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

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

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