Automatic Dependent Surveillance – Broadcast (ADS-B)

Implementaion & Regulation Meeting for the NAM/CAR/SAM Regions (ADS-B/LEG)

Mexico City (Mexico) 26th - 30th November 2018

LEONARDO
SECURITY & INFORMATION SYSTEMS

1948 • 2018

Our Business

Leonardo is a global high-tech company and one of the key actors in Aerospace, Defence and Security worldwide.

DIVISIONS

- **Helicopters**
- **Aircraft**
- **Aerostructures**
- **Airborne & Space Systems**
- **Land & Naval Defence Electronics**
- **Defence Systems**
- **Security & Information Systems**

SUBSIDIARIES AND JOINT VENTURES

- **Leonardo DRS** (100% Leonardo)
- **Telespazio** (67% Leonardo and 33% Thales)
- **Thales Alenia Space** (67% Thales and 33% Leonardo)
- **MBDA** (37.5% BAE Systems, 37.5% Airbus Group, 25% Leonardo)
- **ATR** (50% Leonardo and 50% Airbus Group)
- **Avio** (28%)
- **Elettronica** (31.33%)

Air Traffic Management portfolio

Surveillance

A wide range of products covering PSR, MSSR, SMR, ADS-B, Multilateration including transportable solution

Air Traffic Management

Reliable, expandable and integrated command and control with capability of system architecture for state of art systems. Backup, Disaster & Recovery, Simulator and transportable systems complete the offer

Ground to air voice and data multi-mode communication systems, as well as datalink and AEROMACS broadband ground datalink

Communication

Navigation Aids and Weather Radar

Complete line of ground-based radio navigation and landing aids including DVOR, DME and ILS. Design, manufacture and installation of weather radar sensors and systems.

Security by design assured on all the products delivered and services for cyber prevention and analysis provided by State-of-art Security Operational Center

Cyber ATM

UTM

Unmanned Traffic Management for surveillance of U-Space with new technology and traffic management concept

References in the ATM/Airport sector

OVER 300 SYSTEMS IN OPERATIONS

- ALBANIA
- ALGERIA
- ANTIGUA
- ARGENTINA
- AUSTRALIA
- AUSTRIA
- BAHAMAS
- BAHRAIN
- BARBADOS
- BELARUS
- BELGIUM
- BELIZE
- BOLIVIA
- BOTSWANA
- BRASIL
- BULGARIA
- CAMBODIA
- CAMEROON
- CANADA
- CAPE VERDE
- CHILE
- CIAD
- COLOMBIA
- CONGO
- COSTA RICA
- CROATIA
- CYPRUS
- CZECH REP.
- DENMARK
- DOMINICAN REP.
- ECUADOR
- EGYPT
- ESTONIA
- FINLAND
- FRANCE
- GEORGIA
- GHANA
- GERMANY
- GREECE
- GUADALOUPE
- GUAM MI
- GUATEMALA
- GUINEA BISSAU
- GUYANA
- HONDURAS
- HUNGARY
- INDIA
- INDONESIA
- IRAN
- IRAQ
- IRELAND
- ITALY
- JAMAICA
- JORDAN
- KOSOVO
- KUWAIT
- LATVIA
- LEBANON
- LIBERIA
- LUXEMBOURG
- MACEDONIA
- MALAWI
- MALAYSIA
- MALDIVES
- MALI
- MALTA
- MARTINIQUE
- MEXICO
- MOLDOVA
- MOROCCO
- MOZAMBIQUE
- MYANMAR
- NETHERLANDS
- NEW ZEALAND
- NICARAGUA
- NIGERIA
- NORWAY
- OMAN
- PAKISTAN
- PANAMA
- P. NEW GUINEA
- PARAGUAY
- PERU'
- PHILIPPINES
- POLAND
- PORTUGAL
- P.R. CHINA
- QATAR
- ROMANIA
- RUSSIA
- RWANDA
- SAUDIA ARABIA
- SENEGAL
- SINGAPORE
- SLOVAKIA
- SLOVENIA
- SOMALIA
- SOUTH AFRICA
- SOUTH KOREA
- SPAIN
- SRI LANKA
- SUDAN
- SWEDEN
- SWITZERLAND
- SYRIA
- TAIWAN
- THAILAND
- TOGO
- TRINIDAD & TOBAGO
- TUNISIA
- TURKEY
- UKRAINE
- U.A.E.
- UNITED KINGDOM
- U.S.A.
- URUGUAY
- UZBEKISTAN
- VENEZUELA
- VIETNAM
- YUGOSLAVIA
- ZAIRE
- ZAMBIA
- ZIMBABWE

Leonardo Key Points & Solutions

Mode S eXtended Squitter Capability (MXC)

- Leonardo has more than 20 years of experience in ADS–B Systems.
- To continuously meet International Standards (ICAO, EUROCAE, etc.) ***MXC*** is under constant maintenance.
- ***MXC*** is a CE Marked Product in accordance with RED 2014/53/UE specification.
- ***MXC*** Capabilities have continuously improved by:
  - internal company process;
  - participating to EU Research Program (SESAR).
- ***MXC*** is a scalable & open for different operational implementations:
  - ***Ground Station*** → Stand Alone solution;
  - ***Network of Ground Stations*** → Integrated solution;
  - ***Passive or Active*** Mode configuration.

Mode S eXtended Squitter Capability (MXC)

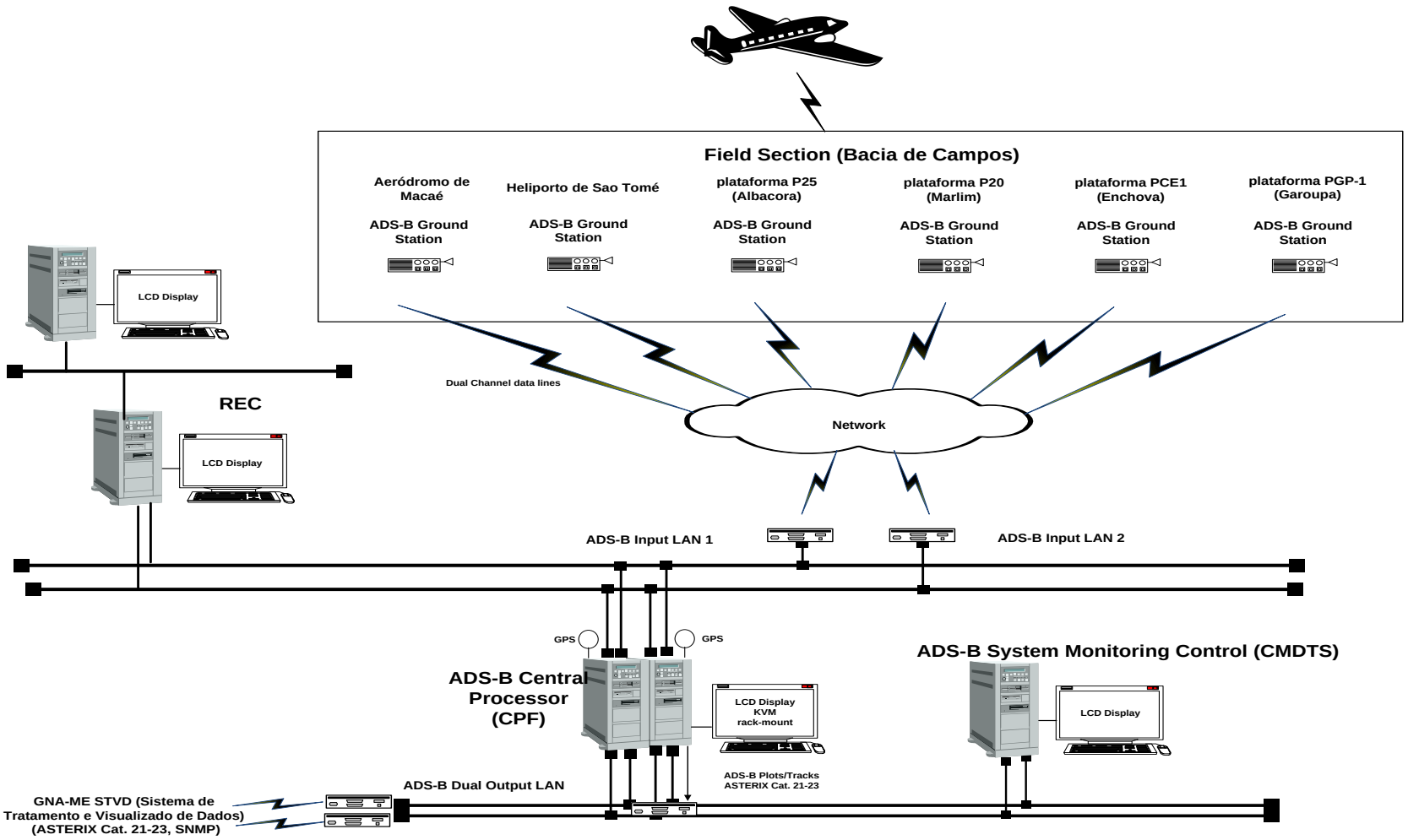
- Product Gen 04 is already on the market following a modernization process that:
  - Removed obsolescence;
  - Reduced number of LRU;
  - Improved Reliability, Maintainability & Availability;
  - Improved Processing Capacity;
  - Introduced Web Application for maintenance operator;
  - Developed Fully Outdoor Configuration with Pole Mount solution.
- Additional Gen 04 achievements:
  - Low Consumption Device (both active and passive < 500 W);
  - Solar Panel Solution Available;
  - Compact Configuration for Indoor and/or Outdoor installation;
  - Training Approach in Factory and/or on site based on CBT.

MXC Solutions

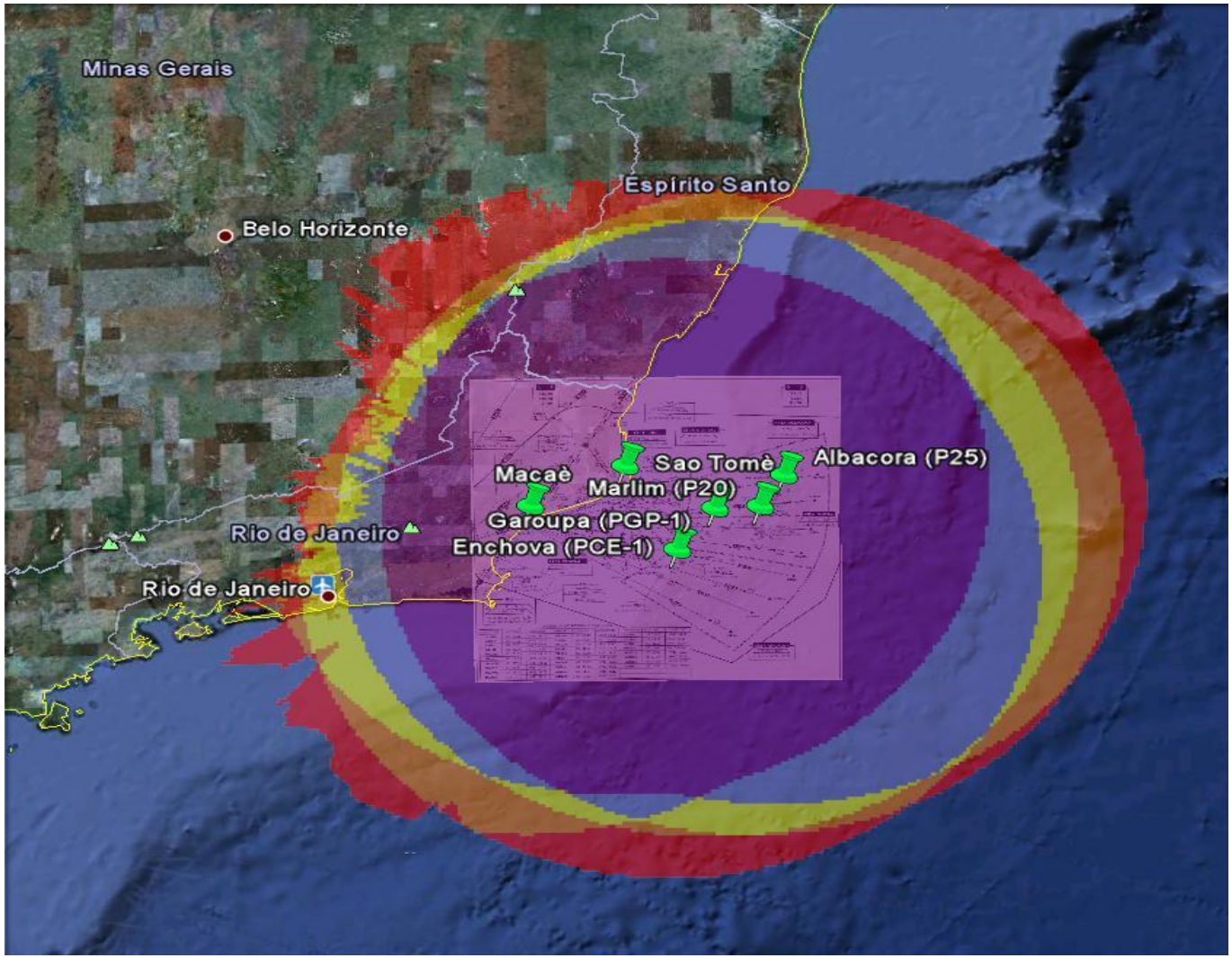
- **MXC** is an Unmanned Application ***Fully Remoted, Controlled & Monitored*** using SNMP Protocols.
- ***MXC*** is designed & developed to assure Safety and Security of Service.
- ***MXC*** allows a high level of flexibility & scalability that supports Customer needs during & after the Coverage Development.
- ***MXC*** is developed to provide WAM Coverage by means of SW Configuration maintaining the same HW Configuration.
- ***MXC*** Solution is compatible with several types of media convertors such as:
  - Dedicated metallic cable link;
  - Dedicated or shared optical fiber link;
  - Dedicated digital microwave link;
  - Wireless network;
  - Other available analog or digital communication network (e.g. VSAT).
- ***MXC*** provides integrated data for Output & Input Recording, Video Recording, Tracks Analysis & Playback.
- ***MXC*** is already integrated in ATM System (Leonardo and/or third company) using Asterix Data in a multi sensors scenario (i.e. PSR, SSR, SMR, MLAT).

ADS-B Notable Experience 1
Brazil Program

Bacia de Campos - Configuration

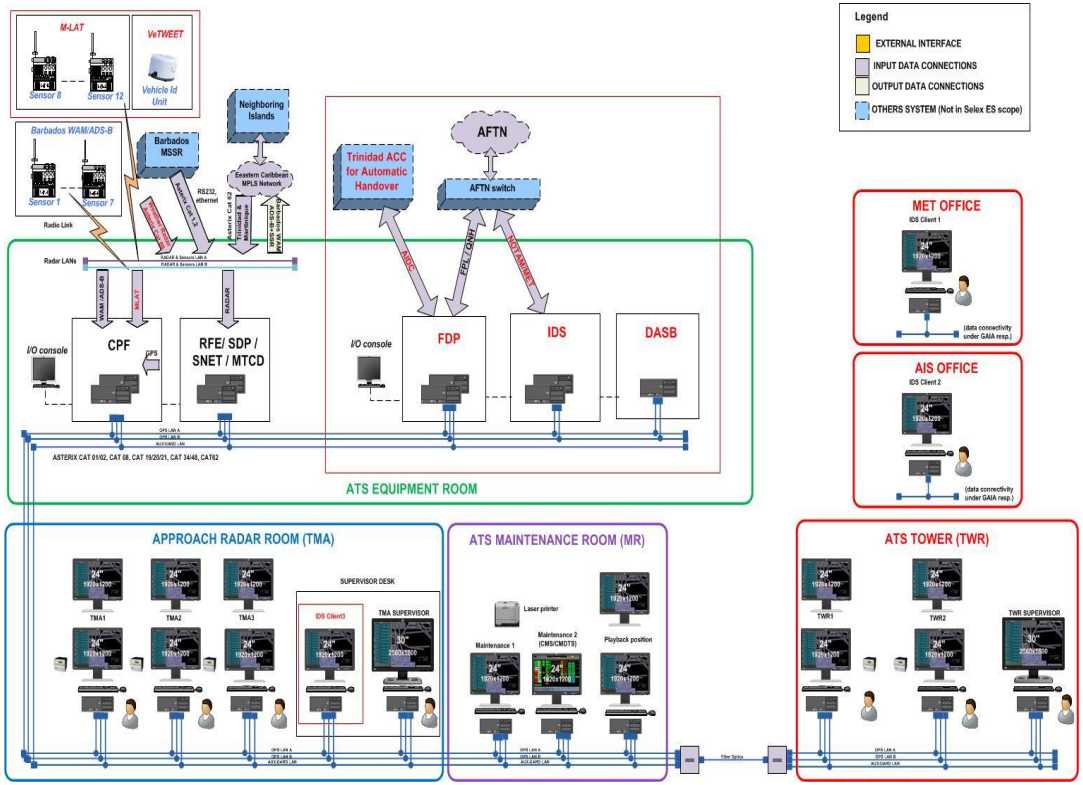


Bacia de Campos - Coverage



ADS-B Notable Experience 2
Barbados Program

Barbados ATM / WAM / MLAT / ADS-B System - Overview



The system is also ready for to the following interfaces:

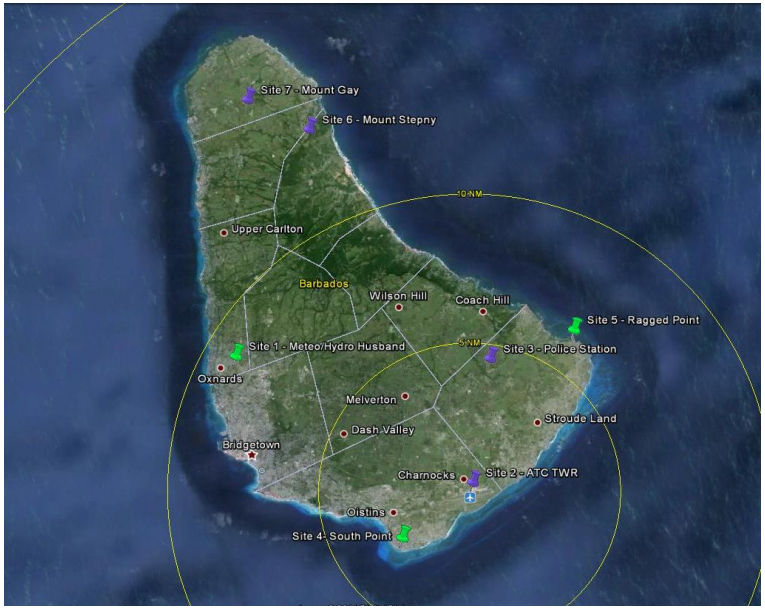
Flight Data: AFTN/AMHS, OLDI/AIDC, AUP/UUP, ADEXP
Meteo Data: QNH, GRIB, NOTAMs Messages MET/AIS (METAR, SPECI, TAF, SIGMET, ATIS, AIRMET, SNOWTAM, GAMET)
Air-Ground data link: ADS-C, CPDLC, DCL ACARS, ATN SITA, ARINC, ADCC FANS / ATN

Barbados **LeadInSky ATM System** offers an example for E-CAR System harmonisation and standardization.
The Barbados ATC system receives surveillance data from all the available sensors (MSSR, WAM/ADS-B, MLAT, Trinidad combined Multiradar data flow) and provides interoperability for regional (Radar) data sharing by providing a source for distribution over the Eastern Caribbean Multi-Protocol Label Switch (MPLS) Network to the neighbouring Trinidad ACC. The System implements the following data interfaces capabilities:

Surveillance Data:
Existing Barbados Dual Channel Raytheon MSSR – Asterix Cat 02
N. 7 WAM/ADS-B ground stations located at the available sites in Barbados, as reported during the site survey (Asterix Cat 19, 20/21);
Combined Radar data feed from neighbouring islands (Trinidad & Martinique) (Asterix Cat 62);
N. 5 MLAT ground station located at the available sites in Grantley Adams International Airport (Asterix Cat 19, 20/21);
The system is ready to receive Weather Radar data (Asterix Cat 08).

Implemented protocols:
Interface Ethernet IPv4 et IPv6;
UDP/ IP, TCP/IP;
RS232 synchronous data from Sunhillo RICI.

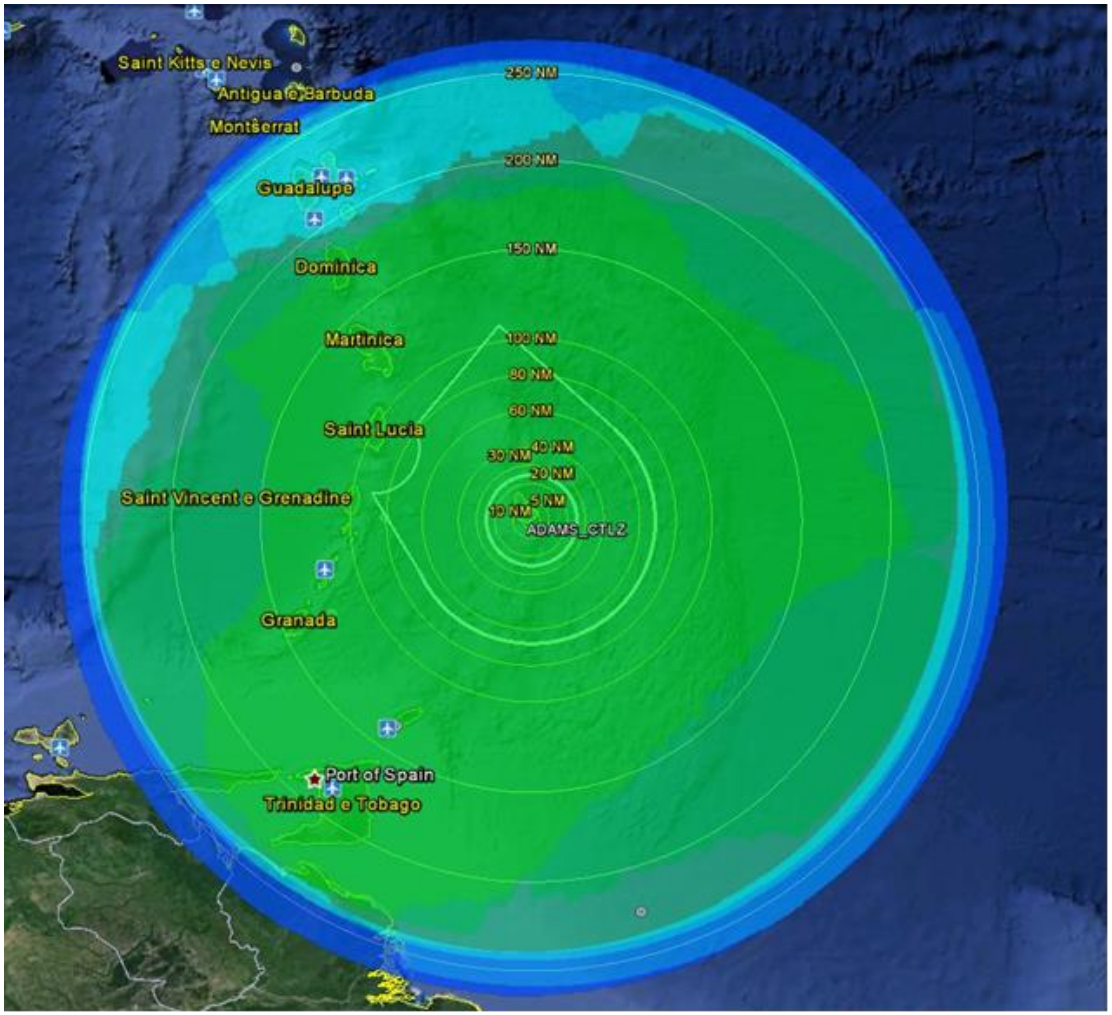
Barbados - Ground Stations Location



Surveillance Data:

- N. 7 WAM/ADS-B ground station (Asterix Cat 19, 20/21)
- N. 5 MLAT ground station located in Grantley Adams International Airport (Asterix Cat 19, 20/21)
- Implemented protocols:
  - Interface Ethernet IPv4 et IPv6;
  - UDP/ IP, TCP/IP;
  - RS232 synchronous data from Sunhillo RICI.

Barbados - Ground Station Coverage Example

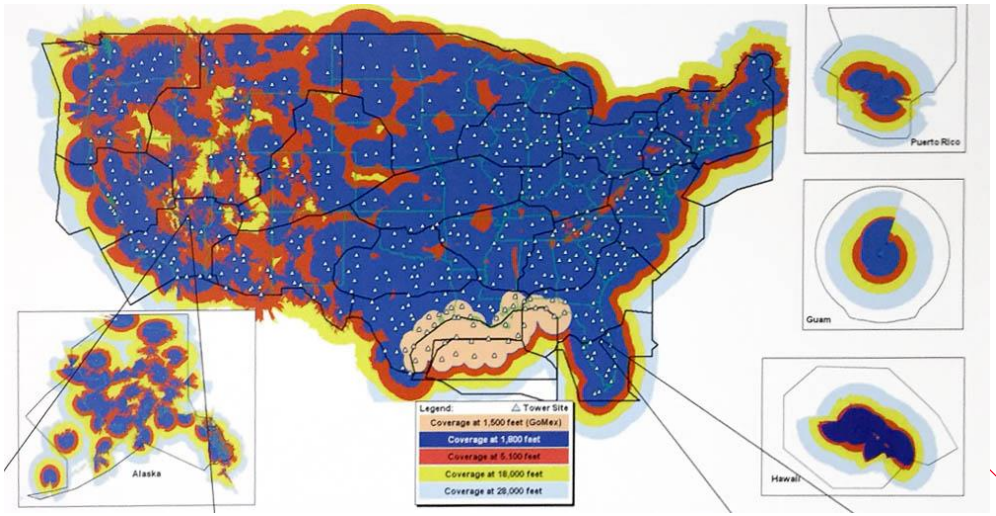


RX Sensor Multi coverage Diagram – 400 FL

ADS-B Notable Experience 3
FAA Program

3300 ADS-B/WAM Radio

- Fully Functional ADS-B/WAM system in one 3U high rack mount unit
- Full Internal Self-Test and Test Message Generation function
- Remote Troubleshooting and Maintenance Capability – SNMP, SSH, HTTP
- Compliant with FAA SBSS, ICAO, and RTCA Radio Requirements
- Multiple Configurations available in similar Form Factor
  - Two and Four channel 1090/1030 Transceiver
  - All configurations support WAM
  - Optional UAT Transceiver in either configuration (second 3U unit)



3300 ADS-B/WAM Radio

- **Harris** pursued quotes for second source ADS-B radio supplier as part of $1.8 Billion dollars US ADS-B service contract to the FAA (**SBS Surveillance and Broadcast Services)**
- Selex won the program and, starting from a blank sheet of paper, began production in 20 months.
- Initial contract 450 ADS-B radios
- Follow-on contract for Colorado WAM with addition of 56 radios
- Follow-on contract for Charlotte WAM with additional 14 radios
- Follow-on contract for LA Basin WAM with additional 40 radios
- All SELEX radios meet both ADS-B and WAM requirements in a single FAA-qualified product

Space based ADS-B
MoU Leonardo & Aireon

Leonardo Signs MOU with Aireon to integrate space-based Automatic Dependent Surveillance-Broadcast (ADS-B) data into its suite of automation products

Leonardo will integrate data from Aireon[SM] into its 'LeadInSky' Air Traffic Management (ATM) solution, facilitating the deployment of space-based ADS–B data

Rome, Italy – September 10, 2018 –Leonardo has announced that it has signed a Memorandum of Understanding (MOU) with Aireon LLC, developer of the world's first space-based air traffic surveillance system. The MOU will allow Leonardo, which provides advanced Air Traffic Management (ATM) solutions for Air Navigation Service Providers (ANSPs), to integrate space-based Automatic Dependent Broadcast (ADS-B) data into its 'LeadInSky' ATM system.

THANK **YOU** FOR YOUR ATTENTION

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Contact Us

Lorenzo Brugiotti
Americas Senior Sales Manager
Leonardo SpA
Via Tiburtina km 12,400
00131 Rome – ITALY
lorenzo.brugiotti@leonardocompany.com
Mobile: +39.335.5693530

Simon Piromallo di Montebello
Americas Sales Manager
Leonardo SpA
Via Tiburtina km 12,400
00131 Rome – ITALY
simonjamespeter.piromallo@leonardocompany.com
Mobile: +39.331.6231396