International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)

WORKING PAPER

ePPRC/02 — WP/09
18/10/20

SECOND GREPECAS PROGRAMMES AND PROJECTS REVIEW COMMITTEE (PPRC)
VIRTUAL MEETING (ePPRC/02)
30 October 2020

Agenda Item 2: **Follow-up on GREPECAS Programmes and Projects**
2.6 CNS C and D Projects

DESCRIPTION AND FOLLOW-UP ON THE IMPLEMENTATION OFACTIVITIES OF THE PROJECTS OF THE GROUND-GROUND AND GROUND-AIR COMMUNICATIONS INFRASTRUCTURE PROGRAMME FOR THE CAR AND SAM REGIONS

(Presented by the Secretariat)

EXECUTIVE SUMMARY

This working paper presents updated information on the status of implementation of the activities of the ATN Architecture (D1) and ATN Ground-Ground and Air-Ground Applications (D2) projects of the Ground-Ground / Air-Ground Communications Infrastructure programme for the SAM Region, as well as the ATN Infrastructure Project in the CAR Region and its Ground-Ground and Ground-Air Applications (D) for the CAR Region from the Fifth Meeting of the PPRC/5 Programmes and Projects Review Committee until to date.

Action:	Presented in Section 4.
Strategic Objectives:	• Air Navigation Capacity and Efficiency • Environmental Protection
References:	• Annex 10 - Aeronautical Telecommunications • Doc 9750 - Global Air Navigation Plan • Reports of the Meetings of the Programmes and Projects Review Committee (PPRC) • Report of the Eighteenth Meeting of the CAR/SAM Regional Planning and Implementation Group (GREPECAS/18), Punta Cana, Dominican Republic, April, 2018. • Report of the Twenty-Fourth Workshop/Meeting of the SAM Implementation Group (SAM/IG/24), Lima, Peru, November 2019

1. Introduction

1.1 Since the last Meeting of the Programmes and Projects Review Committee (PPRC/5), CAR and SAM Regions have developed several specific implementations of each region to comply with GREPECAS projects. The objective of this working paper is to provide an overview of the progress in each Region.

2. Analysis

2.1 The progress of the D programme projects since the PPRC/5 Meeting in the CAR and SAM Regions to date is described below.

CAR REGION

2.2 Information of the CAR Region is presented in IP/6

SAM REGION

D SAM Programme Ground-Ground / Air-Ground Communications Infrastructure

2.3 The SAM Region Ground-Ground / Air-Ground Communications Infrastructure programme consists of the restructuring of the GREPECAS organization (Decision 16/45) of project D1 Architecture of the ATN in the SAM Region and project D2 Ground-Ground and Air-Ground Applications of the ATN SAM.

2.4 The main activities carried out by these projects since the PPRC/4 Meeting, in which the last follow-up of GREPECAS programmes and projects to date, are described below.

Project D1 Architecture of the ATN in the SAM Region - SAM Region Digital Network

2.5 Within the framework of the Regional Project RLA/03/901, which manages the Digital Network of the SAM Region (REDDIG II), a significant achievement was the implementation by the United States (FAA), on 30 September, 2020, of the additional nodes of the REDDIG II terrestrial network (MPLS) in Atlanta and Salt Lake City. **Appendix A** of this working paper details the main advances and improvements of the ATN regional infrastructure for the SAM States.

Project D2 Applications Ground - Ground and Air - Ground of the ATN SAM

2.6 The most significant activities of this project are the operational implementation of AMHS and AIDC. Likewise, as a support to automation, mitigating flight plan errors is also an activity of relevance for States. Other issues that contribute to the automation of air navigation systems and are being dealt with by the SAM States, are the exchange of messages in the new formats based on XML/GML and the ADS-B implementation.

AMHS implementation

2.7 Regarding the AMHS interconnection, as well as the impact caused by the pandemic, important AMHS P1 interconnections were established in 2020. Since the PPRC/4, with the establishment of new interconnections in the years 2018 and 2019, all COM Centres in the Region implemented their AMHS systems and tests with adjacent Centres have already begun. Currently, 26 regional interconnections have already been established, there are only 2 operating AFTN circuits that must be replaced by an AMHS interconnection (P1): SAEZ - SUMU and SBBR - SUMU.

2.8 In addition to the regional interconnections, 2 interregional AMHS interconnections were established in 2020: SPIM (Lima) - KATL (Atlanta) and SBBR (Brasilia) - GOOO (Dakar). Until the end of 2020, two more interconnections that are already in interoperability tests: SVCA (Caracas) – KATL (Atlanta) y SVCA (Caracas) – TTPP (Piarco), must be completed. **Appendix B** to this working paper presents the current status of AMHS implementation in the SAM Region.

AIDC implementation

2.9 Despite the difficulties caused by the pandemic, a great effort was made by Colombia, Ecuador, Panama and Peru to establish three AIDC communications in 2020:

- ACC Guayaquil - ACC CENAMER (16 March, 2020);
- ACC Bogotá - ACC Lima (12 October, 2020); and
- ACC Barranquilla - ACC Panama (15 October, 2020).

2.10 Two other AIDC communications are in the pre-operational phase and should become operational until the end of 2020:

- ACC Barraquilla - ACC Maiquetía; and
- ACC Bogotá - ACC Panama

2.11 The status of AIDC implementation in the SAM Region is presented in **Appendix C** of this working paper.

Mitigation of errors and duplication/multiplicity of flight plans in the SAM Region

2.12 Within the framework of the SAM Implementation Group (SAM/IG), the ATM/FPL Subgroup of the Interoperability Task Force (GT Interop) was activated to deal with issues related to the mitigation of errors and duplication/multiplicity of flight plans. **Appendix D** to this working paper presents the main advances on the subject in the SAM Region.

Implementation of the exchange of OPMET messages in IWXXM format

2.13 Also within the framework of the SAM/IG Group, the MET/IWXXM Subgroup of the Interop TG was activated to deal with the adaptation of aeronautical meteorology users' systems to the new meteorological message format (IWXXM).

2.14 Two main initiatives were addressed by the MET/IWXXM Subgroup: a converter from the TAC format to the IWXXM format, called METAX, developed by personnel from Venezuela, and the adaptation carried out by the Brazilian Administration in the Regional OPMET Data Bank in Brasilia. **Appendix E** to this working paper details the two initiatives.

Regional Implementation of Satellite ADS-B in the SAM Region

2.15 Also within the framework of the SAM Implementation Group (SAM/IG), there is the CNS/SUR Subgroup of the Interop GT, in order to carry out analyses for a regional implementation of Satellite ADS-B (Space-based ADS-B), using the SAM Region Digital Network (REDDIG II) as a distribution platform for surveillance information.

2.16 Regional implementation is considered to be the initiative of a group of States to implement the service, through a Regional Technical Cooperation Project, using the regional IP network as a means of transmitting surveillance information. **Appendix F** to this working paper presents a summary of the data obtained for analysis by the CNS/SUR Subgroup.

3. Suggested actions

3.1 The Meeting is invited to:

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

b) analyse any other matter related to this that the Meeting deems necessary.

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APPENDIX A

1.0 IP DIGITAL NETWORK OF THE SAM REGION (REDDIG II)

Main achievements since PPRC/5

1.1 The implementation of the additional FAA nodes will allow direct communication between the COM AMHS Centers in the United States and the COM AMHS Centers in Brasilia, Caracas, Lima and Piarco.

1.2 Panama is evaluating the implementation of an additional REDDIG node.

1.3 The Aireon company that provides the space-based ADS-B service, has requested the implementation of an additional REDDIG II node for the distribution of ADS-B surveillance information to the states interested in contracting the service. The participating States of the Regional Project RLA/03/901 were consulted, and those that expressed interest in communicating with the Aireon node will be configured for that.

1.4 Currently, a new bidding process is being conducted by TCB that will expand the number of nodes in the terrestrial network (MPLS). Figure 1 illustrates the future topology of the network, considering the additional nodes and the new nodes to be implemented (in blue).

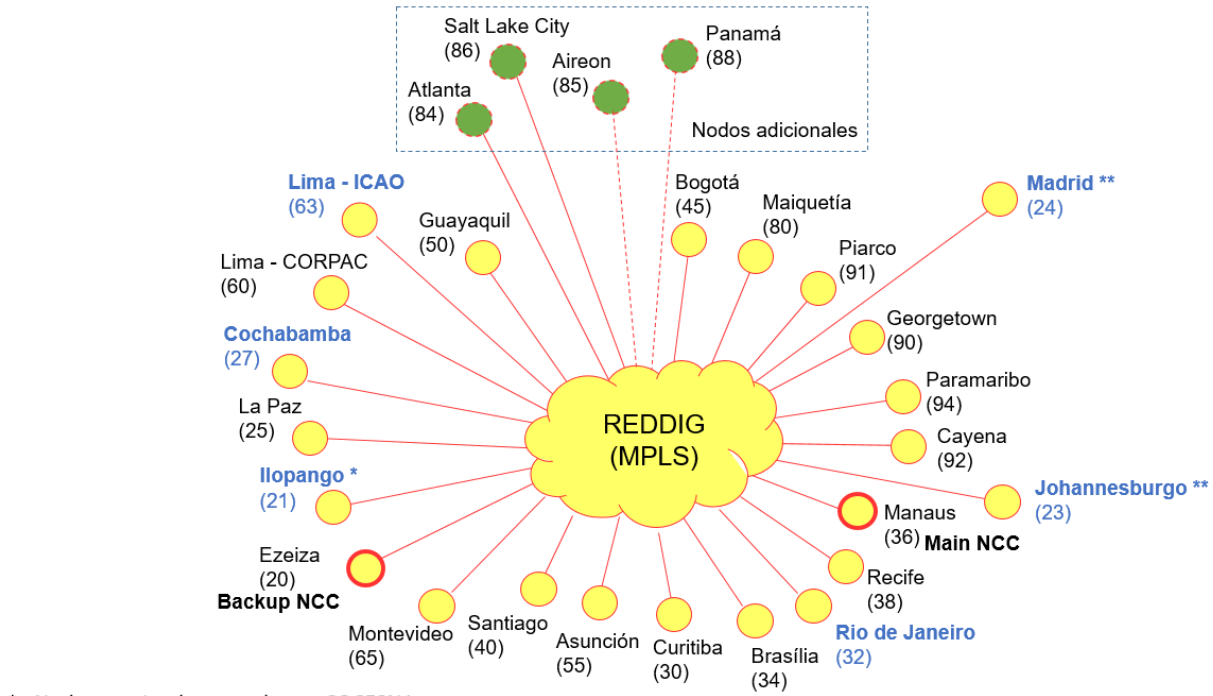

Figure 1 - Topology of the REDDIG II terrestrial network (MPLS)

1.5 Another important initiative that is already in the bidding process by TCB is the acquisition of cyber protection equipment (firewalls) for the network and the training of technical staff. 40 firewalls and other associated equipment are being acquired that will provide the first cybersecurity barrier for the data/information, transmitted in the regional network, of the air navigation services of the States.

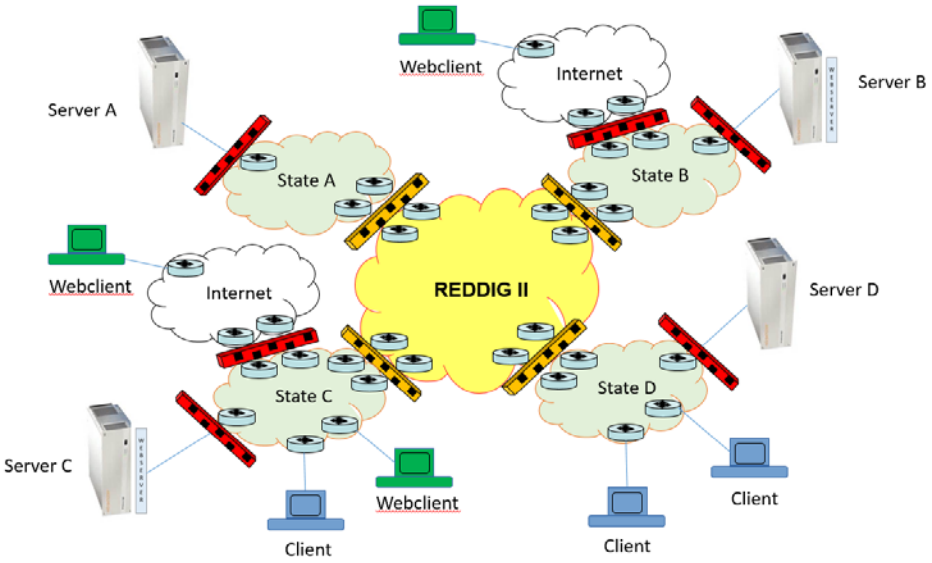

Figure 2 - Cyber Protection

1.1 In Figure 2, the equipment of the first barrier is in orange. In red they would be the protections implemented by the States in their home networks. Special attention must be given to the protections implemented by the States, to allow access by users of public networks such as the Internet.

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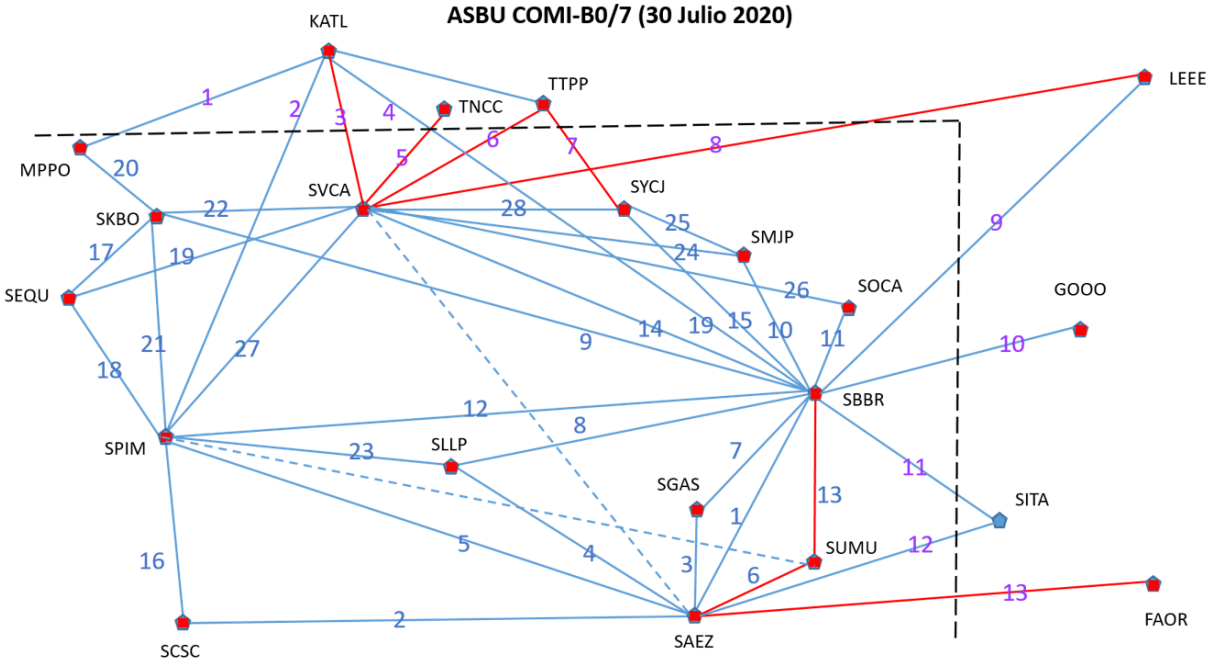
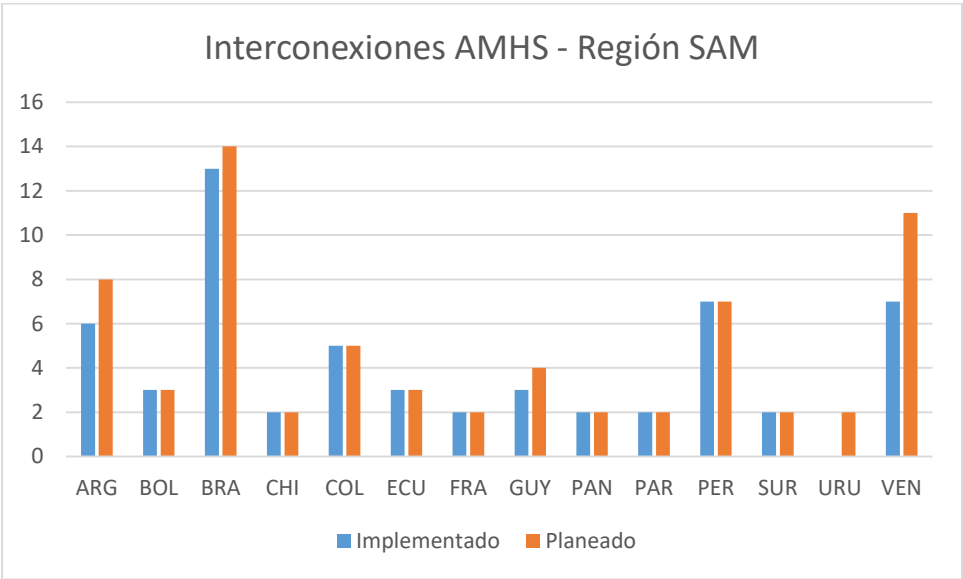
APPENDIX B

AMHS Interconnections / Interconexiones AMHS
ASBU COMI-B0/7 (30 Julio 2020)





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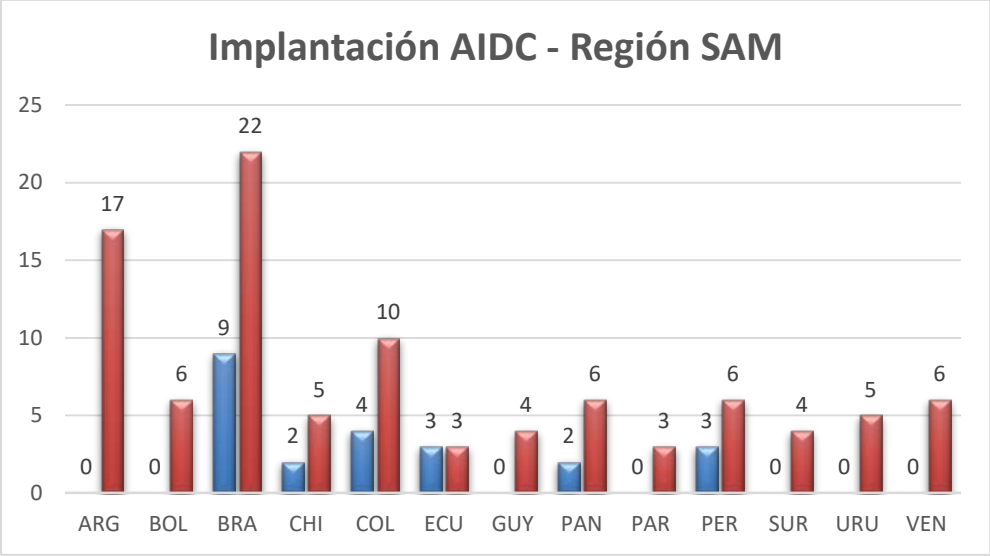
APPENDIX C


Implantación AIDC - Región SAM
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APPENDIX D

1.0 GT Interop ATM/FPL Subgroup

1.1 The ATM/FPL Subgroup, by means of teleconferences, has discussed the centralization of the management of flight plans (and associated messages) and a proposal of messages of acceptance (ACK) or rejection (REJ) of flight plans, providing feedback to flight plan originators.

1.2 This proposal will be presented, for approval, at the next SAM Implementation Group Meeting (SAM/IG/25), to be held from 2 to 4 November 2020, by teleconference.

Accepted Message **(ACK):**

In the event that the flight plan or other standardized message that correctly enters the system via AMHS/AFTN; an ACK message will be transmitted to the originator of the flight plan.

ACK Description: **ACK FPL SPIM CMP124 SPJC 1645 MPTO**

Response type	= ACK
Message type	= FPL
FIR emitting MSG	= SPIM
Flight ID	= CMP124
DEP Aerodrome	= SPJC
EOBT	= 1645
ARR Aerodrome	= MPTO

Rejection Message **(REJ):**

In the event that the flight plan or other standardized message incorrectly enters the system via AMHS/AFTN; a REJ message will be transmitted to the originator of the flight plan. The original flight plan message is copied below the rejection message for reference.

REJ Description: REJ FPL SPIM JBU1824 INCORRECT FL RVSM

FPL-JBU1824-IS
-A320/M-SWE3DFGHIM3RZ/SB1
-SPJC0359
-N464F350 BTE2F BTE UV1 TRU UL780 EVRED/N0456F360 UL780
TBG/N0452F380 UL465 GCM UG448 IKBIX Y183 PEAKY DCT DVALL CURSO5
-KFLL0534
-PBN/A1B1C1D1O1S2T1 NAV/RNVD1E2A1 SUR/260B DOF/190315
REG/N282JB EET/SEFG0110 SKED0156 MPZL0225 MKJK0345 MUFH0427
KZMA0501 SEL/AJKS CODE/AB4F5D

— D2 —

Response type = REJ
Message type = FPL
FIR emitting message = SPIM
Flight ID = JBU1824
Reason for rejection = INCORRECT FL RVSM

Original FPL follow below for reference

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APPENDIX E

1.0 THE METAX CONVERTER

1.1 The METAX system was developed by personnel from Venezuela and is made up of a converter of meteorological information from the TAC format to the IWXXM format. METAX is an application that can be installed on a network or as a web service. Users who access METAX can enter the respective message (METAR, TAF, SIGMET, etc.) in the TAC format and the system will generate an XML file with the meteorological information encoded in the IWXXM format. Weather reports can also be processed by the METAX system.

1.2 The .xml extension file should be routed as an attachment to an AMHS message addressed to a meteorology user, such as, for example, the OPMET Regional Bank of Brasilia (C=XX/A=ICAO/P=SB/O=SBBR/OU1=SBBR/CN=SBBRYZYX).

1.3 The Venezuelan Administration kindly grants, free of charge, the system for installation in other aeronautical administrations, also providing the source codes under the commitment not to be used for commercial purposes.

1.4 A presentation made during the SAM/IG/24 Meeting is available at the following link: https://www.icao.int/SAM/Documents/2019-06901-SAMIG24/metax-iwxxm-ven.pdf.

2.0 CURRENT OPMET REGIONAL DATA BANK OF BRASILIA

2.1 The current OPMET Regional Data Bank of Brasilia was adapted in 2017 to receive and transmit meteorological information in **version 2.1** of the new IWXXM format.

- AMHS address of the OPMET Regional Data Bank of Brasilia:
/ CN=SBBRYZYX/OU=SBBR/O=SBBR/PRMD=SB/ADMD=ICAO/C=XX/

- AFTN address: **SBBRYZYX**

2.2 In accordance with the recommendations contained in **Doc 10003 - ICAO model manual for the exchange of meteorological information and EUR Doc 033 - Operational conception for the transition of OPMET data exchange using IWXXM**, meteorological information in the new IWXXM format is sent as a file (XML extension) attached to an AMHS message.

2.3 A MET user who sends an AMHS message with the meteorological information (attached) correctly encoded in version 2.1 of the IWXXM format, said information will be accepted by the OPMET Regional Data Bank of Brasilia and stored in the database. The system will convert the same meteorological information into the traditional format (TAC) and will also store it in the database.

2.4 If the meteorological information presents a coding error (or inconsistency in the data), the message will not enter the database and an AMHS message is sent to the originator indicating the rejection.

2.5 To consult the meteorological information stored in the OPMET Regional Data Bank of Brasilia, the MET user with the capacity to receive the information in the new format, must send an AMHS request **RQX** message. Example: **RQX/LA**SBBR, SBRJ=

2.6 MET users who do not yet have the ability to send messages in the new format, can enter meteorological information by sending AMHS (or AFTN) messages in the traditional format (TAC). The system will receive the information, convert it to the IWXXM format and store it in the database in both formats (IWXXM and TAC).

2.7 To consult the meteorological information, a MET user without the ability to handle the data in the new format, must send an **RQM** request by means of an AMHS (or AFTN) message. Example: **RQM/SA**SBBR, SBRJ=

Note: observe the difference between the two requisitions (RQX/LA and RQM/SA)

3.0 FUTURE SYSTEM (FORECAST FOR MARCH 2021)

3.1 The main ANSP of Brazil (DECEA) is in the process of implementing a new OPMET Regional Data Bank in Brasilia, adapted to **version 3.0** of the new IWXXM format (and previous versions), with the same characteristics of reception and transmission by the aeronautical messaging service (AMHS or AFTN) described above for the current system in operation. Figure 1 presents the interconnection context of the OPMET Regional Data Bank of Brasilia.

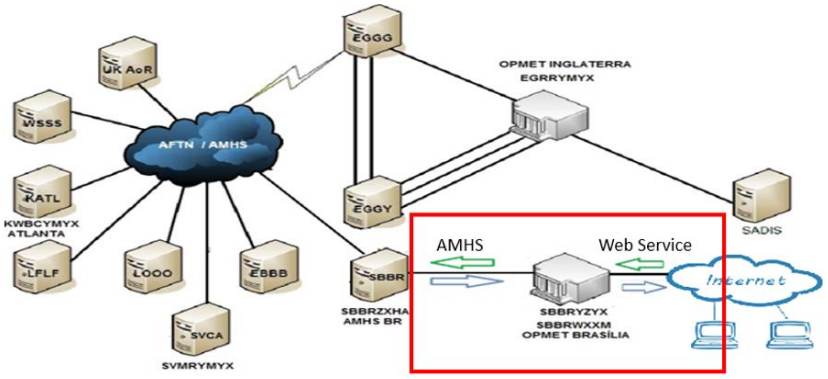

Figure 1 - Context of the OPMET Regional Data Bank of Brasilia

3.2 In addition to these functionalities, the new system will provide that registered MET users can access a web service that will allow the insertion and consultation of meteorological information through IP networks (Intranet or Internet). Figure 2 presents the connection possibilities of MET users to the OPMET Regional Data Bank system.

3.3 The web service will provide screens with their own boxes to fill in the desired meteorological information (METAR, SIGMET, TAF, SPECI, AIRMET, AVA, TCA and SWX). These boxes will be criticized (by the system), if the user enters inconsistent information. The message will only be accepted when all the necessary boxes are filled with consistent information.

3.4 Figure 3 presents an example of the METAR composition screen used in Brazil with its own boxes.

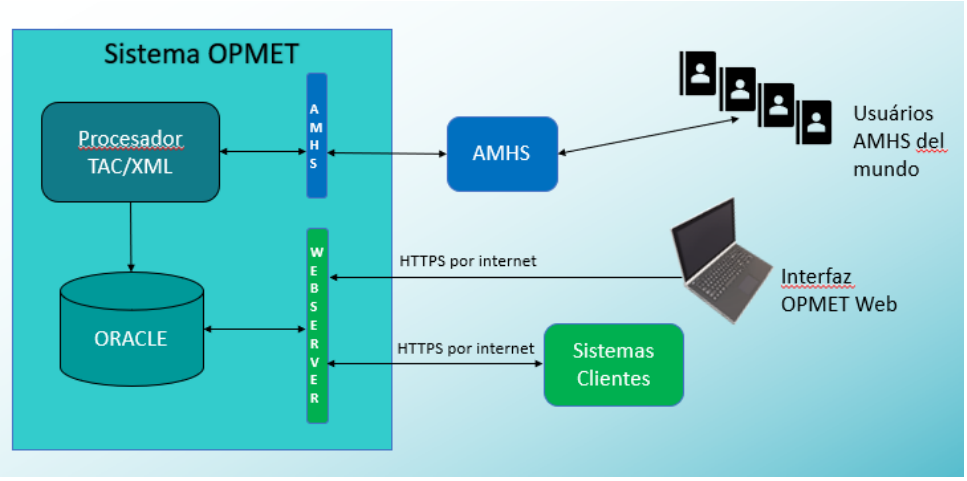

Figure 2 - Possibilities of connection with the new Regional Bank

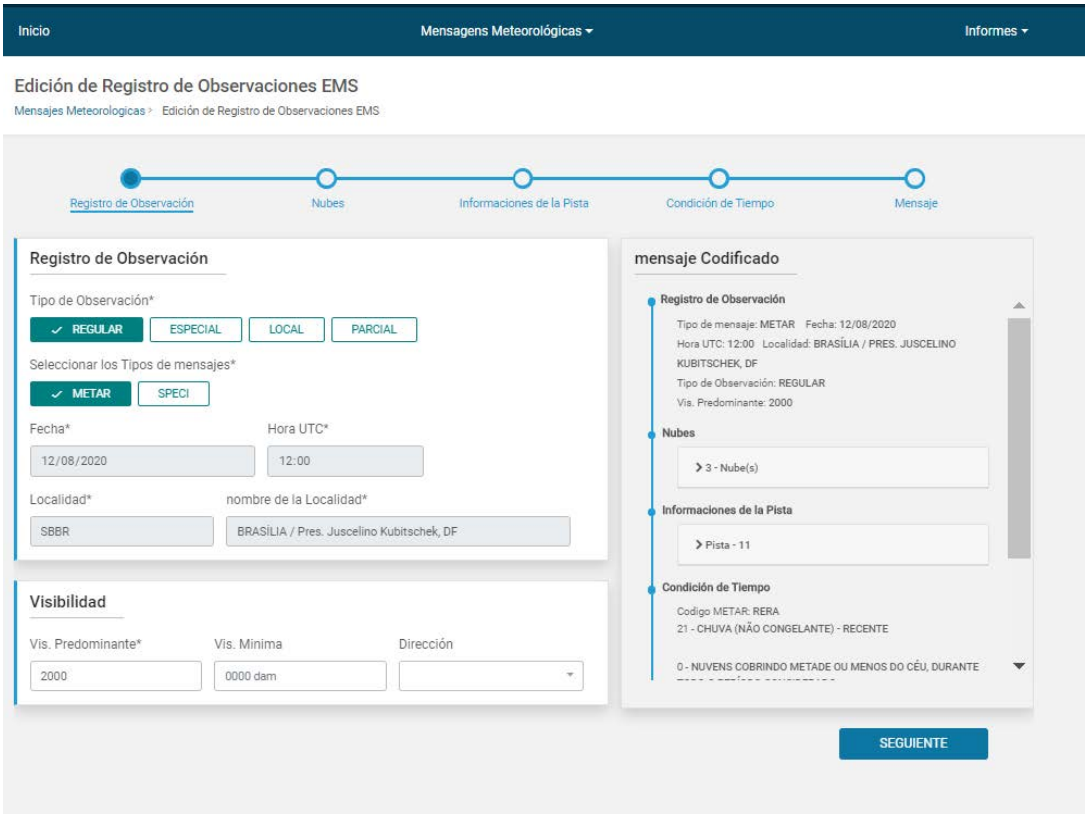

Figure 3 - Meteorological information preparation screen (METAR)

3.5 The system will store the meteorological information in the database (of the OPMET Regional Data Bank of Brasilia) in both formats (TAC and IWXXM). Users may also use the web service to consult the information stored in both formats.

3.6 The future system will also allow other database systems to exchange information directly (from database to database). For this, it is necessary that the systems comply with the interoperability requirements of the Interface Control Document (ICD) for data exchange. The document (ICD) will be forwarded to the ICAO SAM Lima Regional Office, which will make it available to States/Organizations interested in establishing interoperability with the OPMET Regional Data Bank of Brasilia.

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APPENDIX F

1.0 REGIONAL IMPLEMENTATION OF ADS-B SATELLITAL

1.1 Classically, to provide the service, it is necessary to install a service delivery point (SDP) with redundant equipment (1+1) and also redundant communication links, through two MPLS telecommunications service providers. Figure 1 presents the basic configuration of service provision.

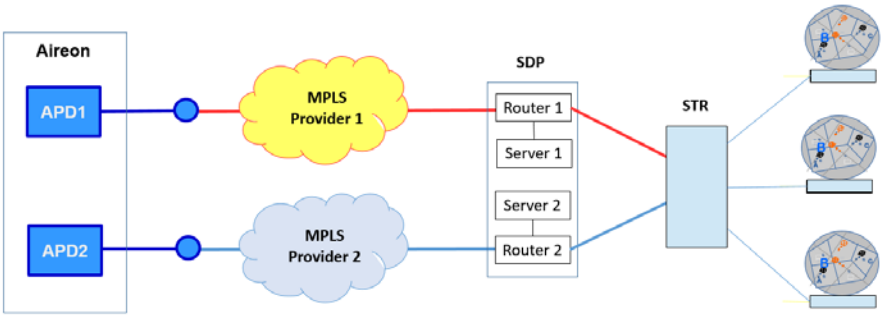

Figure 1 - Basic configuration for service provision

1.2 Once the States of the SAM Region have a regional IP network capable of distributing surveillance information, said infrastructure can be used, lowering the costs of contracting a telecommunications provider.

1.3 In this sense, it is sufficient for the ADS-B Satellite service provider to implement an "additional node" REDDIG II, contracting directly the same telecommunications provider (CenturyLink) of the regional network. Once Aireon is already a CenturyLink customer, it is only necessary to make the configuration to enable the communication of the Aireon node, with the other nodes of the network, that have an interest in receiving the surveillance information. Figure 2 illustrates this possibility.

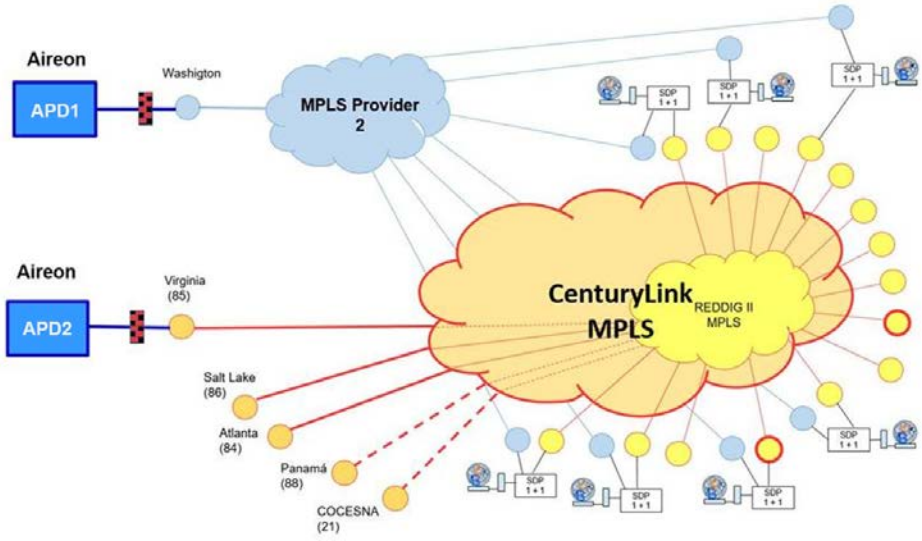

Figure 2 - REDDIG as a distribution link of ADS-B Satellite

1.4 It will only be necessary to contract the second link (MPLS), with another telecommunications service provider, to have communication redundancy, increasing the availability of the service.

1.5 The analysis carried out by the CNS/SUR Subgroup, with the respective recommendations, will be presented at the next SAM/IG/25 Meeting (November 2 to 4, 2020), for a decision by the group.

— END —