Agenda Item 5: Operational implementation of new ATM automated systems and integration of the existing ones

Follow-up to the implementation of activities under the project on Improved ATM situational awareness in the SAM Region

(Presented by the Secretariat)

SUMMARY

This working paper presents information on the follow-up to the implementation of activities under the project on Improved ATM situational awareness in the SAM Region, to the results of the *NAM/CAR/SAM Seminar/Workshop on the Implementation of Advanced Surveillance and Automation Systems*, and to the activities proposed for the triennium 2017-2019 on ASBU modules related to improved situational awareness.

References

- Fourteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/14 – Lima, Peru, 10-14 November 2014)
- Fifteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/15 – Lima, Peru, 11-15 May 2015).
- Third Meeting of the GREPECAS Programmes and Projects Review Committee (PPRC/3 – Mexico City, 21-23 July 2015).
- Second Meeting of Air Navigation and Safety Directors (Lima, Peru, 14-16 September 2015).
- NAM/CAR/SAM Seminar/Workshop on the implementation of advanced surveillance and automation systems (Panama City, Panama, 22-25 September 2015).

ICAO strategic objectives:	*A – Safety* *B – Air navigation capacity and efficiency*

1. Introduction

1.1 The activities under Project (C2) *Improved ATM situational awareness in the SAM Region* of the ATM Automation and Situational Awareness Programme involve, for the time being, the development of guides to support the implementation of situational awareness improvements.

Guides in support of ATM situational awareness implementation in the SAM Region

Guide on technical/operational considerations for the implementation of multilateration (MLAT)

1.2 The SAM/IG/15 meeting took note of the Guide on technical/operational considerations for the implementation of multilateration (MLAT) prepared by an expert in surveillance systems of Ecuador under project RLA/06/901.

1.3 The purpose of the guide is to provide basic information on general matters related to aeronautical surveillance for air traffic control (ATC), particularly the multilateration (MLAT) system, and considerations for its implementation. The guide has three parts: the first is a summary of the surveillance issue; the second describes the characteristics of the MLAT system; and the third presents technical and operational considerations for the implementation of a multilateration system.

1.4 The SAM/IG/15 meeting, upon reviewing the contents of the guide, considered that it should be circulated by the Secretariat to SAM States and Territories for review, approval, and submission to the Sixteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/16). Accordingly, it formulated *Conclusion SAM/IG/15-09 Review and approval of the Guide on technical/operational considerations for the implementation of multilateration (MLAT).*

Guide on technical/operational considerations to support ATFM implementation

1.5 Regarding the drafting of the *guide on technical/operational considerations to support ATFM implementation*, the SAM/IG/15 meeting considered that it should be submitted to the SAM/IG/17 meeting (May 2016), following approval by the Ninth Meeting of the Review Committee of Project RLA/06/901 of a one-week mission by an expert to Lima, Peru in April 2016.

Update of FASID table CNS 4 (Surveillance)

1.6 Taking into account that several States of the Region have recently acquired surveillance systems and are also planning to use ADS-B, FASID table CNS4 needs to be updated, since this information is required for conducting the activity mentioned in the previous paragraph. In this regard, the SAM/IG/14 meeting formulated conclusion *SAM/IG/14-17 Updating of FASID table CNS4,* according to which SAM States were to send to the Secretariat of the ICAO SAM Office an update of FASID table CNS4 by 15 December 2014.

2 Discussion

Guide on technical/operational considerations for the implementation of multilateration (MLAT)

2.1 As a follow-up to conclusion SAM/IG/15-09 *Review and approval of the Guide on technical/operational considerations for the implementation of multilateration (MLAT),* the Meeting is informed that the guide was circulated to SAM States on 24 June 2015 (Letter SA389), with a reminder on 17 August 2015 (Letter SA466).

2.2 Of all the States consulted about the guide, comments were only received from Bolivia, Chile, Brazil, and Ecuador. **Appendix A** to this working paper contains the comments received from Bolivia and Chile for review by the Meeting and approval of the *Guide on technical/operational considerations for the implementation of multilateration (MLAT).* Brazil and Ecuador stated that they had no comments on the guide.

2.3 In light of the proposal to consider the implementation of ADS B in the SAM Region, the Third Meeting of the Programmes and Projects Review Committee approved the extension of project C2 to include these tasks in the project. **Appendix B** to this working paper contains a description of the updated project C2, *NAM/CAR/SAM Seminar/Workshop on the Implementation of Advanced Surveillance and Automation Systems*.

2.4 The NAM/CAR/SAM Seminar/Workshop on the Implementation of Advanced Surveillance and Automation Systems was conducted on 22-25 September 2015, in Panama City, Panama.

2.5 The main objective of this event was to support the implementation or advanced surveillance (ADS-B and multilateration) and automation (AIDC) systems in CAR/SAM States, Territories, and International Organisations in order to meet the surveillance and automation operational requirements specified in the NAM/CAR and SAM regional performance-based implementation plans within the framework of the ICAO Global Navigation Plan (Fourth Edition).

2.6 This event was related to the following modules of ASBU (aviation system block upgrades) Block 0 contemplated in NAM/CAR and SAM regional plans, B0-SURF *Safety and efficiency of surface operations;* B0 ASURF – *Initial capability for ground surveillance;* B0:/FICE – *Increased interoperability, efficiency and capacity through ground-ground integration;* and B0 SNET – *Increased effectiveness of ground safety nets.*

2.7 The Workshop was attended by 82 representatives of NAM/CAR/SAM States, two international organisations of the Regions, and 12 companies. All the presentations and documentation of the seminar/workshop were posted on the ICAO SAM Office website: http://www.icao.int/SAM/Pages/ES/MeetingsDocumentation_ES.aspx?m=2015-SEMAUTOM. The summary of the event, including the recommendations and conclusions, are presented in **Appendix C** to this working paper.

Surveillance activities contemplated for the period 2017-2019

2.8 The Second Meeting of Air Navigation and Safety Directors (AN&FS/2) considered that the priorities established in the Declaration of Bogota responded to the requirements of the Region for the period 2014-2016, and that they did not reflect all the air navigation requirements of the Global Plan and the SAM Regional performance-based air navigation implementation plan (PBIP) for achieving the integration, interoperability and harmonisation of systems in support of the "single sky" concept for international civil aviation.

2.9 The meeting also took note that global and regional air navigation plans are intended to keep pace with global air traffic trends, which has been doubling every 15 years since 1977. It is estimated that this trend will continue in the coming years.

2.10 The global and regional plans define means and goals that allow States and aviation stakeholders to anticipate air traffic growth and manage it efficiently, while actively maintaining or improving safety results. These objectives have been developed in broad consultation with the stakeholders, and serve as the basis for the adoption of harmonised measures at global, regional, and national level.

2.11 In this sense, the AN&FS2 meeting reviewed a list of air navigation implementation activities planned for the period 2017-2019 in the areas of ATM, CNS, AIM, MET, and AGA. This list responds to global air navigation requirements, ICAO strategic objectives, as well as post-2015 sustainable development goals established by the United Nations for the next 15 years.

2.12 Upon reviewing surveillance aspects corresponding to ASBU modules *B0-SUR: Initial capability for ground surveillance, B0-SURF: Safety and efficiency of surface operations (A-SMGCS Level 1-2), and B0-TBO: Improved safety and efficiency through the initial application of data link en-route,* the AN&FS/2 meeting considered that the SAM/IG/16 meeting should review all metrics

corresponding to these modules, which are shown in **Appendix D** to this working paper.

3 Suggested action

3.1 The Meeting is invited to:

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

b) review the comments received concerning the Guide on technical/operational considerations for the implementation of multilateration (MLAT), shown in Appendix A to this working paper, and approve the guide;

c) review the recommendations and conclusions of the *NAM/CAR/SAM Seminar/workshop on the implementation of advanced surveillance and automation systems* shown in Appendix C to this working paper;

d) review FASID table CNS 4;

e) review the surveillance activities and the associated metrics for the period 2017-2019 shown in Appendix D to this working paper; and

f) review the activities of project C2, based on the results of the analysis of paragraphs c and d of the suggested action.

APPENDIX A

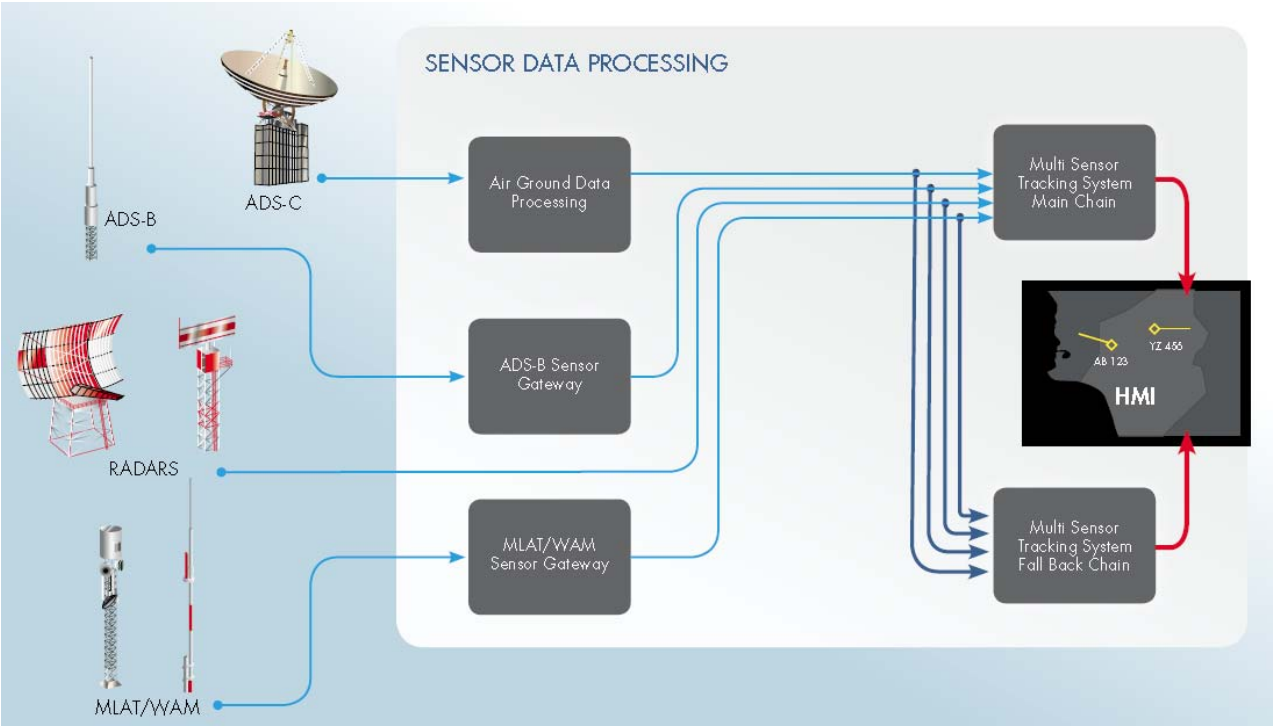
Comments on the Guide on Technical/Operational Considerations for the Implementation of Multilateration (MLAT)

Comments made by BOLIVIA

Proposal to introduce the following information in the guide:

MLAT control and surveillance systems

The use of multilateration (MLAT) technology does not exclude the use of other airspace control and surveillance technologies. MLAT can be integrated into a control and surveillance system, giving due importance to compatibility of communication protocols used for data transportation.



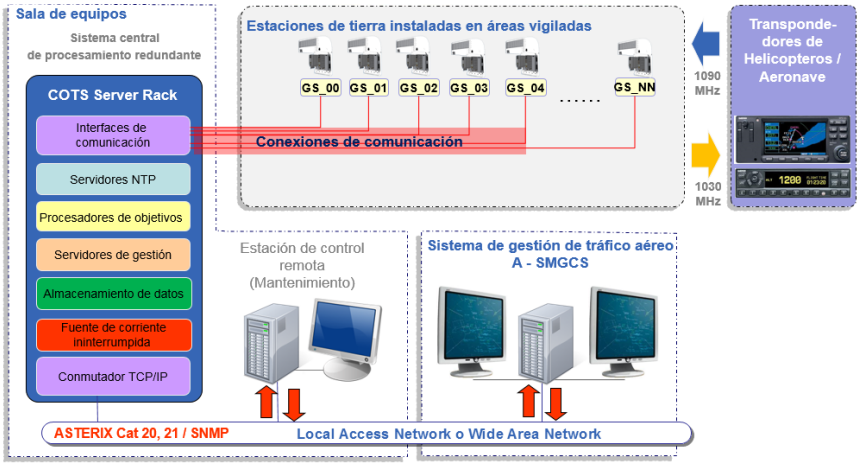
Source http://www.thalesgroup.com/sites/default/files/asset/document/Global%20Surveillance%20Solution%20Booklet.pdf

DATA SOURCE	PROTOCOL
Quadrant sensor or RX or TX	ASTERIX Category 21, V0.23. V0.26, V1.4 ASTERIX Category 23 V0.13, V1.2
Quadrant central processor	ASTERIX Category 19, V1.2 ASTERIX Category 20, V1.5 ASTERIX Category 21, V0.23, V0.26, V1.4 ASTERIX Category 23 V0.13, V1.2

Surveillance protocol source: COMSOFT WAM

It is advisable to have a private data transmission network, which can be a fibre optics, microwave link, VSAT, or other network.

Typical architecture of a Multilateration Surveillance System (MSS)



Source: ERA Corp.

SUMMARISED CHECKLIST OF THE WAM IMPLEMENTATION GUIDE

DEFINE OPERATIONAL REQUIREMENTS		
1.1	Clear decision to install a new or enhanced surveillance system, including its justification	
1.2	Identify stakeholder expectations and aspirations	
1.3	Defined safety arguments	
1.4	Description of operational and area services (*i.e.,* Foreseen use)	
1.5	Details of the requested service volume (*i.e.,* where will services be applied) – 3D assessment needed	
1.6	Perform the Functional Risk Assessment	
1.7	Review ICAO and international informative material	
ANALYSE DESIGN OPTIONS AND SYSTEM REQUIREMENTS		
2.1	Investigate surveillance initiatives through investment plans	
2.2	Define procurement and bidding process options	
2.3	Define the detailed functional architecture of the WAM system	
2.4	Defined operational requirements and system performance	
2.5	Specify active and passive R/F requirements of the WAM system	
2.6	Allows for integration with other surveillance sources	
2.7	Defined interfaces with legacy systems (Interface Control Document)	
2.8	Conduct interoperability evaluation	
2.9	Design potential and nominal failure mode procedures for the local environment	
2.10	Preliminary assessment of the safety system	
2.11	Coordination with NSA (National Safety Agency) to identify “arguments and assumptions”	
2.12	Identify BITE and RMTR requirements	
2.13	Safety risk assessment	
DEFINE ASPECTS CONCERNING THE LOCAL ENVIRONMENT		
3.1	Assessment of impact on service and coverage volume	
3.2	Define measures in case of specific failures (based on Rx and Tx placement)	
3.3	Check the need for transponder	
3.4	Check the specific WAM solution for the local environment (for example, type of communication, level of redundancy, active *vs.* passive)	
3.5	Effects of the active WAM system on R/F spectrum (including transponder and ACAS availability)	
3.6	Environmental impact studies	
3.7	Defined maintenance and spare part schedule	
3.8	Validation and on-going calibration requirement	
3.9	Update the preliminary system safety assessment based on the exact design of the area	
3.10	Written technical and functional specifications	
3.11	Written training and transition plans	
3.12	Call for bids concludes (published)	

DELIVERY, INTEGRATION, AND VALIDATION		
4.1	Approval of effective validation technique	
4.2	Review of the Interface Control Document (ICD)	
4.3	WAM system installed in the local environment	
4.4	SAT (Site Acceptance Test) defined, developed and approved	
4.5	WAM system integration	
4.6	WAM system tuning	
4.7	Test flight to validate system performance and coverage (including simulation verification)	
4.8	Validation of WAM within the CNS/ATM system	
4.9	Verification certification	
ESTABLISH OPERATIONAL SERVICE		
5.1	Definition of procedures and methods (including the operational use of WAM and failure mode procedures)	
5.2	System safety assessment completed	
5.3	Training plan completed	
5.4	Responsibilities and commitments defined in line with SMS	
5.5	Transition plan completed, including the identification of mitigation measures required during the transition	
5.6	Safety case verified and submitted to NSA	
5.7	Operational approval received	
DELIVER OPERATIONAL SERVICE		
6.1	Continuous surveillance task defined (using test transponders and BITE if so required)	
6.2	Continuous review of methods and procedures, analysis of incident reports, including corrective action, as needed	
6.3	Service provision includes refresher courses	

Source: EUROCONTROL "WAM Generic Guidance Process Volume 1/Volume 2.

The "local environment" (zona alrededor) is a portion of the total sorroundings in contact with the system bondaries. It must be large enough for all of its intensive properties to be constant, and it must be insensitive to state changes of the system.

https://www.eurocontrol.int/sites/default/files/publication/files/surveillance-wam-generic-guidance-process-vol-1-process-description-20090108.pdf
https://www.eurocontrol.int/sites/default/files/publication/files/surveillance-wam-generic-approval-process-vol-2-guidance-notes-20090108.pdf

Comments by Chile

A. The text contains several acronyms and abbreviations that are not described and that are important to better understand the text.

B. As to the document itself, regarding the technical and bidding aspects, some items or paragraphs will have to be adapted to our terms; in no way are its provisions complied with.

C. We believe that the most important point that needs to be clarified is ADS-B certification (aircraft/crew and controller). It would be important to clarify the meaning of crew and controller certification, and how and where is it obtained.

D. The guide reinforces general knowledge of the MLAT system.

E. It is a good document to identify the type of sensors required for surveillance coverage over given sectors or areas.

F. It provides good guidance on the technical, operational, logistic, and administrative aspects to be considered for the implementation of a system like MLAT, based on the experience at the Catamayo Airport, which can be used as a reference in our country for deciding on the selection of sensors.

G. The cost-coverage ratio should be considered and emphasized when implementing this system. To this end, an objective calculation should be made of the cost involved in installing an MLAT system to cover a given area *versus* the cost of installing radar to cover the same area. These are aspects of special relevance in countries with topography like ours.

H. An important advantage of the MLAT system is that it generates no cost to the user and its concurrent ADS-B detection capability can be added to the system, aspects that can affect the selection.

APPENDIX B

C2 SAM PROJECT DESCRIPTION

SAM Region	**PROJECT DESCRIPTION (PD)**	**PD N° C2**	
Programme	**Project Title**	**Starting Date**	**Ending Date**
ATM Automation and Situational Awareness *(Programme Coordinator: Onofrio Smarrelli*)	Improve ATM Situational Awareness in the SAM Region *Project Coordinator: Paulo Vila (Peru)* *Contributing experts: José Rubira, Marcos Vidal and Jorge Otiniano (Peru); Javier Vittor (Argentina), Ivan Salas (Ecuador)*	October 2011	May 2016
Objective	Develop guidelines supporting the implementation of improvements in the situational awareness of ATS units in the South American Region		
Scope	Guidelines supporting the implementation of various applications, such as common traffic visualization, common meteorological conditions visualization and communications in general • Analysis of the current surveillance infrastructure and identification of necessary improvements to support en route and terminal airspaces, airspace classification, PBN and ATFM • Implementation of ADS-B, ADS-c and/or MLAT surveillance systems at selected airspaces • Minimum common electronic information and data bases required in support of decision-making process and alert systems towards an interoperable situational awareness among centralized ATFM units • Implement flight plan data process systems (new FPL format) and data communications tools among ACC´s • Implement advanced automation support tools to contribute towards the sharing of aeronautical information		
Metrics	Drafting of following documents: • Regional surveillance strategy for the implementation of systems in support of improvement of situational awareness – revised • Evaluation of the surveillance systems coverage in the SAM Region - completed • Guideline on technical/operational considerations for ADS-B implementation – completed • Guideline on technical/operational considerations for MLAT implementation - completed • Guideline on technical considerations in support of ATFM implementation – completed • Guideline for the presentation of MET products in graphic format – completed • Action plan for ADS-B implementation in the SAM Region		

Strategy	• All tasks will be conducted by experts nominated by States and organizations of the SAM Region members of the Project *Improve ATM situational awareness in the SAM Region,* under management of the project coordinator. Communications among project members, as well as between the project coordinator and programme coordinator, shall be carried out through teleconferences and the Internet. • Once studies are completed, the results will be submitted to the ICAO programme coordinator as a final consolidated document for its analysis, review, approval and presentation at the GREPECAS PPRC
Goals	• Regional surveillance strategy for the implementation of systems in support to situational awareness improvement for July 2012 (completed) • Guideline on technical/operational considerations for ADS-B implementation for October 2012 (completed) • Guideline for the drafting of SIGMET in graphic format (December 2013) (completed) • Guideline for technical/operational considerations for MLAT implementation for March 2015 (completed) • Guideline for technical considerations in support of ATFM implementation (By May 2016) • Action plan for ADS-B implementation in the SAM Region (November 2014) (completed)
Justification	• Improve situational awareness has been identified as a great support for ATM, contributing in the increase of safety and in flight efficiency • In addition, a close relationship with the other programmes and their respective projects is necessary, with the aim of collecting the operational requirements demanded by the mentioned applications and their respective tentative implementation dates • This project contributes to the implementation of modules B0 ASUR, B0 SURV, B0 NOPS and B0 AMET of the *Air Navigation System Performance-Based Implementation Plan for the SAM Region (SAM PBIP)*
Related Projects	• Air Navigation Systems in Support of PBN • Automation • ATFM • ATN Ground-ground and Air-ground Applications

Project Deliverables	Relationship with Performance Based Regional Plan aligned with ASBU	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Evaluation of surveillance infrastructure and identification of surveillance systems improvements					
Evaluation of surveillance systems coverage in the SAM Region	PFF SAM CNS 04 ANRF B0 ASUR	Paulo Vila (Peru)		October 2012	The evaluation of coverage was carried out in connected to the drafting activities of the Guideline on technical/operational considerations for ADS-B implementation. The results are presented as Appendix A to the Guideline and can be downloaded from site http://www.icao.int/SAM/Pages/eDocumentsDisplay.aspx?area=CNS
Drafting of regional plan for ADS-B and MLAT implementation					
Guideline on technical/ operational considerations for ADS-B implementation	PFF SAM CNS 04 ANRF B0 ASUR	José Rubira (Peru) Marco Vidal (Peru)		October 2012	The Guideline was approved for use in the interested States of the SAM Region, by the Eleventh Workshop/Meeting of the SAM Implementation group (SAM/IG/11) held in Lima from 13 to 17 May 2013 and can be downloaded from the following website http://www.icao.int/SAM/Pages/eDocumentsDisplay.aspx?area=CNS
Guideline on technical/ operational considerations for MLAT implementation	PFF SAM CNS 04 ANRF B0 ASUR	Ivan Salas (Ecuador)		October 2015	The Guideline was presented in the Fifteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/15) held in Lima from 11 to 15 May 2015 for initial review and was circulated to all SAM Region States. The final approval is foreseen for the Sixteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/16) to be held in Lima from 19 to 23 October 2015.

[1] ***Gray**: Activity has not started*
***Green**: Activity has or will deliver planned milestone as scheduled*
***Yellow**: Activity is behind schedule on milestone, but still within acceptable parameters to deliver milestone on time*
***Red**: Activity has failed to deliver milestone on time, mitigation measures need to be identified and implemented*

Project Deliverables	Relationship with Performance Based Regional Plan aligned with ASBU	Responsible	Status of Implementation[1]	Delivery Date	Remarks
Guideline on technical considerations in support of ATFM implementation	PFF SAM ATM 05 B0 NOPS	Pending designation		May 2016	The guideline will be supported with the CAR/SAM ATFM Manual approved through GREPECAS Conclusion 16/35.
Guideline for the presentation of MET products in graphical format	PFF SAM MET 03 ANRF B0 AMET	Jorge Otiniano (Peru)		October 2014	The document guideline was delivered to the Secretariat (MET) of SAM Region for its review by the corresponding meteorology specialists. The Guideline was review by the OPMET information exchange Meeting of SAM Region (27 – 29 October 2014) and will be used as guideline for the implementation of SIGMET graphic in Argentina, Chile, Ecuador, Paraguay and Peru by the second half of 2015 sponsored by the technical cooperation regional project RLA/06/901- http://www.icao.int/SAM/Pages/eDocumentsDisplay.aspx?area=CNS
Action plan for ADS-B implementation in SAM Region	ANRF B0 ASUR	Paulo Vila (Peru)		November 2014	The action plan for the regional implementation of the ADS B was presented an approved in the Fourteenth Workshop/Meeting of the SAM Implementation Group (SAM/IG/14) Lima, Peru, from 10 to 14 November 2014. The document can be downloaded from the website
Resources necessary	Experts in the carrying out of the deliverables				

- END-

International Civil Aviation Organization

NACC and SAM Regional Offices

CAR/SAM Seminar/Workshop for the Implementation of Advanced Surveillance and Automation Systems

(Panama City, Panama, 22 to 25 September 2015)

Summary of Discussions

Presented by the Secretariat

September 2015

CAR/SAM SEMINAR/WORKSHOP FOR THE IMPLEMENTATION OF ADVANCED SURVEILLANCE AND AUTOMATION SYSTEMS

SUMMARY OF DISCUSSIONS

Date:	22 to 25 September 2015
Venue:	Panama City, Panama
Participants:	The workshop was attended by 82 representatives of 18 NAM CAR SAM States, 2 international organisations of the Regions and 12 companies. The list of participants appears in the **Attachment** to this document.

1. Introduction

1.1 The workshop was conducted by ICAO and had the following objectives:

a) Support the implementation of advanced surveillance (ADS-B and multilateration) and automation (AIDC) systems to meet the operational surveillance and automation requirements specified in the NAM/CAR and SAM Regional performance-based implementation plans, within the framework of the ICAO Global Air Navigation Plan (Fourth Edition);

b) Receive information from ICAO, the industry, and NAM/CAR/SAM States, mainly on:

- Regional planning and status of implementation of surveillance and automation systems in the CAR/SAM Regions based on NAM/CAR and SAM regional performance-based air navigation plans and the goals of the *Declaration of Bogota* and the *Declaration of Port of Spain.*
- The importance of ADS-B and multilateration as technical enablers of ICAO ASBUs through operational guidance and implementation support.
- Users' vision on the implementation of surveillance and situational awareness systems on board the aircraft.
- Technical and operational information on the new surveillance and automated systems at ATS units, as well as on the activities to be taken into account for their implementation.

1.2 This event supported the implementation of the following Block 0 modules of the Aviation System Block Upgrades (ASBU), contemplated in the NAM/CAR and SAM Regional Plans, B0 *SURF - Safety and efficiency of surface operations;* B0 ASURF - *Initial capability for ground surveillance,* B0 FICE - *Increased interoperability, efficiency and capacity through ground-ground interaction,* and B0 SNET - *Increased effectiveness of ground-based safety nets.* All presentations are posted on the following website http://www.icao.int/SAM/Pages/MeetingsDocumentation.aspx?m=2015-SEMAUTOM

1.3 Mr. Onofrio Smarrelli, CNS Regional Officer of the ICAO SAM Regional Office welcomed the participants and highlighted the importance of the event in supporting the implementation of advanced surveillance and automation systems. Eng. Alfredo Fonseca Mora, Director General of the Civil Aviation Authority of Panama, stressed the relevance of these activities for efficiency and safety in the Region and officially inaugurated the event. Mr. Onofrio Smarrelli and Mr. Julio Siu, CNS Regional Officer of the ICAO NACC Regional Office, acted as Secretary of the event.

2. Conduction of the Workshop

2.1 The workshop was conducted in 5 sessions, as proposed during the introduction:

SESSION 1: ICAO SARPS, DOCUMENTATION, AND GLOBAL AND REGIONAL PLANS FOR THE IMPLEMENTATION OF AERONAUTICAL SURVEILLANCE AND AUTOMATION SYSTEMS FOR ATS OPERATIONS

2.2 ICAO presented a list of ICAO Annexes and Documents containing technical information on surveillance and ATM automation systems at ATS units concerning technical, operational, and training aspects.

2.3 ICAO presented an overview of air navigation implementation, from its vision of the global ATM operational concept to the implementation of national and regional plans, including the aviation system block upgrades (ASBU) methodology, describing block 0 modules related to surveillance and automation.

2.4 Likewise, ICAO presented surveillance and automation information related to the CAR/SAM Regional Air Navigation Plan; the NAM/CAR and SAM regional performance-based plans, GREPECAS organisation, and the implementation of surveillance and automation systems in the NAM/CAR and SAM Regions.

SESSION 2: AVIONIC SOLUTIONS AND ADVANCED SURVEILLANCE SYSTEM ROADMAP

2.5 The presentation by BOEING highlighted compliance by BOEING of existing global mandates on the installation of ADS B avionics, coordination with ANSPs to ensure common avionics requirements to support global harmonisation, and the willingness of BOEING to assist the CAR/SAM Regions in the implementation of ASBU modules.

2.6 The presentation by EMBRAER noted that the E-JET line meets existing global mandates on ADS B under Standard DO 260 since 2010 and under Standard DO 260B since 2012.

2.7 IATA presented the point of view of its members regarding the implementation of CNS infrastructure, stressing the surveillance aspect, the support to the implementation of ground-based ADS-B Out /In 1090 ES and its use for data link, TIS-B and MLAT.

2.8 Rockwell Collins/ARINC presented their Multilink flight tracking service in support of airlines, which uses multiple surveillance sources (ground-based ADS-B, ADS-C, United States TFM radar information, EUROCONTROL radar position information, ACARS reports, HFDL, etc.). Global tracking will be done by airlines together with IATA.

SESSION 3: TECHNICAL AND OPERATIONAL GUIDANCE ON ADVANCED SURVEILLANCE TECHNIQUES AND AIDC AS AUTOMATION APPLICATION

ADVANCED SURVEILLANCE ISSUES

3.1 Thales informed that it could support States in the identification of surveillance solutions and highlighted performance-based surveillance. Regarding performance-based surveillance, it was noted that ICAO had amended Document 9868 by introducing performance-based surveillance, since the initial document only contemplated the performance of communication systems.

3.2 INDRA underlined the benefits of ADS B, such as the high update ratio (0.5 seconds), higher radar precision, and lower installation and maintenance costs. It also described the INDRA ADS-B system, indicating that it had four ADS-B data validation methods: by angle of arrival, time of arrival, power *versus* distance, speed reported by the target *versus* position of the target. Furthermore, its multichannel receiver allowed for a reduction of multipath, reflection and noise, thus increasing range (300 nautical miles).

3.3 INDRA also highlighted that the precision of an MLAT system depended on two factors: the location of receiver stations and the aiming precision of the received signal. It also noted the benefits of the LAT/WAN, such as scalable coverage, ease of expansion, target detection on the surface and at levels where necessary, establishment of configurations to keep the MLAT in operation despite malfunction of one, two or N stations, better precision compared to conventional radar, higher update ratio compared to radar (0.5 sec to 1), stations are easy to install, lower maintenance requirements.

3.4 SAAB presented A SMGCS and ACDM solutions, as well as airspace solutions such as WAM and ADS-B. The multilateration system was first used in 2003 at Heathrow Airport, in London.

3.5 Note was taken of products manufactured by IACIT of Brazil, such as ADS-B and multilateration surveillance systems, VHF T/A communication systems, DME and NDB navigation systems, and meteorological equipment and radars.

3.6 AIREON informed that satellite ADS-B implementation was foreseen to be completed and operational in the period 2018-2020, initially providing surveillance coverage in oceanic and remote continental areas. The Meeting noted that in order to protect the aircraft-satellite link, the forthcoming ITU World Radiocommunication Conference (WRC-15) to be held in November 2015, was expected to approve such protection. The required protection for satellite ADS-B is supported by IATA and many States.

3.7 INTELCAN presented the ADS-B solution implemented in Guyana, with an ADS-B earth station integrated with the automated ATC system, and explained the components and functionalities of its SKYSURV system.

3.8 Harris provided an overview of the United States ADS-B Programme, explaining the requirements, design, integration, implementation, operation, and maintenance of ADS-B stations, which improve safety and efficiency to meet the growing air transport needs in the United States. Furthermore, Harris proposed possible solutions for the Caribbean and Central American Region, explaining the benefits of a regional ADS-B network architecture.

3.9 VNIIRA OVR presented the various surveillance and automation products, describing the experience in the construction of the multi-positional surveillance system with ground vehicle traffic control functions/WAM-MLAT Project in Varadero, Cuba, and the convenience of functional co-existence of ADS-B receivers and MLAT sensors.

3.10 ATECH presented the work done through its project in Bacía de Campos, with the installation of a set of ADS-B antennae on oil platforms, integrated into the SAGITARIO Multi Sensor Tracking System at the Macaé approach centre, in Rio de Janeiro, the purpose of which is to provide air surveillance for helicopters flying to oil platforms and commercial flights flying in the upper airspace.

AUTOMATION

3.11 The Secretariat presented information on regional activities for the integration of automated systems between adjacent ACCs in the NAM CAR and SAM Regions.

3.12 Likewise, ICAO presented various considerations relevant to the implementation of the AIDC service, including GREPECAS conclusions and the description of the CAR/SAM ICD. Information was provided on the benefits of AIDC implementation, such as a significant reduction of controller workload, reduced speech coordinations, reduced coordination errors, mitigation of LHDs, thus avoiding possible mid air collisions, possibility of reverting to manual procedures. The AIDC goals defined in the Declarations of Bogota and Port-of-Spain were identified. Information was provided on the AIDC implementation process in each NAM/CAR and SAM Region, and on the regional guides that had been developed. Finally, a comparison was made of messages between ICDs.

3.13 Thales informed about the implementation of ASBU Block 0 and Block 1 modules, such as B0 SURF, B1 SURF, B0RSEQ, B1 RSEQ, B0 FICE,B1 FICE, BO TBO and B1 TBO, flow management, A CDM and AIDC.

3.14 Thales also informed about its activities concerning ATM automation systems, such as the implementation of AIDC in 19 countries worldwide, the installation of AMN/DMAN, the installation of ACDM at the Charles De Gaulle airport, and the evolution of ASBU modules.

3.15 United States noted the need for a harmonised process and the use of standard protocols for a successful and efficient implementation of automation, and described the various existing and valid ICDs, including the NAM ICD, the selection of the optimum protocol based on an interface environment between specific flight information regions (FIRs),

and continuity of AIDC/NAM information following operational implementation. It highlighted the status of implementation of AIDC in the United States with adjacent FIRs, which had reduced ATC controller workload by 50%.

3.16 ATECH informed the Meeting about the automation of ATM/ATFM systems in Brazil, highlighting its SIGMA and Sagitario systems.

SESSION 4: IMPLEMENTATION OF ADVANCED SURVEILLANCE AND AUTOMATION SYSTEMS BY CAR/SAM STATES

Argentina

4.1 Argentina informed that it had 28 radar stations. (It has started the radar updating process in Ezeiza, Córdoba, Mendoza, Mar del Plata and Paraná. ATM automated systems in Ezeiza and Córdoba. Three new automated systems in Comodoro Rivadavia, Mendoza and Resistencia are in the process of being installed, estimating their pre-operational commissioning in December 2015.) The Córdoba and Ezeiza systems were updated based on the version installed in Resistencia, Mendoza and Comodoro Rivadavia. Capability of automated systems to transmit the Asterix 62 protocol. Installation of two ADS-B stations in the Mendoza to Ezeiza route. Automated processes can process ADS-B and ADS-C (currently integrated into the system). Regarding AIDC: pre-operational phase in Ezeiza - Cordoba; satisfactory testing between Carrasco and Ezeiza; tests pending between Ezeiza - Chile until such time as they make the required adjustments to their system. Exchange of radar data with Uruguay completed through the REDDIG II; conversations were resumed to continue radar data interconnection between Argentina and Chile; and coordination started with Paraguay for radar exchange.

Brazil

4.2 Brazil provided information on the Sirius Programme, progress made in ADS implementation at Cuenca de Campo, plans for implementing ADS-B in the continental area, plans for implementing MLAT in Vitoria, and plans for implementing AIDC and FIXM.

COCESNA

4.3 COCESNA presented the results of its analysis of the reports received from its ADS-B station in Cerro de Hula, highlighting the coverage and precision observed, as compared to radar information. It informed on the status of implementation of the AIDC service through the NAM ICD with Mérida and Cuba and between CENAMER ACC and Central American APPs, illustrating the process of implementation and the operational benefits achieved.

Colombia

4.4 Colombia reported having 12 primary radars providing 80% coverage of airspace at 30000 feet, and 70% at 10000 feet, as well as 16 SSR radars providing 96% coverage at 30000 feet and 70% at 10000 feet. As to advanced surveillance systems, 13 ADS B stations, 4 WAM stations, and 13 ADS-B stations have been installed. Implementation planning in Colombia is recorded in document PNAV COL. The Bogota and Barranquilla ACCs and the Villavicencio, Cali, Rio Negro, San Andrés and Leticia ACCs that control lower level flights have been modernised.

Cuba

4.5 Cuba presented the advantages provided by its ADS-B data analysis software tool, the progress made in aircraft equipage, as well as future modules to be developed. It also described the experience in the implementation of the AIDC service under the NAM ICD, with class I messages.

Ecuador

4.6 Ecuador reported that before 1997, Ecuador had 35% radar coverage (Quito and Guayaquil). It currently has 95% coverage, and 4 additional radar stations have been installed. Likewise, WAM is available in Loja and Latacunga.

Mexico

4.7 Mexico stated that it was planning to implement some 35 ADS-B stations by 2018. At present, 10 stations have been implemented. Likewise, other three stations had been implemented and will be commissioned by late 2015, whose data will be shared with the United States in order to offer surveillance services in the Gulf of Mexico. A description was given of the benefits pursued with this implementation and the improvements to be introduced, such as DO-260B processing. Finally, Mexico shared its experience and benefits obtained with the implementation of AIDC/ PAN ICD between Oakland – Mazatlán and its current AIDC / NAM ICD implementations with the United States, Cuba, and Central America.

Panama

4.8 Panama informed about the evolution of surveillance and automation system implementation. Regarding AIDC, it noted that it had implemented a practical training programme and conducted positive tests with Bogota, and that it expected to enter the operational phase by late 2015.

Paraguay

4.9 It was noted that Paraguay had a single radar (type IRS/20/MP/S), located in Mariano Roque Alonso, which limited its coverage when considering range *versus* level. In terms of implementation of advanced surveillance systems, 6 ADS-B stations have been installed to meet radar coverage needs in support of the main Mode S radar surveillance system. At present, the ADS system is not fully implemented. The current AIRCON 2100 version does not support the ADS-B

Asterix 21 radar data protocol, reason why it cannot be integrated into the automated system. An attempt is being made to solve this problem by updating the AIRCON 2100 system to its latest version, which supports Asterix 21 processing.

4.10 Regarding AIDC, note was taken of positive AIDC tests conducted between Paraguay and Argentina and the implementation of the maintenance programme.

Peru

4.11 Peru informed about the operation of AIDC between Ecuador and Peru and plans to start operational interconnection between Peru-Brazil and Peru-Colombia, to be completed before the end of 2015. Information was also provided on surveillance coverage in the Lima FIR.

Dominican Republic

4.12 Information was provided on plans to implement AIDC under the NAM ICD to be resumed in October 2015, the revision of the draft MOU with the United States, and the achievements made by the technical assistance mission under Project RLA/09/801 for this implementation. Information was also provided on the existing radar coverage and ADS-B implementation plans.

4.13 The ANI/WG AIDC Task Force informed about the tasks it had been entrusted for the implementation of AIDC in the NAM/CAR Regions, describing its activities, mandate, establishment of the FPL monitoring *ad-hoc* group, the technical assistance through the Goteams of Project RLA/09/801, and an assessment of the progress made in the achievement of the regional AIDC goal.

Uruguay

4.14 It was noted that Uruguay had 2 radar stations, one in Durazno and the other in Carrasco, and that radar information of Ezeiza was integrated with the radars of Uruguay. Integration is also underway with the Carrasco radar of Argentina. There are plans to install MLAT, ADS-B in Punta del Este, and WAM in the northern part of the country to improve coverage at low levels.

Venezuela

4.15 Venezuela presented the current status of radar coverage and plan for implementing advanced surveillance system and automation at the Maiquetía ACC. In this regard, it was noted that 10 surveillance radars were interconnected through the Venezuelan VSAT network. This VSAT network also carries voice and data (AMHS) and there are plans to install VSAT, which carries voice, data and AMHS. There are plans to install multilateration and ADS-B systems.

SESSION 5: OPERATIONAL REQUIREMENTS, DESIGN, INSTALLATION, VALIDATION, AND COMMISSIONING OF SURVEILLANCE AND AUTOMATION SYSTEMS

5.1 The United States informed about the Acquisition Management System (AMS), describing its functions, policy, life cycle, and gave an example of WAM implementation. It also informed about the regulations and the list of reference documents required by the FAA for the implementation and operation of surveillance and automation systems, specifically highlighting those related to in-flight validation of ADS-B and multilateration stations.

6. CONCLUSIONS/ RECOMMENDATIONS

6.1 Based on the presentations and discussion, the participants agreed on the following conclusions and recommendations:

General

a) Surveillance implementations on civil aircraft must be coordinated between users and airspace service providers, and supported by a business case and/or a positive operational assessment.

b) Airborne equipment requirements must be harmonised and synchronised (standards and timelines) and be based on pragmatic needs in order to deliver feasible benefits to the customers of airspace users.

c) For air navigation implementation, all CAR/SAM States should follow the Global Air Navigation Plan (GANP), its technological roadmaps, the ICAO ASBU methodology, CAR/SAM regional plans, and align their implementation activities by developing their respective national air navigation plans.

d) The staff in charge of surveillance and automation system planning should have at their disposal all ICAO documents and annexes published on the topic.

e) It is recalled that the third meeting of the GREPECAS Programmes and Projects Review Committee formulated Conclusion 3/10 *Drafting of national air navigation plans aligned with the GANP and the regional performance-based implementation plans.* Accordingly, States that had already drafted their national air navigation plans and that were not yet aligned with the Global Plan (Fourth Edition) and the respective regional plans were urged to complete such process, and those States that had not yet drafted their national air navigation plans were urged to start doing so, based on the same considerations.

f) In order to address the installation of new advanced surveillance systems, the personnel in charge of their installation and maintenance must be properly trained. In this sense, TRAINAIR PLUS member States were invited to develop a standard training package (STP) in the areas of advanced surveillance and automation. Once developed, the STP could be acquired by interested States. Likewise, ICAO was requested to increase this type of activities and to continue collective efforts to help training centres meet these requirements.

AUTOMATION/ AIDC

g) In order to optimise AIDC implementation, States should consider taking action to mitigate/resolve filed flight plan (FPL) issues. It was recommended that regional efforts be consolidated in order to coordinate mitigation actions between the CAR and SAM Regions.

h) The importance for States to comply with plans and commitments to implement radar data and flight plan interconnection was recognised.

i) Close cooperation is required among States in order to achieve the interconnection of automated systems, for instance, the establishment of MoUs, letters of operational agreement, and definition of common aspects to be implemented.

j) Non-compliance with ICAO procedures on management of flight plans and associated messages results in increased flow of unnecessary messages.

k) AIDC implementation has shown its advantages in terms of safety and efficiency:
- ✓ significantly reduces the need for oral coordination between ATS units
- ✓ reduces controller workload
- ✓ reduces repetition/readback errors during coordination
- ✓ reduces coordination errors and "controller-to-controller" language barrier issues
- ✓ mitigates LHDs, thus avoiding mid-air collisions
- ✓ greater support to performance-based navigation initiatives and emerging technologies through automation

l) It recognised the importance of evaluating each operational scenario involving AIDC implementation and management of desirable messages, and subsequently assessing its impact on controller workload and its end results in order to select the most appropriate AIDC ICD for implementation.

m) The preferred ICD for the CAR and NAM Regions is the NAM ICD, and the PAN ICD for the SAM Region.

n) AIDC implementation represents the initial phase towards ground-ground integration and FF/ICE implementation.

SURVEILLANCE

o) Performance-based surveillance helps to identify the best surveillance solution, based on operational requirements.

p) ADS B and multilateration provide more precision compared to radar.

q) ADS-B acquisition and maintenance costs are much lower than those required for installing a radar.

r) ADS-B is an important element that makes it possible to derive the operational benefits of ASBU modules B0 ASUR, SURF, SNET, TBO, etc.

s) For ADS-B implementation, some established target dates shall be considered, such as 31 December 2018 for this same implementation for the NAM and CAR Regions, and 1 January 2020 for ADS-B out in the United States with DO-260B transponder. States/Territories should expedite the trials, analysis and commissioning of their ADS-B stations.

t) Support ICAO's position before the ITU WRC, and establish the necessary protection measures for the installation and operation of surveillance systems.

u) Taking into account the importance of having common situational awareness information, which is achieved by sharing surveillance data, CAR/SAM States/Territories were urged to continue striving to achieve data sharing both at radar and ADS-B system level.

v) The study, acquisition, installation, validation, and commissioning of advanced surveillance and automation systems require the development of a management process by a group of technical and operational experts. Examples are cited for the validation of these systems, such as those presented by the United States (Order 8200.25 for ADS-B and 8200.1D for different systems, including WAM).

— END —

Appendix

CAR/SAM Seminar/Workshop for the Implementation of Advanced Surveillance and Automation Systems

(Panama City, Panama, 22 to 25 September 2015)

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CAR/SAM Seminar/Workshop for the Implementation of Advanced Surveillance and Automation Systems

(Panama City, Panama, 22 to 25 September 2015)

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APPENDIX D

AIR NAVIGATION IMPLEMENTATION PLAN - PERIOD 2017- 2019

B0 – SUR: Initial ground surveillance capability						
ELEMENTS	**SCOPE**	**INDICATORS / METRICS**	**GOALS: %/ Date**			**STATUS**
			2017	***2018***	***2019***	
Implementation of ADS B	All States	Indicator: % of ADS B systems implemented Support metrics: Number of ADS B systems implemented **30 ADS B systems implemented by the end of 2019**	**5**	10	15	New implementation
Implementation of multilateration	All States	Indicator: % of multilateration systems implemented Support metrics: Number of multilateration systems implemented **10 multilateration systems implemented by the end of 2019**	6	2	2	New implementation
Surveillance interconnection systems	All States	Indicator: % of surveillance interconnection systems implemented between adjacent ACCs Support metrics: Number of surveillance interconnection systems implemented **15 surveillance interconnection systems implemented between adjacent ACCs by the end of 2019**	5	5	5	New implementation
Modernisation of the ACC automation system	All States	Indicator: % of new ACC automation systems implemented Support metrics: Number of ACC automation systems implemented **10 new ACC automation systems by the end of 2019**	4	4	2	New implementation

B0-SURF: Safety and efficiency of surface operations (A-SMGCS Level 1-2)						
ELEMENTS	**SCOPE**	**INDICATORS / METRICS**	**GOALS: %/ Date**			**STATUS**
			2017	***2018***	***2019***	
A-SMGCS Level 1*		Indicator: % of applicable international aerodromes that have implemented A-SMGCS Level 1 Support metrics: Number of applicable international aerodromes that have implemented A-SMGCS Level 1 **4 A-SMGCS Level 1* by the end of 2019**		2	2	New implementation
A-SMGCS Level 2*		Indicator: % of applicable international aerodromes that have implemented A-SMGCS Level 2 Support metrics: Number of applicable international aerodromes that have implemented A-SMGCS Level 2 **2 A-SMGCS Level 2* by the end of 2019**			2	New implementation

B0 – TBO: Improved safety and efficiency through the initial application of data link en-route						
ELEMENTS	**SCOPE**	**INDICATORS / METRICS**	**GOALS: %/ Date**			**STATUS**
			2017	***2018***	***2019***	
Implementation of ADS C	All States	Indicator: % of FIRs that have implemented ADS C Support metrics: Number of ADS C systems implemented **2 ADS C systems implemented by the end of 2019**		2		New implementation
Implementation of CPDLC	All States	Indicator: % of CPDLC systems implemented in FIRs in oceanic and remote continental areas Support metrics: Number of CPDLC systems implemented Oceanic area Remote continental area **2 CPDLC systems implemented in the oceanic area by the end of 2019**		2		New implementation