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South American Regional Office 05/04/18
Eleventh Multilateral Meeting of the SAM Region for the transition from AIS to AIM (SAM/AIM/11)
Lima, Peru, 23 to 27 April 2018

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

GREPECAS Project G1

(Presented by the Secretariat)

SUMMARY

This working paper presents the development of the implementation of electronic terrain and obstacle data sets (eTOD).

REFERENCES

- Annex 15 – Aeronautical Information Services
- ICAO Roadmap for the transition from AIS to AIM
- Reports of SAM/AIM meetings
- Report of CRPP/4 Meeting
- Report of the Fourth Meeting of Air Navigation and Safety Directors (AN&FS/3)
- Conclusions of the workshop on TOD
- Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information (Doc. 9881)

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

1. Introduction

1.1 The developments obtained in the implementation of e-TOD in the SAM Region have been analyzed by the SAM/AIM meetings.

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

1.3 The roadmap for the transition from AIS to AIM foresees the implementation of e-TOD Phase 1.

1.4 The activities of this Project were analyzed by PPRC/3 and PPRC/4.

2. **Analysis**

2.1 The continuation of GREPECAS Project G1 "*Implementation of provision of Terrain and Obstacle Data (e-TOD)"* was analyzed during PPRC/4 Meeting. The meeting expressed its concern due to the delay in e-TOD implementation in States of the SAM Region. However, it noticed advances which were detailed in SAM/AIM/9 Meeting.

2.2 During SAM/AIM/10 Meeting, advances in some States were reported. Advances observed during this meeting are transcribed below:

AREA 1 - Terrain

2.3 Information was compiled in relation to compliance with terrain surveying requirements in Area 1, with the following results:

a) Regarding implementation, **Argentina, Brazil, Chile, Colombia, French Guiana, Panama, Paraguay, Peru** and **Venezuela** had a terrain and/or elevation or surface digital model for the development of Area 1. During SAM/AIM/9, **Panama** informed that surveying was being conducted at national level, currently reaching 90% They expected to complete it in December 2016, but have not reported on the conclusion of same. The current implementation percentage is 64% of States in the Region with digital models. **44% pending completion before November 2018. The progress made since March 2017 was 8%.**

b) Regarding compliance with terrain requirements for Area 1, according to Annex 15 Table 8-1, **Argentina, Brazil, Chile, French Guiana, Paraguay** and Venezuela were in compliance. The current implementation percentage is 57%. **43% is pending. The progress made since August 2016 is 7%.**

c) Regarding the ISO 19110 Digital Model Methodology, **Argentina, Brazil, Chile, Colombia, French Guiana, Panama** and **Venezuela** reported compliance, reaching 56% of States in the SAM Region. **44% is pending. No improvement was registered since August 2016.**

AREA 1 - Obstacles

2.4 Information was compiled on compliance with obstacle surveying requirements for Area 1, with the following results:

a) Regarding the availability of an obstacle database covering Area 1, **Argentina, Brazil, Colombia, French Guiana** and **Venezuela** reported compliance, thus reaching 42% implementation in the Region. **Chile** complied only partially, so it is considered as not completed. **58% pending to be completed by November 2018. No progress was registered since November 2017.**

b) **Argentina, Brazil, Chile, Panama, Uruguay** and **Venezuela** reported compliance with the obstacle requirements of Table 8-1 for Area 1. The implementation level in the Region went to 42%. **58% pending to be completed by November 2018. No improvement was registered since November 2017.**

AREA 2 - Terrain

2.5 Regarding Action Plans for obtaining electronic terrain data in Area 2a, **Argentina, Bolivia, Brazil, Chile, Ecuador, Panama, Paraguay** and **Uruguay** accounted for **56%. 44% pending, which should have been completed during 2015. No progress was registered since August 2016**.

2.6 When analyzing compliance with the provision of terrain data for the take-off path, States that reported the development of an Action Plan were **Argentina, Brazil, Chile, Ecuador, Panama, Paraguay** and **Uruguay**. The Region increased compliance in 57%. **43% pending which should have been completed during 2015**. **No improvement was registered since November 2017.**

2.7 Regarding the provision of electronic terrain data corresponding to the area defined by the lateral extension of the aerodrome obstacle limitation surfaces, **Argentina, Brazil**, **Chile**, **Ecuador**, **Panama** and **Paraguay** accounted for **50% implementation. 50% pending which should have been completed during 2015. Progress made in this area since August 2015 was 15%.**

AREA 2 - Obstacles

2.8 **Argentina, Bolivia, Brazil, Chile, Ecuador, Panamá** and **Paraguay** developed Action Plans for the compilation of Area 2a data, concerning obstacles that penetrated the obstacle limitation surface, in accordance with Appendix 8 to Annex 15, reaching 57% compliance. **43% pending which should have been completed during 2015. No progress had been made in this area since August 2016.**

2.9 Likewise, **Argentina, Bolivia, Brazil, Chile, Ecuador, Panama** and **Paraguay** reported progress in their Action Plans for the provision of electronic data on objects protruding from the flat slope of 1.2% with respect to the take-off path, thus increasing implementation in the Region from 42% to 57%. **43% pending which should have been completed during 2017. No progress had been made since August 2016.**

2.10 Regarding the provision of electronic data on the penetration of obstacle limitation surfaces at aerodromes, **Argentina, Bolivia, Brazil, Chile, Ecuador, Panama** and **Paraguay** had develped Action Plans to comply with the requirement. Compliance reached 64%. **36% pending which should have been completed in 2017. No progress had been made since March 2015.**

2.11 Likewise, in the Region **Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guiana, Panama, Paraguay, Peru, Suriname** and **Uruguay** had produced a Manual on technical specifications for e-TOD implementation. **16% pending for completion in 2018. No progress had been reported since August 2015.**

2.12 With regard to obstacle surveying for Area 2, **Argentina** informed that obstacle surveying had been completed in four airports, **Chile** in two airports, **Panama** was in a bidding process for two airports, **Peru** had awarded the job for the Cuzco airport, and **Uruguay** expected to complete the survey by the end of 2017.

2.13 Regarding e-TOD implementation, Suriname informed that they were in the planning stage, and could not give any dates yet nor define an Action Plan for either terrain or obstacles.

2.14 Guyana informed that it would take some time for the Project to be implemented. Regarding Area 2, it was informed that the main runway was currently being extended and, if obstacle

surveying started now, efforts would be duplicated. The runway was foreseen to be completed in 2017 and, after that, they would prepare the obstacle survey plan for Area 2

e-TOD training in the SAM Region

2.15 SAM/AIM took note that regarding e-TOD training, there had been no change in the Region. **Argentina, Brazil, Chile, Colombia, Ecuador, French Guiana, Panama, Uruguay** and **Venezuela**, continued with e-TOD training plans, accounting for **71% of States. 29% is pending for conclusion during 2018. No progress had been reported in this area since August 2016.**

2.16 Regarding the inclusion of operational concepts in training, **implementation reached 72% in the Region**. **28% pending to be completed during 2018.** There is no progress since 2015.

2.17 Regarding equipment and programmes required for e-TOD information managmenet, the Region had reached 56% compliance in this requirement, with **44% pending completion in 2018**. **No progress had been reported since August 2016**.

Service Level Agreement (SLA) and Geographic Information System (GIS)

2.18 SAM/AIM/10 noted that during 2017, regarding Service Level Agreements (SLA) between AIM units and data providers, **Argentina** had implemented it. **Chile** informed that it was included in the Quality Integrated System. **Paraguay** reported that it had issued a Circular containing requirements to be complied by data and information providers when providing data to AIS/AIM, aiming to meet the SLA requirements. **Guyana** informed that it had prepared a draft SLA and were working together with 15 providers for the implementation of same. **Bolivia** reported that it had not yet implemented the SLA. Venezuela indicated that it is preparing a draft of the mentioned document.

2.19 **Present level of implementation of SLAs can be considered as of 56%. No progress had been registered since November 2017**, as shown in following table**:**

2017 State	% of States with Automated or GIS system = 56%	% of States that have established SLA agreements = 57%
ARG	YES	YES
BOL		
BRA	YES	YES (Standard)
CHI	YES	YES (within the Quality Integrated System)
COL	YES	
ECU		
FGY	YES	
GUY		
PAN	YES	YES
PAR		
PER	YES	YES
SUR		
URU	YES	YES
VEN		

3. **Conclusions on the implementation of Project G1 - Implementation of Provision of Electronic Terrain and Obstacle Data (e-TOD)**

3.1 Regarding the above, it is necessary that States update during this Meeting the information for **Appendix A** to this working paper and inform on their implementation plans.

3.2 The Secretariat expresses its concern considering that no progress had been observed in above mentioned items since beginning of 2017 until SAM/AIM/11 Meeting.

3.3 AN&FS/4 noted the progress in the implementation of e-TOD. It observed that current implementations do not consider all international airports in the States, for which strategies to accelerate the process should be evaluated.

3.4 SAM/AIM/10 had extended the programme of activities of Project G1, considering there are tasks to be fulfilled. Aforementioned Project is described in **Appendix B**.

3.5 Additionally, the Secretariat continues to monitor the corrective Action Plans submitted by States in order to lift the deficiency related to the e-TOD Action Plans. los Planes de Acción Correctiva enviados por los Estados para levantar la deficiencia relacionada a la Norma de implantación del e-TOD.

4. **Suggested action:**

4.1 That States of the SAM Region:

a) update the information on the increase in e-TOD implementation in Appendix A to this working paper, in accordance with their national implementation plans;

b) analyse the activities indicated in Project e-TOD and make the comments considered appropiate;

c) inform the Meeting on the progress obtained in the acquisition of geographic information systems;

d) inform the Meeting on the current or future difficulties encountered to continue with the implementation in the period established in Annex 15; and

e) analyze strategies to fasten the process of e-TOD implementation.

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APÉNDICE A / APPENDIX A

SEGUIMIENTO NIVEL DE IMPLANTACIÓN DE LA NORMA PARA LA PROVISIÓN DE DATOS ELECTRÓNICOS SOBRE EL TERRENO (E-TOD) PARA EL ÁREA 1 (Ref.: Anexo 15, 10.1.3)

FOLLOW-UP LEVEL OF IMPLEMENTATION OF THE STANDARD FOR THE PROVISION OF ELECTRONIC TERRAIN OBSTACLE DATA (E-TOD) FOR THE AREA 1 (Ref.: Annex 15, 10.1.3)

ESTADOS / STATES	ARG	BOL	BRA	CHI	COL	ECU	GUY	FGU	PAN	PAR	PER	SUR	URU	VEN
Modelo digital – DIGITAL MODEL														
¿Dispone la Oficina de un Modelo Digital del Terreno (MDT) o de un Modelo Digital de Elevación (MDE) u otro? (Especifique) / Does the Office have a Model for Digital Terrain (MDT) or a Model for Digital Elevation (MDE) or other? (Specify).	Y	N[1]	Y[1]	Y	Y[1]	N	N	Y[1]	Y	Y	Y	N	N	Y
¿De dónde los obtuvo? (¿de la propia organización, de organización externa? - ¿cuál?) Where did you obtain it? (from your organization, an external organization? - which?).	Y[8]	-	Y[2]	N	Y[2]	N	-	Y[2]	N	N	Y[4]	N	N	*1
¿La precisión de este modelo está de acuerdo con los requerimientos? / The accurateness of this model is according to the requirements?	Y		Y/P						Y					
¿Cumple con Tabla A8-1; requisitos de los datos sobre el terreno para el Área 1 del Anexo 15? / Does it comply with Table A8-1; data requirements for Annex 15, Area 1?	Y	N	Y[4]	Y	N	N	N/A	Y[4]	Y/P	N	N	N	N	Y
¿Dicho modelo cumple con la Norma ISO 19110? (Si/No) / Does such model comply with the ISO standard 19110? (Yes/No)	Y	N[4]	Y[5]	Y	Y[4]	N	N/A	Y[5]	Y	N	Y	-	N	Y

ESTADOS / STATES	ARG	BOL	BRA	CHI	COL	ECU	GUY	FGU	PAN	PAR	PER	SUR	URU	VEN
Obstáculos – OBSTACLES														
¿Dispone de una base de datos de obstáculos que abarque todo el territorio de su país? (Si/ No) / Is there an obstacle data base covering all territory in your country? (Yes/No).	Y[1]	N	Y[6]	N	Y[5]	N	N	Y[6]	P	N	N[1]	N	N	N[4]
¿Cómo los obtuvo? (¿de la propia organización, de organización externa? -¿cuál?) / How did you get them (from your organization, from an external organization? – which?	Y[2]	N	Y[7]	N	Y[6]	N	N/A	Y[7]	Y[3]	N	N	-	Y	*[5]
¿Dichos datos cumplen con la Norma ISO 19110? (Si/No) / Does the data comply with the ISO 19110 standard? (Yes/No).	Y[3]	N	Y[8]	N	N	N	N/A	N[8]	Y	N	N	-	N[3]	Y
¿Cumple con Tabla A8-2; requisitos de los datos sobre obstáculos para el Área 1 del Anexo 15? / Does it comply with Table A8-1; data requirements on terrain for Annex 15 Area 1?	N	N	Y	N	N	N	N/A	N[9]	P[3]	N	N	N	Y	Y
Planificación – PLANNING														
¿Ha establecido la Oficina un plan detallado con las tareas, plazos, análisis de riesgos, aspectos económicos y demás para la ejecución del proyecto de implantación del e-TOD para el Área 1? (Si/No). (Si la respuesta es Si, indicar plan y fechas de cumplimiento). / Has your office established a detailed plan with tasks, risk analysis, economical aspects, etc. for the execution of the e-TOD implementation project for Area 1 (Yes/No). (If answer is Yes, indicate plan and dates of compliance).	N	N	Y[10]	Y[1]	N	Y[1]	N	Y[10]	P	N	N	N	Y[4]	N

ESTADOS / STATES	ARG	BOL	BRA	CHI	COL	ECU	GUY	FGU	PAN	PAR	PER	SUR	URU	VEN
¿Ha definido la Oficina un manual de especificaciones técnicas para dicha implantación? (Si/No). (Consultar si se puede acceder al mismo). / Has the office defined a manual with technical specifications for such implementation? (Yes/No). (Ask if there is easy access to the same).	Y[5]	Y	Y[11]	Y	Y	Y	N	Y[11]	Y	Y	Y	Y	Y[5]	N
¿Ha definido y firmado Acuerdos de Nivel de Servicio (SLA) con los proveedores de datos? (Si/ No). (Consultar si se puede obtener una copia modelo de los mismos). / Has your office defined and signed Service Level Agreements (SLA) with data providers? (Yes/No). (Ask if there is an available copy of the same).	Y[6]	N	Y[15]	N	N	N	N	N[12]	Y	N	Y	N	Y[6]	N
¿Dispone de un programa de capacitación para aquellas personas que tengan que operar con los datos del e-TOD en la dependencia AIS? (Si/No). (Consultar si se puede acceder al mismo). / Is there a training programme for those persons that have to operate with e-TOD data in AIS unit? (Yes/ No). (Ask if the same may be accessed).	Y	N	Y[12]	Y	Y	Y[2]	N	Y[13]	N	Y[4]	N	N	Y	N
¿Se han tenido en cuenta los conceptos operacionales en este proyecto? (Si/No). (Comentar el plan). / Have operational concepts been taken into account? (Yes/No). (Comments on the plan).	Y	Y	Y	Y	Y	Y[3]	N	N[14]	-	Y	Y	N	N	-

ESTADOS / STATES	ARG	BOL	BRA	CHI	COL	ECU	GUY	FGU	PAN	PAR	PER	SUR	URU	VEN
¿La Oficina dispone de equipamiento y programas para la gestión de la información referida a e-TOD? (Si/No). (En caso de respuesta Si, indicar característica de los equipos y programas). / Does the office have equipment and programmes for information management referred to e-TOD? (Yes/No). (In case answer is Yes, indicate the characteristic of equipment and programmes).	N	N	Y[13]	Y	Y[7]	Y[4]	N	N[15]	Y	N	Y[3]	N	Y[7]	N
¿Se han definido cronogramas y especificaciones para la carga y verificación de los datos referidos al e-TOD? (Si/No). (En caso de respuesta Si, indicar tiempos y formas de la verificación). / Have schedules and specifications been defined for the load and data verification referred to e-TOD? (Yes/No). (In case answer is Yes, indicate times and ways to check).	N[7]	N	Y[14]	Y	N	Y[5]	N	N[16]	N	N	N	N	Y[8]	N

Y = Si / Yes
[1, 2, ...] = Ver comentarios / See comments
N = No
P = Parcialmente / Partially
N/A = No aplicable / Not applicable
S/R = Sin respuesta / Without answer

COMENTARIOS DE LOS ESTADOS / COMMENTS BY STATES

ESTADOS/ STATES	COMENTARIOS / COMMENTS
ARG	[1] Se dispone de datos de obstáculos que se han incorporado a una base de datos. / *Obstacle data available, which has been incorporated in a data base*. [2] El proveedor es el departamento de aeródromos. / *Aerodrome Department is the provider*. [3] Se está evaluando. / *Under assessment*. [4] Está en proceso de elaboración. / *In process of preparation*. [5] Está en proceso de elaboración. / *In process of preparation*. [6] Está en proceso de elaboración. / *In process of preparation*. [7] En proceso de realización con el proveedor. / *Under process of implementation by the provider*. [8] Carta digital obtenida del ING / *Digital chart obtained from ING*.
BOL	[1] Las elevaciones de los obstáculos están en base a las elevaciones proporcionadas por el Estado Plurinacional de Bolivia. / *Obstacles are in base to elevations provided by Plurinational State of Bolivia*. [2] Del Instituto Geográfico Militar/IGM. / *From the IGM*. [3] Las elevaciones del IGM tiene una precisión de 1×10^{-4}. / *IGM elevations have a precision of* 1×10^{-4}. [4] No se tiene implantado el Sistema de Gestión de la Calidad. / *Quality assurance system is not implemented*.
BRA	[1] Brasil tiene un Modelo Digital de Terreno (MDT) para el Área e-TOD 1 (todo el territorio nacional). Para las otras áreas Brasil adoptará Modelo Digital de Superficie (MDS). / *Brazil has the Digital Terrain Model (DTM) for the e-TOD Area 1 (all national territory). For the other areas, Brazil will adopt the Digital Surface Model (DSM).* [2] El Modelo Digital de Terreno para el Área 1 e-TOD comprende líneas de contorno y puntos ploteados en 3D obtenidos de las cartas aeronáuticas con una escala de 1:250,000 y cartas topográficas con escalas de 1:100,000 y 1:50,000. Las Cartas Aeronáuticas se producen por el ICA y las cartas topográficas se producen por agencias federales encargadas de la cartografía del territorio nacional. Para áreas del territorio nacional en que no existen los productos mencionados, se usa el Modelo Digital de Terreno derivado del SRTM y disponible libre de cargo por el gobierno de EEUU. El Modelo Digital de Superficie para las otras áreas se encuentra en preparación por parte de ICA (Instituto de la Cartografía Aeronáutica, la agencia brasileña responsable de la preparación de cartas aeronáuticas, publicaciones AIS y e-TOD), y se obtiene por medio de fotografías aéreas. / *The Digital Terrain Model for the e-TOD Area 1 comprises contour lines and points plotted in 3D obtained from the aeronautical charts with a scale of 1:250,000 and topographical charts with scales of 1:100,000 and 1:50,000. Aeronautical charts are produced in the Air Force Institute of Cartography (ICA) and topographical charts are produced by federal agencies that have the allocation of mapping the national territory. For areas of national territory where the mentioned products do not exist, it is used the Digital Terrain Model derived from the Shuttle Radar Topography Mission (SRTM) and available free of charge by the U.S. Government. The Digital Surface Model for the other e-TOD areas is being made by ICA (Aeronautical Cartography Institute, the Brazilian agency responsible for the aeronautical charts, AIS publications and e-TOD) through aerophotogrammetry.* [3] La precisión del Modelo Digital de Terreno para un área particular geográfica dependerá de la información utilizada, de acuerdo a los siguientes valores: / *The accurateness of the model digital terrain for a particular geographic area will depend on the input used, according to the following values*: • Cartas aeronáuticas a escala / *aeronautical charts at scale of 1:250,000 = altimetry (±50 m to 70 m) and planimetry (±125m to 250 m)*; • Cartas topográficas a escala / *topographical charts at scale of 1:100,000 = altimetry (±-25 m to 37.5 m) and planimetry (±50m to 100 m);* • Cartas topográficas a escala */ topographical charts at scale of 1:50.000 = altimetry (±10 m to 15 m) and planimetry (± 25m to 50 m);*

ESTADOS/ STATES	COMENTARIOS / COMMENTS
	• SRTM = ±20m en altimetría, pero hay discrepancias en areas que presentan valores de altitud / *SRTM = ±20m in altimetry, but there are discrepancies in areas that present altitude values.* Se obtendrá la precisión del Modelo Digital de Superficie con el fin de cumplir con las recomendaciones de la OACI. / *The accurateness of the Digital Surface Model will be obtained in order to comply with the recommendations of the ICAO.* [4] Todos los ítems cumplen con los requerimientos, con la excepción de la precisión vertical y precisión horizontal, cuando el Modelo Digital de Terreno se obtiene por la carta a escala 1:250,000, carta a escala 1:100,000 y por SRTM debido a que dichos datos comprenden valores menos exactos que aquellos definidos en la Tabla A8-1. / *All items comply with the requirements with the exception of vertical accuracy and horizontal accuracy, when the Digital Terrain Model is obtained by aeronautical chart at scale of 1:250,000, topographical chart at scale of 1:100,000 and by SRTM because such data comprises values less accurate than those defined in Table A8-1.* [5] Las series de la norma ISO 19110 todavía serán estudiadas e implantadas. / *The series of ISO Standard 19110 will still be studied and implemented.* [6] Hay una base de datos nacional, pero no se asegura que el 100% de obstáculos de más de 100 metros sean registrados en la base de datos, tal como se requiere en el Anexo 15 para el Área 1 e-TOD, debido a regulaciones recientes que son efectivas desde el 2011 (Orden No.256/GM5). / *There is a national database, but it is not assured that 100% of obstacles of more than 100 meters are registered in the database, as required by Annex 15 for the e-TOD Area 1, due to the recent regulations that are effective as of 2011 (order N.256/GM5).* [7] Los obstáculos se obtienen a través de estudios topográficos llevados a cabo por el ICA o a través de diversas organizaciones nacionales responsables del control regional de los obstáculos y la navegación. / *Obstacles are obtained through topographic survey conducted by the Air Force Institute of Cartography (ICA) or through the other organizations that are responsible for the regional control of obstacles and air navigation.* [8] Las series ISO 19110 aún serán estudiadas e implantadas. / *The series of ISO standard 19110 will still be studied and implemented*. [9] Los datos obtenidos por el ICA cumplen con la Tabla A8-2. Los datos procedentes de fuentes externas sólo se incluirán en la base de datos de obstáculos si cumplen con los requisitos de la Tabla A8-2, debido a la nueva legislación (CIRCEA 53-2), que entró en vigor en 2013. Sin embargo, no es posible garantizar el cumplimiento de estos requisitos para los datos existentes en la base de datos antes de que la legislación citada. / *Data from external sources will only be included in the database of obstacles if they comply with the requirements of Table A8-2, due to new legislation (CIRCEA 53-2), which entered into force in 2013. However, it is not possible to ensure compliance with these requirements for existing data in the database before the cited legislation*. [10] El plan de Acción está implantado. / *Action Plan implemented.* [11] Brasil estableció un manual de especificaciones técnicas que definen el proceso de recolección, procesamiento, distribución y almacenamiento de los datos recogidos por fotogrametría. Sin embargo, se está evaluando la posibilidad de adoptar otros métodos de recolección de datos, así como la adición de mejoras en el proceso que se utiliza en la actualidad, por lo que este manual está en proceso de revisión. / *Brazil established a technical specification manual defining the process of collecting, processing, distribution and storage of the data collected through photogrammetry. However, other methods of data collection are being considered, as well as adding improvements to the process that is used today, so this manual is under revision*. [12] Los técnicos que trabajan con la adquisición y tratamiento de datos Aerofotogramétricos tenían formación adecuada, sin embargo, no existe un plan formal para el mantenimiento de la capacitación. El establecimiento de este plan es parte del Proyecto AIM-BR, creado para gestionar la transición del AIS a la AIM. / *Technicians working with the acquisition and processing of photogrammetric data has proper training, however, there is no formal plan for continuous training. The establishment of this plan is part of AIM-BR Project, created to manage the transition from AIS to AIM*. [13] El sector responsable de e-TOD está equipado con 4 estaciones de trabajo con ajuste apropiado para la actividad, incluidos los monitores y ratones 3D y almacenamiento de datos de alta capacidad. Los programas más utilizados son ArcGIS, ERDAS LPS y Global Mapper. /

ESTADOS/ STATES	COMENTARIOS / COMMENTS
	The sector responsible for e-TOD is equipped with 4 workstations appropriate for the activity, including monitors and mice 3D and high data storage capacity. The most used programs are ArcGIS, ERDAS LPS and Global Mapper. [14] Se establecieron las especificaciones de carga y verificación de datos e-TOD, formalizado en una guía de instrucciones para los operadores. El cronograma establecido se está revisando, y será parte del plan del proyecto e-TOD (véase la respuesta 10). / *Load and e-TOD data verification specifications were established, formalized in an instruction guide for operators. The schedules are being revised, and will be part of the e-TOD project plan (see item 10)*. [15] Brasil tiene una normativa con relación a la provisión de los datos e informaciones de los proveedores a la sección AIS. La misma contempla todos los puntos observados en los SLA. / *Brazil has regulations regarding the provision of data and information from suppliers to the AIS section. It contemplates all the points observed in the SLA.*
CHI	[1] Hay establecido un grupo de trabajo que ha definido un Proyecto de Plan con tareas, plazos, análisis de riesgos y aspectos económicos para la implantación de las Áreas 1, 2, 3 y 4. El citado Proyecto de Plan está en una etapa de evaluación, por lo cual aún no se ha definido un calendario de ejecución. / *There is a work group which has defined a Plan Project with tasks, deadlines, risk analysis and economical aspects for the implementation of Areas 1, 2, 3 and 4. The mentioned Plan Project is under assessment, and for this reason an implementation calendar has not been defined yet.*
COL	[1] Se dispone de un DTM. / *There is a DTM*. [2] Instituto Geográfico Agustín Codazzi. IGAC. [3] 30 metros. / *30 mts.* [4] Es producido con estándares IPGH. / *Produced with IPGH standards*. [5] Base de datos Programa FEAMAN, GFEAMAN, ARGIS, MICROESTATION / *Data Base Programme FEAMAN, GFEAMAN, ARGIS, MICROESTATION*. [6] Diversas fuentes externas / *Different external sources.* [7] Programas FEAMAN, GFEAMAN, ARGIS, MICROESTATION / *Programmes FEAMAN, GFEAMAN, ARGIS, MICROESTATION*.
ECU	[1] El Plan de implementación e-TOD – SIG está planificado realizarlos desde el 2014 al 2016. / *e-TOD - SIG implementation plan is planned to be carried out starting in 2014 to 2016.* [2] Dentro del proyecto de implantación del SIG y e-TOD, se contempla la capacitación del personal AIM responsable del mismo. / *Training of AIM personnel responsible for the SIG and e-TOD Project is contemplated within its implementation.* [3] El plan contempla los nuevos requisitos que emanan del concepto operacional de ATM mundial; los servicios de información aeronáutica deben integrarse en un concepto más amplio de gestión de la Información Aeronáutica centrada en los datos y también se tiene en cuenta lo establecido en la Hoja de Ruta de transición del AIS al AIM de Ecuador. / *The plan contemplates new requirements which emanate from the global ATM operational concept; the aeronautical information services must be integrated within an ample concept of aeronautical information management centered in data and also what is established in the Roadmap for transition from AIS to AIM of Ecuador*. [4] Personal AIS/MAP con experiencia y conocimientos básicos de GIS. / *AIS/MAP personnel with experience and basic knowledge of GIS.* Software Microstation 95, ArcGIS 9 (En proceso de compra de licencias). / *Microstation 95, ArcGIS 9 software (under process of licenses acquisition).* [5] El cronograma estará basado en tiempo establecido para el desarrollo del proyecto, seguimiento a través de Indicadores de cumplimiento de cada etapa./*The Schedule is based in time established for the development of the project, follow-up through indicators of compliance in each stage.*

ESTADOS/ STATES	COMENTARIOS / COMMENTS
GUY	Estamos en el proceso de entrenar al personal para establecer una dependencia MAP para el AIS. / *We are in the process of of training personnel to establish a MAP unit for the AIS.*
FGU	[1] Modelo Terreno Digital (DTM). / *Digital Terrain Model (DTM).* [2] Organización externa: Institut Geographique National (the French National Geodetic and Mapping Agency) – ver AIC A 2008_31 (*https://www.sia.aviation- ‑ civile.gouv.fr/dossier%5Caicfrancea%5CAIC_A_2008_31_EN.pdf*). Las condiciones para adquirir estos datos (licencias) se encuentran en el catálogo IGN. / *External organization: Institut Geographique National (the French National Geodetic and Mapping Agency) – see AIC A 2008_31 (https://www.sia.aviation- ‑ civile.gouv.fr/dossier%5Caicfrancea%5CAIC_A_2008_31_EN.pdf). The conditions relating to acquisition of these datasets (licensing) are provided in the IGN catalogue*. [3] El producto IGN BD ALTI® es una descripción de referencia terrestre del territorio Francés. Los Modelos DTM (Modelos Terrestres Digital) y contornos describiendo el terreno a diferentes escalas (de 1:50 000 a 1:1 000 000) se derivan del BD ALTI®. El BD ALTI® consiste en archivos de vector estructurados del escaneo de contornos del terreno francés. El intervalo de contorno puede variar de 5 a 40 m. Los datos se ingresan en mapas IGN a 1:25 000 a 1:50 000 y de fotografías adicionales a 1:20 000; 1:30.000 y 1:60 000. / *IGN BD ALTI® product is a terrain reference description of French territory. DTM (Digital Terrain Models) and contours describing the terrain at different scales (from 1:50 000 to 1:1 000 000) are derived from the BD ALTI ®. The BD ALTI® consists of structured vector files from scanning all the contours of French terrain. The contour interval can range from 5 to 40 m. Data is entered on IGN maps at 1:25 000 at 1:50 000 and from additional aerial photographs at 1:20 000; 1:30.000 and 1:60 000.* [4] *Excepto en áreas escarpadas donde el IGN-F recolecta datos adicionales para mejorar la precisión. / Except in very steep areas where IGN-F is collecting additional data to improve accuracy.* [5] Los metadatos se pueden obtener gratuitamente en el website de IGN-F, en francés. / *Metadata is provided free on IGN-F website, in French.* [6] La recolección y evaluación de los datos existentes está en proceso. Nuevos estudios se realizan cada año (por ejemplo en Guyana Francesa en 2011 y en el Caribe en 2012). / *Gathering and assessments of existing data are on-going. New surveys are scheduled every year (e.g. in French Guiana in 2011 and the Caribbean in 2012).* Obstrucciones aisladas artificiales aparecen en el AIP francés. / *Artificial Isolated Obstructions are listed in French AIP;* (ver / *see: https://www.sia.aviation-civile.gouv.fr/aip/enligne/uk/..%5CPDF_AIPparSSection%5CAIP%20FRANCE%5CENR%5C5%5C1201_ENR-‑5.4.pdf*). [7] De nuestra organización con apoyo de IGN-F. / *From our organization with IGN-F support.* [8] En proceso, con apoyo de IGN-F. / *On-going with IGN-F support*. [9] La evaluación de datos existentes está en proceso, con apoyo de IGN-F. Los datos nuevos serán compatibles de conformidad con los acuerdos de nivel servicios (SLA) con los proveedores de datos. / *Assessments of existing data are on going with IGN-F support. New data will be compliant according to service level agreements (SLA) with data providers*. [10] En proceso, con apoyo de IGN-F. / *On-going with IGN-F support.* [11] EUROCONTROL está escribiendo un Manual de Datos de Obstáculos del Terreno, un material de guía de datos de obstáculo en el terreno, de acuerdo al Anexo 15 de la OACI. La primera edición del Manual de Datos de Obstáculos del Terreno ha sido evaluado por un Estudio de Pilotos Suizo-Francés para poner el e-TOD en práctica. / *EUROCONTROL (European organisation for the safety of air navigation) is writing a "Terrain and Obstacle Data Manual", a guidance material on the provision of Terrain and Obstacle Data (TOD) in accordance with ICAO Annex 15. First release of "Terrain and Obstacle Data Manual" has been evaluated through a Swiss-French Pilot Study in view of putting eTOD into practice*. [12] En proceso. / *On-going,* [13] El entrenamiento en todas las ediciones geodéticas y de cartas. / *The training is global on all the geodetic and charting issues*.

ESTADOS/ STATES	COMENTARIOS / COMMENTS
	[14] En proceso. / *On-going.* [15] Varios Sistemas de Información Geográfica (GIS) como ESRI ArcGIS. / *Various Geographic Information Systems (GIS) such as ESRI ArcGIS.* [16] En proceso. / *On-going*.
PAN	[1] Sólo se dispone de algunos obstáculos dentro del territorio nacional, sin embargo el Instituto Geográfico Nacional Tommy Guardia, desarrolló un proyecto de levantamiento en todo el territorio nacional, llevando un avance del 90%, por lo que culminando este proyecto estaremos en capacidad de contar con los datos del terreno área 1, de acuerdo a convenio de cooperación que existe entre las dos instituciones del estado. / *There are only some obstacles within the territory, however, the National Geographic Instituto Tommy Guardia developed a surveying project in the entire national territory, with 90% increase, therefore, when completing this project Panama will be able to have área 1 terrain data, in accordance with the cooperation agreement between the two State entities.* [2] Panamá obtuvo el software de base de datos AIXM junto con el ArcGis para la confección de las cartas electrónicas de acuerdo con una inversión que realizó el estado para el mejoramiento de los Servicios de Navegación Aérea. / *Panama obtained the AIXM database software with ArGis for the preparation of electronic charts with an investment of the State for the improvement of Air Navigatio Services*. [3] Los obstáculos en el área de los aeródromos se tienen parcialmente en cada aeródromo, sin embargo se hacen las coordinaciones para el levantamiento de nuevos obstáculos construidos en las inmediaciones de los aeródromos. Tocumen, S.A. junto con AAC harán los esfuerzos para el levantamiento de los obstáculos para los aeródromos dentro del área terminal. / *Obstaches in the aerodromes área are partially in each aerodrome, however coordinations are being made for the surveying of new obstacles built in the aerodromes surroundings. Tocumen S.A. with the CAA will make efforts for obstacle surveying for the aerodromes within the terminal area.* [4] Panamá dispone de un Programa de Capacitación anual en donde están incluidos todos los aspectos relacionados a cursos y seminarios e-TOD. / *Panama has an annual Training Programme where all the issues related to e-TOD courses and seminars are included*.
PER	[1] Sólo se dispone de información gráfica aislada de obstáculos de algunos aeródromos y que aparecen en algunas cartas aeronáuticas, no se encuentra en una base de datos. / *Only isolated obstacle graphical information available of some aerodromes and shown in some aeronautical charts, not found in a data base.* [2] De levantamientos topográficos realizados por la propia organización. / *Topographical surveying by same organization*. [3]Se cuenta con equipos de medición GPS R8 diferencial y estación total TOPOCON 7500, 02 estaciones de trabajo HP Z800, software de diseño CAD. / *GPS R8 differential measuring equipment available and total station TOPOCON 7500, 02 workstations HP Z800, CAD design software*. [4] Carta digital obtenida del ING. / *Digital chart obtained from ING*.
URU	[1] En proceso. / *On-going.* [2] En proceso. De la propia Organización y externa. IGM – Instituto Geográfico Militar. / *On-going. From the organisation and outsided source. IGM.* [3] En proceso. / *On-going*. [4] 2011 - 2015 [5] En proceso. / *On-going.* [6] En proceso. / *On-going*. [7] Sistema de Información Geográfica ARC-GIS ESRI. / *Geographical Information System ARC-GIS ESRI*. [8] 2011 – 2015.

ESTADOS/ STATES	COMENTARIOS / COMMENTS
VEN	*[1] De organización externa. / *Outside sources.* Souttle Radar Topography Mission-National Geospatial Inteligence Agency (NGA) y/and National Aeronautics and Space Administration (NASA). *[2] 90 metros. / *90 mts*. *[3] 90 metros. / *90 mts.* *[4] Se tiene archivos de trabajos geodésicos para los Aeropuertos Internacionales de Venezuela, donde hay obstáculos en el alrededor y aprox. del aeropuerto. / *There are geodetic work files for International Airports in Venezuela, where there are obsctacles around and approx to the airport.* [5] Los archivos mencionados anteriormente se obtuvieron por trabajos de la propia organización. / *The files previously mentioned were obtained by works of the same organisation.* El Servicio AIS de Venezuela a fines de 2013 adquirió un GIS que está en Fase 1 de ejecución (completar Base de datos estructurados y no estructurados) para generar un AIP electrónico. En la Fase 2 se adquirirá el Módulo e-TOD para gestionar la base de datos e-TOD de Obstáculos y Terreno que afectan las Áreas 1, 2 y 3 de los aeropuertos internacionales y espacios aéreos adyacentes.en Venezuela. / *By end 2013 AIS Service in Venezuela acquired a GIS which is in execution phase 1 (complete structured and no structured database) to generate electronic AIP. In phase 2 e-TOD module will be acquired to manage e-TOD Obstacle and Terrain database affecting Areas 1, 2 and 3 of international airports and adjacent airspace in Venezuela*.

APPENDIX B

SAM Region	**PROJECT DESCRIPTION (DP)**	DP N° G1	
Programme	**Title of the Project**	**Start**	**End**
AIM (ICAO Programme Coordinator: Jorge Armoa)	Implementation of the provision of electronic terrain and obstacle data (e-TOD) (SAM) Project coordinator: Juan González (Uruguay) Experts contributing to the project: SAM/AIM IG	26/09/11	31/12/19
Objective	Support the implementation of the provision of e-TOD by SAM States, and provide guidance to States on GIS acquisition and management.		
Scope	The scope of the project contemplates the assessment and identification of implementation levels associated to the provision of electronic terrain and obstacle data. It contemplates the drafting of an Action plan and guides for the implementation of e-TOD to support developments in the provision of electronic terrain and obstacle data for the evolution of digital terrain models (DTM) to gradually improve electronic aeronautical charts and other similar products, with the support of tools such as the geographical information systems (GIS).		
Metrics	• Number of States that have implemented GIS or automated systems. • Guide-document with action plan approved. • Number of States that establish SLAs. • Main Airports with Area 2 (eTOD) Surveyed		
Strategy	The conduction of project activities will be coordinated among project members, the project coordinator, and the programme coordinator, mainly through teleconferences (*GoToMeeting* application) and meetings that may be held within other scheduled events, based on the activities of the work programme. The project coordinator will coordinate with the programme coordinator for the inclusion of additional experts, if warranted by the tasks and works to be executed. The results of the work done will be submitted to the consideration and review of State experts in the form of a final consolidated document for analysis, review, and approval, and for presentation to the GREPECAS PPRC by the programme coordinator.		

Goals	Draft the Guide-document containing the objectives of the e-TOD project. 2012. Define the technical and e-TOD project specifications. 2012. Prepare the document containing the e-TOD technical specifications. 2012. Guide on the acquisition of a geographical information system (GIS). 2012. GIS implementation Manual. 2012. Available Methodology and tools for surveying Area 2. 2013 Main International Airports with Area 2 surveyed. 2017
Rationale	Compliance with the SARPs of Annexes 15 and 4 to facilitate the execution of performance-based air operations and to advance with the AIS-AIM Transition Roadmap. A close relationship with other projects is needed in order to obtain the operational requirements of the aforementioned applications and their respective tentative dates of implementation.
Related projects	This project is related to Project G3 *"Implementation of the Quality Management System in the AIM units"* in the CAR/SAM States.

Project deliverables	**Relationship with the performance-based regional plan (PFF)**	**Responsible party**	**Status of implementation***	**Delivery date**	**Comments**
Survey on the status of e-TOD implementation.	PFF: SAM AIM/02	Juan González Uruguay		30/11/2011	Finalised on schedule.
Generate follow-up report.	PFF: SAM AIM/02	Juan González Uruguay		30/04/2012	Finalised on schedule.
Develop Guide-Document with the objectives of the e-TOD project.	PFF: SAM AIM/02	Juan González Uruguay		30/09/2012	Finalised on schedule. Delivered 30/09/2012
Define the technical specification of the e-TOD project.	PFF: SAM AIM/02	Juan González Uruguay		30/09/2012	Finalised on schedule. Delivered 30/09/2012
Develop the document with the e-TOD technical specifications.	PFF: SAM AIM/02	Juan González Uruguay		30/09/2012	Finalised on schedule. Delivered 30/09/2012

Guide for the acquisition of a geographical information system (GIS).	PFF: SAM AIM/01	Juan González Uruguay		09/03/2012	Finalised on schedule.
GIS implementation manual.	PFF: SAM AIM/01	Juan González Uruguay		09/03/2012	Finalised on schedule.
Present to States the different options available for surveying Area 2	ASBU:BO30 DATM	ICAO Coordinator		26/07/2013	Finalised on schedule.
Guide to develop a Digital Terrain Model (DTM) or a Digital Elevation Model (DEM)	PFF: SAM AIM/02 ASBU:BO30 DATM	*Ad-hoc* Group SAM/AIM/7 Meeting		30/03/2015	Finalised on schedule
Complete 50% States with DTM and/or DEM implementation before SAM/AIM/7 Meeting	PFF: SAM AIM/02 ASBU:BO30 DATM	States		12/11/2016	49% finalised on schedule.
Availability of programmes to manage e-TOD informaiton	PFF: SAM AIM/02 ASBU:BO30 DATM	States		12/11/2016	49% States finalised on schedule.
Action Plan for electronic **terrain** data in Area 2	PFF: SAM AIM/02 ASBU:BO30 DATM	States		12/11/2017	49% States finalised on schedule.
Action Plan for electronic **obstacle** data in Area 2	PFF: SAM AIM/02 ASBU:BO30 DATM	States		12/11/2017	42% States finalised on schedule.
Resources required	Designation of experts in the execution of some of the deliverables. More commitment by States to support the designated Coordinators and experts.				

**Grey* *Task not started*
Green *Activity underway as scheduled*
Yellow *Activity started with some delay but expected to be completed on time*
Red *It has not been possible to implement this activity as scheduled; mitigating measures are required*