ADS-B IMPLEMENTATION AND STATUS OF CAR ANSP AUTOMATED SYSTEM

Automatic Dependent Surveillance – Broadcast (ADS-B) Implementation Meeting (ADS-B/IMP)
Mexico City, Mexico, 27-29 April 2015
OUTLINE

• ADS-B/MLAT implementation
• Regional CAR/SAM ADS-B Implementation Guidance
• Operational Scenario for the CAR Region
• ANSPs ADS-B Data Processing capabilities
ADS-B/MLAT implementation

- Operational implementation of data link-based surveillance.
- The implementation of equipment to allow traffic information to be displayed in aircraft supporting implementation of conflict prediction and collaboration between flight crew and the ATM system.
- Improve situational awareness in the cockpit by making available electronic terrain and obstacle data of required quality.
Implementation of surveillance systems for surface movement at aerodromes where weather conditions and capacity warrant will also enhance safety and efficiency. Improved flight efficiency and increased capacity result from reduction in separation minima and an enhancement of safety.

- Surveillance to areas where there is no primary or secondary radar
- In airspaces where radar is used, enhanced surveillance can bring further reductions in aircraft separation minima
- In high traffic density areas, improved flight efficiency and increased capacity lead to enhanced safety levels.

Implementation of surveillance systems for surface movement at aerodromes where weather conditions and capacity warrant will also enhance safety and efficiency while implementation of cockpit display of traffic information and associated procedures will enable pilot participation in the ATM system ADS-B can be used to enhance traffic surveillance in domestic airspace.
ADS-B/MLAT implementation

ICAO Aeronautical Surveillance Systems Doc 9924
Chap 7 Surveillance system deployment considerations

STEPS RECOMMENDED FOR PLANNING AND IMPLEMENTATION OF SURVEILLANCE SYSTEMS

a) Define the operational requirements:
   • Select applications to be supported
   • Define area of coverage
   • Define the type of traffic

b) Define local environment (current and future):
   • Current and expected future traffic densities
   • Route structure
   • Type of airborne equipage currently mandated for the different types of flights
   • Type of aircraft
   • Segregation between the different types of traffic
   • Specific local RF environment.
c) Analyse design options and determine which techniques can be used
   • existing surveillance sensors may be re-used
   • new surveillance sensors and techniques may be deployed at lowest cost
   • the number of sites and investigate their availability
   • the level of redundancy required and fall-back mode of operation
   • whether new airborne equipment carriage will be necessary
   • impact on operational procedure;
   • cost-benefit studies and feasibility analyses

d) Make a safety analysis of the new proposed system:
   • To demonstrate that the system will provide the necessary performance
     in its nominal mode of operation;
   • To demonstrate that the different failures have been analysed;
   • To demonstrate that they have been found to be either acceptable or can
     be mitigated.
ADS-B/MLAT implementation

e) Implement:
   • If new airborne equipment is required, then prepare airborne carriage mandate
   • Procure and install the new system
   • Evaluate the performance of the new system

f) Establish operational service
   • Transition from existing system to the new system

f) Deliver operational service
   • Periodically verify the performance of the new system
   • Conduct regular and preventive maintenance.
CONSIDERATIONS:

a) an adequate level of protection against common mode failures

b) fallback surveillance system and/or some operational procedures to accommodate the loss of the GNSS function in an individual aircraft (e.g. due to an equipment malfunction) would be required

c) the possibility of the loss of the GNSS function over an extended area (e.g. due to interference effects on GNSS operation) should be taken into account

d) Validation of the reported ADS-B position

e) The performance of a surveillance system for a given area and an operational scenario should be specified by the responsible authority. Depending upon the particular airspace and the application, this may imply the need to continue to retain a certain level of SSR operation during the transition period.
Regional CAR/SAM ADS-B Implementation Guidance

It is envisaged that the use of ADS/ADS-B will gradually increase, especially in areas where the provision of radars is not practical or economical. Planning and implementation of ADS: CAR/SAM States, in coordination with airspace users, should consider the implementation of ADS for providing surveillance in areas in which the provision of radar is not feasible or economical.
Regional CAR/SAM ADS-B Implementation Guidance

ACTIVITIES TO BE CONSIDERED FOR ADS B TRIAL

**Planning Function**

- ✓ develop a Concept of Operations (CONOPS): scope, the operational requirements, kind of service will be provided in the trial area, the complete schedule to perform the actions required, and the issues that have to be addressed (e.g. efficiency improvement, fuel savings, capacity enhancement, etc.)
- ✓ All stakeholders should be identified and brought to the program by promoting some user and customer conferences, to discuss the contents of the CONOPS and present the benefits of new technologies.
- ✓ It is also important to have some Airline candidates to commit and be part of the program from the beginning.
# Regional CAR/SAM ADS-B Implementation Guidance

## ACTIVITIES TO BE CONSIDERED FOR ADS B TRIAL

<table>
<thead>
<tr>
<th>EXPECTED CRITERIA</th>
<th>TEST PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ The migration to ADS-B environment should be cost effective</td>
<td>✓ Update rate of the prototype on the designated airspace (en-route, TMA, ground);</td>
</tr>
<tr>
<td>✓ The use of the new technology must provide safety benefit</td>
<td>✓ accuracy of the system should be evaluated by comparison with a known legacy system (e.g. secondary radars);</td>
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<tr>
<td>✓ The trial must be concluded in a reasonable time frame</td>
<td>✓ Performance of the system should be monitored, in terms of NUC/NIC/NAC;</td>
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<tr>
<td>✓ The ANSPs must get full commitment from users and regulators before the beginning of activities</td>
<td>✓ Probability of reception should also be measured over a very large sampling of flights;</td>
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<tr>
<td>✓ It is important to have some radar coverage (at least partial) over the trial area to validate ADS-B position reports</td>
<td>✓ Flight ID sent by any aircraft;</td>
</tr>
<tr>
<td>✓ A performance baseline for the designated areas of trials (e.g. existing routes) should be established to make future comparisons possible</td>
<td>✓ Overall service availability must be measured and determined Anomalies of all types shall be recorded and analyzed.</td>
</tr>
<tr>
<td>✓ A Cost Benefit analysis (CBA) should be performed for the customers by the ANSP</td>
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<tr>
<td>✓ Data collection should be performed and a safety case based on that data should be presented to Regulators.</td>
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Regional CAR/SAM ADS-B Implementation Guidance

ACTIVITIES TO BE CONSIDERED FOR ADS-B TRIAL

TRIAL LIMITATIONS

✓ should be limited to ADS-B only;
✓ validate the performance of the existing communication infrastructure;
✓ Monitor spectrum within the trial area: frequency 1090MHz won’t be affected for the legacy systems that are currently deployed;
✓ It is desirable to have a monitoring system for the health of the GPS constellation to validate its performance during the test event.

RESULTS DISSEMINATION

During the trial processes, a dedicated team should be assigned to collect, organize and analyze data that will be used to write a complete report of the ADS-B trial results.
OPERATIONAL SCENARIO FOR CAR REGION

- Radar Coverage in main Traffic Flows
- Radar Data Sharing/exchange
- Mode S Radar implementation
- Regional telecommunication Networks:
  - MEVA II
  - E/CAR AFS Network
  - Central American Network (Vsat and Terrestrial)
  - MEVA II/REDDIG/ E.CAR AFS Interconnection
Radar Coverage in main Traffic Flows

OPERATIONAL SCENARIO FOR CAR REGION
Radar Coverage in main Traffic Flows

Operational Scenario for CAR Region
OPERATIONAL SCENARIO FOR CAR REGION
## OPERATIONAL SCENARIO FOR CAR REGION

### Radar Data Sharing/exchange

- Within Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, COCESNA)
- Mexico / Central America
- Mexico / Cuba
- Mexico / USA
- Cuba/ Central America/ Jamaica/
- French Antilles / Saint Lucia / Barbados/ Trinidad & Tobago
- Planned: Jamaica/ Central America,, Radar Data Server in E/CAR, Dominican Republic/Curacao, ...

### Mode S Radar implementation:

- 7 SSR Mode S Radar in Central America
- 1 SSR Mode S in Trinidad and Tobago
- 2 SSR Mode S in Bahamas
- Mode S - IC Regional Register
OPERATIONAL SCENARIO FOR CAR REGION

Regional telecommunication Networks
## ANSPs ADS-B Data Processing capabilities

<table>
<thead>
<tr>
<th>ANSP</th>
<th>Status</th>
<th>Remark</th>
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<tbody>
<tr>
<td>Anguilla</td>
<td>NIL</td>
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<tr>
<td>Antigua and Barbuda</td>
<td>NIL</td>
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<tr>
<td>Aruba</td>
<td>Implemented</td>
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<tr>
<td>Bahamas</td>
<td>New ATC Automated System implemented 1 Q of 2015. Mode S radar data processing</td>
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</tr>
<tr>
<td>Barbados</td>
<td>Radar Data Processor only</td>
<td>RDP to be updated for ADS-B Data processing</td>
</tr>
<tr>
<td>Belize</td>
<td>Radar Data Processor available</td>
<td>RDP to be updated for ADS-B Data processing</td>
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<tr>
<td>British Virgin Islands</td>
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<tr>
<td>Canada</td>
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<tr>
<td>Cayman Islands</td>
<td>Radar Data Processor available</td>
<td>RDP to be updated for ADS-B Data processing</td>
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<tr>
<td>COCESNA</td>
<td>Implemented</td>
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<tr>
<td>Costa Rica</td>
<td>Radar Data Processor available</td>
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<tr>
<td>Curacao</td>
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<td>Dominica</td>
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<td>Dominican Republic</td>
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<td>El Salvador</td>
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<td>Grenada</td>
<td>NIL</td>
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<td>Guatemala</td>
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<tr>
<td>French Antilles</td>
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<tr>
<td>Haiti</td>
<td>NIL</td>
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<tr>
<td>Honduras/San Pedro Sula</td>
<td>Radar Data Processor available</td>
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<td>Jamaica</td>
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<td>Mexico</td>
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<td>Montserrat</td>
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<tr>
<td>Netherlands (BES Islands)</td>
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<td>Nicaragua</td>
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<td>Saint Kitts and Nevis</td>
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<td>Saint Lucia</td>
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<tr>
<td>Saint Vincent and the Grenadines</td>
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