ICAO UNITING AVIATION

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.

ADS-B/MLAT implementation

ADS-B / MLAT

- reductions in separation minima and an enhancement of safety
- increase in capacity
- improved flight efficiency

COST-EFFECTIVE BASIS

- ✓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 improve the quality of surveillance information (ground/ air), increasing 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.

ADS-B/MLAT implementation

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

g) Deliver operational service

- Periodically verify the performance of the new system
- Conduct regular and preventive maintenance.

ADS-B/MLAT implementation

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

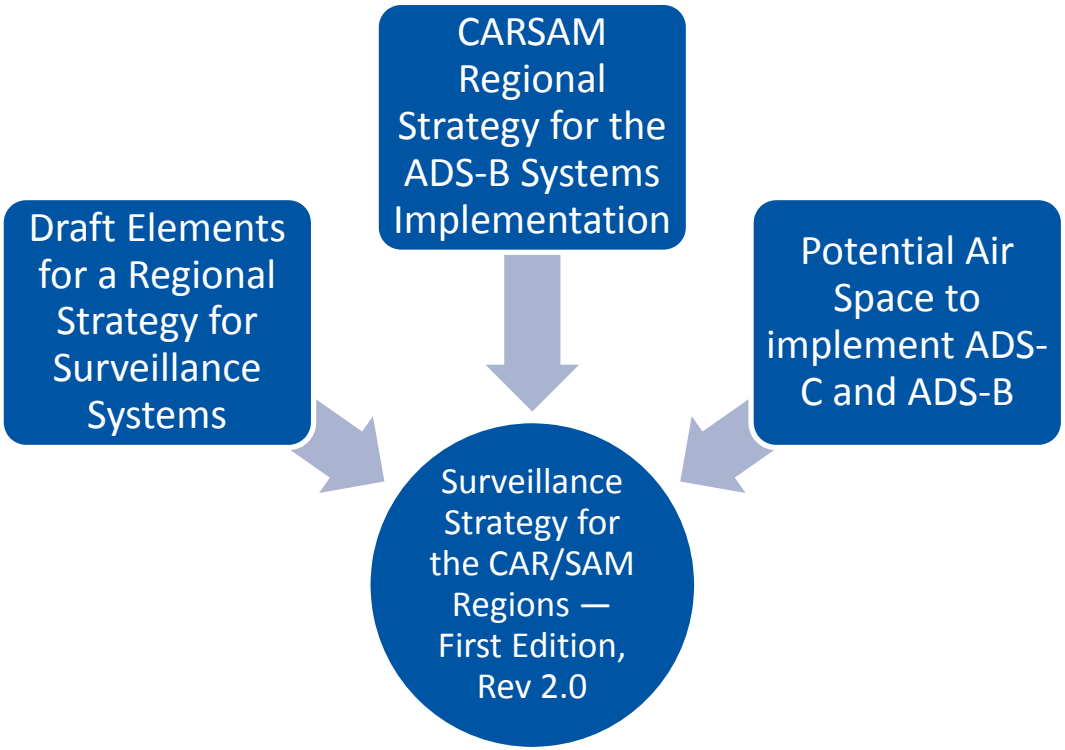
d) Validation of the reported ADS-B position

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

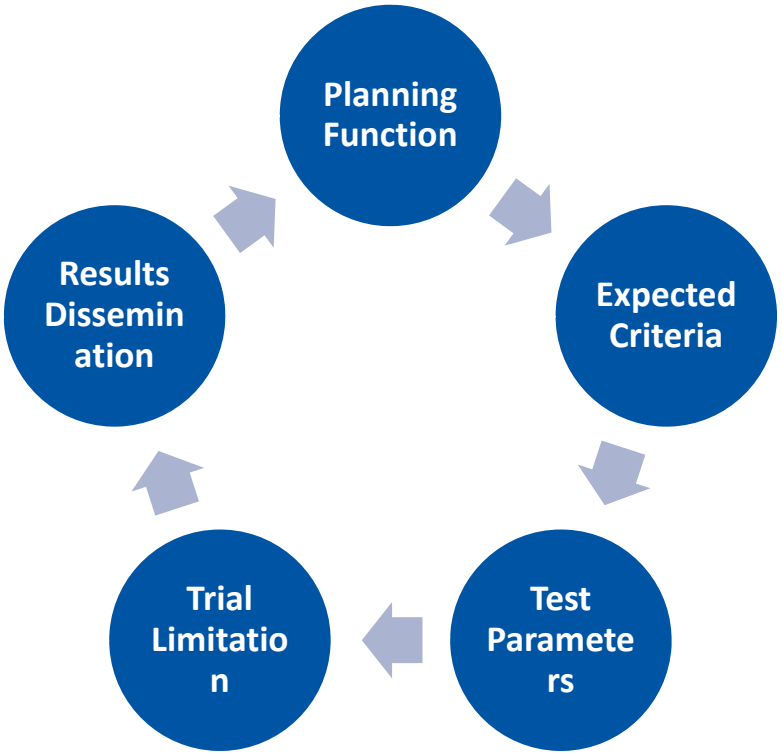
It is envisaged that the use of ADS/ADS-B will gradually increase, especially in areas where the provision of radars is not practical or economical.

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

EXPECTED CRITERIA

- ✓ The migration to ADS-B environment should be cost effective
- ✓ The use of the new technology must provide safety benefit
- ✓ The trial must be concluded in a reasonable time frame
- ✓ The ANSPs must get full commitment from users and regulators before the beginning of activities
- ✓ It is important to have some radar coverage (at least partial) over the trial area to validate ADS-B position reports
- ✓ A performance baseline for the designated areas of trials (e.g. existing routes) should be established to make future comparisons possible
- ✓ A Cost Benefit analysis (CBA) should be performed for the customers by the ANSP
- ✓ Data collection should be performed and a safety case based on that data should be presented to Regulators.

TEST PARAMETERS

- ✓ Update rate of the prototype on the designated airspace (en-route, TMA, ground);
- ✓ accuracy of the system should be evaluated by comparison with a known legacy system (e.g. secondary radars);
- ✓ Performance of the system should be monitored, in terms of NUC/NIC/NAC;
- ✓ Probability of reception should also be measured over a very large sampling of flights;
- ✓ Flight ID sent by any aircraft ;
- ✓ Overall service availability must be measured and determined Anomalies of all types shall be recorded and analyzed.

Regional CAR/SAM ADS-B Implementation Guidance

ACTIVITIES TO BE CONSIDERED FOR ADS B TRIAL

TRIAL LIMITATIONS

- ✓should be limited to ADS-B out 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

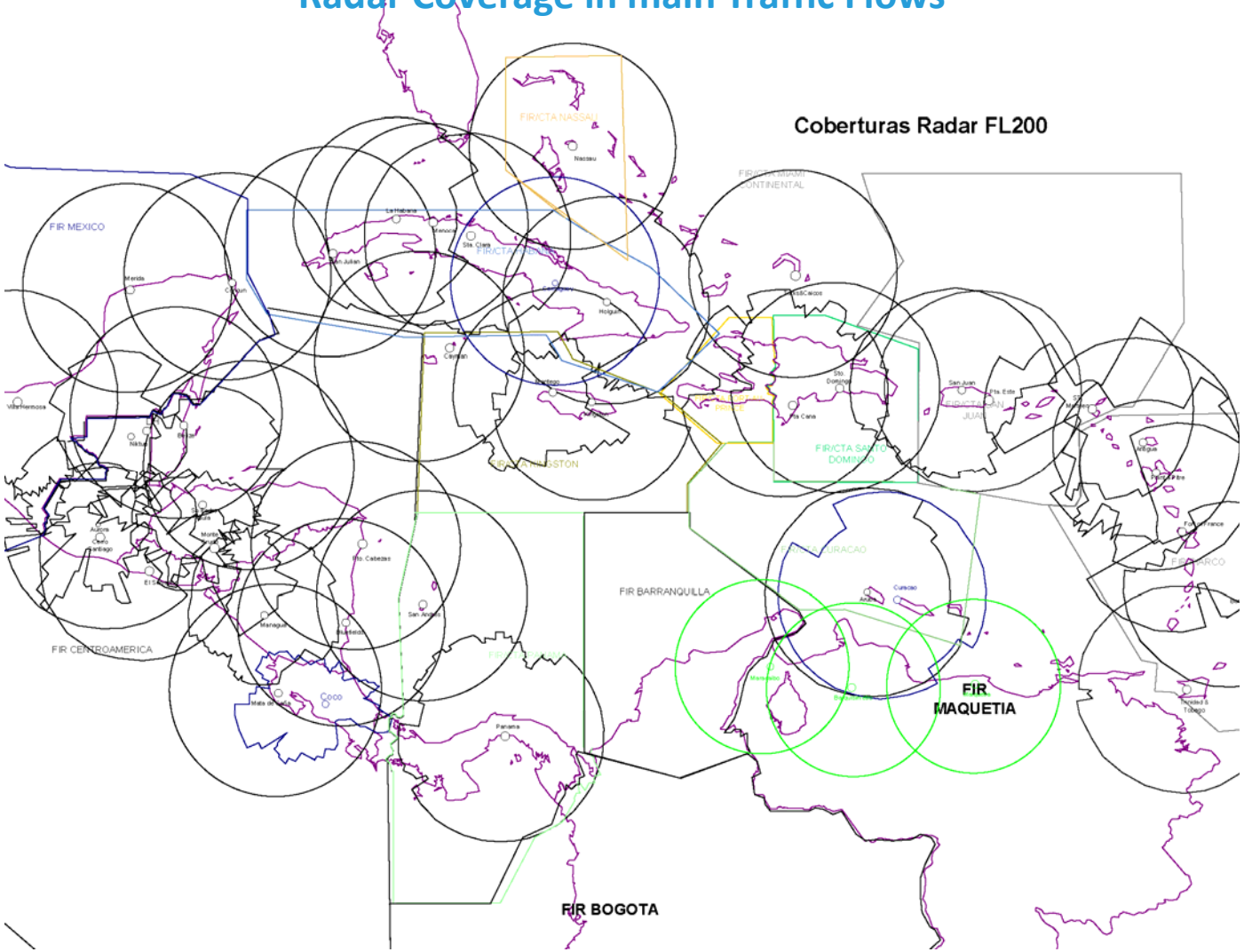
During the trial processes, a dedicated team should be assigned to collect, organize and analyze data that will be used to write a complete report of the ADS-B trial results

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

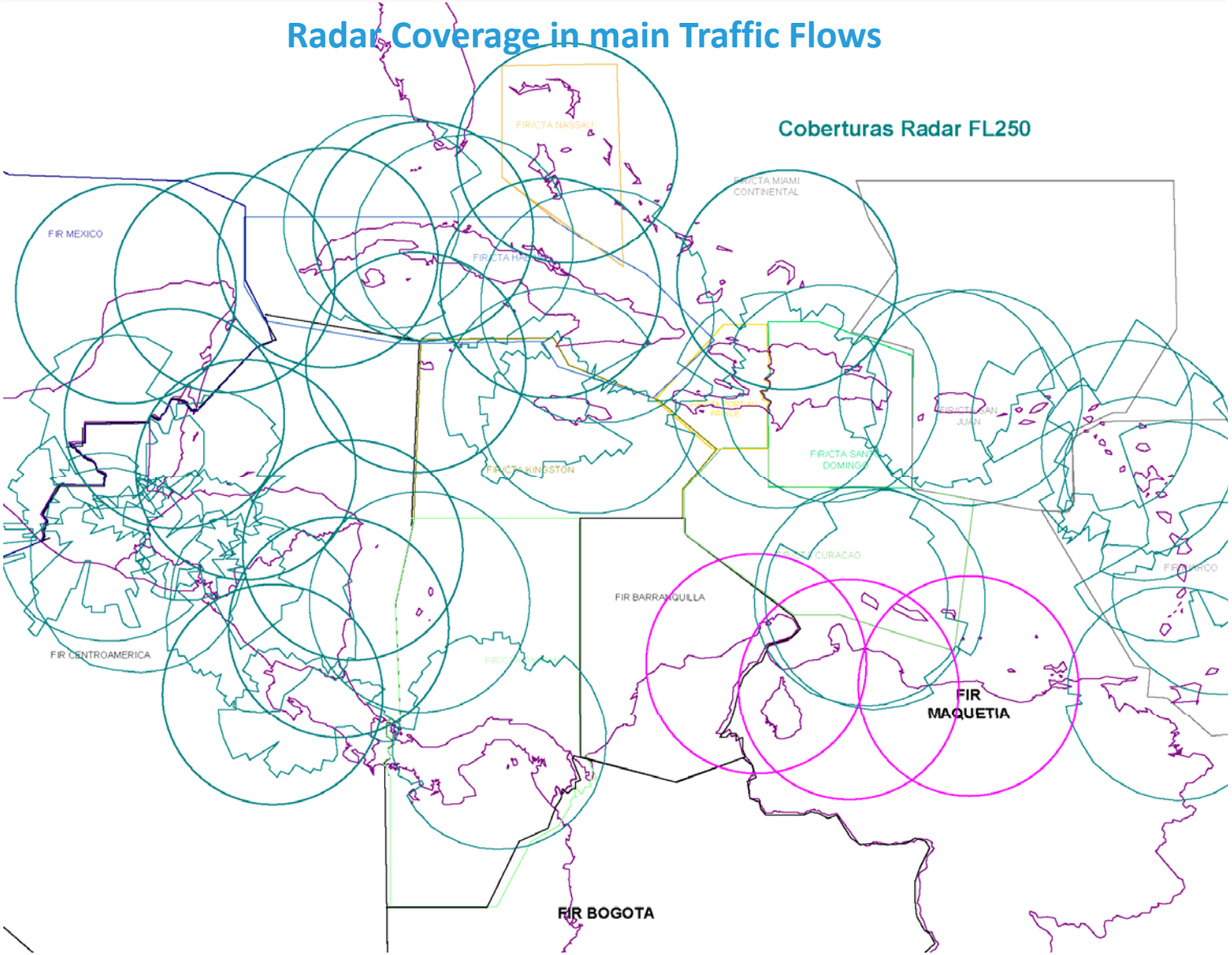
OPERATIONAL SCENARIO FOR CAR REGION

Radar Coverage in main Traffic Flows



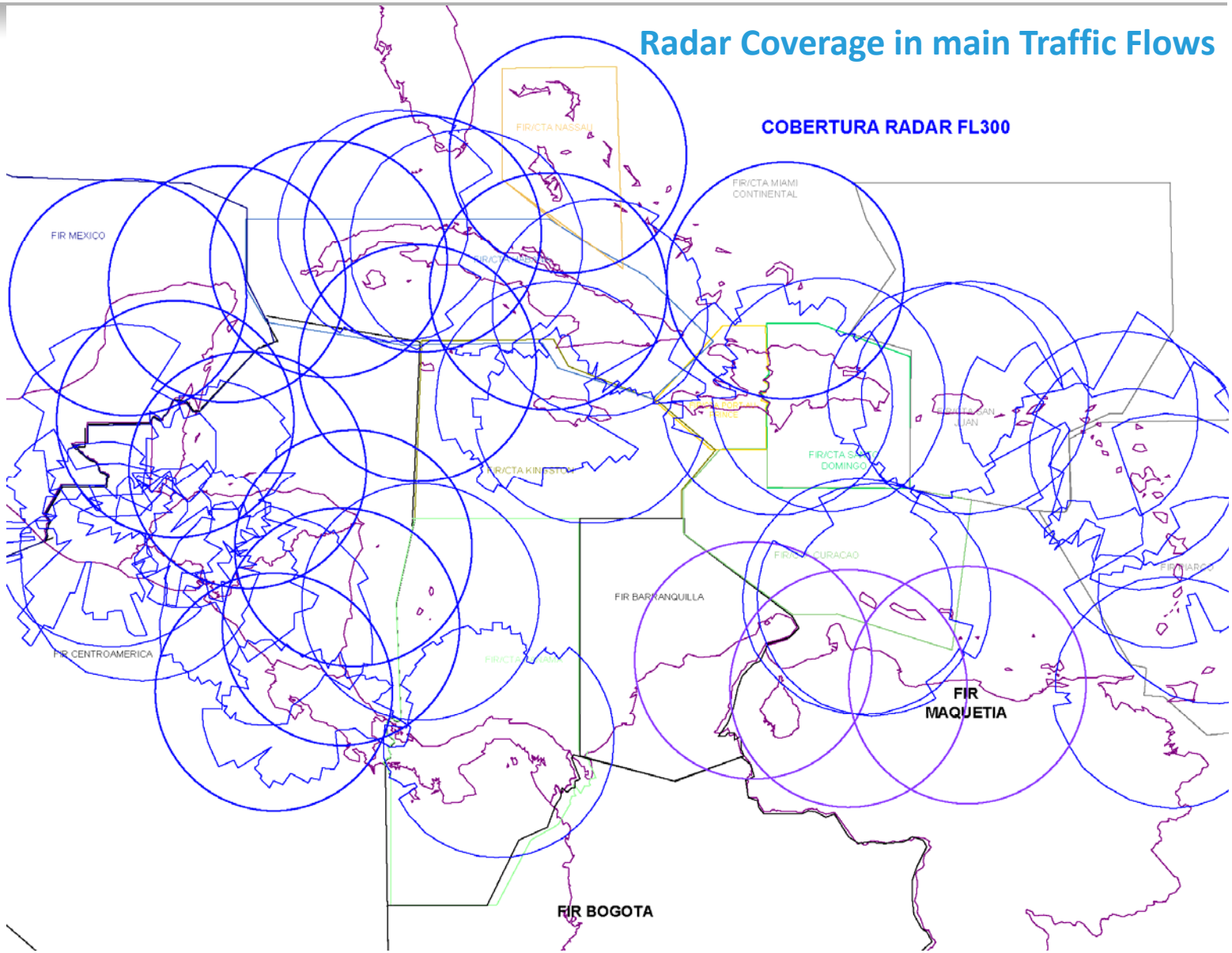
OPERATIONAL SCENARIO FOR CAR REGION

Radar Coverage in main Traffic Flows



OPERATIONAL SCENARIO FOR CAR REGION

Radar Coverage in main Traffic Flows



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

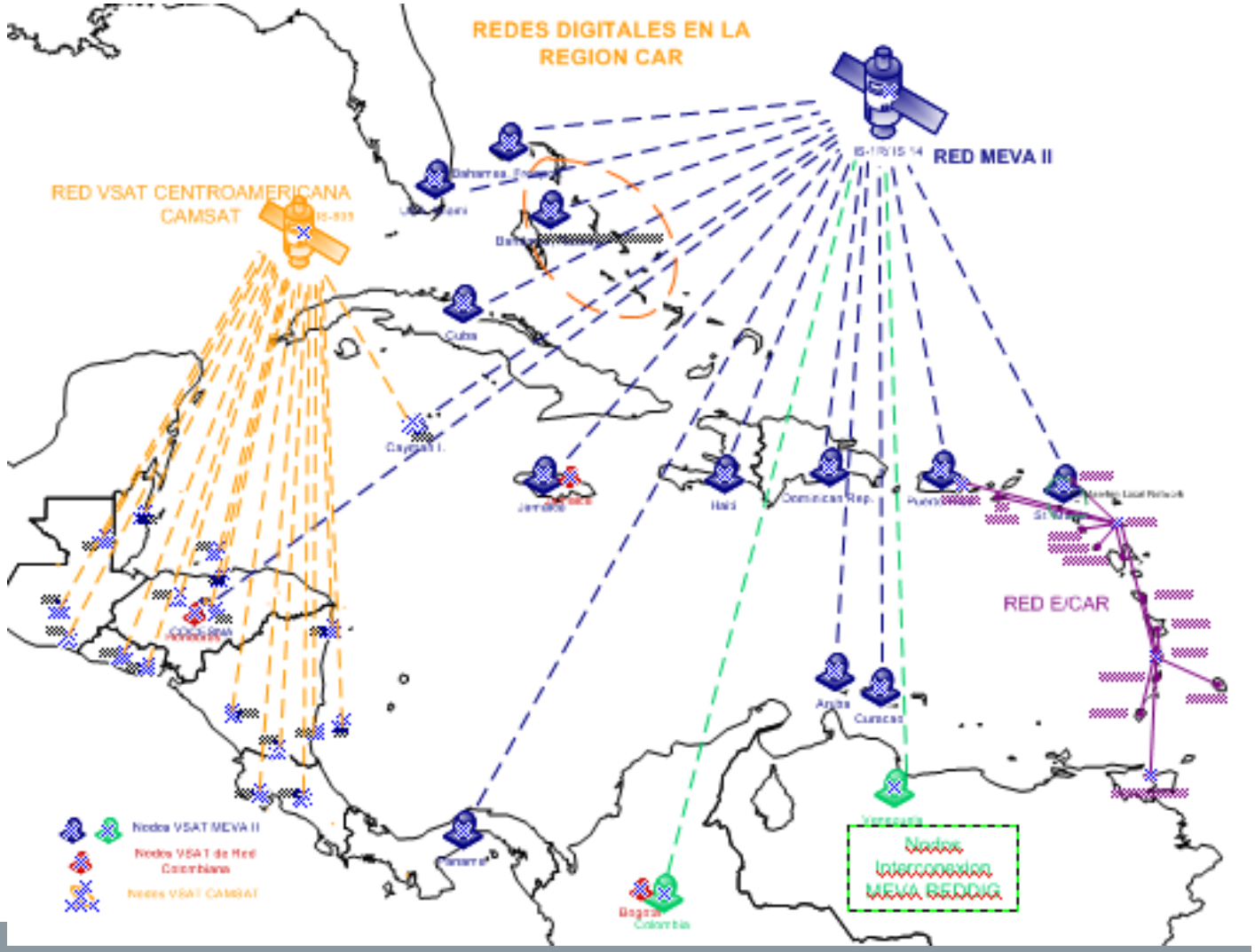
✓1 SSR Mode S in Trinidad and Tobago

✓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

ANSP	Status	
	ATC Automated System – Surveillance Data Processor	Remark
Anguilla	NIL	
Antigua and Barbuda	NIL	
Aruba	Implemented	
Bahamas	New ATC Automated System implemented 1 Q of 2015.	Mode S radar data processing
Barbados	Radar Data Processor only	RDP to be updated for ADS-B Data processing
Belize	Radar Data Processor available	RDP to be updated for ADS-B Data processing
British Virgin Islands	NIL	
Canada	Implemented	
Cayman Islands	Radar Data Processor available	RDP to be updated for ADS-B Data processing
COCESNA	Implemented	
Costa Rica	Radar Data Processor available	RDP to be updated for ADS-B Data processing
Cuba	Implemented	

ANSPs ADS-B Data Processing capabilities

Curacao	Radar Data Processor available	RDP to be updated for ADS-B Data processing
Dominica	NIL	
Dominican Republic	Implemented	
El Salvador	Implemented	
Grenada	NIL	
Guatemala	Implemented	
French Antilles	Implemented	
Haiti	NIL	
Honduras/San Pedro Sula	Radar Data Processor available	RDP to be updated for ADS-B Data processing
Jamaica	Implemented	
Mexico	Implemented	
Montserrat	NIL	
Netherlands (BES Islands)	NIL	
Nicaragua	Implemented	
Saint Kitts and Nevis	NIL	
Saint Lucia	NIL	
Saint Vincent and the Grenadines	NIL	
Sint Maarten	Implemented	
Trinidad and Tobago	Implemented	
Turks and Caicos	Radar Data Processor available	RDP to be updated for ADS-B Data processing

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THANK YOU