity requirements, therefore South Africa will not fully comply with Chapter 10, ICAO Annex 15, and has filed differences (alternative

method of compliance differences have been filed on 10.2.5, 10.4.2 and 10.5.6). The issue is that we are dealing with legacy obstacle data whose integrity cannot be guaranteed. Circular Error of Probabilities (CEPs) will be provided with all data whose positional integrity does not fully comply with Chapter 10, ICAO Annex 15. The SACAA text will state that not all Electronic Obstacle Data complies with the integrity requirements of Chapter 10, ICAO Annex 15.

2.3 State Policy for Scope of eTOD for Four Areas

The requirements for providing electronic terrain and obstacle data can be grouped as follows:

- Data collection requirements (geographical area): Areas 1,2,3 and 4;
- Data quality requirements (data accuracy, integrity and resolution);
- Database requirements (terrain database and obstacle database);
- Availability requirements (when / how data to be made available by States).

Area	Definition
Area 1	Entire State territory including aerodromes / heliports
Area 2	For IFR aerodromes / heliports, designated TMAs or 45 km radius,
Area 3	RWY edges up to 90 metres from RWY centre line and 50 metres from the edges of the rest of the movement areas
Area 4	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 (only for precision approach Cat II / III

2.3.1 Area 1

Terrain Data

The SACAA has taken responsibility for the provision of Area 1 data and will consist of a complete 20 m seamless DEM of South Africa (including Swaziland and Lesotho as well as a 35 km buffer into neighbouring countries).

- Datum: WGS84
- Spheroid: WGS84
- Projection: Lamberts Conformal Conic
- Format: DTED1/ESRI Binary

Quality Attributes	Area 1 – the State
Horizontal Accuracy	50.0 m
Data Integrity	Routine (10^{-3})
Vertical Accuracy	30.0 m
Vertical Resolution	1.0 m
Confidence Level	90 %
Post Spacing	3 arc second (approx. 90 m)

Obstacle Data

This is the responsibility of the South African Civil Aviation Authority and will consist of every known obstacle within Area 1 whose height above the ground is equal to or greater than 60 m.

Quality Attributes	Area 1 – the State
Horizontal Accuracy	50.0 m
Data Integrity	Routine (10^{-3})
Vertical Accuracy	30.0 m
Vertical Resolution	1.0 m
Confidence Level	90 %
Maintenance Period	As required

The integrity of legacy obstacle data cannot be guaranteed, Circular Error of
Probability will therefore be specified for every non-compliant obstacle, and differences have been filed in this respect.

2.3.2 Area 2

Area 2 is the responsibility of the ATS Service Provider, and for IFR Aerodrome without an ATS Service Provider, eTOD will be provided by the ATS Service Provider in conjunction with the SACAA.

Area 2 is the most complex area in terms of the operations supported. It addresses to the following functions:

- Take-off and landing
- Arrival, approach and departure procedures
- Contingency procedures
- Instrument flight procedure design
- Aeronautical chart production (SID/STAR/IAC, PATC, AOC, etc.)
- Aerodrome / heliport obstacle restriction and removal

Terrain Data

Terrain data for Area 2 has a geographical footprint as follows:

- Within 10 km from the ARP;
- Between 10 km from the ARP extending to the TMA boundaries or to 45 km, whichever is smaller, for terrain that penetrates the horizontal plane of 120
metres above the lowest RWY elevation.
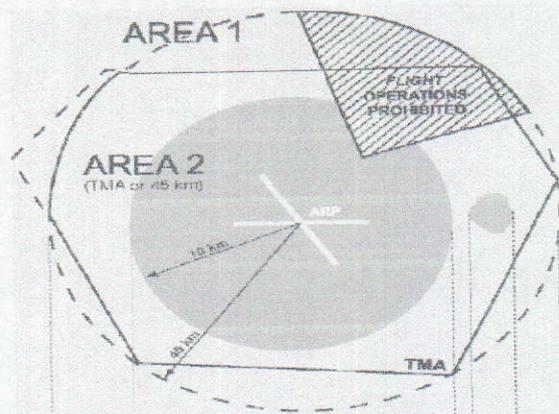
Quality Attributes	Area 2 – Terminal Airspace
Horizontal Accuracy	5.0 m
Data Integrity	Essential (10^{-5})
Vertical Accuracy	3.0 m
Vertical Resolution	0.1 m
Confidence Level	90 %
Post Spacing	1 arc second (approx. 30 m)

Obstacle Data

Obstacle data for Area 2 has a geographical footprint as follows:

- 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 % slope until it reaches 120 m above the lowest runway elevation of all operational runways at the aerodrome;
- Between 10 km from the ARP extending to the TMA boundaries or to 45 km, whichever is smaller, the horizontal plane of 120 metres above the lowest RWY elevation.

Area 2 Profile View

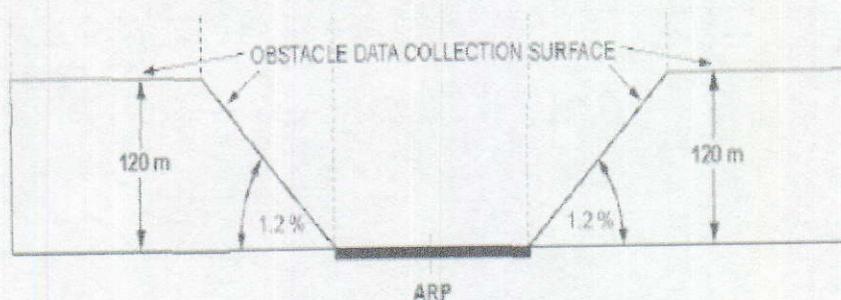| Quality Attributes	Area 2 – Terminal Centred Area
Horizontal Accuracy	5.0 m
Data Integrity	Essential (10^{-5})
Vertical Accuracy	3.0 m
Vertical Resolution	0.1 m
Confidence Level	90 %
Maintenance Period	As required

The integrity of legacy data cannot be guaranteed, Circular Error of Probability will therefore be specified if applicable, and differences have been filed in this respect.

2.3.4 Area 3

Area 3 is adjacent to the movement area and extends from the edges of the RWYs up to 90 metres from the RWY centreline and for the rest of the movement area, 50 metres from its edges.
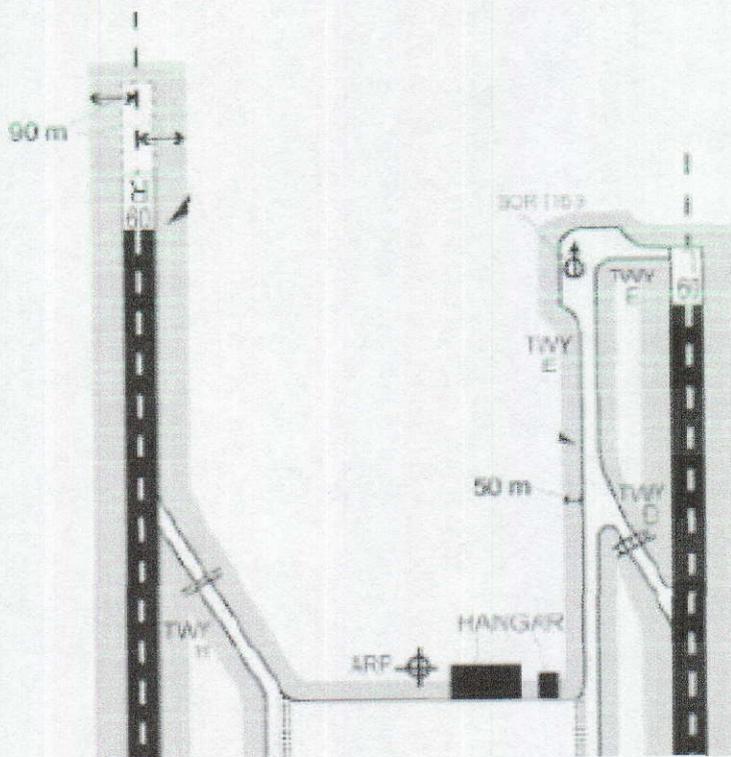
Concerning the obstacle collection, all obstacles that rise higher than 0.5 metres above the horizontal plane passing through the nearest point of the movement area shall be taken into consideration.

Terrain Data

Quality Attributes	Area 3 – Aerodrome Mapping
Horizontal Accuracy	0.5 m
Data Integrity	Essential (10^{-5})
Vertical Accuracy	0.5 m
Vertical Resolution	0.01 m
Confidence Level	90 %
Post Spacing	0.6 arc second (approx. 20 m)

Obstacle Data

Quality Attributes	Area 3 – Terminal Centred Area
Horizontal Accuracy	0.5 m
Data Integrity	Essential (10^{-5})
Vertical Accuracy	0.5 m
Vertical Resolution	0.01 m
Confidence Level	90 %
Maintenance Period	As required
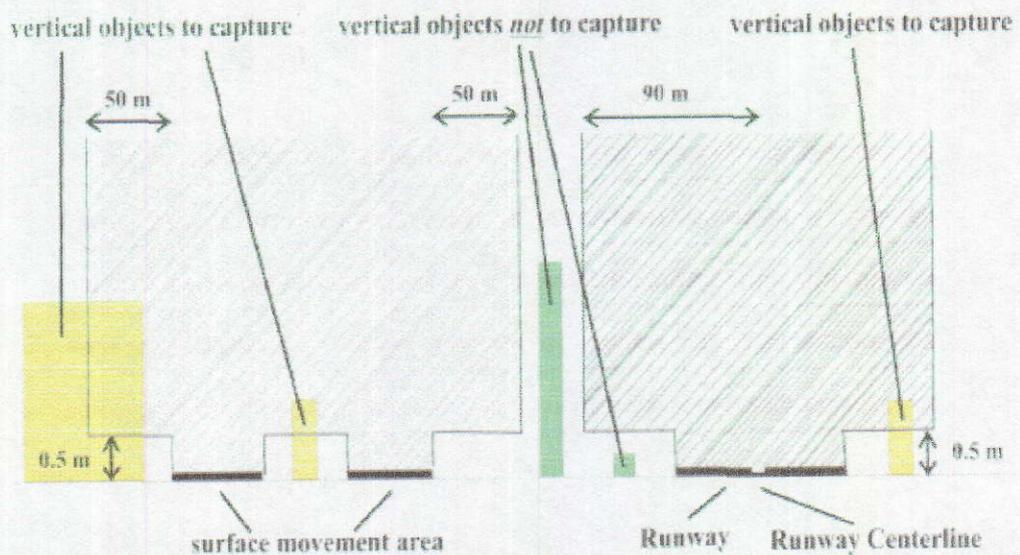
2.3.5 Area 4

Defined as the radar altimeter area for CAT II/III precision approach procedures, and is 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 the assessment, by use of radio altimeters, the effect of terrain
on decision height determination.

The width of the area shall be 60m on either side of the extended runway centre line while the length shall be 900m from the runway threshold measured along the extended runway centre line.
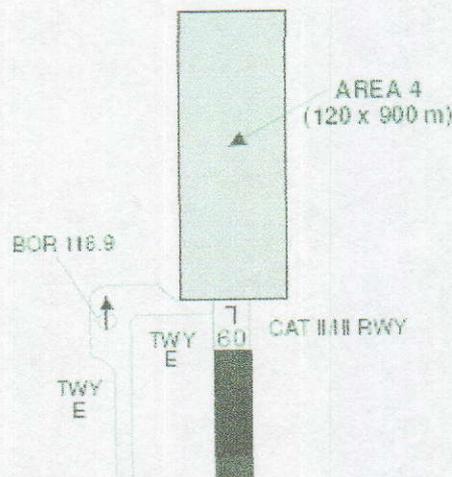
The policy of the South African Civil Aviation Authority is that the eTOD responsibility for Area 4 fall to the Aerodrome License Holder – which for South Africa is presently limited to 2 ACSA owned aerodromes:

- Cape Town International;
- OR Tambo International.

Terrain Data

Quality Attributes	Area 4 – CAT II/III Operation Area
Horizontal Accuracy	2.5 m
Data Integrity	Essential (10^{-5})
Vertical Accuracy	1.0 m
Vertical Resolution	0.1 m
Confidence Level	90 %
Post Spacing	0.3 arc second (approx. 9 m)

Obstacle Data

There are currently no ICAO obstacle data requirements for Area 4, but SACAA intends to make available a dataset that contain all the features which may impact on height determination and which are not contained within the terrain dataset.

Obstacle data includes data generated and issued to ACSA by ATNS as well as additional obstacles identified within the ACSA Geodatabase.

2.4 How, When and by Whom eTOD will be Made Available

All the eTOD Obstacle data will reside with the SACAA in a Geodatabase, the database will be maintained by the Procedure Design & Cartography Department. Area 1 Obstacle data will be maintained and disseminated to all interested parties by the SACAA.

With regard to Area 1 Terrain data, the SACAA intends to conclude an Accredited Supplier arrangement with a Commercial Vendor, who would then be the official supplier of the data. Any Person/Organisation/Sub-contractor/State Organ that requires the terrain data would be directed to the Accredited Supplier.

Area 2 terrain and obstacle data for IFR Aerodrome *with* an ATS Service Provider shall remain the responsibility of ATS Service Provider – hence they will also be the custodians of this data for both maintenance and for data dissemination. For an IFR Aerodrome *without* an ATS Service Provider, eTOD will be the responsibility of the Aerodrome License Holder.

Area 3 and Area 4 will be the responsibility of the Aerodrome License Holder and they will be the custodians of this data for both maintenance and for data dissemination.

2.5 Considerations

Two databases for each area shall be provided: a terrain database and an obstacle database. Neither of the databases shall contain data belonging to the other one.

Ref. ICAO Annex 15, 10.3.2: Terrain is, *"naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles"*. Ref. ICAO Annex 15, 10.4.1: Obstacles are *"all fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight shall not be included in terrain databases.*

3. REGULATION

3.1 Applicable Regulation

ICAO Annex 15, 10.5.2 requires States to provide specifications for the terrain and obstacle data made available: "... *statement of available electronic terrain and obstacle data sets shall be provided in the form of terrain data product specifications as well as obstacle data product specifications ...*". Terrain and obstacle data shall comply with ISO 19100 series requirements in terms of data modelling.

3.1.1 International Regulation

The eTOD implementation shall be in compliance with ICAO provisions contained in Annex 15, as amended, and Document 9881, and will be managed by the SACAA as a national programme supported by necessary resources, a high level framework and a detailed planning, including priorities and timelines for the implementation of the programme.

3.1.2 National Regulation

No National Regulation currently exists. It is foreseen that National Regulations will be required. Required regulations will be drafted by the SACAA and will undergo the normal CARCOM process before promulgation. Voluntary compliance with the national implementation is expected of all stakeholders pending the promulgation of the required regulations.

3.1.3 Considerations

The SACAA has adopted/followed a collaborative approach involving all concerned parties in the implementation of eTOD provisions and has established a multi- disciplinary implementation team defining clearly the responsibilities and roles of the different stakeholders within and outside the SACAA in the implementation process i.e. AIS Department, Aerodrome Operators, Military, National Mapping Agency, *et cetera*.

3.2 Regulation of Data Sources

This section documents the South Africa approach to regulating data sources, to ensure that the appropriate standards and processes are applied.

3.2.1 Regulation

Terrain and obstacle data shall comply with ISO 19100 series requirements in terms of data modelling. Appendix 8 of ICAO Annex 15 contains the provisions for the definition of Areas 1, 2, 3 and 4 as well as for the quality requirements and data attributes (metadata) for collecting terrain and obstacle numeric data.

4. DATA SOURCES

This section lists the organisations that have been consulted to assess if the data they originate and maintain meets the appropriate requirements of eTOD. Where data is available and is suitable for use, this section provides information about the liability, cost/cost recovery and license issues associated with it.

4.1 Data Sources Consulted

For eTOD implementation, 3 commercial vendors were consulted in order to acquire Area 1 terrain data – ComputaMaps, GISCOE and TeleAtlas. Furthermore, the SACAA also looked at using Shuttle Radar Topography Mission (SRTM) data - available for free from NASA Jet Propulsion Laboratory (JPL) or from the US Geological Survey (USGS).

4.1.1 Liability

ComputaMaps

"ComputaMaps disclaims all other warranties, express or implied, including the
implied warranties of merchantability and fitness for a particular purpose. ComputaMaps shall not be liable for any damage or loss of any kind arising out of or resulting from your possession or use of the Product (including data loss or corruption), regardless of whether such liability is based in tort, contract or otherwise.
If the aforegoing limitation is held to be unenforceable, ComputaMaps maximum liability to you shall not exceed the amount of the licence fees paid by you for the Product. The remedies available to you against ComputaMaps under this agreement are exclusive. In the event that any particular state does not allow the limitation or exclusion or implied warranties or liabilities for incidental or consequential damages contained herein, the above limitations and exclusions shall not apply to you."

TeleAtlas Africa

Will not be liable to the SACAA *"for any damages, which includes incidental and/or consequential damages (including but not limited to loss of profit), which may arise out of any occurrence related to the work done with the DATA or the Product or from the use of the DATA or the Product by the Purchaser or ant third party. In this regard TeleAtlas Africa guarantees the accuracy of our processes and the subsequent results to be guaranteed according to the source data used."*

NASA - SRTM

NASA states that *"..Although these data have been processed successfully on a*
computer system at the U.S. Geological Survey, EROS Data Center, no warranty expressed or implied is made by either regarding the utility of the data on any system, nor shall the act of distribution constitute any such warranty. The USGS will warrant the delivery of this product in computer-

readable format and will offer appropriate adjustment of credit when the product is determined unreadable by

correctly adjusted computer peripherals, or when the physical medium is delivered in damaged condition..."

4.1.2 Cost Model

ComputaMaps

South Africa, including Lesotho, Swaziland and a 35km buffer: ca 1,381,000 km^2 – R540,000.00.

TeleAtlas Africa

South Africa, including Lesotho, Swaziland and a 35km buffer: ca 1,381,000 km^2 – R190,000.00.

GISCOE

South Africa, including Lesotho, Swaziland and a 35km buffer: ca 1,381,000 km^2 – R473,533.20.

NASA – SRTM

South Africa, including Lesotho, Swaziland and a 35km buffer: ca 1,381,000 km^2 – Free, but coverage is incomplete.

4.1.3 Licensing

ComputaMaps

"ComputaMaps grants the licensee a non-exclusive, personal, non-transferable and non-assignable right to use the Product on a maximum of fifteen (15) workstations within a single client organisation.

The ownership of the copyright and all other intellectual property rights in the digital data contained in the Product vests in ComputaMaps and its suppliers and is supplied under license from the said copyright owner(s). Furthermore, the copyright and intellectual property rights in the data selection, processing, enhancements, packaging, structure and format of the Product vest in ComputaMaps."

TeleAtlas Africa

"All spatial data products licensed by TeleAtlas Africa, remains the sole property of TeleAtlas Africa. Data is licensed on a user license basis and the following conditions apply:

- *Spatial Data products licensed by TeleAtlas Africa are licensed without distribution rights and my not be licensed (value added or not) or distributed in any form to other organizations but the Purchaser without express permission from TeleAtlas Africa.*

- *Copyrights exists on all spatial data products licensed by TeleAtlas Africa.*
  Data may not be copied in any form (analog or digital) without express permissions by TeleAtlas Africa.
- *TeleAtlas Africa must be acknowledged in publications referring to the data and in any electronic media using the data."*

NASA – SRTM

The objective of the SRTM mission is to obtain elevation radar data on a near-global scale and generate the most complete high-resolution digital topographic database of the Earth. The information collected by SRTM will be used to provide a tool to enhance the activities of scientists, the military, commercial, and civilian users and there are no licensing issues to consider.

4.2 Considerations

With regard to obstacle data the following organisations have/will be contacted and engaged with:

- ATNS
- ACSA
- ESKOM
- Telecommunication companies
- Petroleum & Gas companies
- SA National Defence Force
- Department of Public Works
- Statistics SA
- NIMAC
- Local Councils

5. CROSS-BORDER HARMONISATION

Currently there are arrangements to include as part of the South African eTOD implementation the terrain data for Lesotho and Swaziland, but there no arrangements for cross-border harmonization with Namibia, Botswana, Zimbabwe and Mozambique.

It is recommended that some form of harmonisation activity is undertaken with neighbouring States, perhaps through the medium of a Memorandum of Understanding (MoU). Further, it is recommended that, where appropriate, States could make arrangements for data within its boundary to be provided to the other State, where it is needed for the other State's aerodrome. To assist with the exchange of data between States and other users, it is recommended that a common eTOD exchange format is adopted.

The SACAA, in its function as the manager of the South African eTOD implementation program, will endeavour to attempt to establish contact with neighbouring states in order to implement MoUs to enable data harmonisation.

6. OVERSIGHT MONITORING

6.1 Progress Monitoring

A South African eTOD Workgroup has been established, consisting of stakeholders in the South African aviation community, to manage and oversee the eTOD
implementation in South Africa.

The following stakeholders are involved:

- SACAA (PD&C, AIS, Aerodrome Section);
- ATNS;
- ACSA;
- SA Air Force;
- Chief Director Surveys and Mapping;
- Private IFR Aerodrome License holders;
- IATA.

6.2 Audit

Make an inventory of and evaluate the quality of existing (legacy) terrain and obstacle datasets.

7. CHARGING AND COST RECOVERY

This section documents how South Africa will finance, from whom the finance will be obtained and the cost recovery mechanisms associated with the initial and ongoing costs for eTOD, for each of the four Areas.

7.1 Initial Costs

7.1.1   Cost Recovery for Area 1

	Who	How	Cost
Terrain	SACAA	50k interpolation	Data user
Obstacles	SACAA	Obstacle database	Data user

7.1.2   Cost Recovery for Area 2

	Who	How	Cost
Terrain	ATNS	10k interpolation	User charges
Obstacles	ATNS	Obstacle database	User charges

7.1.3 Cost Recovery for Area 3

	Who	How	Cost
Terrain	ACSA	stereoscopic aerial photography	User chargers
Obstacles	ACSA	ATNS Surveys	User charges

7.1.4 Cost Recovery for Area 4

	Who	How	Cost
Terrain	ACSA	stereoscopic aerial photography	User charges
Obstacles	ACSA	ATNS Surveys	User charges

7.2 Ongoing Costs

	Terrain	Obstacles
Area 1	Data user	Owner
Area 2	Data user	ATS Service Provider
Area 3	Data user	AD charges
Area 4	Data user	AD charges

8. DATA VALIDATION AND VERIFICATION

The requirements for aeronautical data quality are provided in several ICAO SARPS, grouped in two main categories:

- Data collection (calculated or surveyed) – accuracy and integrity level;
- Data publication – (charting and publication) resolution and integrity level.

The ICAO SARPS responsible for data collection requirements are:

- ICAO Annex 11 Air Traffic Services, Appendix 5 geographical coordinates and the elevations for obstacles in Area 1 and Area 2 (outside the aerodrome / heliport boundary); instrument approach procedure altitudes; obstacle clearance altitudes / heights; minimum (flight) altitudes
- ICAO Annex 14, Volume I, Appendix 5 – geographical coordinates and the elevations for obstacles in Area 2 (within the aerodrome / heliport boundary) and Area 3;
- ICAO Doc 8168, Vol. II – PANS-OPS (for calculated data):
  o obstacle clearance altitudes / heights;
  o minimum (flight) altitudes.
- ICAO Doc 9674 WGS-84 Manual (for surveyed and calculated data):
  o obstacles en-route;
  o obstacles in the approach and take-off area;
  o obstacles in the circling area;
  o instrument approach procedure altitudes;
  o obstacle clearance altitudes / heights;
  o minimum (flight) altitudes.

The ICAO SARPS responsible for data publication requirements are:

- ICAO Annex 4, Aeronautical Charts, Appendix 6 (charting resolution and integrity level):
  o geographical coordinates and the elevations for obstacles in Areas 1, 2 and 3;
  o instrument approach procedure altitudes;
  o obstacle clearance altitudes / heights (OCA / H);
  o minimum (flight) altitudes.
- ICAO Annex 15, Appendix 7:
  o geographical coordinates and the elevations for obstacles in Areas 1, 2 and 3;
  o minimum (flight) altitudes.
- ICAO Doc 8168, Vol. II – PANS-OPS (for calculated data):
  o obstacle clearance altitudes / heights;
  o procedure altitudes;
- ICAO Doc 9674 WGS-84 Manual (for surveyed and calculated data):
  o obstacles en-route;
  o obstacles in the approach and take-off area;
  o obstacles in the circling area;
  o instrument approach procedure altitudes;

> o   obstacle clearance altitudes / heights;
> o   minimum (flight) altitudes.

8.1 Data Quality – Confidence Levels

Accuracy requirements for aeronautical data are based upon a 95% confidence level, as required by ICAO Annex 11, 2.19.1 and ICAO Annex 14, Vol. I and II, 2.1.1. Three types of positional data are considered: surveyed points, calculated points (mathematical calculations from known surveyed points / fixes) and declared points.

ICAO Doc 9674, WGS-84 Manual provides an interpretation of the 95% confidence level to be taken into consideration.

- The statistical principles governing the determination of a two dimensional position consider a circular normal distribution around the real location of the measured data. Because there is no 100% certainty that what is measured reflects the reality, the statistical calculation aims at determining the probability of the measurement to fall inside of a circle of a certain radius, <u>centred on the reported position</u>.
- In order to better understand the confidence level, another two terms have to be introduced: confidence interval and confidence limit.
- <u>Confidence interval</u>: an estimated range of values which is likely to include an unknown population parameter, the estimated range being calculated from a given set of sample data.
- <u>Confidence limits</u>: represent the lower and upper boundaries / values of a confidence interval.
- <u>Confidence level</u>: the statistical probability that a random variable (in our case the position) lies within the confidence interval of an estimate.

8.2 Assessment of Existing Data

Change in mindset required for ICAO AMDT 33:

- Change from "approval-oriented" (Annex 14) to a "flight-safety and data- oriented mindset"(Annex 15);
- Electronic obstacle data should no longer be a by-product of an approval process.
- Electronic obstacle data should be a tool to ensure flight safety.

Electronic Data Provision

- Standards for electronic data exchange

Quality and integrity

- Verify 3D-elevations against accurate terrain model;
- Verify accuracy of existing obstacles;
- Ensure integrity in the data chain.

8.3 Requirements

Data must comply with requirements of Annex 15, Chapter 10 (as supplemented by ICAO Doc 9881), which include the following:

- Data must meet the ICAO numerical requirements as specified;
- Dataset must have the required associated metadata;
- Data must have full traceability.

9. DATA PROVISION AND MAINTENANCE

9.1 Data Exchange Formats

Establish a consistent basis for the interchange of data among originators, integrators, system designers and users. Furthermore, the exchange format must be compliant with ISO 19100 series of standards, provide unique DPS for terrain, obstacle, and aerodrome mapping data sets.

The Aeronautical Information Exchange Model (AIXM) is a data exchange format originating from Eurocontrol and FAA that is now readable using ArcGIS, PLTS aeronautical extension. AICM and AIXM are emerging international standards for describing and exchanging aeronautical data. AIXM is being increasingly used in government aviation agencies and COTS vendors are beginning to adopt AIXM for representing aeronautical data.

The SACAA will ultimately deliver eTOD data to users in an AIXM database format which will allow interoperability with AIS packages.

9.2 Means / Media

Data will be distributed to users via CD, DVD or external Hard Drives, depending on file size.

9.3 Data Maintenance

The erecting and dismantling of temporary obstacles happens on short notice and within days:

- Besides the initial preparation of the data a constant monitoring of the information is necessary to provide updated obstacle data
- Periodic systematic surveys are not sufficient to meet this requirement
- A collaborative approach for improving the data collection and data delivery process for obstacles involving owners, local authorities, airports, AISP and
  regulator should guarantee the timely availability of quality data

Updating of database to account for errors, new or amendments to existing data sets. In that way, applications that use data continue to be trustworthy. The updates should be as required, or in accordance with the AIRAC system. The process should include data integrator issuing updated database together with list of changes made from the previous edition.

9.4 Recommendations

- Collaborative approach involving all affected parties with possible ICAO
  support;
- Update cycle, institutional issues such as cost recovery, sharing of liability need to be addressed and defined;
- Closer collaboration of States with data integrators (electronic data exchange, application requirements in the transition phase;
- Sharing information on eTOD in States already advancing on the Implementation.

ANNEXURE A – IMPLEMENTATION STATUS

	Feature	ICAO Implementation Data	Status	Target Implementation Date	Action Plan Reference Number
Area 1	Terrain	20 November 2008	Not implemented	28 February 2009	AP/001/8/9/10
	Obstacle	20 November 2008	Not implemented	28 February 2009	AP/002
Area 2	Terrain	18 November 2010	Not implemented	18 November 2010	AP/003
	Obstacle	18 November 2010	Not implemented	18 November 2010	AP/004
Area 3	Terrain	18 November 2010	Not implemented	18 November 2010	AP/005
	Obstacle	18 November 2010	Not implemented	18 November 2010	AP/006
Area 4	Terrain	20 November 2008	Implemented	20 November 2008	AP/007
	Obstacle	Not required	Not required	Not required	

ANNEXURE B – ACTION PLAN

Ref Number	Area Feature	Description	Action By	Target Date	Implementation Date	Comments
AP/001	1 Terrain	Terrain dataset for South Africa, including Lesotho and Swaziland, available from commercial vendors. Not yet verified and validated to ensure compliance with ICAO requirements.	SACAA	28/02/2009	28/02/2009	Awaited SACAA budget approval for procurement of terrain data for in-house use.
AP/002	1 Obstacle	Meeting held with owners of structures on the 14th of October 2008 at SACAA offices. ICAO obstacle data requirements were discussed and their co-operation was requested.	SACAA	14/10/2008	14/10/2008	See AP/008
AP/003	2 Terrain	To be addressed at the SA eTOD WG meetings.	SA eTOD WG	18/11/2010		Next meeting on the 20th January 2009.
AP/004	2 Obstacle	To be addressed at the SA eTOD WG meetings.	SA eTOD WG	18/11/2010		Next meeting on the 20th January 2009.
AP/005	3 Terrain	To be addressed at the SA eTOD WG meetings.	SA eTOD WG	18/11/2010		Next meeting on the 20th January 2009.
AP/006	3 Obstacle	To be addressed at the SA eTOD WG meetings.	SA eTOD WG	18/11/2010		Next meeting on the 20th January 2009.

AP/007	4	Terrain	Terrain dataset available from and maintained by ACSA.	ACSA	20/11/2008	20/11/2008	
AP/008	1	Obstacle	SACAA to provide the ICAO Obstacle data requirements to the owners of the structures.	SACAA	20/10/2008	17/10/2008	See AP/009
AP/009	1	Obstacle	Structure owners to provide available obstacle data for verification by the SACAA.	SACAA	13/03/2009		See AP/010
AP/010	1	Obstacle	Guarantee that all CEPs for obstacle data are eliminated.	SACAA	18/11/2010		

ANNEXURE C - ACRONYMS

A

ACSA Airport Company South Africa
AGL Above Ground Level
AIRAC Aeronautical Information Regulation and Control
AIS Aeronautical Information Service
AISP Aeronautical Information Service Provider
AIXM Aeronautical Information Exchange Model
AMDB Aerodrome Mapping Database
AOC Aedrome Obstacle Chart
ARP Aerodrome Reference Point
ASCII American Standard Code for Information Interchange
ATC Air Traffic Control
ATIS Automatic Terminal Information Service

B

C

CARCOM Civil Aviation Regulations Committee
CEP Circular Error of Probability

D

DEM Digital Elevation Model
DPS Data Product Specification
DSM Digital Surface Model
DTED1 Digital Terrain Elevation Data Level 1
DTM Digital Terrain Model

E

ED EUROCAE Document
EROS Earth Resources Observation and Science
eTOD electronic Terrain and Obstacle Database
EUROCONTROL European organization for safety of air navigation

F

FAA Federal Aviation Administration

G

GIS Geographic Information System
GPS Global Positioning System

H

I

ICAO International Civil Aviation Organization
IFR Instrument Flight Rules
ILS Instrument Landing System
ISO International organisation for standardization

J

K

L

M

MSL Mean Sea Level

N

NASA National Aeronautics and Space Administration
NIMAC National Imagery and Mapping Advisory Council
NM Nautical mile

O

P

PATC Precision Approach Terrain Chart
PD&C Procedure Design & Cartography

Q

R

RWY Runway

S

SACAA Civil Aviation Authority
SA eTOD WG South African eTOD Work Group
SARPs Standards and Recommended Practices
SID Standard Departure Chart – Instrument
SRTM Shuttle Radar Topography Mission
STAR Standard Terminal Arrival Route

T

TMA Terminal Area

U

V

W

WGS-84 World Geodetic System – 1984

X

XML Extensible Mark-up Language

Y

Z

ANNEXURE D - DEFINITIONS

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

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.

Aerodrome elevation. The elevation of the highest point of the landing area.

Aerodrome mapping database (AMDB). One or more files containing information in a digital form that represent selected aerodrome features. This data includes geo-spatial data and metadata over a defined area. The files have a defined structure to permit an AMDB management system and other applications to make revisions that include additions, deletions, or modifications.

Aerodrome reference point (ARP). The designated geographical location of an aerodrome.

Aerodrome surface movement area. That part of an aerodrome that is to be used for the take-off, landing, and taxiing of aircraft. This includes runways, taxiways, and apron areas.

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

Aeronautical database. Any data that is stored electronically in a system that supports airborne or ground based aeronautical applications. An aeronautical database may be updated at regular intervals.

Aeronautical Information Publication (AIP). A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

Aeronautical information regulation and control (AIRAC). A system aimed at advance notification based on common effective dates, of circumstances that necessitate significant changes in operating practices.

Aeronautical information service (AIS). A service established within the defined area of coverage responsible for the provision of aeronautical information/data necessary for the safety, regularity and efficiency of air navigation.

Altitude. The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

Bare earth. Surface of the Earth including bodies of water and permanent ice and snow, and excluding vegetation and man-made objects.

Canopy. Bare earth supplemented by vegetation height.

Completeness. The primary quality parameter describing the degree of conformance of a subset of data compared to its nominal ground with respect to the presence of objects, associations instances, and property instances.

Confidence. Meta-quality element describing the correctness of quality information.

Confidence level. The probability that the true value of a parameter is within a certain interval around the estimate of its value. The interval is usually referred to as the accuracy of the estimate.

Coordinate reference system. Coordinate system that is related to the real world by a datum.

Coordinate system. Set of mathematical rules for specifying how coordinates are to be assigned to points

Coverage. A feature that acts as a function to return one or more feature attribute values for any direct position within its spatiotemporal domain.

Cultural features. Manmade morphological formations that include transportation systems (roads and trails; railroads and pipelines; runways; transmission lines), and other manmade structures, (buildings, houses, schools, churches, hospitals).

Culture. All man-made features constructed on the surface of the Earth, such as cities, railways and canals.

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

Data element. A term used to describe any component of an AMDB. For example: a feature, an attribute, an object, an entity, or a value.

Data integrator. The part of an organisation, which takes data from one or more sources to produce a terrain or obstacle database that satisfies a particular specification.

Data originator. The part of an organisation which performs measurements by a particular means and which then groups those measurements to represent an area of terrain or a set of obstacles.

Data product. Data set or data set series that conforms to a data product specification.

Data product specification. Detailed description of a data set or data set series together with additional information that will enable it to be created, supplied to and used by another party.

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

Data set. Identifiable collection of data.

Data set series. Collection data sets sharing the same product specification.

Data type. Specification of the legal value domain and legal operations allowed on values in this domain.

Datum. Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities.

Digital Elevation Model (DEM). The representation of terrain surface by continuous elevation values at all intersections of a defined grid, referenced to common datum.

Note.— Digital Terrain Model (DTM) is sometimes referred to as DEM.

Digital surface model. Digital model of the topographic surface, including vegetation and man-made structures.

Elevation. The vertical distance of a point or a level, on or affixed to the surface of the earth, measured from mean sea level.

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

End-user. An ultimate source and/or consumer of information.

Error. Defective or degraded data elements or lost or misplaced data elements or data elements not meeting stated quality requirements.

Feature. Abstraction of real-world phenomena.

Format. The process of translating, arranging, packing, and compressing a selected set of data for distribution to a specific target system.

Geodetic datum. A minimum set of parametres required to define location and orientation of the local reference system with respect to the global reference system/frame.

Geographic coordinates. The values of latitude, longitude, and height that define the position of a point on the surface of the Earth with respect to a reference datum.

Geographic data. Data with implicit or explicit reference to a location relative to the Earth.

Geoid. The equipotential surface in the gravity field of the Earth, which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.

Height. The vertical distance of a level, a point, or an object considered as a point, measured from a specified datum.

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost or altered since the data origination or authorized amendment.

Mean sea level (MSL). The average location of the interface between the ocean and the atmosphere, over a period of time sufficiently long so that all random and periodic variations of short duration average to zero.

Metadata. Data about data.

Model. Abstraction of some aspects of reality.

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

Originate. The process of creating a data item or amending the value of an existing data item.

Originator (data). The first organization in the aeronautical data chain that accepts responsibility for the data.

Polygon. A surface or area described by a closed line.

Position (geographical). Set of coordinates (latitude and longitude) referenced to the mathematical reference ellipsoid that define the position of a point on the surface of the Earth.

Post spacing. Angular or linear distance between two adjacent elevation points.

Precision. The smallest difference that can be reliably distinguished by a measurement process.

Quality. Degree to which a set of inherent characteristics fulfils requirements.

Quality assurance. Part of quality management focused on providing confidence that quality requirements will be fulfilled.

Resolution. A number of units or digits to which a measured or calculated value is expressed and used.

Runway. A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

Spatial resolution. The capacity of the system (lens, sensor, emulsion, electronic components, etc.) to define the smallest possible object in the image. Historically, this has been measured as the number of lines pair per millimetre that can be resolved in a photograph of a bar chart. This is the so-called analogue resolution. For the modern photogrammetric cameras equipped with forward motion compensation (FMC) devices and photogrammetric panchromatic black and white

emulsions, the resolution could (depending on contrast) be 40 to 80 lp/mm (line pairs per millimetre).

Specification. Document which establishes the requirements the product or service should be compliant with.

State. An internationally recognized geographic entity that provides aeronautical information service.

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

Threshold. The beginning of that portion of the runway useable for landing.

Traceability. Ability to trace the history, application or location of that which is under consideration.

Validation. Confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled.

Verification. Confirmation, through the provision of objective evidence that, specified requirements have been fulfilled.

ANNEXURE E - REFERENCES

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AFI REGION ELECTRONIC TERRAIN AND OBSTACLE DATA WORKING GROUP
(E-TOD WG)

A) **TERMS OF REFERENCE**

With a view to harmonize, coordinate and support E-TOD implementation activities on a regional basis, the AFI Region E-TOD Working Group shall be established as follows:

Mission

To identify, develop, validate and establish support mechanisms and serve as a forum by which
the AFI States may implement the provision of electronic Terrain and Obstacle Data (eTOD),
in accordance with ICAO Annex 15, in a consistent and harmonised manner.

Reporting Line

The e-TOD Working Group (e-*TOD WG)* will report to the APIRG.

Participants profile

The e-*TOD WG* will be open to participants from any relevant domain, including, but not limited to, AIS/AIM personnel, surveyors, regulators, industry and international organisations in AFI and non-AFI States.

Tasks

Overall, the *TOD WG* shall support the:

● establishment of a common understanding of the intentions of Annex 15 with regard to eTOD;

● promotion of awareness of the responsibility and accountability of States for the implementation of eTOD;

● specification of the responsibilities for the bodies involved (regulator, surveyor, service provider etc.);

● specification of a concept and the development of the associated guidance material for the implementation of eTOD. The guidance material should assist in the definition of:

    o Qualities of data collection techniques;

    o Methods for the validation and verification of eTOD;

    o The data model(s) to be used;

    o Mechanisms for the storage and exchange of eTOD;

    o Data protection and other quality processes;

    o Quality management / assurance (verification and validation) criteria;

    o Cross-border harmonisation;

    o Methodologies for cost recovery, if appropriate;

    o Guidance relating to the assessment of eTOD for periodic resurvey

(timeliness).

- working with other fora to develop harmonised approaches to copyright, liability,intellectual property, and methodologies for cost recovery, if appropriate; etc.;

- Review of the requirements for Area 2

- introduction, by States, of regulation to support the act of data provision;

- facilitation and coordination of eTOD implementation within AFI Region;

- monitoring of the progress towards implementation of eTOD within the AFI Region;

- the promotion of the means for global harmonisation;

- submission of material created under the project to ICAO and its promotion on a world-wide basis;

- AIM domain in gaining the necessary support and resources from the Agency management.

B)   COMPOSITION

The AFI Region E-TOD Working Group will be composed of Experts nominated by the AFI Region States, ANSP and participants from any relevant domain, including, but not limited to,AIS/AIM personnel, surveyors, regulators, industry and international organisations in AFI and non-AFI States.
Other representatives from industry and user organizations having a vested interest in the aeronautical services and E-TOD in particular, could participate in the work of this Working Group

C)   WORKING ARRANGEMENTS

The AFI Region E-TOD Working Group shall report to the AIS-AIM Implementation Task Force established under the AFI Planning Implementation Regional Group (APIRG).

The work of the AFI E-TOD Working Group shall be carried out mainly through exchange of correspondence (email, facsimile, Tel, etc) between its Members. The Working Group shall meet as required and at least once in every year prior to an APRIG Meeting. The convening of the Working Group meetings should be initiated by the established AIS-AIM Implementation Task Force Secretariat based on the need to address AIS-AIM deficiencies in the AFI Region.