International Civil Aviation Organization SAM/AIM/9-WP/03
South American Regional Office 03/10/16
Ninth Multilateral Meeting of the SAM Region for the transition from AIS to AIM (SAM/AIM/9)
Lima, Peru, 24 to 28 October 2016

Agenda Item 1: Implementation of Provision of Electronic Terrain and Obstacle Data (e-TOD)

Deficiencies in e-TOD implementation and Action Plan

(Presented by the Secretariat)

SUMMARY

This working paper presents the description of the deficiency regarding e-TOD provision and a corrective action plan model to be considered by the States.

REFERENCES:

- Annex 15 – Aeronautical Information Services
- Reports of PPRC/3 and PPRC/4 meetings
- ICAO Roadmap for the transition from AIS to AIM
- Doc 9881 - Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information
- e-TOD Manual (Eurocontrol)

ICAO Strategic Objectives	*A - Safety* *E – Environmental protection*

1. Introduction

1.1 Annex 15 has established as the implementation date for the provision of e-TOD for Area 2a, take-off path area and the areas defined by the lateral extensions of the aerodrome obstacle limitation surfaces of international airports, as well as for Area 4 of the airport with Cat. II and III runways, 12 November 2015.

1.2 Significant safety benefits for international civil aviation will be provided by ground and in-flight applications based on quality terrain and obstacle electronic data.

1.3 The implementation of e-TOD data established in Annex 15, represent a requirement for States to support PBN implementation project, with regard to PANS-OPS and aeronautical charts.

1.4 It shall be reminded that the provision of terrain and obstacle data in electronic format is one of the steps contained in the Roadmap for the transition from AIS to AIM.

2. Analysis

2.1 States should consider that the increasing number of aircraft with equipment and air traffic control units around the world, with systems using terrain electronic data, require the standardization in the provision of support data.

2.2 In addition, the use of terrain information is each time more frequent, mainly in the cockpit, and other people involved with operations are also benefit from the use of terrain information and obstacle data quality. The risk in the use of these data in operations is that often multiple data sources are used resulting in a possible degradation of the data by inconsistent or inappropriate specifications for the required quality.

2.3 Aware of this situation, ICAO in a joint effort with EUROCAE WG 44 and RTCA SC 193, besides some comments received from States, has established in Amendment 36, that States should provide terrain and obstacle data in electronic format. Also, data quality, coverage and precision requirements to be provided have been specified.

2.4 However, worryingly, in the SAM Region, e-TOD implementation has been postponed by States. During PPRC/3 Meeting this situation was analyzed taking into account that the implementation date was 12 November 2015. When considering the low implementation percentage in the SAM Region, the Meeting decided to inquire States on their implementation plans and, if it was less than 50%, consult the Air Navigation Commission (ANC) on the possibility of postponing e-TOD implementation date.

2.5 The Secretariat has made the consultation to SAM States, in several letters, but no responses were obtained on e-TOD implementation plans. For this reason, postponement of e-TOD implementation date could not be requested to ANC.

2.6 The PPRC/4 addressed this issue once again. The Secretariat clarified States that after e-TOD implementation date, failing to implement it will become a deficiency of the State and, therefore, it is important to present a Corrective Action Plan with e-TOD implementation as final objective.

2.7 The Secretariat has requested the Corrective Action Plan through a State Letter in September 2016.

2.8 In order to assist States in this issue, **Appendix A** presents a Model of Corrective Action Plan Template to be presented to the Secretariat for its implementation.

2.9 When planning e-TOD implementation, States should take into account that the purpose of the data product specifications is intended to support information interchange between interested parties by providing feature types, feature attributes, geometry and attribute encoding rules, maintenance, quality requirements and metadata. It should be taken into account that successful interchange of data sets implies delivery, receipt and interpretation of data among the communicating parties and this interchange could be achieved through data set transfer.

2.10 In view of the above, it should be considered that this type of interaction-based process represents an extension of the fundamental interchange principle and would lead to a dynamic (real-time) interchange of terrain and obstacle data. Therefore, the Standards in Annex 15 for terrain and obstacle data interchange represent a conceptual step towards networked interoperability aimed at an XML-based implementation of the data set transfer model (AIXM).

3. Suggested action

3.1 That States of the SAM Region:

a) analyze e-TOD implementation Action Plan model presented in Appendix A;

b) take note of the information presented in this working paper; and

c) take other actions the may be considered necessary.

APPENDIX A

TOD IMPLEMENTATION PLAN TEMPLATE

(Extract of the Terrain and Obstacle Data Manual of EUROCONTROL)

C.1 INTRODUCTION

C.1.1 Purpose and Scope

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

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.

[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.]

C.2 THE FOUR AREAS

C.2.1 State Policy with Regard to Current SARPS

C.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]**.

C.2.1.2 State Policy [Provide the State policy here.]

C.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.]

C.2.1.4 Text of ICAO Difference

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

C.2.2 State Policy for Scope of TOD for Four Areas

C.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.

C.2.2.2 State Policy for Area 1

[Provide the State Policy for Area 1 here.]

C.2.2.3 State Policy for Area 2

[Provide the State Policy for Area 2 here.]

C.2.2.4 State Policy for Area 3

[Provide the State Policy for Area 3 here.]

C.2.2.5 State Policy for Area 4

[Provide the State Policy for Area 4 here.]

C.2.3 State policy of how, when and by whom TOD will be made available

C.2.3.1 Purpose of this Section

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

C.2.3.2 State Policy

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

C.3 REGULATION

C.3.1 Applicable Regulation

C.3.1.1 Purpose of this Section

This section documents ICAO, European Community and other international and national regulations applicable to TOD.

C.3.1.2 International Regulation [List international regulation for TOD here.]

C.3.1.3 National Regulation

[List any national regulation for TOD here.]

C.3.1.4 Considerations

[In addition to ICAO regulation, SES regulation, such as the SES Common Requirements and 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 TOD and ensure that all actors accept their responsibilities. Any national Regulation related to TOD 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.]

C.3.2 State Policy on Aerodrome Safeguarding

C.3.2.1 Purpose of this Section

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

C.3.2.2 State Policy

[Provide the State policy for aerodrome safeguarding here.]

C.3.3 Obstacle Permission Process

C.3.3.1 Purpose of this Section

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

C.3.3.2 Process

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

C.3.3.3 Considerations

[It is recommended that a State considers the development of an obstacle permission process. This may take best practice from the FAA, Germany 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.]

C.3.4 Regulation of Data Sources

C.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.

C.3.4.2 Regulation

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

C.4 DATA SOURCES

C.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 TOD. 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 TOD.

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

C.4.2 Data Sources Consulted

C.4.2.1 Data Source Provider

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

C.4.2.2 Liability

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

C.4.2.3 Cost Model

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

C.4.2.4 Licensing

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

C.4.2.5 Formal Arrangements

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

C.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 TOD 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.]

C.5 SURVEY

C.5.1 Survey Formats

C.5.1.1 Purpose of this Section

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

C.5.1.2 Formats

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

C.5.2 Survey Requirements

C.5.2.1 Purpose of this Section

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

C.5.2.2 Survey Requirements for Area 1 [Provide the survey requirements for Area 1 here.]

C.5.2.3 Survey Requirements for Area 2 [Provide the survey requirements for Area 2 here.]

C.5.2.4 Survey Requirements for Area 3 [Provide the survey requirements for Area 3 here.]

C.5.2.5 Survey Requirements for Area 4 [Provide the survey requirements for Area 4 here.]

C.5.3 Survey Contracts

C.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.

C.5.3.2 Survey Contracts

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

C.5.4 Surveyor Vetting

C.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.

C.5.4.2 Vetting Process

[Provide the State vetting process for surveyors here.]

C.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.

C.6 CROSS-BORDER HARMONISATION

C.6.1 State Agreements / Arrangements

C.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 TOD.

C.6.1.2 Arrangements

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

C.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 TOD exchange format is adopted.]

C.7 OVERSIGHT MECHANISM

C.7.1 Progress Monitoring

C.7.1.1 Purpose of this Section

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

C.7.1.2 Monitoring Policy

[Detail how the State will monitor the implementation of TOD, including how any obligations to meet European oversight monitoring will be met.]

[List the State policy for monitoring TOD implementation.]

C.7.2 Audit

C.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 TOD.

C.7.2.2 State Plan

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

C.8 COST RECOVERY AND CHARGING

C.8.1 Cost Recovery

C.8.1.1 Purpose of this Section

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

C.8.1.2 Initial Costs

C.8.1.2.1 Cost Recovery for Area 1

[Provide the means of cost recovery for Area 1 here.] C.8.1.2.2 Cost Recovery for Area 2

[Provide the means of cost recovery for Area 2 here.] C.8.1.2.3 Cost Recovery for Area 3

[Provide the means of cost recovery for Area 3 here.] C.8.1.2.4 Cost Recovery for Area 4

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

C.8.1.3 Ongoing Costs

C.8.1.3.1 Cost Recovery for Area 1

[Provide the means of cost recovery for Area 1 here.] C.8.1.3.2 Cost Recovery for Area 2

[Provide the means of cost recovery for Area 2 here.] C.8.1.3.3 Cost Recovery for Area 3

[Provide the means of cost recovery for Area 3 here.] C.8.1.3.4 Cost Recovery for Area 4

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

C.8.1.4 Considerations

[Consideration should be given to the need to recover costs not only in 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 TOD implementation and provision;
- Indirect costs such as the adaptation of procedures due to new / updated obstacle data.]

C.8.2 Charging Mechanisms

C.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 TOD.

C.8.2.2 Mechanisms

[Provide the charging mechanisms for TOD here.]

C.9 DATA VALIDATION AND VERIFICATION

C.9.1 Assessment of Existing Data

C.9.1.1 Purpose of this Section

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

C.9.1.2 State Policy

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

C.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.]

C.9.2 Data Validation and Verification

C.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.

C.9.2.2 Purpose of this Section

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

C.9.2.3 Purpose of this Section

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

C.9.2.4 Purpose of this Section

[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.]

C.10 DATA PROVISION AND MAINTENANCE

C.10.1 Data Exchange Formats

C.10.1.1 Purpose of this Section

This section details the data exchange formats to be used for electronic TOD (eTOD).

C.10.1.2 Data Formats

[List the exchange formats to be used for eTOD.]

C.10.2 Means / Media

C.10.2.1 Purpose of this Section

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

C.10.2.2 Means of Provision: XXXX

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

C.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.]

C.10.3 Data Maintenance

C.10.3.1 Purpose of this Section

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

C.10.3.2 State Policy

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

TOD IMPLEMENTATION CHECKLIST

D.1 AWARENESS

Task	Considerations	Status	Completion Date	Comments / Further Details
Determine the affected stakeholders in your State:	• Ministry responsible for Transportation; • Civil Aviation Authority; • AISP; • ANSP; • Military; • National Geodetic, Cadastral or State Survey organisation; • Commercial survey companies or associations such as the Royal Institute of Chartered Surveyors (UK); • Military survey organisation; • Aerodrome operator or airport association(s); • National airlines; • General Aviation; • Helicopter operators or helicopter operator associations including Air Ambulance and civil SAR; • Local authorities or those responsible for aerodrome safeguarding / construction approval in the vicinity of the aerodrome; • Ministry responsible for local government, land planning and environment; • Power transmission companies;			

Task	Considerations	Status	Completion Date	Comments / Further Details
	• Regulatory authority for radio and television broadcasts; • GSM antenna operators; • 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.				

D.2 THE FOUR AREAS

Task	Considerations	Status	Completion Date	Comments / Further Details
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.				

D.3 REGULATION

Task	Considerations	Status	Completion Date	Comments / Further Details
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.	• 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.				

D.4 DATA SOURCES

Task	Considerations	Status	Completion Date	Comments / Further Details
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.				

D.5 SURVEY

Task	Considerations	Status	Completion Date	Comments / Further Details
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.				

D.6 CROSS-BORDER HARMONIZATION

Task	Considerations	Status	Completion Date	Comments / Further Details
Consider how cross-border harmonisation could be organised, if applicable.				
Consider the establishmentof agreements with neighbouring States to exchange and harmonise common data.				

D.7 OVERSIGHT MONITORING

Task	Considerations	Status	Completion Date	Comments / Further Details
Determine a means of providing oversight management for monitoring progress.				
Determine a policy or the audit of involved organisations.				

D.8 CHARGING AND COST RECOVERY

Task	Considerations	Status	Completion Date	Comments / Further Details
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.				

D.9 DATA VALIDATION AND VERIFICATION

Task	Considerations	Status	Completion Date	Comments / Further Details
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.				

D.10 DATA PROVISION AND MAINTENANCE

Task	Considerations	Status	Completion Date	Comments / Further Details
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.				