



ICAO

International Civil Aviation Organization
North American, Central American and Caribbean Office
South American Office

Caribbean and South American Regions (CAR/SAM)

Automatic Dependent Surveillance – Broadcast (ADS-B) Implementation and Regulation Meeting for the NAM/CAR/SAM Regions

ADS-B/LEG

Final Summary of Discussions

Mexico City, Mexico, 26 to 30 November 2018



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Summary of Discussions

Date	26 to 30 November 2018
Location	Mexico City, Mexico
Opening Ceremony	<p>The Meeting was attended by 51 participants. A detailed list is attached at Appendix A.</p> <p>Mr. Julio Siu, Deputy Regional Director of the ICAO Regional North American, Central American and Caribbean (NACC) Office welcomed the participants.</p> <p>The meeting was chaired by Sr. Carlos Jimenez, representative of Cuba and rapporteur of the NAM/CAR Automatic Dependent Surveillance – Broadcast (ADS-B) Implementation Task Force, who also served as Chairman of the meeting.</p> <p>The NAM/CAR and SAM Regional Officers of Communications, Navigation and Surveillance, Mrs. Mayda Ávila and Mr. Francisco Almeida, respectively, served as the Secretariat.</p>
1.	<p>References</p> <ul style="list-style-type: none">• State Letter NT-N1-8.3.13, NT-NS2-35 — E.OSG - NACC74965 dated 18 September 2018
2.	<p>Objectives</p> <ul style="list-style-type: none">• Updating the state of ADS-B implementation, the state of the agreed activities during the last Meeting in Lima, Peru, in November 2017, and updating the activities and encourage the States to share surveillance information.• Assist the States in the ADS-B implementation accordingly to the established goal of the Regional Performance Objectives (RPO) on situational awareness (B0-ASUR and B0-SURF Modules), specified in the NAM/CAR Regional Performance-Based Air Navigation Implementation Plan (RPBANIP) and the SAM Performance-Based Air Navigation Implementation Plan (PBIP), including the review of regulation matters for is implementation.

3.

Introduction

In 2018 a new Presidency of the CAR/SAM Planning and Implementation Regional Group (GREPECAS) was elected, and one of the improvement pillars that will be implemented is the objective measurement of benefits for the States and the Region, regarding the GREPECAS programmes and projects.

Within the Projects of GREPECAS (e.g. Program C), the aim is to improve accountability and, above all, to have more evidence of the results and benefits obtained. In this regard, the Meeting of the ADS-B group aimed this improvement proposed for GREPECAS, in order to report progress and especially the achievements of each State and the Region on the ADS-B.

With these objectives, on 26 November 2018 was held the Meeting where the ADS-B status of the activities was followed-up, as well as the developments on radar data sharing, which served as an introduction for the subjects developed in the ADS-B/LEG Meeting, a four-day event where States were assisted with the implementation of ADS-B, in accordance with the established targets of the Regional Performance Objectives (RPOs) on situational awareness (Module B0-ASUR and B0-SURF), specified in the NAM/CAR Regional Performance-Based Air Navigation Implementation Plan (RPBANIP) and the Air Navigation System Performance-Based Implementation Plan (PBIP) for the SAM Region, including the review of regulation matters for its implementation.

The Meeting covered the implementation gaps identifying the regulatory needs to be established to share experiences in this matter.

Since the adoption and commitment of the NAM/CAR States to the No Country Left Behind Assistance Programme of the ICAO NACC Regional Office, now the Systematic Assistance Programme (SAP), ICAO has established and implemented a very practical and systematic mean of driving the progress for implementation, customizing the assistance on focused priorities of States and the Region.

ADS-B is part of this Programme and a performance indicator of this assistance, as can be seen on the implementation and results of ADS-B and surveillance improvements that have been obtained.

4.

Meeting Schedule and Activities

The Automatic Dependent Surveillance – Broadcast (ADS- B) Implementation Task Force and the ADS-B/LEG meeting were held from 9am to 4pm, every day, except for the last day that covered half a day.

The webpage of the meeting is located at:

<https://www.icao.int/NACC/Pages/meetings-2018-adsb.aspx>

Discussion Items

Agenda Item 1

Review and Approval of Provisional Agenda and Schedule

1.1 With the WP/01 the Secretariat presented the Provisional Agenda and Schedule for the Meeting, which was approved by the Meeting.

1.2 The Secretariat also thanked the FAA (Federal Aviation Administration) of the United States and Nav Canada for their assistance in this event.

1.3 The Secretariat also highlighted the participation of the industry and the support of AIREON, FREQUENTIS, INDRA, LEONARDO and THALES.

1.4 The Secretariat indicated the importance of the joint work and the coordination that States must carry out internally with their organizations, with their adjacent States and industry.

Agenda Item 2

NAM/CAR Automatic Dependent Surveillance – Broadcast (ADS- B) Implementation Task Force

Report of the developments of the Automatic Dependent Surveillance – Broadcast (ADS- B) Implementation Task Force

2.1 Under WP/02 the rapporteur of the NAM/CAR Automatic Dependent Surveillance – Broadcast (ADS- B) Implementation Task Force presented a development report of the surveillance tasks, carried out during 2018, following up the NAM/CAR/SAM Automatic Dependent Surveillance – Broadcast (ADS-B) Implementation Meeting/Workshop (ADS-B/IMP), that was held in Lima, Peru, in November 2017, and the as a result of agreements of other NAM/CAR Meetings.

2.2 It was informed that the Automatic Dependent Surveillance – Broadcast (ADS- B) Implementation Task Force was modified for the inclusion of all surveillance systems in addition to the ADS-B Implementation that gave rise to it, and that is working based on its new Terms of Reference (ToRs) and the updating of its action plan, in order to make more efficient implementation activities related to new surveillance systems combined with existing radar systems, to ensure the air navigation safety in the Region.

2.3 As a part of the Meeting, it was agreed to review the membership of the Automatic Dependent Surveillance – Broadcast (ADS- B) Implementation Task Force, which was updated accordingly with the information contemplated in the Appendix B to this Report.

2.4 As a result of the analysis of the working plan, the activities were updated as presented in the Appendix C to this Report.

	<p>2.5 The Meeting reviewed, discussed and approved the Terms of reference of the Task Group.</p> <p>2.6 The NAM/CAR ADS-B implementation status, and other surveillance techniques, were presented.</p>
Barbados	<p>2.7 The State has a recently installed surveillance radar system. However, a planning process for a Multilateration (MLAT) implementation with seven MLAT stations and five stations for surface movement is on-going.</p>
Cuba	<p>2.8 The installation of two MLAT systems in Varadero and La Havana Airports has concluded.</p>
Jamaica	<p>2.9 The State is finalizing a process of renewing their Air traffic service (ATS) system, which within the project is the renewal of surveillance systems, but the project does not include ADS-B.</p>
Mexico	<p>2.10 Ten ADS-B antennas have been installed. FAA ADS-B stations in Merida (MID), Tampico (TAM) and Cancun (CUN) are operative since February 2015, but without usage in the Control Centres (ACC) MID, MEX and MT.</p>
Dominican Republic	<p>2.11 Indicated that is in the process of evaluating the wide area multilateration (WAM) implementation.</p>
Trinidad y Tobago	<p>2.12 Is in the process of developing a project to update the Air Traffic Management (ATM) system, which includes new features, including ADS-B data management.</p>
COCESNA	<p>2.13 Reported that its surveillance systems were updated with the integration of S-mode Radars and integrated ADS-B, a new ADS-B antenna on the island of Coco and the renewal of single-pulse radars of the States, from terminal control area (TMA) to Mode S + ADS-B systems.</p> <p>2.14 The rapporteur of the Automatic Dependent Surveillance – Broadcast (ADS-B) Implementation Task Force invited the Meeting to follow up on the recommendations, resulting from the NAM / CAR / SAM meeting that was held in Lima, Peru, in 2017, which are presented in the Appendix D.</p> <p>2.15 As part of the discussion and of the functions of the NAM/CAR Automatic Dependent Surveillance – Broadcast (ADS- B) Implementation Task Force, carrying out of a series of activities was discussed, which will be integrated to the surveillance task activities included in Appendix C to this report.</p>

Review and updating of activities for the implementation of ADS-B, installed ADS-B equipment, availability of infrastructure and capacity of ADS-B data processing and integration systems by the NAM / CAR / SAM States.

2.16 Under WP/03 the Secretariat indicated that work has been carried out for the implementation activities of the ADS-B and to promote agreements to share surveillance data among the States.

2.17 The Secretariat indicated the concern that during the meetings the execution of a series of activities is agreed without the necessary follow-up being provided. As a result of the Secretariat's analysis, it was indicated that this type of meetings should always be attended by the same personnel to follow up on the agreements; the recommendation of the States to achieve man/hours work in each State to carry out and finalize the activities agreed in this Meeting was also requested.

2.18 Some other factors to be taken into account in the ADS-B implementation were also discussed, such as safety-based planning and efficiency, capacity based on the needs of users, airspace and air navigation services, following global / regional objectives, taking into account the requirements of all interested parties and ensure harmonization and standardization.

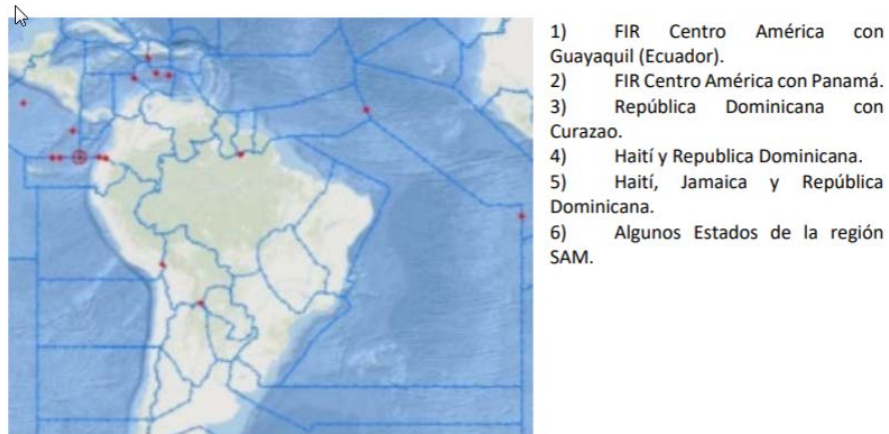
In this sense, it is necessary for the States to identify the following factors in the ADS-B implementation process:

1. Stakeholders.
2. Operational benefits
3. Risk analysis
4. National, regional and global requirements
5. Interconnection factors.
6. Share data with adjacent flight information regions (FIRs)
7. Others own of its operations.

Review of regional and interregional programmes for surveillance data sharing.

2.19 Under WP/04 the Secretariat presented information on the status of surveillance data sharing among States. Indicated the operational benefits in terms of operational safety of this practice, in addition to the fact that States that share radar data can better promote the implementation of the AIDC automation protocols and the implementation of PBN.

2.20 The Secretariat informed the suggestion of the GREPECAS Scrutiny Working Group (GTE) that ICAO raise a safety case to encourage States sharing their surveillance data and to carry out the Air Traffic Services Inter-facility Data Communication (AIDC) implementation as alternative strategies in the region to mitigate the risks of large height deviation (LHD). Furthermore, the points where there are coordination problems in the NAM / CAR / SAM regions were presented.



2.21 The Secretariat presented the WP/09 with a summary of the main activities developed by the SAM States, concerning the ADS-B implementations.

Implementation initiatives for ground-based ADS-B

Argentina

2.22 Argentina has implemented ADS-B data Exchange trials using REDDIG communication network to receive information from ADS-B stations of Paraguay.

2.23 Furthermore, is trying to concrete a Memorandum of Understanding (MoU) with the satellite ADS-B supplier to carry out trials.

Brazil	<p>2.24 Brazil has developed an ADS-B implementation to support, mainly, air operations in the TMA-Macaé, of interest in the oil activity that is characterized by the movement of helicopters in the continent and the platforms of vessels anchored in that basin, in the oceanic zone, for people and cargo transportation.</p> <p>2.25 To serve the Campos Basin, in the airspace corresponding to the TMA-Macaé, six ADS-B stations were installed: four stations on maritime platforms and two in the continent. This infrastructure is integrated with the current radar network that supports air traffic control in that region, allowing surveillance throughout the TMA airspace at 500 feet and more.</p> <p>2.26 Brazil is finalizing the procedures to sign a Technical and operational Agreement with the provider of the Satellite ADS-B, to test the information provided by the company in the first quarter of 2019.</p>
Colombia	<p>2.27 Currently, Colombia has ten installed ADS-B stations (INDRA), which are operating in the different Aeronautical Regions: Antioquia (Santa Helena hill), Atlantic (San Andres, B/keel, Montería, Bañaderos hill), Meta (Carimagua, San Jose del Guaviare, Mitú), Santander (Tasajero hill) and Valle (Tumaco).</p> <p>2.28 Seven Frequentis Comsoft ADS-B stations were acquired to be installed in Araracuara (Caquetá), Carepa (Antioquia), Puerto Leguizamo (Putumayo), Santana (Cauca), Leticia (Amazonas), Puerto Carreño (Vichada) and Puerto Inírida (Guainía), which will be installed and put into operation before the end of this year.</p>
French Guayana	<p>2.29 French Guiana has plans to implement 5 ADS-B stations in the following locations in 2019: Rochambeau (airport), Mont-Matoury, Maripasoula, Mana and Saint Georges.</p>
Guyana	<p>2.30 Guyana has implemented a project to implement five ADS-B Skysurv stations. They were initially implanted four in the following locations: Port Kaituma (SYPK), Kamarang (SYKM), KAleteur SYKA) and Annai (SYAN).</p>
Paraguay	<p>2.31 Paraguay has implemented six ADS-B stations at the M. R. Alonso Unified Control Centre, Guarani Airport, Concepción Airport, San Juan Baptista, Mariscal Estigarribia Airport and Bahia Negra Airport.</p>

Agenda Item 3

Overview of ADS-B Versions

Differences between DO-260 (Version 0), DO-260A (Version 1), and DO-260B (Version 2).

3.1 Under P/01 United States presented information about the difference between the different versions for ADS-B, and described the difference of parameters between the versions.

3.2 Furthermore, information was also presented on the use of two different frequencies of ADS-B (UAT and 1090) accepted in the United States. United States also provided a summary on the ADS-B that they provide. In one part of the presentation, it was indicated that the 1090 frequency is the only frequency recognized by ICAO. In the end, United States recommended that States implementing an ADS-B Out regulation only consider the use of 1090 and no of other frequencies (e. g. UAT and 1090).

3.3 States are required to identify the version(s) they require for their operations and, when making the purchase of surveillance systems and equipment, identify their needs and the versions they require to meet their operational needs. It was indicated that there may be several needs for the identification of the operational objectives of the States, for which States must understand very well how their airspace operates and determine the best solution to be implemented.

3.4 The objectives of harmonization and standardization of operations in the region and the fact that the implementation of the ADS-B supports other services was discussed; thus, identifying minimum regional (operational/technical) requirements should be key to achieving these goals.

3.5 The industry indicated that ADS-B surveillance equipment they provide can process all the indicated versions and that the management must be completed with the ability of the ATC to manage this information.

3.6 The Meeting discussed the difficulty that each State of the CAR region, and even SAM States, implements a different regulation for its operations and that it is necessary that the mandate be done regionally since the operational environment of these States is very different from the North American States where their operational environment is different. In this regard, it is necessary to update the regional objectives based on the current status of the implementation of the ADS-B based on the operational objectives.

3.7 A more harmonized work is required with the operational work groups that lead the operational implementations, since that work can define the operational objectives of which the surveillance infrastructure supports its implementation.

3.8 The meeting also discussed the possibility of implementing, thanks to the use of the ADS-B, operational benefits, such as the eventual reduction, regionally speaking, of the longitudinal separation between operations. The meeting agreed that as part of this workshop recommendations should come for technical implementations, but that the operational objectives should be defined by the operational areas and not by the technical areas.

3.9 The meeting indicated the importance of States and their suppliers speaking the same language, identifying technical requirements and understanding the needs of the State, on the one hand, and on the other, those of the industry, in order to provide solutions that best apply to these needs.

Agenda Item 4

Technical and operational requirements required for the ADS-B implementation

Considerations for ADS-B Implementation accordingly with ICAO SARPs

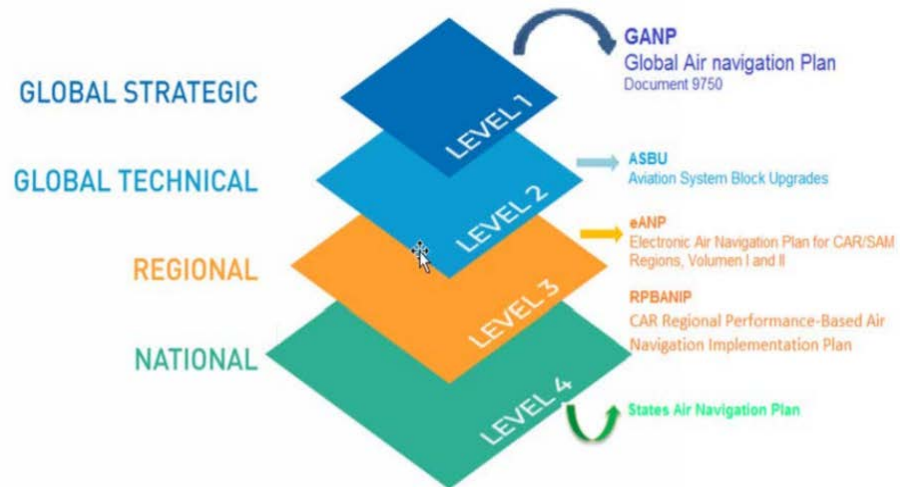
4.1 Under P/06 the Secretariat presented considerations for the implementation of the ADS-B, operational concepts to be taken into account in the development of the regulation, the importance of defining the operational benefits, the bases of the implementation and the ICAO documentation related to this implementation.

4.2 The Secretariat indicated the need for States to identify and know their operational environment very well, and to define the technical and operational requirements for the implementation of the ADS-B, beginning with the evaluation of the current state of its communications, navigation and surveillance (CNS) infrastructure.

4.3 The States must have the necessary information to carry out analyses that support the implementation decisions and their investment plan in air navigation, such as coverage area, type of traffic they manage, current status of their operations, CNS structure, avionics of the fleet of aircraft that have operations in their airspace, their projections of future growth and above all perform cost-benefit analysis.

4.4 The Secretariat indicated the importance of States defining their operational concept based on objectives, operational environment, ATM functions and their CNS infrastructure and, above all, with the identification of the benefits and the corresponding risk management analyses.

4.5 The planning bases that each State should take into account when carrying out its implementation plans were explained.



4.6 The need to know and integrate the requirements of the Annexes and the ICAO Documentation for the implementation of their air navigation projects was indicated. Air navigation services are defined in Annexes 2, 11, PAN/ATM (Doc 4444) and regional supplements (Doc 7030). Annex 10 contains all the CNS regulation. Annexes 4 and 15 contain the requirements for aeronautical publications.

4.7 The Secretariat mentioned the importance of defining the requirements; ADS-B team, define the airspace affected by the regulations, establish technical and operational standards and determine the responsibilities of each of the parties.

4.8 Under P/04, Canada, explained the reasons for implementation of ADS-B in different Canada regions, defined by operational needs, going through the process of coordination and approval by the regulator (Transport Canada), the participation of the service provider and the obtaining of the operational benefits.

4.9 The operational needs of the different areas were explained, ensuring a complete system of operational safety, including monitoring, review and updating of any operational method of ADS - B.

4.10 It was indicated that the implementation of the ADS-B will be carried out in phases and that it will be mandatory until 2024.

4.11 The implementation process of the satellite ADS-B in Canada was indicated and the approval for its implementation required an independent approval based on public interest, socio-economic, operational and environment benefits.

4.12 Emphasis was placed on the need to recognize operational needs and implement solutions that satisfy them.

4.13 The involvement of all stakeholders is a key factor for the success of an implementation, in addition to its analysis process before and after its implementation.

4.14 Under P / 07, FREQUENTIS indicated that surveillance systems are required to provide greater safety, reduce separation, increase airspace capacity and improve performance.

4.15 The key benefits of each implementation of the different ADS-B systems were also explained.

4.16 Frequentis has presented its history of existence, area of performance and experience, giving focus on its product line for surveillance for A'SMGCS, Local Area Multilateration (LAM), Wide Area Multilateration (WAM), Precision Runaway Monitoring (PRM).

4.17 The Meeting was informed that the Frequentis solution has more than 300 ADS-B / MLAT receivers sold in the world, with examples in Poland, India, Singapore, the United Arab Emirates, Sweden, Denmark, Scandinavia and other locations. The product stands out for the ability to operate in severe weather conditions.

4.18 Under WP/05, United States presented information regarding the operational procedures to be taken into account in the ADS-B implementation.

4.19 The necessity of a depth knowledge of the ADS-B functioning was recommended, as well as the quality of the information that it provides and the requirements for each version of the ADS-B. Additionally, that when processing data criteria must be applied in the ATC control centre to which the data is integrated.

4.20 An analysis should be carried out to define which ADS-B quality values are required to provide equal or better surveillance to a reference radar that supports certain minimum separation, whereby it is important to define the operational benefits of these implementations.

4.21 Reference was made to a series of documents developed by Eurocontrol and to other of the ADS-B operational requirements that are recommended to be evaluated, to a better understanding of the technical and operational requirements related to the different types of implementation, especially the ICAO Doc 4444 (PANS/ATM).

4.22 It was recommended that the ADS-B information should be monitored by the ANSP, by the regulator, and technically/operatively, verifying parameters of interest.

Agenda Item 5

4.23 A document will be developed by the Secretariat for States to take into account the considerations set forth for the ADS-B implementation.

Quality of ADS-B information

5.1 The Secretariat presented the Considerations for the Implementation of the ADS-B in accordance with the ICAO Standards and Recommended Practices (SARPs).

5.2 RO/CNS stressed that the implementation process was a work involving several actors and should be developed in a coordinated manner

5.3 The operational concept must be clearly understood, identifying the benefits to be achieved and carrying out all necessary analyses, especially risk analysis, for effective decision-making, guaranteeing, mainly, the operational safety and efficiency of air operations.

5.4 Indicated the planning bases and their hierarchy based on the Global Air Navigation Plan (GANP), the Aviation System Block Upgrade (ASBU) that defines a methodology, the Regional Plans that harmonize the efforts and initiatives of the States in a region embodied in their National Plans. Given the international nature of aviation, special efforts must be made to ensure harmonization through compliance with ICAO SARPs. The choice of systems to support ADS-B must consider not only the required performance of the individual components, but also their compatibility with other CNS systems.

5.5 The CNS/ATM environment is an integrated system which includes physical systems (hardware, software and communication networks), human elements (pilots, controllers and engineers), and operational procedures for its application. ADS-B is a surveillance system that must be integrated with other surveillance technologies or that could also operate as an independent source to watch the monitoring within the CNS/ATM system. It is necessary to develop adequate regulations defining operational and technical requirements, affected airspace and involved actors, as well as determining the responsibilities of all parties.

5.6 LEONARDO has presented its portfolio of products, subsidiaries and Joint Venture, emphasizing its portfolio of Air Traffic Management with products for Surveillance Systems, Air Traffic Management, Communications, Aids to Air Navigation and Meteorological Radar, Cyber ATM and Unmanned Traffic Management System (UTM).

5.7 In terms of surveillance, several implementation projects were presented in Brazil (Campos Oil Basin), in Barbados and the United States in the FAA programme.

5.8 In the end it was announced that LEONARDO signed a Memorandum of Understanding (MoU) with AIREON for integration of the ADS-B information based on the space in its LeadInSky ATM system.

5.9 LEONARDO indicated the need that before buying a system, States should carry out studies of necessary coverage to ensure a better implementation.

5.10 Additionally, indicated the need to identify the operational requirements of the objectives that wish to be covered, among others. Also indicated that LEONARDO has a flexible system policy that allows the States that can adapt the technical parameters of their systems according to their needs.

5.11 LEONARDO also expressed the need for States to make their implementations taking the necessary actions to strengthen their means of communication, to ensure that the signal received in the antennas are correctly transmitted to the control centres. The communications network must have redundancy as well.

5.12 Likewise, States must have additional systems such as data and voice recording systems among others, since they support the monitoring of implementation.

5.13 The Meeting took advantage of the presentation to discuss the problems of interoperability of different systems such as the problems of interconnection of data, incompatibility of protocols, personalization of some fields of the protocol and customizations of each company, among others.

5.14 THALES and INDRA indicated that the systems undergo updates and that in each update the developed facilities are integrated.

5.15 The industry agreed to recommend that States promote the knowledge of their specialists.

5.16 The States indicated that the role of the industry has changed and that they are not only equipment sellers, but have the responsibility to advise the States on their projects and support/ensure interoperability

5.17 THALES made another presentation addressing some specific ADS-B implementation issues

5.18 One situation is that some ATM systems do not manage to correlate the 24 bits of the targets with the flight plan data. These systems only manage the Mode A codes of the secondary radar. There are two possibilities to mitigate the situation:

- Use the passive responses of the ADS-B aircraft to the interrogations of a radar - if it is within the coverage of a Mode S radar; and
- Use an additional transmitter capable of interrogating the aircraft to obtain the Mode A code - if it was radar coverage.

5.19 Another issue is the quantity of equipped aircrafts. New aircraft have a high avionics index with Version 2 (DO-260B). On the other hand, aircraft that have retrofit have a low average with Version 2

5.20 In the survey carried out in Paris, France, and presented by THALES, resulted that aircrafts operating above the flight level (FL) 250, 91% are equipped with ADS-B, being 70% Version 0; 3% Version 1 and 18% Version 2, aircrafts operating only under the FL 150, only 3% are equipped with ADS-B, all with Version 2. Considering all the flight levels, 67% of the aircrafts are equipped with ADS-B, being 51% Version 0; 2% Version 1 and 14% Version 2.

5.21 Another issue addressed was the issue of security and prevention against spoofing, modification, deletion and jamming.

5.22 In the end, the characteristics and functionalities of the THALES product for automated air traffic control centres (TopSky) were presented.

5.23 THALES also highlighted the long term experience and large installed base of ADS-B and WAM/MLAT solutions. More than 2000 ADS-B receivers in more than 80 projects have been implemented and taken into operation the last 20 years. The implementations demonstrate the large scalability and flexibility of the product and vary from single ADS-B systems to countrywide coverage of USA and Australia.

Agenda Item 6

ADS-B regulation considerations

6.1 The Secretariat presented information to the participants, initially, indicating the approach and purpose of the surveillance system: In most cases, an aeronautical surveillance system provides its user with knowledge of "who" is in "where" and "when", other information provided may include horizontal and vertical speed information, identifying characteristics or intension. The required information and its technical performance parameters are specific to the application that is being used. As a minimum, the aeronautical surveillance system provides information on the position of aircraft or vehicles at a known time.

6.2 The requirements for ATS surveillance systems are contained in the Doc 4444 -Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM), Chapters 6 and 8. Those requirements should be used in conjunction with the technical support material contained in this document for proper planning and implementation of surveillance systems.

6.3 Following the abovementioned, the parameters that must be taken into account and directly related to the quality of service were presented:

- Monitoring information;
- Accuracy;
- Integrity of information;
- Availability;
- Continuity; and
- Reliability

6.4 Likewise, issues related to performance were indicated, being important to verify that the surveillance system meets the requirements before the service is put into operation. The environment in which the system operates can change through time. For example, coverage may have an impact due to new obstructions, or the density of traffic may increase, also, some components may degrade through time. Therefore, it is important to adopt measures to ensure continuous compliance with performance requirements. Examples of these measures are:

1. Periodic verification of system performance. The initial verification test can be used as a baseline for comparison.
2. Ensure that the surveillance system has sufficient built-in tests and external monitoring functions to continuously demonstrate that performance requirements are being met.

6.5 To comply with the requirements of the integrity system, States should carry out a validation process which confirms the integrity of the equipment and procedures. These processes should include:

- Evaluation of the safety system for new implementations is the basis to define the requirements of the performance system. Where existing systems are being modified to use additional services, the validation demonstrates that the ATS provider system will meet safety objectives;
- Results of the integration tests that confirm the interoperability for an operational use of aerial or terrestrial systems; and
- Confirmation that the ATS operating manuals are compatible with those of adjacent suppliers.

6.6 During the initial period of implementation of ADS-B technology, it is necessary to routinely collect information to ensure that the system continues to meet or exceed its performance, safety and interoperability requirements, and the service and delivered operational procedures are working as planned. The monitoring program is a double process. Firstly, a summary of the statistical information showing the performance of the system should be produced periodically. This is done through periodic reports of the ADS-B state. Subsequently, as abnormalities or problems emerge, they must be identified, analysed and corrected and the information distributed, using the ADS-B Problem Report.

6.7 It is recommended that ATS Providers and communication service maintain records for at least 30 days to allow accident/incident investigation processes. These records should be available upon request by a relevant State safety authority. When looking for data from an adjacent State, the usual channels from one State to another should be used. These records must be in a form that allows the reproduction of the situation and the identification of the messages received by the ATS system.

6.8 With regard to the identification and correction of avionics problems, ATS providers must develop systems to:

- Detect the anomalies and faults of the ADS-B avionics;
- Advise regulators and, when appropriate, aircraft operators on ADS-B avionics anomalies and faults detected;
- Design mechanisms and procedures to address the flaws identified; and
- Ensure that appropriate corrective measures are taken to address the flaws identified.

6.9 Under WP/06, United States highlights the elements that must be taken into account in the development of regulation for the use of ADS-B, such as the use of avionics, provision of air navigation services (Doc 4444).

6.10 The use of ADS-B information, the CNS capacity and its integration in the process, the demand of air traffic, the impact on available services and future services were also included.

6.11 States should consider adequate regulation the risk of problems with the Global navigation satellite system (GNSS) signal and the impersonation signal (false target attack).

6.12 The avionics regulations for the use of ADS-B can be developed through three methods that can be a State defines its own equipment and operational requirements, that the State copies equipment and operational requirements of another State or finally the State makes direct reference to the documentary requirements of another state.

6.13 Depending on the use of ADS-B information to provide ATS surveillance services, aerospace regulations should be required. These regulations can range from a warning informing operators that airlines equipped with ADS-B will receive priority in the assignment of cruising altitudes in a region of airspace; to Establish corridors the upper altitude airspace where only aircraft equipped with ADS-B are authorized to fly.

6.14 Stakeholders will want to know what regulation is proposed, cost, time, benefits, risks and how it affects them.

6.15 Under WP/08, Brazil presented its experience in the ADS-B implementation within the DECEA strategic program for the evolution of Brazilian air traffic management, SIRIUS BRAZIL, harmonizing the recommendations contained in Doc 9750 and aligned with the ASBU in the Campos basin project and the Air Traffic structure and services at TMA-Macaé where this was implemented mainly to support the air operations of interest of the oil activity, which is characterized by the flow of helicopters between the mainland and the oil platforms or vessels anchored in that Basin, in the ocean area, for the transportation of persons and cargo.

6.16 The implementation of a new airspace structure based on RNAV routes, new operational procedures that envisage en-route and platform operations; infrastructure, expansion and modernization of the automatized system for the ADS-B data integration.

6.17 Besides safety, one of the operational benefits is the ADS-B used in TMA-Macaé that jointly with other automatization capacities and ATS communications allowed the Macaé approximation (APP) to provide a minimum separation of up to 5NM between aircraft flying at low altitudes.

6.18 Brazil indicated that it's in the process of the continental ADS-B and MLAT in the implementation in Puerto Alegre terminal, in South Brazil. Both projects will start in 2019.

6.19 Mexico shared the interest of Brazil, and indicated that the provided services in the Gulf of Mexico to the oil rigs are a similar service.

6.20 Mexico requested ICAO support to develop the required guidelines for a similar project in the Gulf of Mexico allowing the State strengthening safety.

6.21 In the same way, Brazil is open to support Mexico with its knowledge and lessons learned. It is necessary that Mexico make a formal consultation of the request when required.

6.22 The WP/07 provided an overview of the United States plan to discontinue the issuance of operational approvals related to automatic dependent surveillance – broadcast (ADS- B) OUT. As mentioned in the working paper, the ICAO Asia/Pacific Air Navigation Planning and Implementation Regional Work Group (APANPIRG) required aircraft operators in 2010 to have an ADS-B Out operational approval from the State of Registry. The APANPIRG removed this requirement in their September 2015 meeting in which the United States fully supported the decision. The US discussed their rationale for supporting the removal of the OpSpecs requirement to include the lack of practical safety or operational benefit gained from the issuance of such an operational specification.

6.23 The United States specified that by the end of 2018 OpSpecs for ADS-B Out will no longer be issued. Furthermore, the working paper noted that the US will continue to require and issue OpSpecs for operators intending to use automatic dependent surveillance – broadcast (ADS- B) IN applications (e.g. ITP, FIM, CAVS, etc.).

6.24 Under P/11 COCESNA shared the state of implementation of the ADS-B in the Central American FIR, explaining the planning process of the Surveillance Systems, the modernization of the Surveillance Systems, ADS-B coverage, the process of sharing and integrating ADS-B data, the evaluation of its benefits and ADS-B statistics.

6.25 COCESNA indicated that there is not a unique solution for the current deficiencies, thus, the use of conventional surveillance systems and new technologies (MLAT, ADS-B and Automatic dependent surveillance - contract - ADS-C) or its combination are being considered, as is the case of the TMA La Aurora, where the first WAM system in Central America will be installed.

6.26 In this regard, the Meeting took note of the shared experiences of Brazil, Canada, United States and now COCESNA, that the solutions must be targeted on the solution of specific issues and a sole solution is not applicable, and that previous analysis is needed to determine the best solutions.

6.27 Aireon presented IP/05, supported by P/09 as a progress update on Satellite ADS-B. The overview covered the evolution and deployment of ADS-B technology on a satellite-based infrastructure, starting 2011. The final deployment of the full constellation is estimated for December 2018. The meeting noted that 12 ANSP customers had already signed up, while also recognizing that 5 ANSPs also constituted the majority shareholding. Aireon is also in the process of gaining approval by EASA as a recognized ATM/ANS service provider by means of a comprehensive system performance demonstration and audit. This approval includes elements of System & Organizational functional aspects, Financial, Management, Safety management, Methods, Procedures, Competency, Software Assurance and System Verification and Contingency, reporting, ICAO standards.

6.27.1 In respect to system performance, it was highlighted that layered benefits extend to global surveillance, both laterally as also vertically and no additional equipage requirements, while also adhering to current and future ADS-B standards, based on measured update interval performance. Additionally, Aireon in collaboration with the Irish Aviation Authority are offering “Aireon Alert” a no-cost locating and tracking service available to ANSPs. Yet another service – GlobalBeacon addresses the requirements under the (ICAO) Global Aeronautical Distress Safety System (GADSS) scheduled for 2021.

6.27.2 Finally, the results of three tests performed by Aireon were updated to the meeting.

6.27.3 Test 1- The Independent validation of aircraft position via Space-based ADS-B, whereby Precision Timing and Position (PTP) messages being received by a common group of inter-networked satellites could be ‘multi-laterated’ using time difference on arrival (TDOA) algorithms to provide resilience to GNSS spoofer, outages, faulty avionics as also assuring data integrity.

6.27.4 Test 2: Using Space-based observations from the DO260B messages in identifying Airborne collision avoidance system (ACAS) advisories and aircraft avionics anomalies, such as duplication of the 24-bit aircraft address and invalid flight aircraft IDs.

6.27.5 Test 3: Technical Performance Metrics (TPMs) using on-orbit tests and characterizations to measure and validate technical performance metrics of Availability, Latency and Update Interval.

6.27.6 The Aireon deployment is scheduled for 1Q 2019 and is offered to States and ANSP with the unique value provision of global coverage, reduced costs from hosted payload and extended surveillance benefits, mainly to procedural airspace- i.e. based on aircraft tracking based on position reports.

Study on the convenience and feasibility of space-based ADS-B for regional implementation

Satellite ADS-B implementation initiative

Study on the convenience and feasibility of space-based ADS-B for regional implementation

6.28 Information on the activities carried out on the Study on the convenience and feasibility of space-based ADS-B for regional implementation were also presented.

6.29 With the support of the General Directorate of Civil Aviation of Ecuador, Mr. Iván Salas Garzón, CNS specialist, carried out a mission in Lima, Peru, from April 23 to 27, 2018, when he prepared a preliminary study that he had presented at the SAM /IG /21 Meeting, held in Lima from May 21 to 25, 2018.

6.30 The study concludes the convenience and feasibility of a regional implementation of the Satellite ADS-B and points out recommendations for a possible implementation using the SAM Digital Network (REDDIG), as a platform for the distribution of surveillance information.

6.31 SAM/IG/22 Meeting approved the study and requested the Secretariat to circulate the document for the knowledge of all the States of the Region, for the evaluation of those responsible for the planning of each country, with a view to supporting the discussions regarding participation in a regional implementation at the next SAM / IG / 23 Meeting, to be held in Salvador-Brazil, from May 20 to 24, 2019.

6.32 Under IP/03 and P/05, AIREON provided an update on this highly adaptable technology including Space-Based ADS-B Operational Use Cases, and the EASA initial certification process that AIREON had to do and how this process applies to regional regulators and air navigation services providers (ANSPs).

6.33 This process included:

1. Certification scope;
2. Geographical scope of the EASA certificate;
3. Performance Requirements;
4. Notification Requirements;
5. Continuous Oversight;
6. ANSP Safety Case;
7. Development Approach;

- 6.34 AIREON also presented:
1. AIREON deliverables as input to ANSP safety case;
 2. ANSP Safety Case Implementation for Space-based ADS-B;
 3. Definition of Airspace Concept;
 4. Oceanic 15NM Separation Performance Requirements;
 5. En-Route/TMA Radar Environment Performance Requirements;
 6. En-Route/TMA Non Radar Environment Performance Requirements;
 7. Aireon Technology Insertion Based on Existing Standards;
 8. Identification of ADS-B Performance Requirements: Service Level Agreement (SLA) Metrics;
 9. Overview on the Safety Assessment;
 10. Preparation for Implementation; and
 11. Sample ANSP Safety Case Outline
 1. Introduction
 - a. Purpose and scope of the Safety Case Document (SCD)
 - b. Applied Method
 - c. Document Content
 - d. Applicable Documents
 - e. Definition of terms

2. Description of the Service and environment
 - a. ATC Service ICAO Definition
 - b. Operational Environments and ATC services
 - c. Operational Surveillance Information provided to the ATC
 - d. Functional Architecture of the Surveillance System
 - e. Architecture and Functional Description of the Surveillance System
 - f. External Systems supporting the ATC Service g. System Human Interface
3. Scope of the Safety Case
 - a. In-Scope of the Safety Case
 - b. Out of Safety Case Scope
4. Safety Arguments
5. Assessment for airspace where ADS-B ground stations could be used
 - a. Overview of the Process
 - b. Identification of Safety and Performance requirements and assumptions
 - c. Evidence for the design of the Surveillance System
 - d. Evidence for the implementation of the Surveillance System 25
6. Assessment for airspace where ground-based surveillance is not possible
 - a. Overview of the process
 - b. Specifications of the Surveillance Service
 - c. Evidence for the design of the Surveillance System
 - d. Evidence for the implementation of the Surveillance System
7. Safe operations of the Surveillance Service
 - a. Roles, responsibilities, interfaces and agreements with suppliers and customers b. Procedures for operations and maintenance
 - b. Procedures regarding transition to a new build
 - d. Safety assurance and monitoring procedures
 - d. Safety promotion activities
 - e. Quality Management
8. Synthesis of Requirements and Assumptions
 - a. Safety Case Requirements and Assumptions
 - b. ADS-B-NRA Requirements
 - c. ADS-B-RAD Requirements and Assumptions
 - d. ICAO Annex 10 Requirements
 - e. OSED Requirements and Assumptions
 - f. Safety Requirements and Assumptions
 - g. Conclusions and recommendations

6.35 The SAM Region CNS Officer has presented more information about the study carried out to analyze the convenience and feasibility of space-based ADS-B for a regional implementation in the SAM Region.

	<p>6.35.1 The study contains information on the characteristics, performance, coverage, and cost of current surveillance technologies that allow States to compare the adoption of the satellite-based ADS-B service with other aeronautical surveillance possibilities, such as secondary radar (SSR) and ground ADSB stations.</p> <p>6.35.2 Following a brief introduction to ADS-B technology and the presentation of key reference documents on the topic, the service provided is described and then gets into the main topics of the study: feasibility and convenience.</p> <p>6.35.3 At the SAM/IG/19 meeting, States recognised the operational benefits and advantages that could be derived from the satellite-based ADS-B service, such as:</p> <ul style="list-style-type: none">- Coverage of existing gaps in the surveillance systems of the States in the Region;- Coverage in boundary areas as an alternative to the exchange of surveillance data between adjacent States;- Coverage in oceanic areas out of reach of ground surveillance systems;- Surveillance solution for non-FIR airspace;- Constant update of target positions, unlike periodic update provided by ADS-C; and- With States obtaining information from a single source, with the same parameter levels, it is possible to standardize air navigation services throughout the region. <p>6.35.4 The study concludes that the use of the satellite-based ADS-B system in the region is feasible due to its coverage, response time in the information transfer process or latency, and availability of information, for en-route airspaces above 10,000 feet, which was the airspace analyzed in this study.</p> <p>6.35.5 The following benefits of a regional implementation are identified in the study:</p>
Feasibility	
Safety	<p>6.35.6 Effective surveillance in areas that currently lack coverage, definitely contributing to increased safety.</p>
Flight efficiency	<p>6.35.7 Effective surveillance of ADS-B information, providing the means to optimise flights and increase airspace utilisation capacity.</p>

Flexibility	<p>6.35.8 The service provided allows the ANSP to hire specific areas or volumes at the flight levels of operational interest, as the only means of surveillance or as augmentation of the existing surveillance infrastructure, and as redundancy in areas of critical operational interest.</p>
Homogeneity	<p>6.35.9 With States obtaining information from a single source, with the same parameter levels, it is possible to standardize air navigation services throughout the region.</p>
Environment	<p>6.35.10 Improved flight management, increasing capacity, more direct flights and reduced waiting times contribute to reduce adverse impact of aviation on the environment.</p>
Profitability	<p>6.35.11 With more efficient and economic flights, the profitability for aircraft operators becomes sustainable, with positive impact for the final user. From the point of view of the ANSPs, the reduction in implemented infrastructure and the required maintenance have a significant impact on this aspect.</p>
Convenience	<p>6.35.12 Convenience was analysed quantitatively, based on the methodology used in the preliminary study presented at the SAM/IG/21 meeting (May 2018), comparing the cost of ground SSR and ADS-B technologies with satellite-based ADS-B.</p> <p>6.35.13 The approach adopted to align, in a simpler manner, the coverage limitation of ground sensors with the broad coverage capacity of satellite-based ADS-B. The approach suits better those States that have oceanic and continental areas with relatively equal traffic (homogeneous), such as Panama and Colombia.</p> <p>6.35.14 The methodology adopted in the preliminary study was maintained in order to be compatible with any analysis of convenience.</p> <p>6.35.15 A practical way of understanding the approach used is to consider the percentage of coverage by ground sensors with respect to the coverage of all FIR areas under the responsibility of the State.</p> <p>6.35.16 The preliminary study considered a period of 15 years of useful life for radar sensors (SSR) and 20 years for ground ADS-B sensors. It also considered 20% for maintenance (personnel, equipment and spare parts), telecommunications, and infrastructure cost over the life of the ground sensors. Consequently, coverage at the indicated levels results in an annual cost per km² of FIR (total).</p>

6.35.17 It is important to note that 20% for maintenance is considered to be relatively lower than what is considered in practice for maintenance of ground infrastructure, taking into account the indicated useful life periods (10 and 15 years).

6.35.18 Conversely, the annual values used for the cost of the satellite ADS-B are based on the average annual traffic estimated to 2030, considering the hiring of all the FIRs of the States for a period of 15 years.

6.35.19 The study shows that, when comparing satellite ADS-B with the radar sensors, there is a substantial disadvantage in the use of this type of ground sensor.

6.35.20 Regarding ground ADS-B sensors, the comparison is more tight and although, in general, satellite ADS-B has lower costs in some States, depending on the flight level involved, the annual cost per km² of FIR of the ground ADS-B appears to be more interesting.

6.35.21 This is shown as an apparent advantage, because, due to limitations of ground sensors and factors such as terrain in the region and airspace of operational interest, it is not possible to achieve complete surveillance with the ground sensor, despite the lower annual cost per km² de FIR.

6.35.22 The use of the SAM REDDIG can lower implementation costs for States interested in hiring satellite ADS-B services. It would also expedite regional implementation.

6.35.23 The SAM Regional Office will circulate the approved study in the SAM/IG/22 to all States with participation in the REDDIG network, for acknowledge and, also, to nominate focal points for this subject in the next meetings of the Implementation Group and the RLA/03/901 Project Coordination Committee (REDDIG administration).

Agenda Item 7

Next Steps- Need for guidance and polices to aid in equipage and the usage of information

7.1 THALES presented the development of versions of the applied specifications to aeronautical monitoring, emphasizing ADS-B versions, from the DO-260 to DO-260B version (versions 0, 1 and 2). Also an overview of the mandate initiatives in the world was presented.

7.2 During the presentation, several technical implementation aspects, which refer to the position information integrity and its compliance for Air Navigation Services (ATS) were indicated.

Agenda Item 8

7.3 Airbus Helicopters México shared links that provide information of the ADS-B system installation recommendations in aircrafts and on the FAA approved equipment for the ADS-B systems and their respective sensitivity time controls (STCs).

<https://www.faa.gov/nextgen/equipadsb/installation/>

<https://www.faa.gov/nextgen/equipadsb/installation/equipment/>

Other business

8.1 The Safety Information Monitoring System (SIMS) is an information system based in the ICAO Website and integrated by different applications that generate indicators to support the State Safety Programme (SSP) and the Safety management system(s) (SMS).

8.2 The application has the following benefits:

1. Key follow up indicators
2. Analyse different air navigation efficiency indicators for the airspace use
3. Prioritise the areas with identified security issues
4. Achieve the objectives of the ICAO Global Aviation Safety Plan
5. Show the economic and social results of aviation development, and
6. Communicate (to the approved audience) the States reports and the developments of the agreed objectives

8.3 The catalogue of all the indicators that support the SIMS Application can be found at the following link:

<https://www.icao.int/safety/Pages/Indicator-Catalogue.aspx>

8.4 SIMS is for the ICAO Member States (and their service providers), its use is free and information can be obtained at the following link: www.icao.int/safety/sims or through the E-mail to sims@icao.int

8.5 The Secretariat informed that the follow-up meeting to the implementation of the ADS-B will be held in 2019, Ottawa, sponsored by Canada for NAM/CAR States, and SAM States are welcome to participate.

**Analysis of
implementation of
new Projects**

Outcomes/Recommendations

States' recommendations

- Before a project for presentation of air navigation services is executed, the State must ensure that it carries out the preliminary evaluation of it including stakeholders, data for evaluation, risk analysis, among others.
- The State, before executing the implementation of any surveillance system, must ensure that it has carried out the coverage analyses to ensure that it meets the coverage.
- States must ensure that they identify the operational objectives prior to the development of any project and ensure that operational benefits are achieved after implementation.
- States should ensure that global, regional and national goals are incorporated into their air navigation plans and any operational goals.
- States must ensure that ICAO SARPs are present in the process of developing the technical and operational requirements of the projects, in their implementation phase and validation of compliance with requirements.
- States should include Annexes 2, 11 and PANS/ATM in the ADS-B implementation process (Doc 4444) to ensure the operational implementation process of ADS-B, documents 4 and 15 to ensure the publication of the States in regard to its implementation and regulation. And Annex 10 in all its volumes to ensure the CNS infrastructure that supports the implementation requirements.
- States should integrate, as part of the process, especially Annex 10, Volume IV and Doc 9924 Aeronautical Surveillance Manual.
- States must ensure that they integrate their projects with adjacent States and their coordination and interconnection requirements to achieve goals within their projects.
- The States must work so that the region can achieve 100% coverage of short-term surveillance and boost safety in the operational areas of interest and oceanic areas in which control services are provided to boost safety.

Other aspects

Preventive and Corrective Maintenance Recommendations	<ul style="list-style-type: none">• The States should guarantee their participation in the meetings of the Automatic Dependent Surveillance – Broadcast (ADS- B) Implementation Task Force with specialists who have sufficient technical expertise and who allow continuity to the tasks and actions agreed upon, and keep the same personnel through time.• The States should guarantee the participation of specialists with sufficient technical and operational expertise of the different specialties when contracting equipment• The States should guarantee in their processes of contracting automated processing systems and surveillance services, that they have sufficient capacity and flexibility to allow the incorporation of all the existing and developing surveillance systems, both their own and those of the Neighbouring States.• The States must analyse the possibility of making strategic agreements with the Industry that allows them to update their systems with the entry of the new updates and not when their systems are about to end their life cycle.• The aeronautical authorities of the States of the region must verify the existence of preventive/corrective maintenance procedures in the ANSP, which guarantee the quality of the services associated with the surveillance system.• States should have adequate electronic tools to monitor the operation of surveillance systems and the collection of statistics for technical analysis or to meet operational needs.• The States must verify that sufficient technical and operational training actions are carried out in their air navigation service providers to guarantee the adequate operational implementation of the new surveillance systems.
ADS-B Regulation	<ul style="list-style-type: none">• The States must evaluate the need to modify their aeronautical regulations for the operational implementation of the ADS-B systems. They also should analyse, in the short –term, how their operations are affected by their own implementations or by the implementations in adjacent operational States.
Recommendations from the industry	<ul style="list-style-type: none">• That the industry integrates a solution approach to the operational requirements and not just a supplier of a team.

ICAO

- That the industry includes within its processes procedures that ensure that the company accompanies the States throughout the implementation process, until the operational objectives have been met and the integration, harmonization of its connections with other States.
- That the industry relies on ICAO and regional requirements to include the regional interconnection requirements for its projects.
- To standardize software solutions that satisfies regional interoperability.
- To implement continuous improvement processes and include lessons learned to ensure that mistakes are not repeated in new projects.
- The States recommended that ICAO must continue including the participation of airlines in these ADS-B events, since their participation is important to achieve a harmonized implementation of the ADS-B.

APPENDIX A / APÉNDICE A

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APPENDIX B / APÉNDICE B**SURVEILLANCE TASK FORCE Membership / Membresía del Grupo de Tarea sobre Vigilancia**

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APPENDIX C
SURVEILLANCE TASK FORCE Working Plan

ITEM	TASK	DELIVERABLE	STARTING DATE	ENDING DATE	COMPLETED PERCENTAGE	RESPONSIBLE
1	ToRS Review and Updating	Revised ToR	26/11/18	29/11/18	100%	Group Members
2	TF Working Plan review and updating	Updated working plan	26/11/18	29/11/18	100%	Group Members
3	ADS - B trials in States that have not carried them out	Resulting statistics of the trials	30/10/14	31/12/19	Valid	States/Territories Developed by States
4	ADS-B trial statistics collection	Trial statistics	30/10/13	31/12/19	Valid	Cuba, Mexico, Jamaica, Trinidad & Tobago and COCESNA
5	CONOPS review and updating	Updated CONOPS	26/11/18	31/01/19	Valid	CONOPS AdHoc Group, integrated by Cuba, Curacao, Dominican Republic and COCESNA,
6	Feasibility study on the use of satellite ADS-B	Feasibility study on the use of satellite ADS-B	30/11/2018	30/04/2019	Valid	CONOPS AdHoc Group, integrated by Dominican Republic, United States and COCESNA, AIRON will support

ITEM	TASK	DELIVERABLE	STARTING DATE	ENDING DATE	COMPLETED PERCENTAGE	RESPONSIBLE
7	Support the implementation of surveillance data sharing	Summary table of the implementation status	26/5/17	31/12/20	Valid	TF Members
8	Developing of a guide for the planning of acquisition of surveillance systems	Guide for the planning of surveillance systems	29/11/18	31/01/19	Valid	Rapporteur and selected members
9	Start the process of implementation of the new surveillance systems (ADS-B, ADS-C, CPDLC, MLAT and WAM)	Implementation Regional Plan	1/1/20	1/1/23	Valid	TF Members
10	Notify the implementation plans.	States Progress table updating	29/5/17	29/5/19	Valid	TF Members
11	Report the progress of the implementations	States Progress table updating	31/7/17	29/5/19	Valid	TF Members
12	Required national regulations for the implementation of the new surveillance systems.	States Progress table updating	29/11/18	31/12/19	Valid	TF Members
12	Achieve 100% of the surveillance coverage required by the PBN in each FIR.	AIP publication	26/5/17	31/12/20	Valid	TF Members

ITEM	TASK	DELIVERABLE	STARTING DATE	ENDING DATE	COMPLETED PERCENTAGE	RESPONSIBLE
13	ADS-B Implementation Guide development	ADS-B Implementation Guide	26/11/2018	28/02/2019	Valid	ICAO

Surveillance infrastructure table

To be completed by the States

NO.	STATE	LOCATION NAME	TYPE (PSR, SSR, MSS-S, MLAT, ADSB)	SUPPLIER	MODEL	PROVIDED ASTERIX PROTOCOL	LOCATION (GEOGRAPHICAL COORDINATES)	ALTITUDE (METERS ABOVE SEA LEVEL)	INTERROGATOR CODE (II) (IF ASSIGNED)	OBSERVATIONS
1	2	3	4	5	6	7	8	9	10	11
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

APPENDIX D
RESULTS OF THE MEETING/WORKSHOP – RECOMMENDATIONS

Based on the information presented at the Meeting/workshop, the participants formulated the following recommendations:

ADS-B benefits: All the participants identified and agreed on the benefits derived from ADS-B implementation in terms of surveillance coverage and operation, and cost reduction, compared with the implementation of conventional and Mode-S radar systems. However, most CAR/SAM States have considered maintaining the conventional surveillance solutions currently in use for the short and medium term.

Current use of ADS-B: The CAR/SAM States that have implemented ADS-B or have plans to implement ADS-B in the short term are planning to use it as backup to radar surveillance or as an alternative for areas currently lacking radar coverage.

Need for data on aircraft equipage: The participants felt the need to have data on aircraft equipage in terms of the avionics required for ADS-B, in accordance with the different interrogation protocols. Accordingly, the recommendation was to consult the possibility of obtaining fleet statistics from the FAA, NAV Canada, IATA, and Aireon. In this sense, ICAO will discuss with the FAA, Nav Canada, and Aireon the possibility of sharing this information with the States so as to have it available by the end of the first quarter of 2018.

List of activities required for ADS-B implementation: Taking into account the importance of consulting stakeholders and having comprehensive and strategic plans for ADS-B implementation, the Meeting recommended that ICAO, through its NAM/CAR/SAM working groups, develop a checklist of stakeholders and a detailed outline of ADS-B implementation activities required to assist States in joint and consistent implementation planning. Each ICAO Office, both NAM/CAR and SAM, will fulfil the activity within their corresponding working groups. Upon completion, it will be integrated into a single regional version that will be available to NAM/CAR/SAM States. This would be prepared during the first semester of 2018.

ADS-B implementation: The meeting identified the need for a long-term ADS-B vision that will allow States to update their short-, medium-, and long-term regional and national plans, taking into account the following factors:

- a. The meeting noted the importance of planning specific safety, efficiency, or capacity improvements based on the requirements of airspace users and air navigation service providers (ANSPs). Requirement-based planning ensures the selection of the appropriate technologies and that all stakeholders, including the regulator, understand and agree on the required performance for communication and ATS systems and on-board avionics.
- b. It was recommended that CAR/SAM States follow the Global Air Navigation Plan (GANP), its technological roadmaps, the ICAO ASBU methodology, and the NAM/CAR and SAM regional performance-based plans, taking them into account when developing their national air navigation plans.
- c. When implementing ADS-B, the States should consult and ensure the participation of all stakeholders as a priority to obtain the benefits of implementation.

d. When implementing management projects, States should include in their feasibility and risk analyses the aeronautical infrastructure and operations with each of the adjacent FIRs, in order to ensure standard, harmonised and efficient coordination.

e. In their strategic planning, States should define surveillance data requirements (speed, precision, Pd, routes/levels, etc.) in order to define minimum technical/operational requirements to be met, and subsequently define the surveillance technology best suited to meet their needs (radar, ground-based ADS-B, space-based ADS-B, multilateration). This information would support the decision whether or not to eliminate radars and determine future investments in technology.

f. It is recommended that, when conducting the risk analysis for selecting a new technology, States include the risk analysis of both its implementation and lack of implementation to ensure that projects to be executed include all risk factors when selecting new surveillance technologies.

g. It is recommended that, based on the ATM operational concept of achieving seamless paths, and in order to meet the regional goals of ASBU Block 0, and taking into account the mandatory use of ADS-B in North America as of 1 January 2020, States make the necessary efforts to plan for the implementation of ADS-B and define whether mandatory actions should be established.

h. In order to obtain the benefits of ADS-B technology, all aircraft in designated airspace should be equipped with the ADS-B OUT system. To this end, States should analyse whether a mandate would be required to ensure fleet uniformity.

i. States should make sure that the investments to be made in subsequent years contemplate current and future requirements, minimising the risk of having to make unexpected investments in the short term.

j. The meeting/workshop deemed it advisable for CAR/SAM States to study the possibility of co-locating ADS-B station(s) with existing radar surveillance systems that are reaching the end of their lifecycle, so that they can be used as backup to the latter. Likewise, to analyse the status of implementation of ADSB in the aircraft fleet. At the end of the radar lifecycle, and based on the experience gained with ADS-B during this period, a more informed analysis can be made whether to continue with radar or replace it with ADS-B.

For data exchange, the meeting recommended: that each State share information on surveillance systems with adjacent States in order to analyse the coverage and overlap of surveillance data to serve as backup in air traffic control coordination areas between FIRs. States that have not yet delivered their updated data to ICAO, in accordance with attachment C to the invitation, must do so by 30 January 2018.

Improved situational awareness in the Region: Taking into account the importance of having common situational awareness information, which is obtained by sharing surveillance data, CAR/SAM States/Territories were urged to continue making efforts to complete data sharing both at radar and ADS-B system level.

ATS infrastructure: States must conduct an analysis of their ATS infrastructure and determine whether it is capable of ADS-B management, directly integrated in the ATS system, without the need for conversion of surveillance protocols, thus offering optimum surveillance data management to operational personnel.

Commitment by system and equipment providers: The participants noted that the commitment of system providers (Thales, Indra, etc.) was required for the implementation of solutions that ensured compatibility and easy integration of ADS-B systems. In this sense, providers were requested, when implementing new projects in the Region, to assist States in ensuring standardisation, harmonisation and integration of systems.

Assessment of space-based ADS-B: The participants pointed out the need for an integrated and cooperative assessment to determine the correct use of space-based ADS-B. In this regard, the SAM Region will include this activity within the actions to be carried out by the working group that is currently validating the use of the communication infrastructure for this purpose. The NAM/CAR Region will include this task within the activities of the NAM/CAR Surveillance Working Group.

Development by the State of regulations for ADS-B implementation: The regulator may need to change the wording of ATS regulations to allow for the use of both ADS-B and radar. The regulator will need to certify aircraft and operators. The technical and maintenance personnel of operators and ANSPs will need to learn new systems and procedures. Coordination and operational arrangements with neighbouring ANSPs may need to be updated. Taking into account the experiences shared at the meeting, the participants concluded that States should start developing legislation/regulations on the use of ADS-B in each State.

Regional meeting: The participants agreed on the need to hold a NAM/CAR/SAM regional meeting on the second half of 2018 in order to follow up on ADS-B implementation. The meeting would analyse, inter alia, aspects related to operational and airworthiness requirements for ADS-B implementation and the lessons learned by States that have already implemented ADS-B in the NAM/CAR/SAM Regions.