IACIT Soluções Técnológicas S/A

EED
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ISO 9001:2008
IFI

ADVANCED SURVEILLANCE SYSTEMS

Reinaldo de Campos Gonçalves Junior
Manager, Marketing & Sales

Empresa Estratégica de Defesa
Strategic Defence Company

AGENDA

- IACIT Institutional and its Capabilities & Experience
- Advanced Surveillance Systems Solution
- ADS-B & Multilateration
- Advanced Surveillance Systems Architecture
- HW & SW Main Components
- Related Services

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Empresa Brasileira

INFRASTRUCTURE IN BRAZIL

HEADQUARTERS

RADAR TEST PLANT

MANUFACTORE

- LOGISTIC SUPPORT
- Manaus
- Fortaleza
- Recife
- Brasília
- Rio de Janeiro
- São Paulo

CERTIFICATES & AWARDS

Prêmio FINEP de Inovação 2012

IACIT BUSINESS SEGMENTS

DEFENSE & PUBLIC SECURITY

- Surveillance Radars
  - Maritime
  - Ground
  - Airborne
- Command & Control
- Communications
- Gun Fire Locator
- Electro-optics

CNS / ATM

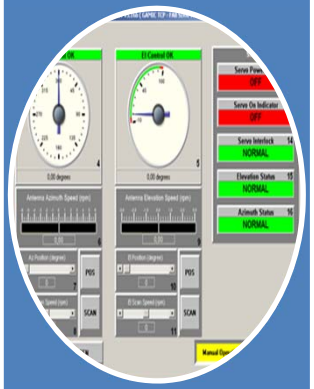
- Communication
- Surveillance
- Navigation Aids

METEOROLOGY

- Weather Radar
  - S Band
  - X Band
- Oceanic Radar
- Cast SW Suite

INTEGRATED NETWORKS

- Structured cabling
- Optical networks
- Satellite Ground Stations
- HW, SW & peripheral devices



TELEMETRY

- Remote Control
- Monitoring System

SERVICES

- R&D Services
- SW Development
- Integrated Logistic Support
- Turn Key Projects
- Professional Services

IACIT SOLUTION PORTIFOLIO

Strategic Defence Company

CNS / ATM

Develops, manufactures and installs equipment and Systems applied to the **Air Navigation and Maritime Navigation Management**, **Air Traffic Control** and **Communication**.

The company also provides to its customers **Integrated Logistic Support (ILS)** with technical training, preventive and corrective maintenance 24 hours per day.

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CNS / ATM

Communication

- **ATIS 0100** - Automatic Terminal Information Service
- **VHF-AM** - VHF Aeronautical Radio Communication (Ground-Air)

Navigation

- **DME 0200** - Distance Measurement Equipment
- **NDB 0200** - Non-Directional Beacon
- **VOR 0100** - VHF Omnidirecional Range
- **GBAS 0100** - Ground based Augmentation System (under development)

Surveillance

- **QUADRANTE 0100**
  - **ADS-B** - Automatic Dependent Surveillance – Broadcast
  - **MLAT** – Multilateration

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CNS / ATM

- **QUADRANTE 0100**
  - Transfer of technology agreement with COMSOFT
  - Intended to be adapted and customized to application in LATAM and Caribbean
- **DME 0200**
  - It's a fully digital DME
  - 100W and 1000W
  - Certification by ICEA (Nov15)
  - Can be used in DME-DME Navigation
- **GBAS 0100**
  - 1st prototype installed near São José dos Campos
  - Currently under development - ionosphere modeling stage

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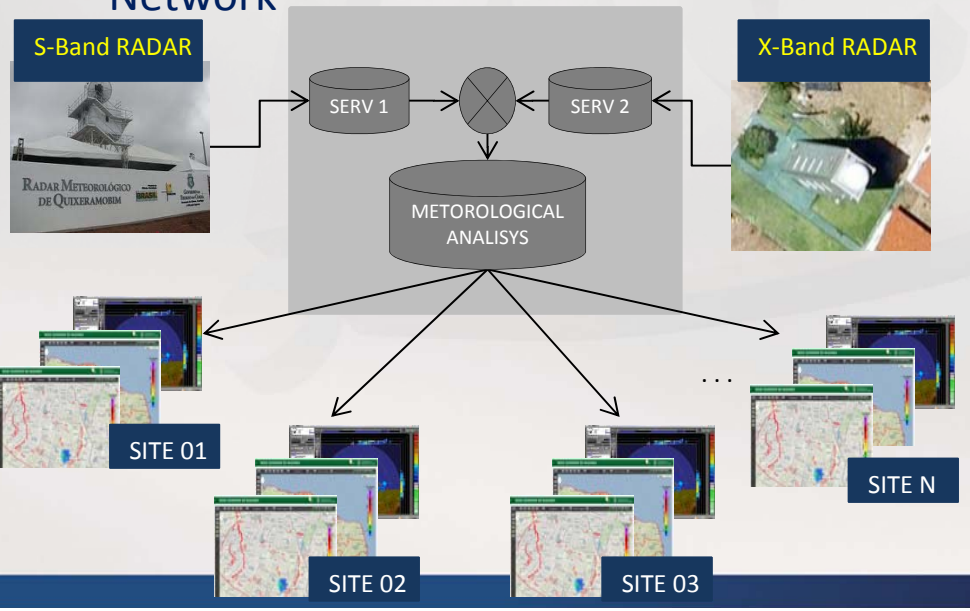
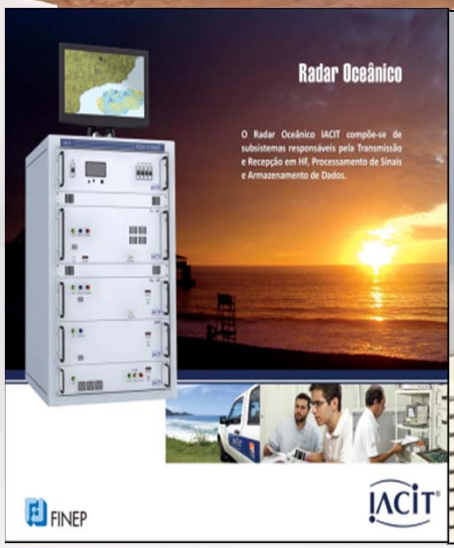
METEOROLOGY

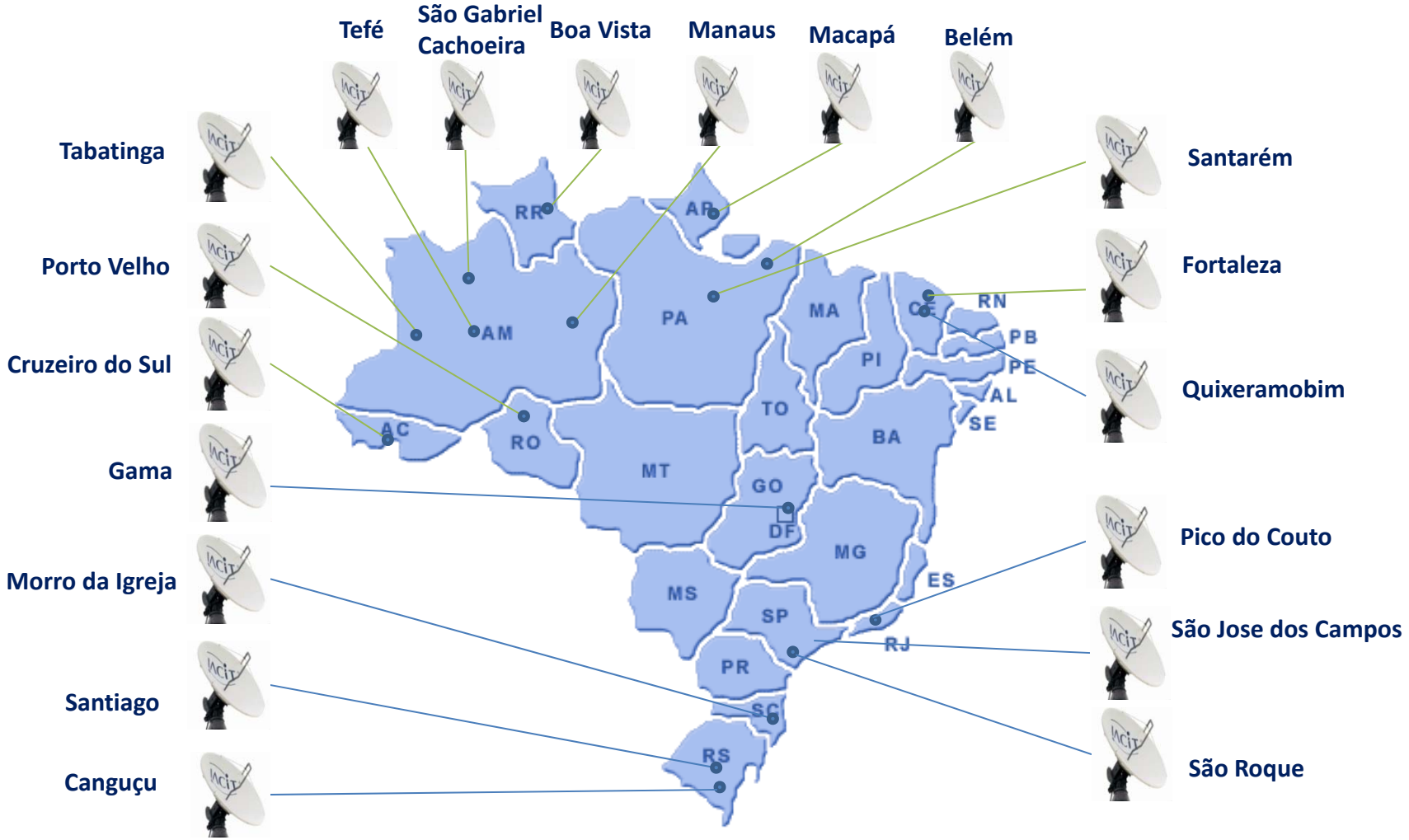
Weather Radars

- **RMT 0100DS**: Doppler S Band Weather Radar
- **RMT 0100DX** - Doppler X Band Weather Radar
- **RADH 0200** - Oceanic Radar - HF Radar Platform
- **Integrated Systems** for Multi-Radar Network

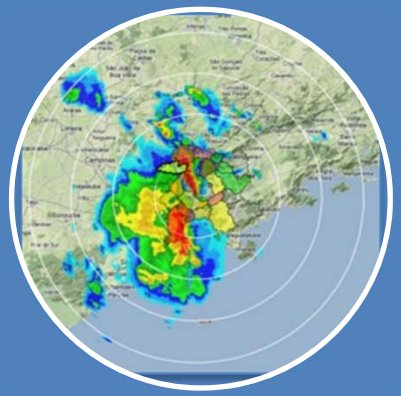




Modernized and IACIT Weather Radars in use by BAF's ATM



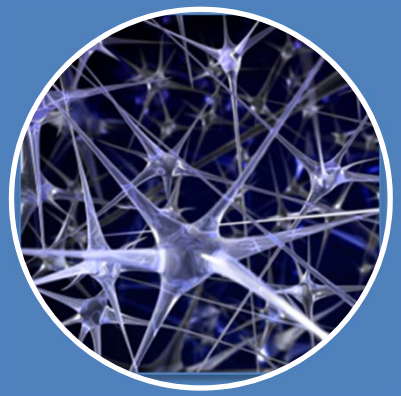
CAST SW Suite



NOWCast

Friendly and interactive interface to monitor rainfall, fog and lightning events:

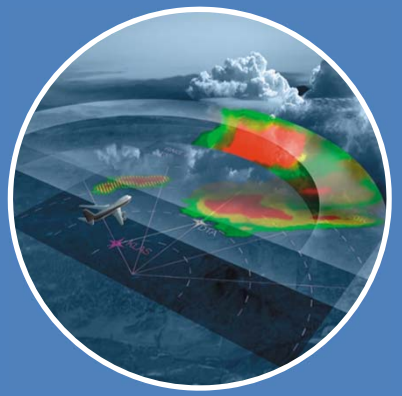
=> Issue very short term warnings



NEURALCast

Meteorological trends (ceiling, visibility, occurrence of gusts, wind speed and direction) based on artificial neural networks to:

=> Predict Airdrome weather condition



ROUTECast

Identify, monitor and predicting volume of airspace under effect of severe weather events:

=> Avoid risk to aircraft on route

FULL AWARENESS OF WEATHER CONDITIONS

INTEROPERABILITY & FLEXIBILITY

- **DESIGNED TO BE INTEGRATED TO ANY WEATHER SENSORS/NETWORKS AVALIABLE**
- **CAN PROVIDE PRODUCTS VIA DIFFERENT FORMATS TO ANY ATC SYSTEMS**
- **FULLY CUSTOMIZEABLE SYSTEM TO ATTEND USERS NEEDS**
- **100% SCALABLE SOLUTION**

ALREADY APPLIED TO BAF ATFM BY DECEA

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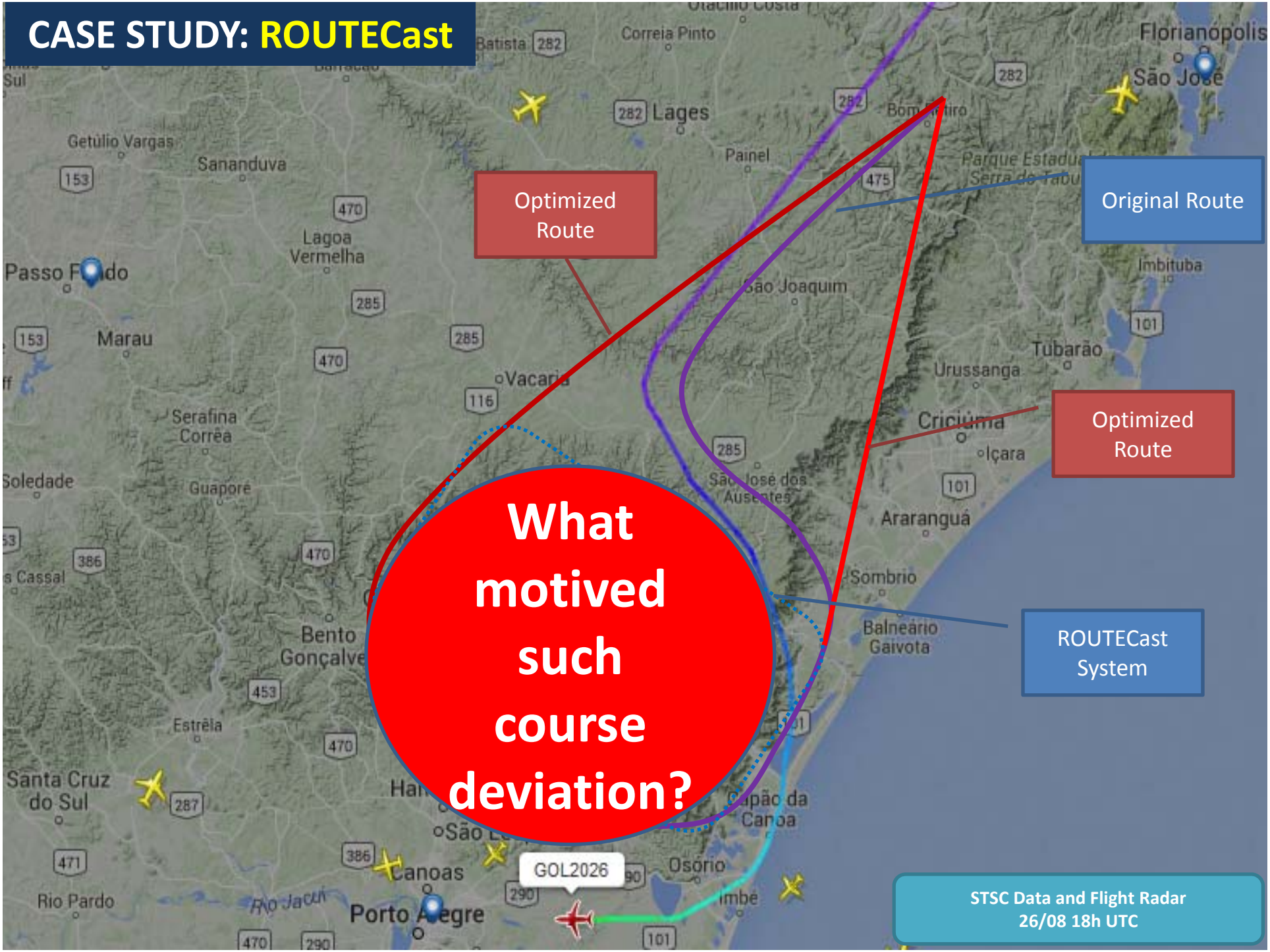
CASE STUDY: ROUTECast



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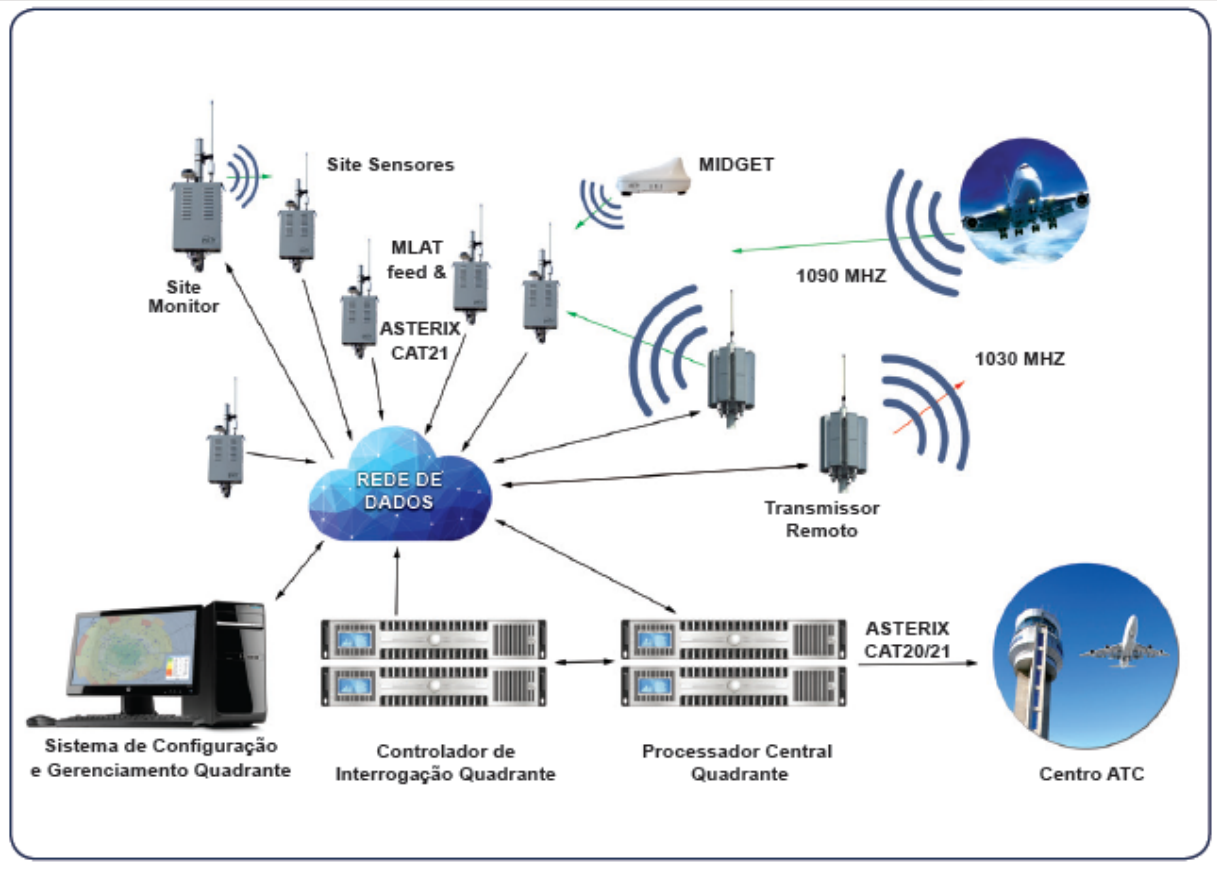
QUADRANTE 0100

What is QUADRANTE 0100?

A product family supporting ADS-B and Multilateration (MLAT) applications



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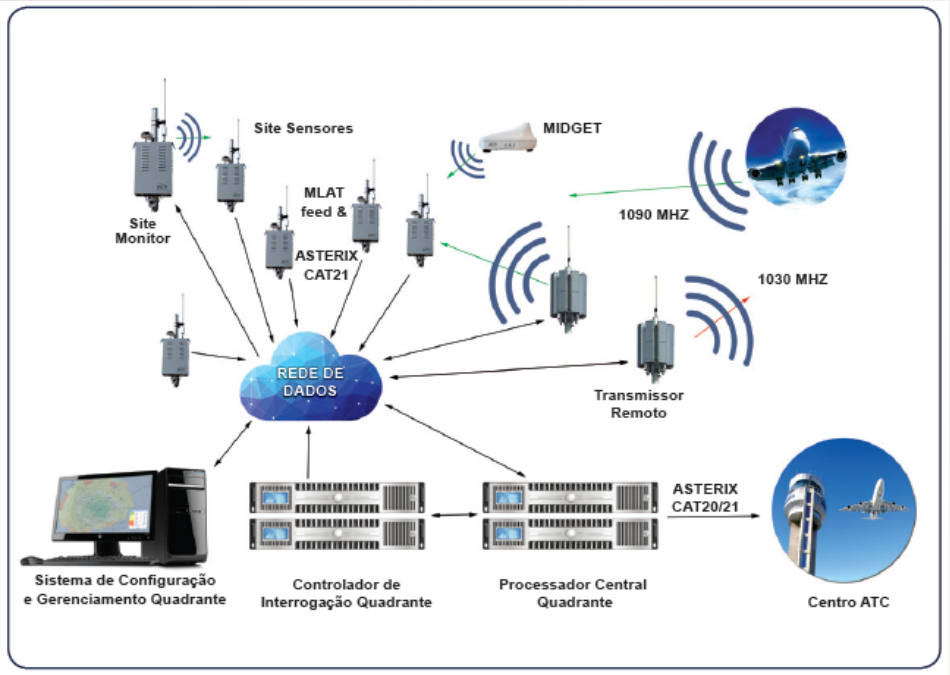
QUADRANTE 0100

Family Components

- QUADRANTE Sensor (**RX**)
- QUADRANTE Transmitter (**TX**)
- QUADRANTE Central Processor (**QCP**)
- QUADRANTE Interrogation Controller (**QIC**)
- QUADRANTE Configuration Management System (**QCMS**)
- MIDGET



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QUADRANTE Sensor

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QUADRANTE Sensor

- Connection to existing ATM systems due to strict ASTERIX compliance
- Operates as ED-129 compliant 1090 MHz ADS-B ground station
- Operates as MLAT sensor within an ED-142-compliant MLAT system without any modification
- Remote capabilities allowing remote upgrade of firmware and software
- Robust, low-power, high-performance unit with small footprint
- Ideal for remote deployment in harsh environments
- High processing capabilities within the ADS-B/WAM receiver
- Satellite independent synchronisation for wide area MLAT using GPS as backup

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QUADRANTE Sensor

System Performance

Output Messages:	ASTERIX CAT021 V2.1, V1.3, V0.23/V0.26
	ASTERIX CAT023 V1.2
	ASTERIX CAT020 V1.8
	ASTERIX CAT019 V1.3
	ASTERIX CAT010 V1.1
Output Modes:	Data Driven
	Periodic Delayed
	Throttled Data Driven
Multilateration Accuracy:	< 70 m TMA
Surveillance Client Profile:	Geographic filters
	Altitude filters
	Address filters
	Output mode selection
Control and Monitoring:	Complete remote access
	Access level configurable
	Real-time monitoring and analysis

QUADRANTE Sensor Performance

Operational Range:	> 250 nautical miles
Message Processing:	Up to 3000 Extended Squitter messages/second
Target Load:	Up to 1500 Targets
Frequency:	1090 MHz
Decoding:	RTCA DO-260 / ED-102
	RTCA DO-260A
	RTCA DO-260B / ED-102A

QUADRANTE Sensor Installation

- “Out of the Box” Installation
- No special tools required
- No prerequisites
- Automated Set-Up
- Merely confirm GPS Coordinates and assign client IP-Address(es)

“Plug and Play”

Connect Power and LAN and instantly receive ASTERIX CAT 021

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QUADRANTE Transmitter

The QUADRANTE Transmitter incorporates at least one of the following functions in a single unit

- Site Monitor
- Reference Transponder
- Interrogator

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QUADRANTE Interrogator

Why Do I need an Interrogator?

- **System "relies" on ADS-B messages from equipped aircraft**

  Aircraft with no ADS-B capability (i.e. private aircraft or older aircraft not yet updated) do not deliver required information

- **System also uses responses from SSR interrogations**

  If no SSR is in range or if it is the goal to eliminate existing SSR these responses need to be triggered by another source

- **Enhanced Surveillance**

  Specific interrogation

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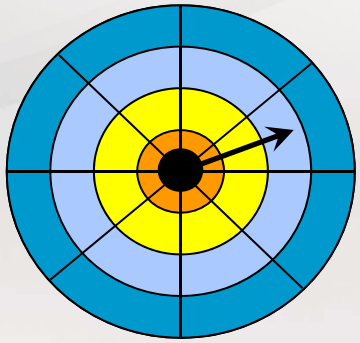
QUADRANTE Interrogator

- Up to 1000 Watt RF power
- Up to 8 interrogation sectors
- Individual set up to required sectors
- Variable power (range)
- Optionally includes:
  - 1090ES reference transponder
  - Site monitor for heartbeat validation



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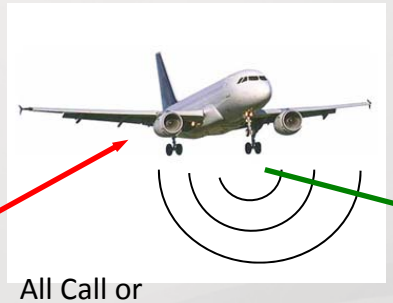
QUADRANTE Interrogator



1030 MHz

1090 MHz

All Call or
Selective interrogation

Interrogator

QUADRANTE Sensor

- Mode 3/A (for identification)
- Mode C (for pressure altitude)
- Mode-S (UF4, UF5, UF11, UF20, UF 21)

LAN

QUADRANTE Interrogator Controller

QUADRANTE Central Processor

QCMS

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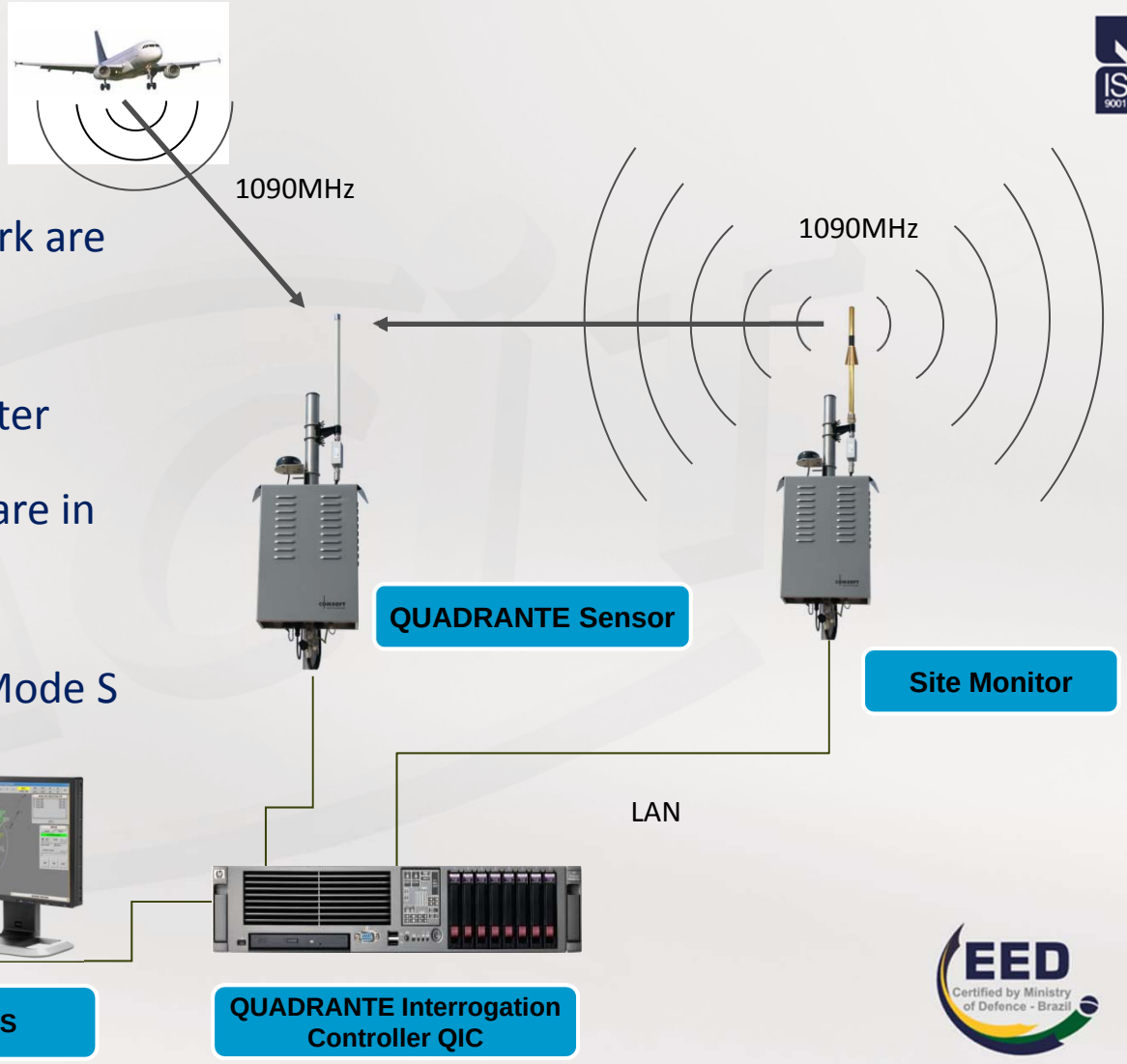
QUADRANTE Site Monitor

- Used to verify sensors in network are still working
- Ground based Mode S transmitter
- Placed where as many sensors are in range as possible
- Periodically broadcasts ADS-B Mode S Squitter



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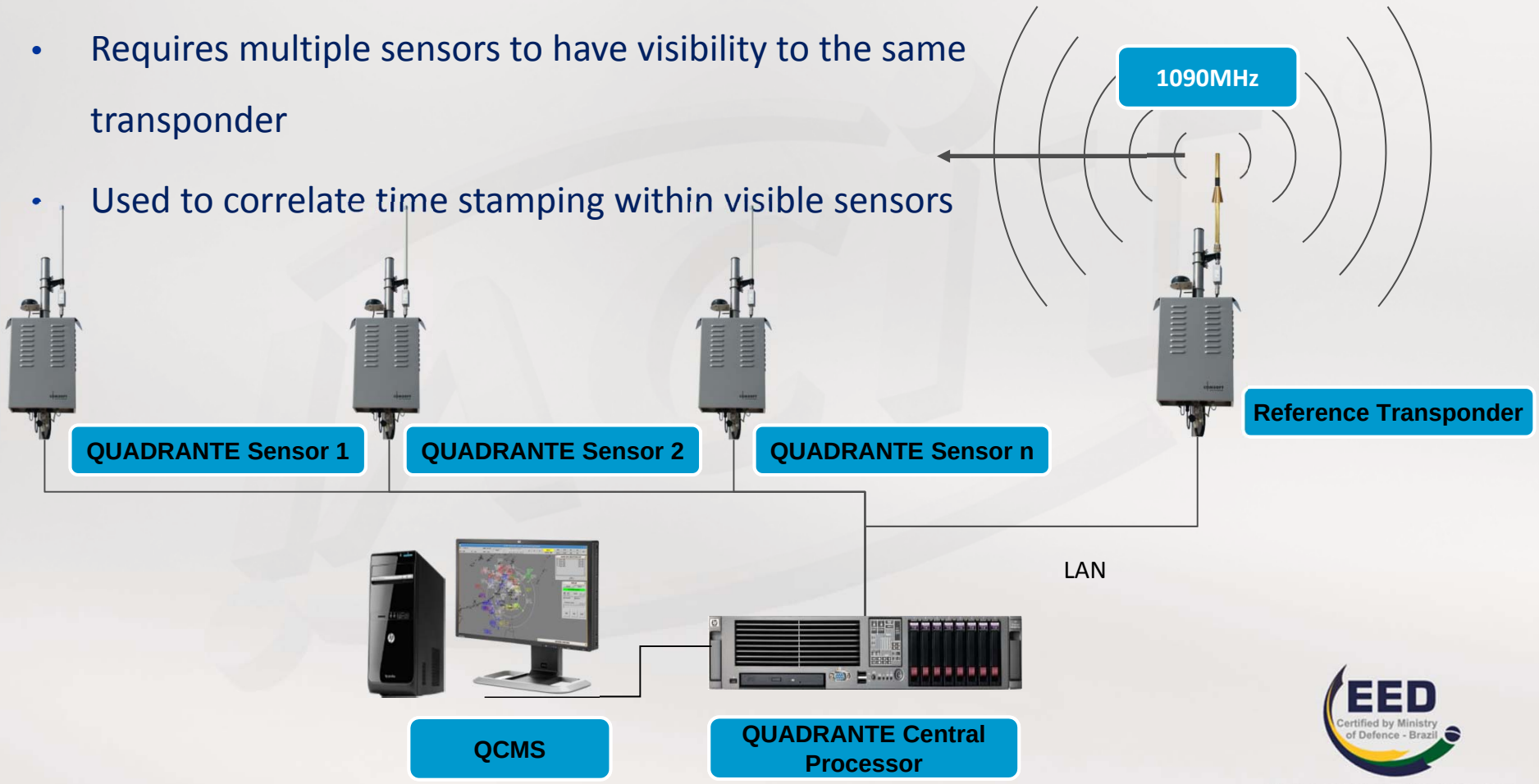
QUADRANTE Reference Transponder

- Used to increase accuracy of a multilateration network
- Requires multiple sensors to have visibility to the same transponder
- Used to correlate time stamping within visible sensors



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QUADRANTE Interrogator

The interrogator is the essential cornerstone for an independent MLAT or WAM system!

The QUADRANTE Interrogator offers the following features and technical data

- Designed to be remotely deployed, ultra compact and rugged design
- Remote maintenance, configuration and update
- Can be connected with standard TCP/IP (UPD/IP) networks
- RF Output power is adjusted adaptively, max. power can be configured to reduce interference

Interrogator Performance	
Output Messages:	Mode A, Mode C Whisper Shout
	Mode S ELS
	Mode S EHS
	Configurable MIP
Frequency:	1030 MHz
Transmit Power: 150 – 500 W	
	Variable Dynamically
Antenna:	Omni-Directional
	Directional
Power Consumption:	< 200 W (avg. for transmitter)
Dimensions:	400 mm x 480 mm x 155 mm
User configurable requested data:	Mode S ICAO (24 bit) address
	Altitude information
	Mode A Code
	Geographic Position
	Aircraft ID
	On the ground status
	.....

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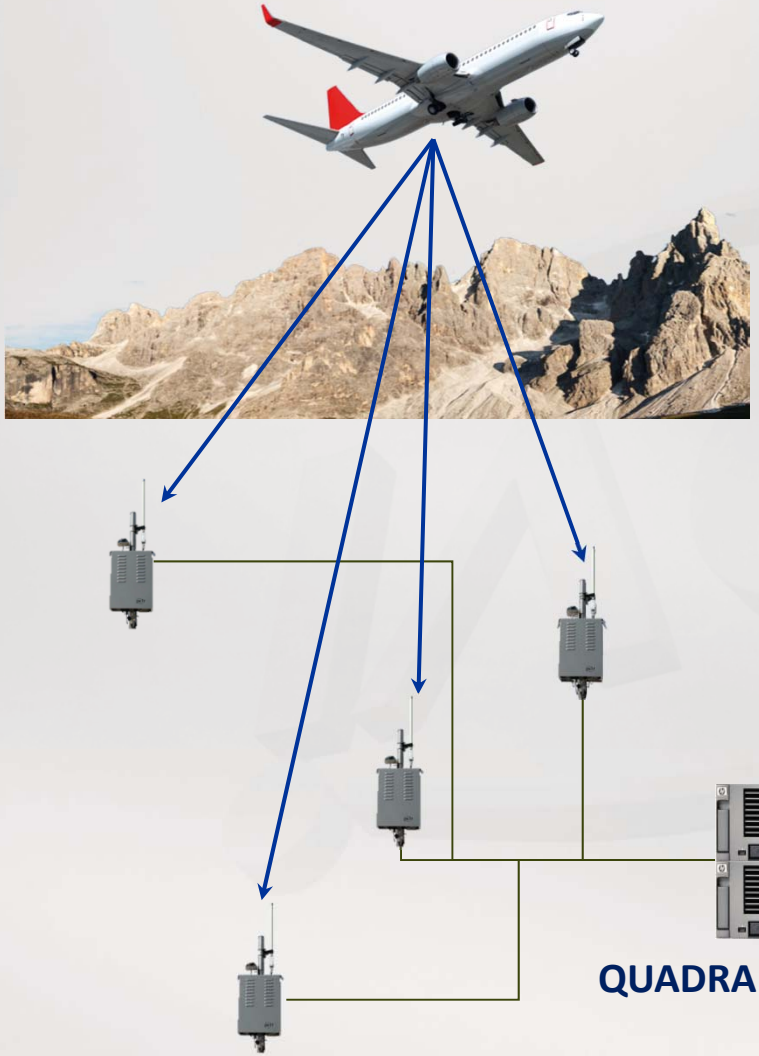
QUADRANTE Ground Vehicle Transmitter MIDGET

- **MIDGET** (**M**obile **D**evice for **G**round **E**mergency vehicle **T**ransmitter)
- Small size Mobile Device for Ground Emergency vehicle Transmitter
- Parameters (Call Sign, 24bit ICAO number and Type) selectable via
- Built in re-chargeable battery for temporary installation
- Fixed installation with zero power from vehicle when stationary
- Complies to RTCA DO-260 / DO-260A

QUADRANTE Central Processor



Position calculations

Based on the difference in arrival times of the messages

- It combines information from sensors
- High refresh rate
- It supports up to 100 sensors

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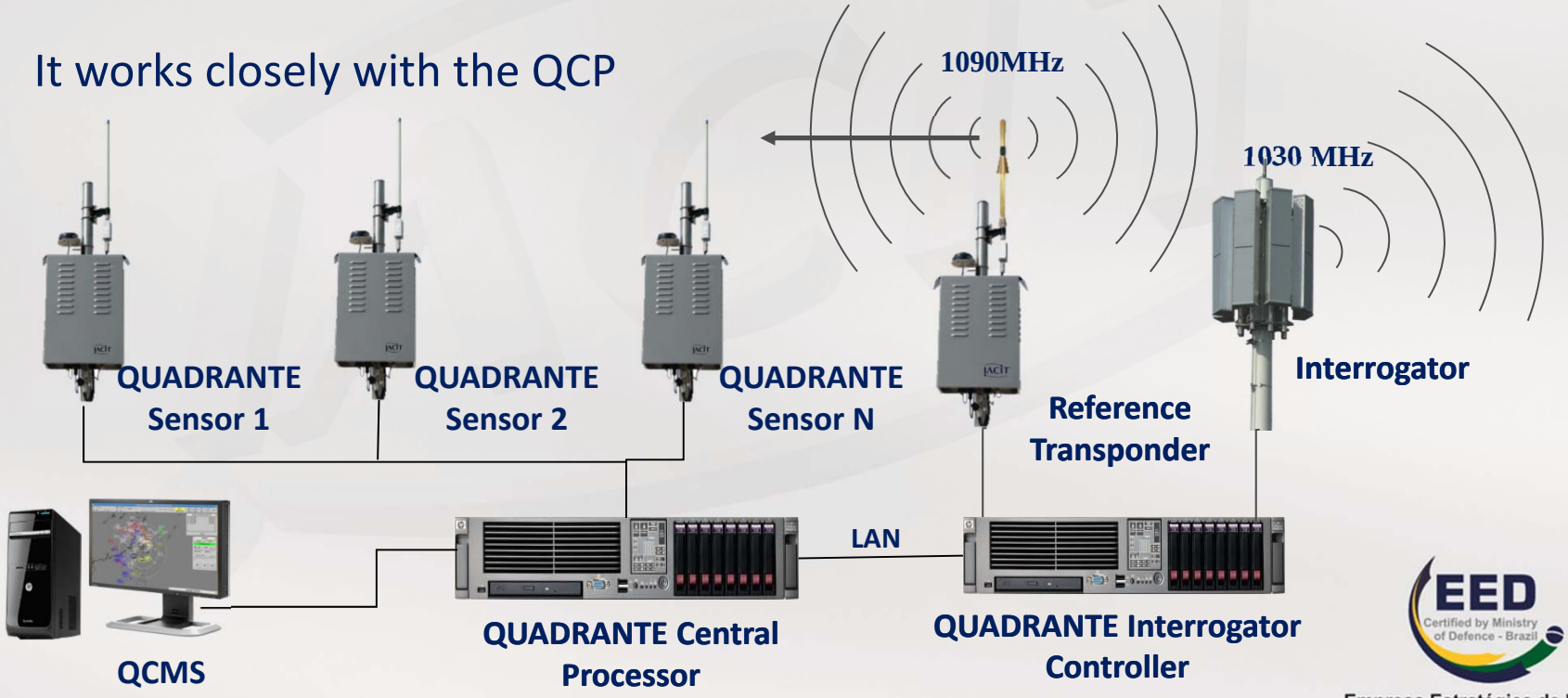
QUADRANTE Interrogator Controller

Functions

- Controls one or more Transmitters
- Manages transmissions
- It works closely with the QCP



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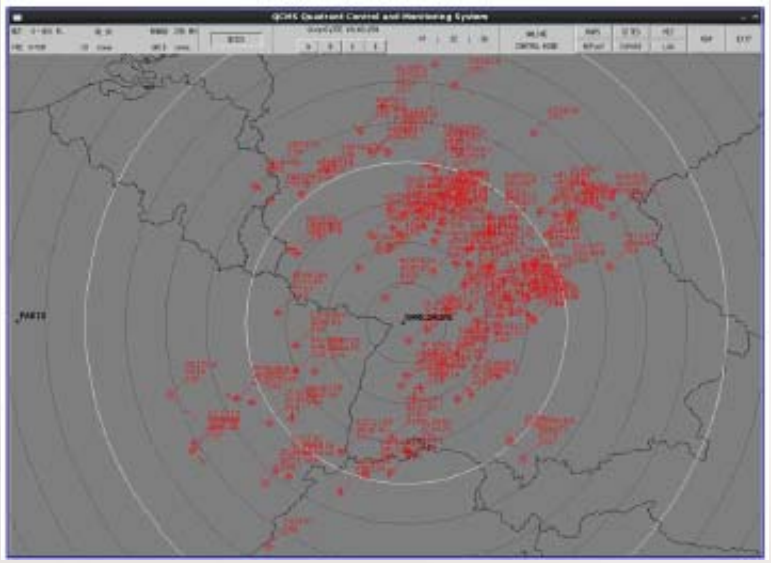
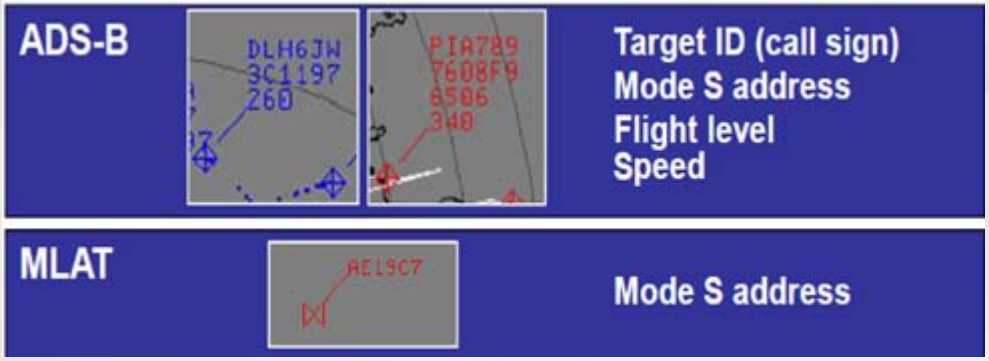
QUADRANTE Control & Management System

Functions

- Graphically display monitoring surveillance data
- Continuous recording and replay of data
- Control and monitoring of the sensors
- SNMP communication
- Statistics





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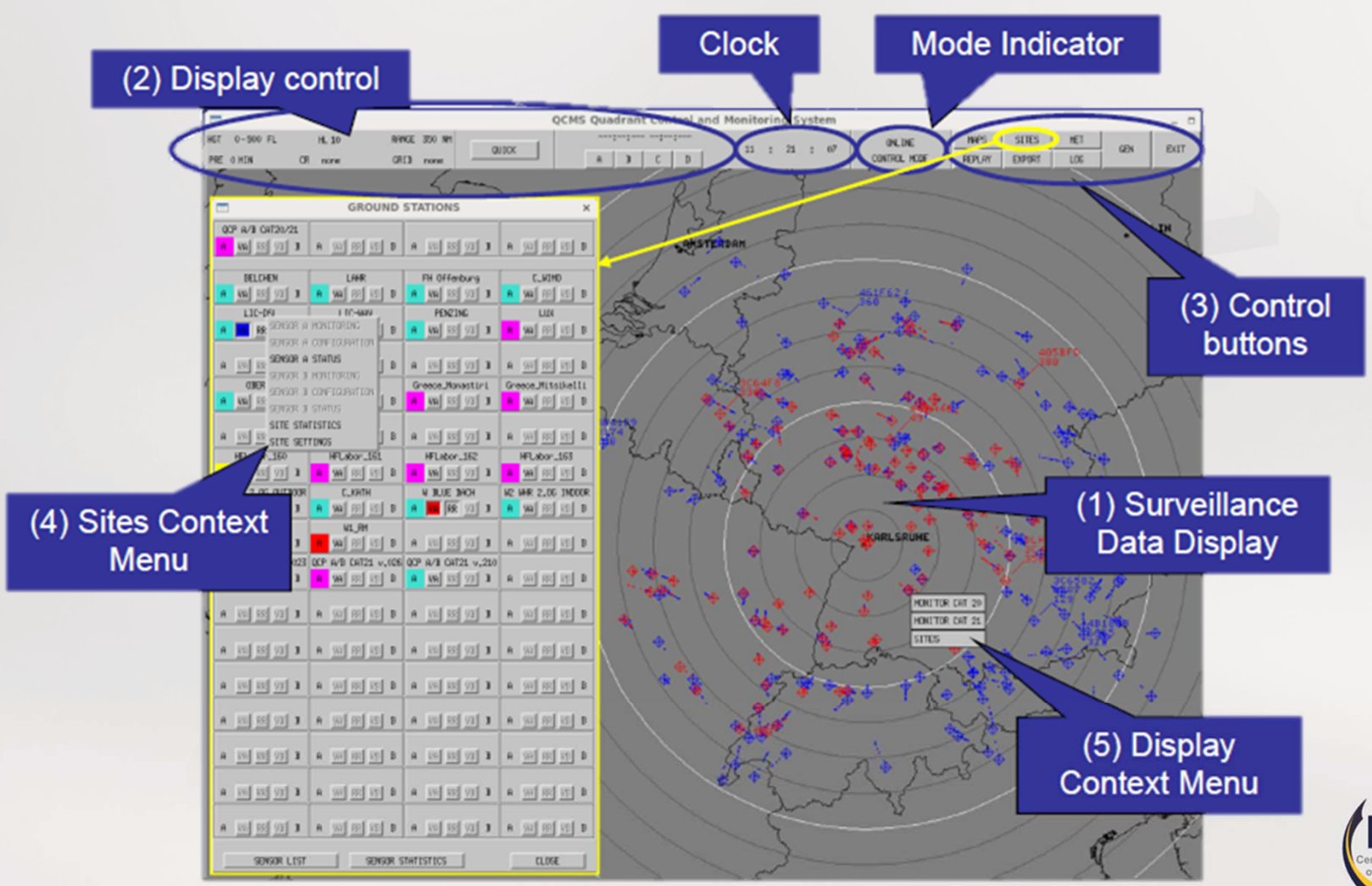
QUADRANTE Control & Management System



ISO 9001:2008

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Why are ADS-B & MLAT so attractive?

- reliable
- high update rate (once per second)
- adaptable to customer needs
- Nearly no maintenance
- redundancy
- geometric height determination
- size advantage
- versatile & flexible
- environmental impact
- provides surveillance in mountainous or desert areas
- high accuracy

cost effectiveness installation & life cycle

ISO 9001:2008

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COMPLIANCE

100 % compliant to the following standards

EUROCAE

- ED-142
- ED-129
- ED-117
- ED-153
- ED-102/102A

EUROCONTROL

- ESARR 4 + 6
- ASTERIX CAT 10, 19, 20, 21, 23

RTCA

- DO-260
- DO-260A
- DO-260B

ICAO

- Anexo10 Vol. IV

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Highlights to remember!

- Ultra compact, low weight, extremely flexible in deployment
- Lowest power requirements: < 10 W for the sensor

- Lowest bandwidth requirements: approx. 21 kb/s (100 Targets ADS-B)
  42 kb/s (100 Targets MLAT)
- Pre-processing is done in the sensor
- Passive sensor -> virtually no limitations when selecting installation sites
- ADS-B / MLAT and WAM all in the same sensor
- Smallest antenna with 550 mm (< 22'') – operational range
- > 250 NM

(typically up to 290 NM – line of sight)

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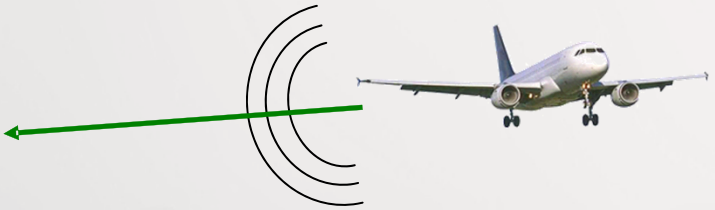
Single ADS-B System



ASTERIX
CAT21

Remote
Ground Station

Data Network

ATC Center

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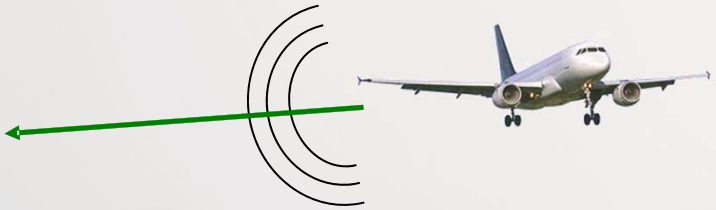
Extended ADS-B System



ASTERIX
CAT21

ATC Center

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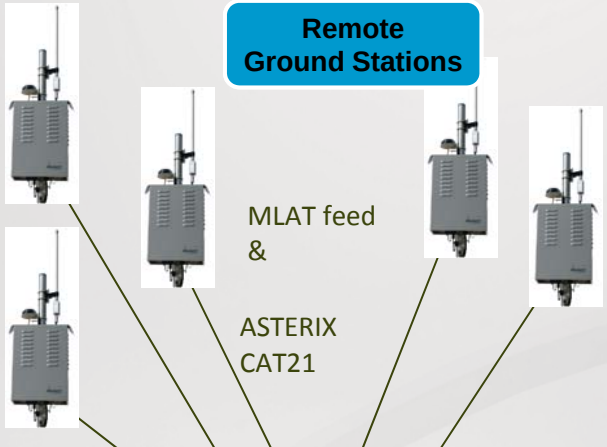
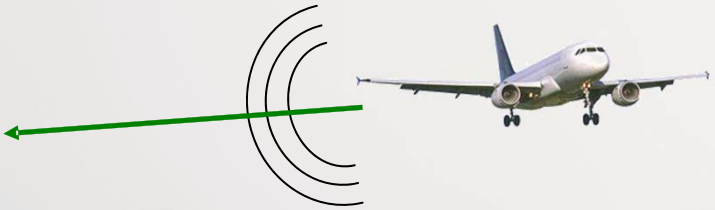
Passive MLAT System



Remote Ground Stations

MLAT feed
&
ASTERIX
CAT21

Data Network



QUADRANTE Central Processor

ASTERIX
CAT20/21

ATC Center

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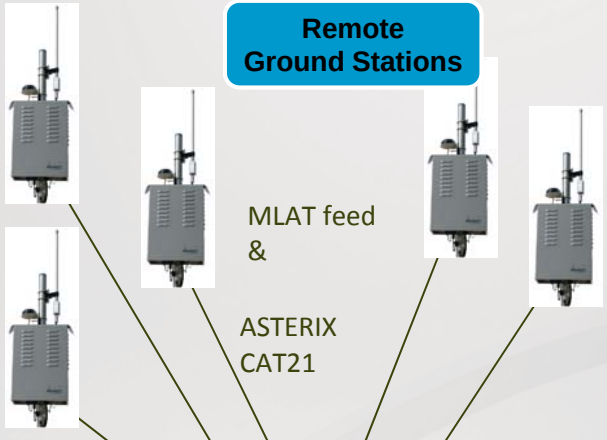
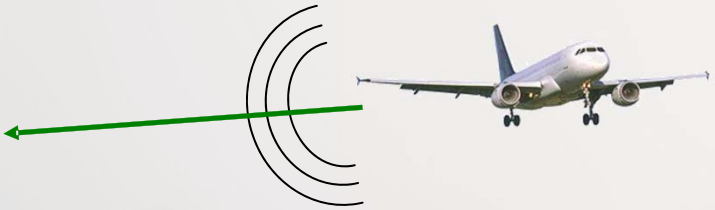
Active MLAT System



Remote Ground Stations

MLAT feed &

ASTERIX CAT21



Remote Transmitter

Data Network

QUADRANTE Interrogation Controller

QUADRANTE Central Processor

ASTERIX CAT20/21

ATC Center

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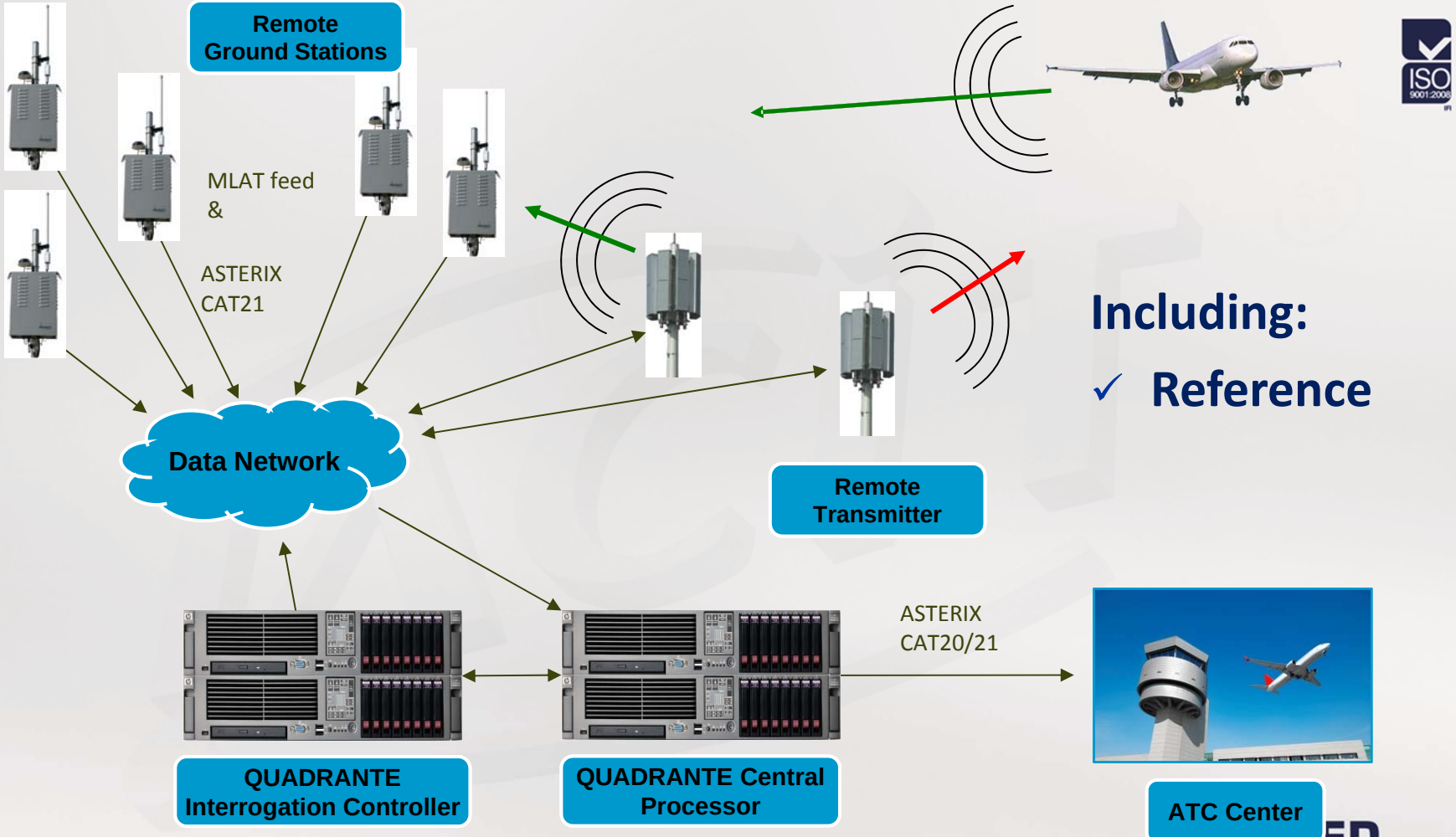
Active MLAT System



Including:

- ✓ **Reference**

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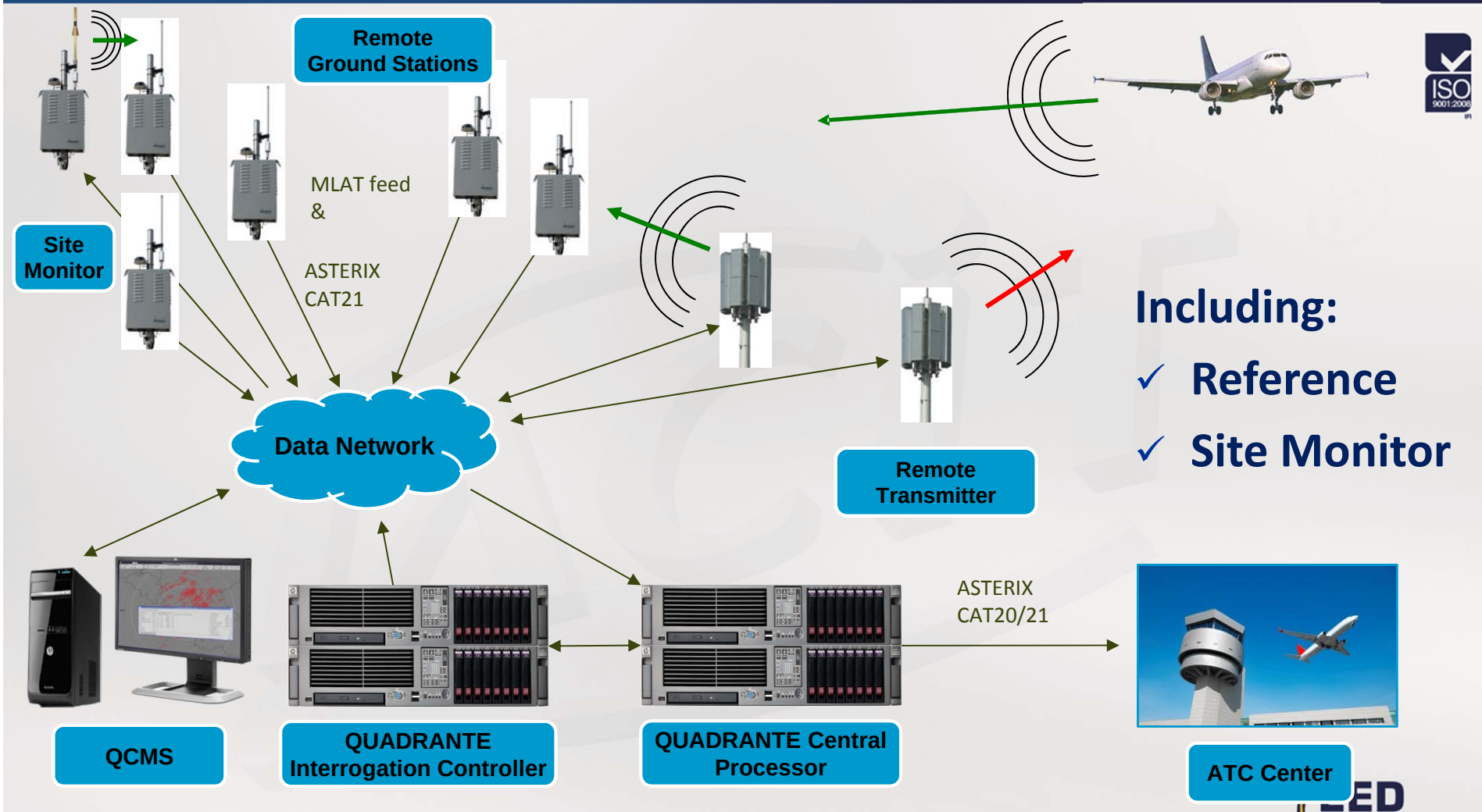
Active MLAT System



Including:

- ✓ **Reference**
- ✓ **Site Monitor**

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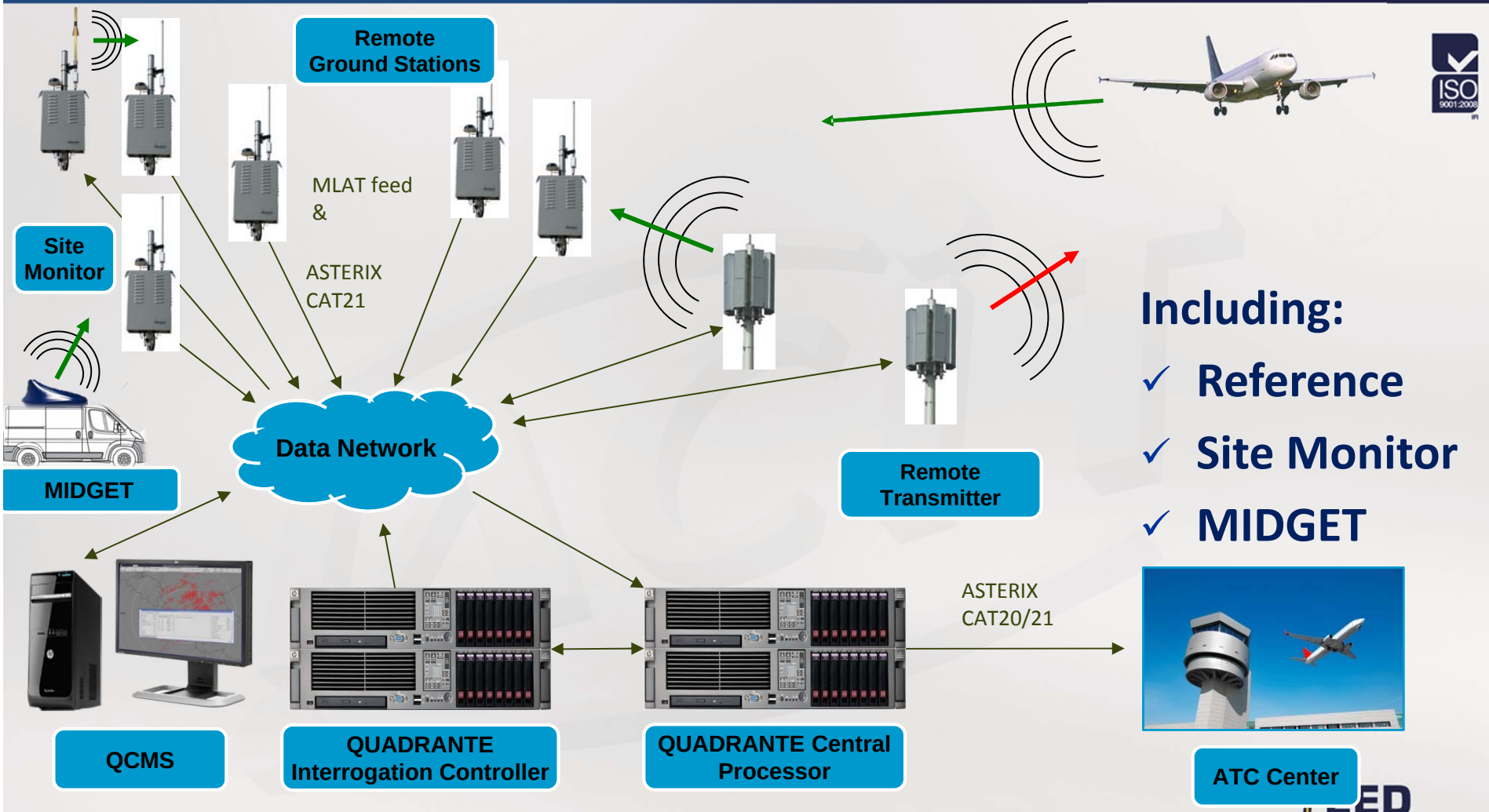
FULL QUADRANTE System



Including:

- ✓ Reference
- ✓ Site Monitor
- ✓ MIDGET

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- IACIT Institutional and its Capabilities & Experience
- Advanced Surveillance Systems Solution
- ADS-B & Multilateration
- Advanced Surveillance Systems Architecture
- HW & SW Main Components
- Related Services

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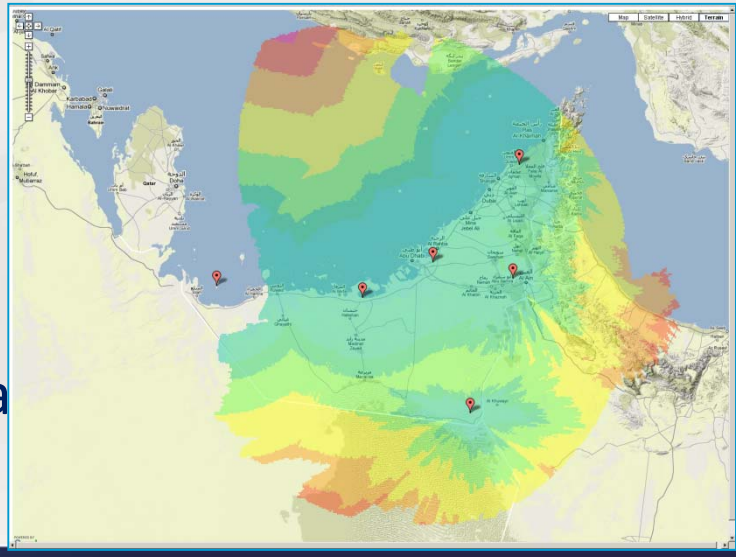
SERVICES

- Initial Planning and Coverage Prediction
- Site Survey
- Coverage and DOP Analysis
- Deployment and Integration
- Project and Configuration Management
- Quality and Safety Management
- Site Acceptance Test
- Factory and on site Training
- After Sales Services
- Test Flight support with analysis and data comparison reports



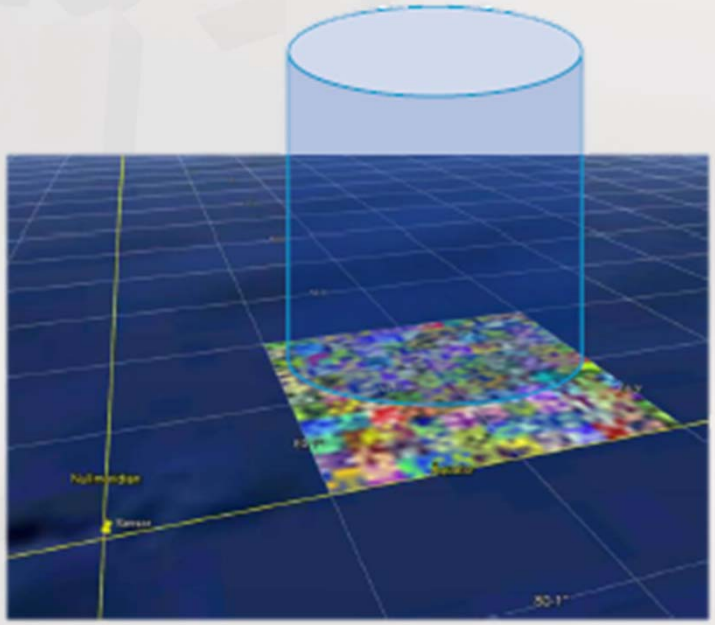
QUADRANTE Performance Analyze Tool QPAT

Function

- Provide ADS-B coverage simulation / MLAT

Input Data

- Cover Volume
- Number of RX and TX
- Type of service (ADS-B / MLAT)
- Accuracy desired
- Scenario redundancy (n-1, n-2)



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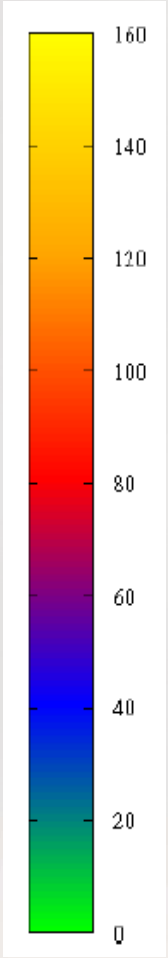
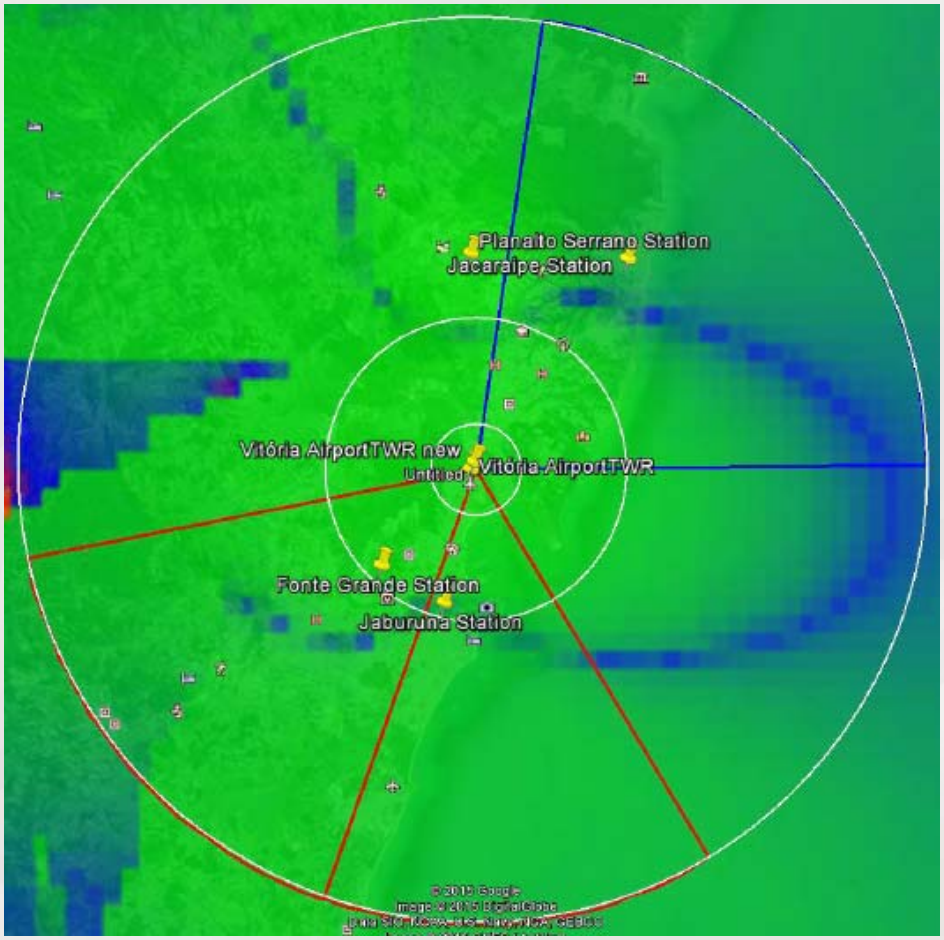
QUADRANTE Performance Analyze Tool QPAT



[m] RMS



MLAT Coverage 4.000ft

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QUESTIONS

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THANK YOU!

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