



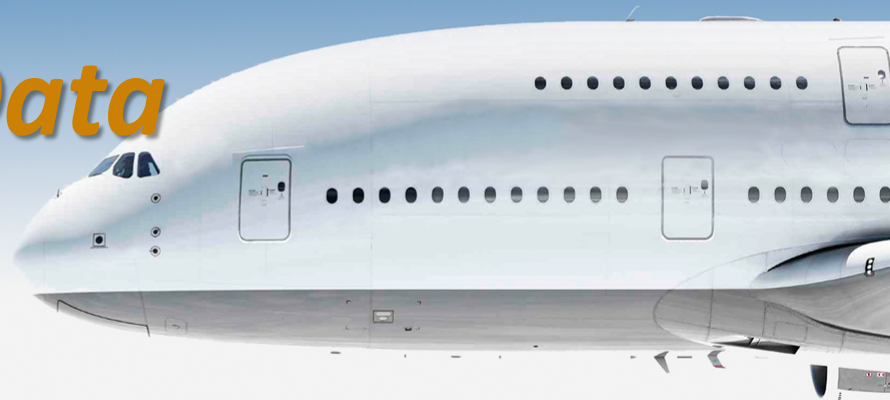
ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



# *ADS-B Evaluation Data*



Mayda Ávila/CNS ICAO NACC regional Officer

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

Mexico City, Mexico, 26-30 November 2018



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



# Agenda

- SURVEILLANCE SYSTEM PURPOSE AND SCOPE
- DEFINITION OF PARAMETERS CONTRIBUTING TO QUALITY OF SERVICES
- **ATS SYSTEM INTEGRITY**
- **ATS SYSTEM VALIDATION**
- SDP SYSTEMS
- INTEGRATION TEST
- SYSTEM MONITORING
- ADS-B PROBLEM REPORTS
- **LOCAL DATA RECORDING AND ANALYSIS**
- **AVIONICS PROBLEM IDENTIFICATION AND CORRECTION.**





ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



## **SURVEILLANCE SYSTEM PURPOSE AND SCOPE**

- ✈ An aeronautical surveillance system provides the aircraft position and other related information to ATM and/or airborne users. In most cases, an aeronautical surveillance system provides its user with knowledge of “who” is “where” and “when.” Other information provided may include horizontal and vertical speed data, identifying characteristics or intent. The required data and its technical performance parameters are specific to the application that is being used. As a minimum, the aeronautical surveillance system provides position information on aircraft or vehicles at a known time.



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



## **SURVEILLANCE SYSTEM PURPOSE AND SCOPE**

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



## DEFINITION OF PARAMETERS CONTRIBUTING TO QUALITY OF SERVICES

- ✈ Surveillance information
- ✈ Accuracy
- ✈ Data integrity





ICAO

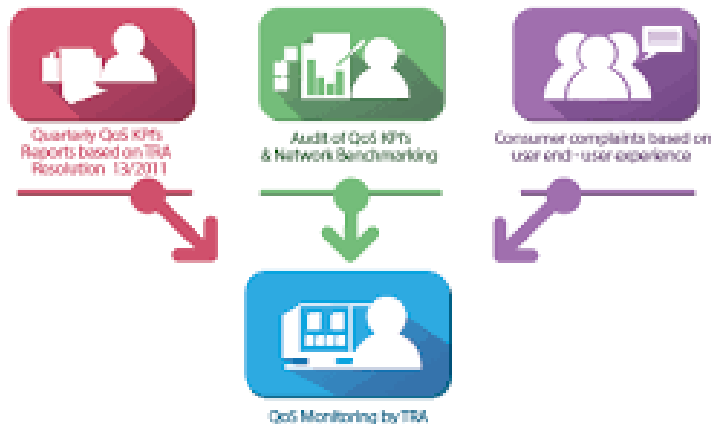
UNITING AVIATION

NO COUNTRY LEFT BEHIND



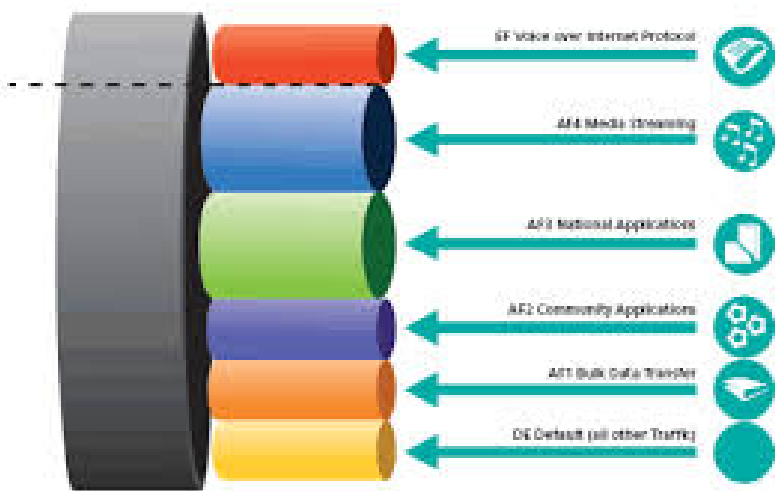
## DEFINITION OF PARAMETERS CONTRIBUTING TO QUALITY OF SERVICES

- ✈ Availability
- ✈ Continuity
- ✈ Reliability





## DEFINITION OF PARAMETERS CONTRIBUTING TO QUALITY OF SERVICES



- ✈ Update rate
- ✈ Integrity (system)
- ✈ Integrity (data)
- ✈ Coverage



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



# PERFORMANCE-RELATED ISSUES

- ✈ It should be verified that a surveillance system meets the requirements prior to being put into operational service. The environment in which the system operates can change over time. For example, the coverage may be impacted by new obstructions, or traffic density may increase. Also, some components may degrade over time. It is therefore important to put measures in place to ensure continued compliance to performance requirements. Examples of such measures are:
  - ✈ periodically verifying the performance of the system. The initial verification testing can be used as a baseline to compare against; or
  - ✈ ensuring that the surveillance system has sufficient built-in tests and external monitoring features to continuously demonstrate that the performance requirements are being met.





ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



# ATC SYSTEM VALIDATION

## Safety Assessment Guidelines

- ✈ To meet system integrity requirements, States should conduct a validation process that confirms the integrity of their equipment and procedures. Such processes shall include:
  - ✈ system safety assessment for new implementations is the basis for definitions of system performance requirements. Where existing systems are being modified to utilize additional services, the assessment demonstrates that the ATS Provider's system will meet safety objectives;
  - ✈ Integration test results confirming interoperability for operational use of airborne and ground systems; and
  - ✈ Confirmation that the ATS Operation Manuals are compatible with those of adjacent providers where the system is used across a common boundary.



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



# ATS System Integrity

- ✈ With automated ATM systems, data changes, software upgrades, and system failures can affect adjacent units. States shall ensure that:
  - ✈ Procedure to manage any changes to the system;
  - ✈ Aircrew, aircraft operating companies and adjacent ATSU(s) are notified of any planned system changes in advance
  - ✈ ATSUs have verification procedures in place to ensure that following any system changes, displayed data is both correct and accurate
  - ✈ ADS-B surveillance data is provided with equal to or better level of protection and security than existing surveillance radar data.



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



# SDP SYSTEMS

- ✈ Aeronautical surveillance systems often include a number of sources (e.g. PSR, SSR and ADS-B), each of which provides data to a processing system. Once aircraft information is received from the various sensors, it needs to be processed by SDP systems and passed onto the display systems used by air traffic controllers.
- ✈ A number of aircraft tracking schemes are used in SDP systems, including mosaic tracking, track fusion and position report fusion systems



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



### ***Short Term Conflict Alert (STCA)***

This element is intended to assist the controller, in an effective manner, in preventing collision between aircraft by generating, in a timely manner, an alert of a potential or actual infringement of separation minima. STCA must alert when the separation provision layer has been compromised but must also provide sufficient warning time to allow for corrective action, i.e. ideally avoiding that an Airborne Collision Avoidance System (ACAS) resolution advisory will be generated when the geometry of the situation permits this. In some environments this necessitates the use of separation minima in STCA that are significantly lower than the separation minima used in the separation provision layer. STCA is only effective when each alert causes the controller to immediately assess the situation and if necessary take appropriate action.

Compatibility between ACAS and STCA has to be ensured through the procedures

### ***Area Proximity Warning (APW)***

This element is intended to warn the controller, in an effective manner, about unauthorised penetration of an airspace volume by generating, in a timely manner, an alert of a potential or actual infringement of the required spacing to that airspace volume. APW can be used to protect static, fixed airspace volumes (e.g. danger areas) but increasingly also dynamic, modular airspace volumes to enable flexible use of airspace.



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



### ***Minimum Safe Altitude Warning (MSAW)***

This element is intended to warn the controller, in an effective manner, about increased risk of controlled flight into terrain accidents by generating, in a timely manner, an alert of aircraft proximity to terrain or obstacles. MSAW is only effective when each alert causes the controller to immediately assess the situation and if necessary take appropriate action.

### ***Approach Path Monitor (APM)***

This element, generally associated with MSAW, is intended to warn the controller, in an effective manner, about increased risk of controlled flight into terrain accidents by generating, in a timely manner, an alert of aircraft proximity to terrain or obstacles during final approach. APM is only effective when each alert causes the controller to immediately assess the situation and if necessary take appropriate action.



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



# Integration test

- ✈ States should conduct trials with suitably equipped aircraft to ensure they meet the operational and technical requirements to provide an ATS. Alternatively, they may be satisfied by test results and analysis conducted by another State or organization deemed competent to provide such service. Where this process is followed, the tests conducted by another State or organization should be comparable





ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



Doc 9924

Aeronautical Surveillance Manual

Second Edition, 2017



Agreement by endorsement under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION

## GUIDANCE FOR AUTOMATIC DEPENDENT SURVEILLANCE

- ✈ DOC. 9924: AERONAUTICAL SURVEILLANCE MANUAL
- ✈ Appendix P— BROADCAST (ADS-B) FLIGHT TESTING GUIDANCE MATERIALS FOR ADS-B FLIGHT TESTING



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



# SYSTEM MONITORING

- ✈ During the initial period of implementation of ADS-B technology, routine collection of data is necessary in order to ensure that the system continues to meet or exceed its performance, safety and interoperability requirements, and that operational service delivery and procedures are working as intended. The monitoring program is a two-fold process. Firstly, summarised statistical data should be produced periodically showing the performance of the system. This is accomplished through ADS-B Periodic Status Reports. Secondly, as problems or abnormalities arise, they should be identified, tracked, analyzed and corrected and information disseminated as required, utilizing the ADS-B Problem Report.





ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



# ADS-B problem reports

- ✈ Problem reports may originate from many sources, but most will fall within two categories; reports based on observation of one or more specific events, or reports generated from the routine analysis of data. The user would document the problem, resolve it with the appropriate party and forward a copy of the report to the PRS for tracking and distribution. While one occurrence may appear to be an isolated case, the receipt of numerous similar reports by the PRS could indicate that an area needs more detailed analysis.



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



# LOCAL DATA RECORDING AND ANALYSIS

## Data recording

- ✈ It is recommended that ATS Providers and Communication Service Providers retain the records defined below for at least 30 days to allow for accident/incident investigation processes. These records should be made available on request to the relevant State safety authority. Where data is sought from an adjacent State, the usual State to State channels should be used. These recordings shall be in a form that permits a replay of the situation and identification of the messages that were received by the ATS system.



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



# Avionics problem identification and correction

- ✈️ ATS providers need to develop systems to :
  - ✈️ detect ADS-B avionics anomalies and faults
  - ✈️ advise the regulators and where appropriate the aircraft operators on the detected ADS-B avionics anomalies and faults
  - ✈️ devise mechanisms and procedures to address identified faults
  - ✈️ Regulators need to develop and maintain systems to ensure that appropriate corrective actions are taken to address identified faults.



ICAO

UNITING AVIATION

NO COUNTRY LEFT BEHIND



Questions?