

25 *anos*  
1986-2011

!ACiT®



**Excellence in Technical Solutions**



# SUMMARY



- **Introduction**
  - IACIT's History
  - Services and Products
  - FINEP – Financier of Studies and Projects
- **GBAS IACIT**
  - Flexibility in compair with ILS
  - Designed to Agree
  - Perspectives for IACIT's GBAS-GSS
- **IACIT Investments**
  - Future Solutions



# IACIT's History



- **1986~1990:** VHF integrated stations for the DACTA II implementation services
- **Since 1990:** Activities on the airport infrastructure sector
- **Since 1991:** Telecommunications sector activities
- **Since 1996:** TMA São Paulo 24/7 maintenance
- **Since 1999:** Customized solutions, project and services for international manufacturers
- **Since 2002:** Air Traffic Operation and Control activities
- **2004:** Remote Control System - RCS 100 development, integration and sales
- **2004:** Partnership with IFOTEC for network solutions on optoelectronic technology
- **2005:** Road Traffic product development and manufacturing
- **2008:** Aeronautical equipments and radars development and manufacturing
- **2009:** GBAS 0100 System development with FINEP financial support
- **2009:** Authorized system integrator in Brazil by ORTRONICS
- **2009:** Oceanic Radar development with FINEP financial support
- **2010:** IACIT's Weather Radar Modernization
- **2011:** Modernization of 06 Weather Radars of Força Aérea Brasileira



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# Service



- **Research and Development:**
  - Aeronautical Products and Solutions
  - Integrated Network and Air Traffic Solutions
  - Meteorological Products
- **Manufacturing and Testing**
- **Technical Installation and Commissioning:**
  - Commissioning
  - Field Survey
  - Design and Development of Customized Solutions
  - Operation and Logistic Support
  - Infrastructure, building and energy
  - Support to obtain authorization to operate

## ISO 9001:2008

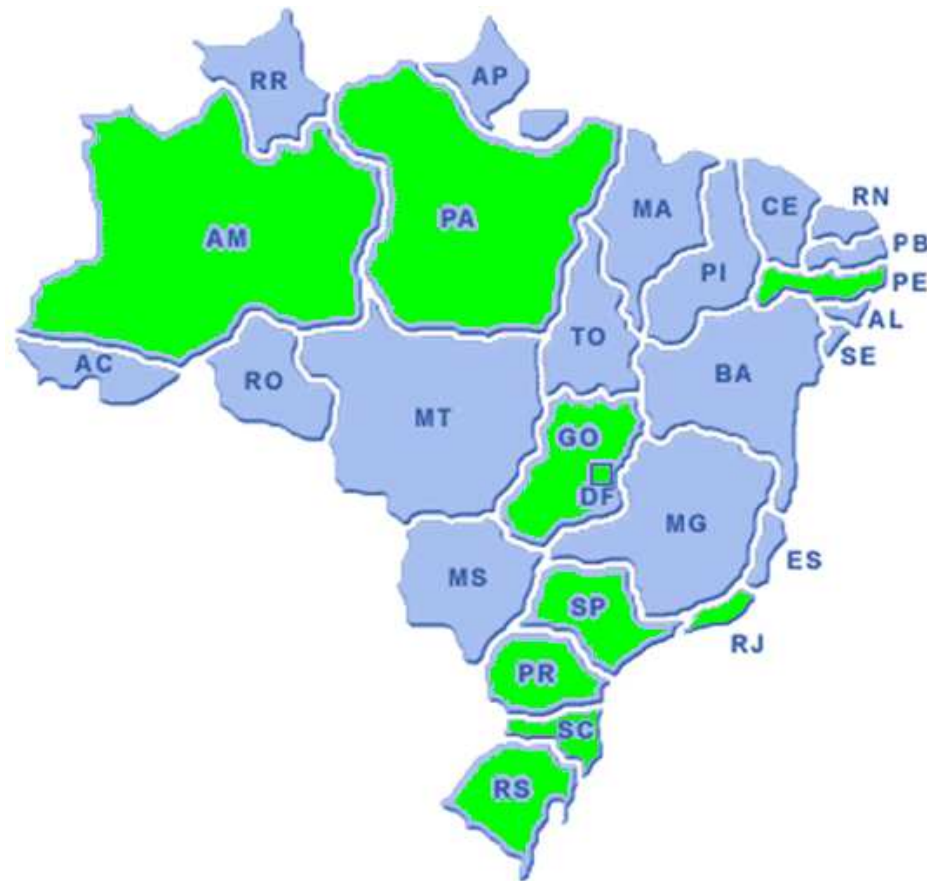




# IACIT's Presence



- ☞ **Rio de Janeiro**
- ☞ **São Paulo**
- ☞ **Brasília**
- ☞ **Porto Alegre**
- ☞ **Recife**
- ☞ **Manaus**
- ☞ **Belém**
- ☞ **Curitiba**
- ☞ **Florianópolis**



# Main Products - Aeronautical



## Aeronautical VHF Radio VHF v300

Analogic and Digital VHF-AM radios applied in aeronautical ground stations, single-channel or multichannel for the Aeronautical Mobile Service (AMS).



# Main Products - Aeronautical





# Main Products - Aeronautical

## Non-Directional Radio Beacon NDB

The NDB system manufactured and supplied by IACIT is a radio navigation system used in the CNS and ATM systems providing the NDB's direction and its identification (Morse code) for the aircrafts during execution of the procedures for approach and landing in Terminal Areas (TMA), en route or for offshore oil and gas platforms and buildings, in accordance with the instructions and aeronautical regulations in force.



# Main Products - Aeronautical



## DME 0100

The DME 0100 ground station is a radio navigation system for aircrafts used in the CNS and ATM systems to provide distance information.



# Main Products - Aeronautical



**ATIS 0100**

The ATIS 0100 is a aeronautical VHF-AM broadcast system to the Automatic Information Service in Terminal Areas (TMA), generally, installed at airports.





# Main Products - Aeronautical



**VOR / DME**

The VOR/DME 0100 ground station is a radio navigation system for aircrafts used in the CNS and ATM systems to provide azimuth and distance information during the execution of the procedures for approach and landing.

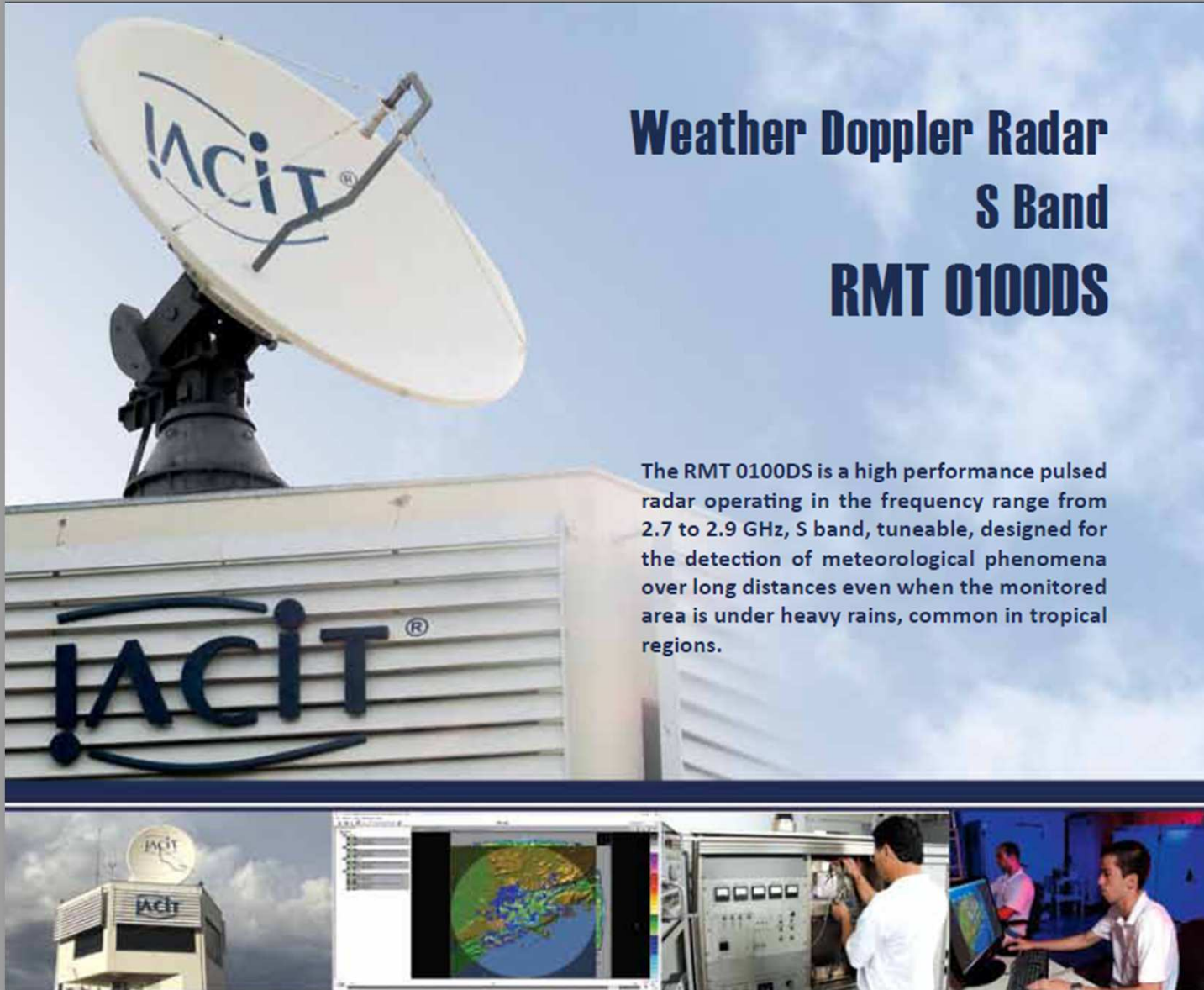




# Main Products – Meteorology

## Weather Doppler Radar S Band RMT 0100DS

The RMT 0100DS is a high performance pulsed radar operating in the frequency range from 2.7 to 2.9 GHz, S band, tuneable, designed for the detection of meteorological phenomena over long distances even when the monitored area is under heavy rains, common in tropical regions.

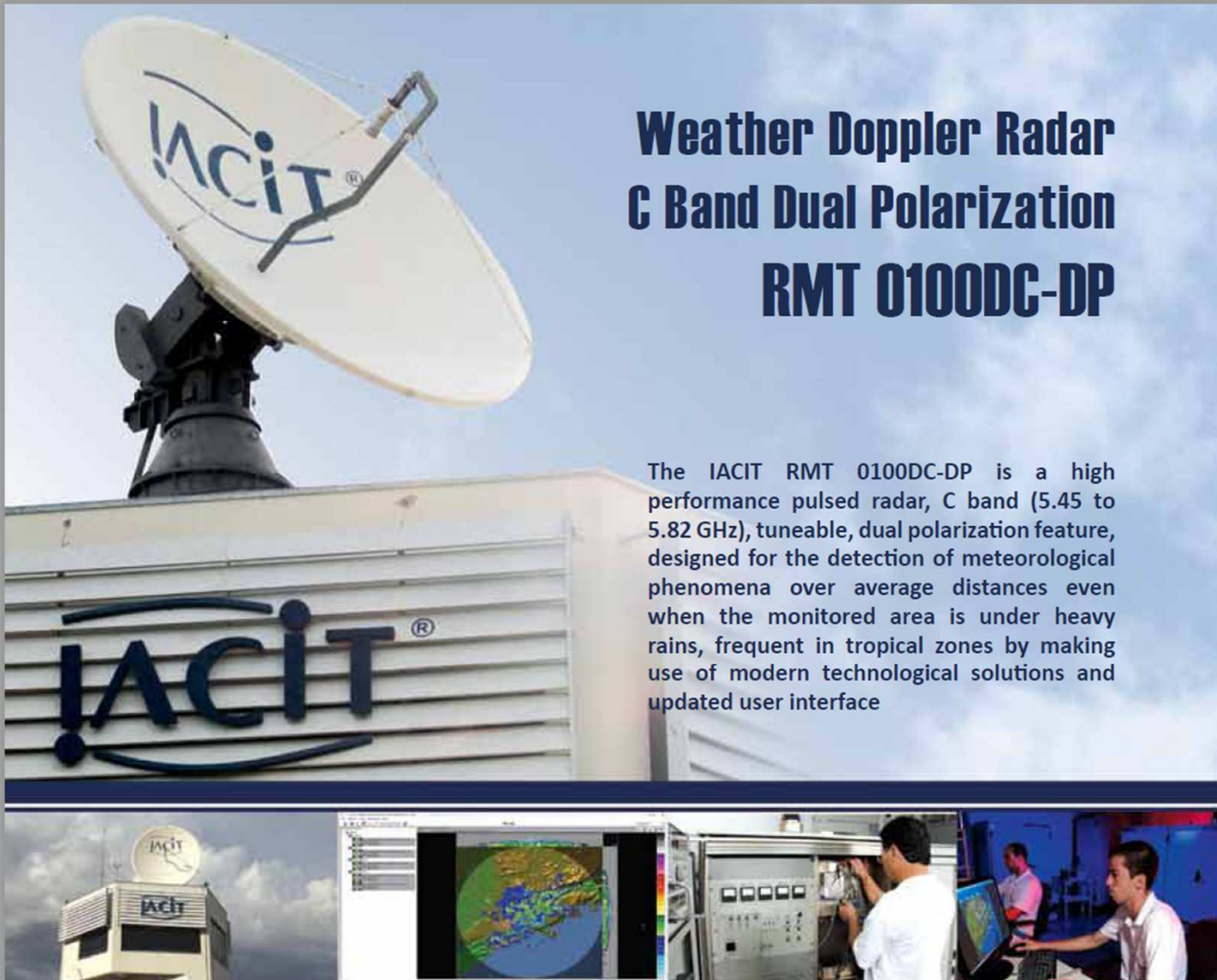


# Main Products – Meteorology

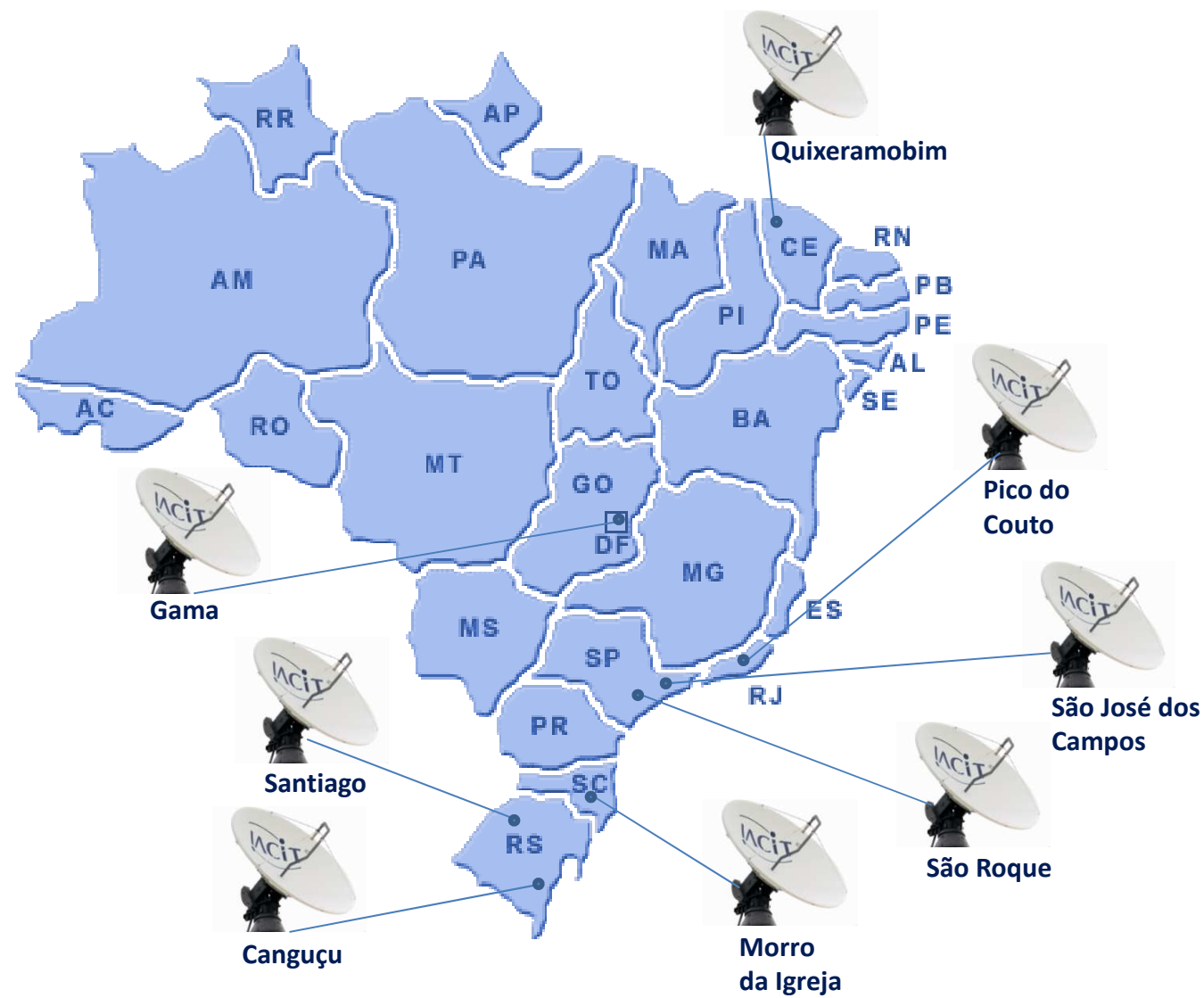


## Weather Doppler Radar C Band Dual Polarization RMT 0100DC-DP

The IACIT RMT 0100DC-DP is a high performance pulsed radar, C band (5.45 to 5.82 GHz), tuneable, dual polarization feature, designed for the detection of meteorological phenomena over average distances even when the monitored area is under heavy rains, frequent in tropical zones by making use of modern technological solutions and updated user interface



# IACIT Weather Radars



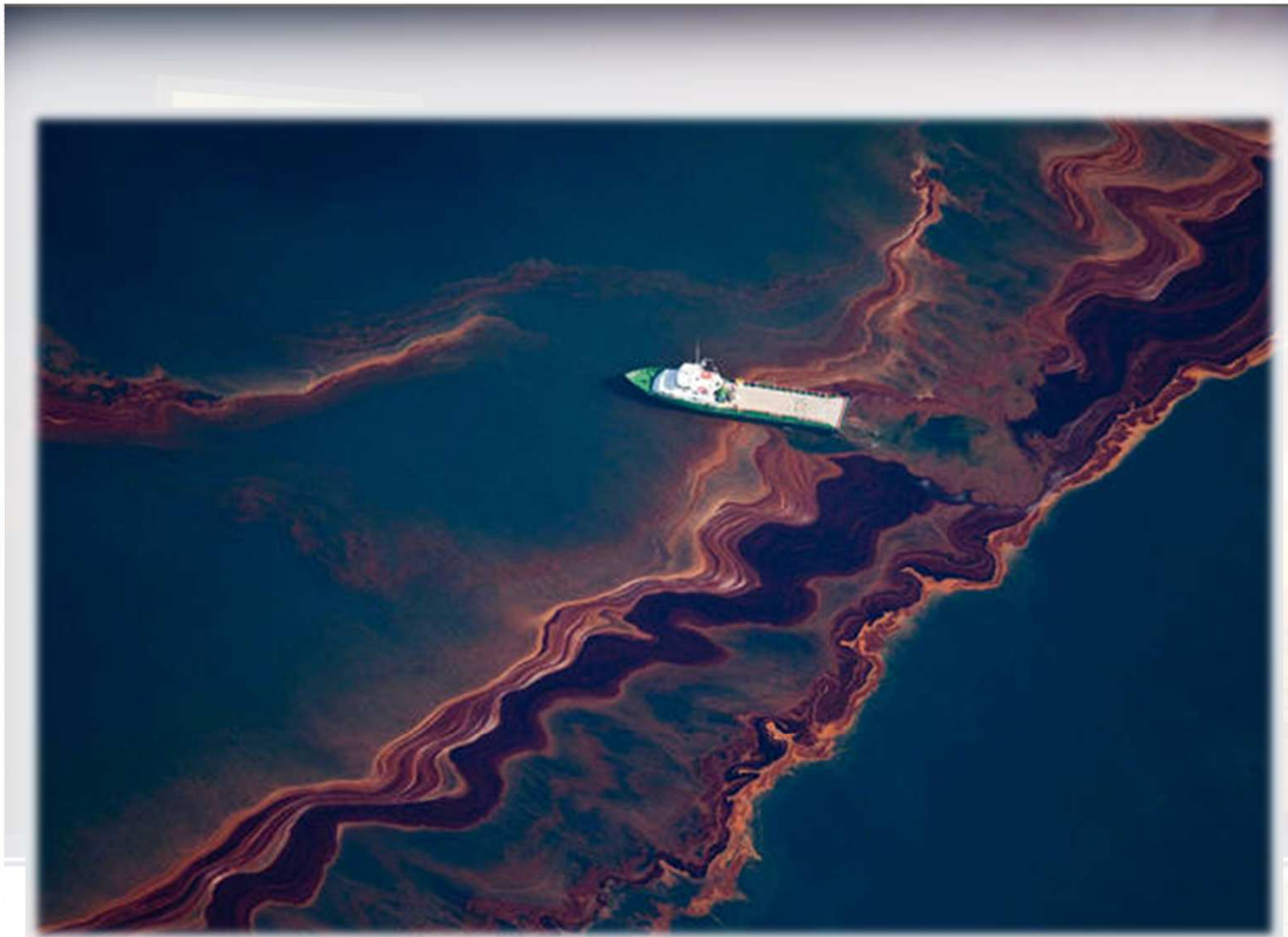


# IACIT Oceanic Radar





# IACIT Oceanic Radar



# **FINEP – Financier of Studies and Projects**



## **Projects funded by FINEP**

- **GBAS**
- **Oceanic Radar**
- **DME of Precision**
- **Navigation System for Unmanned Aerial Vehicle (UAV)**

*Transforming Brazil by Innovation*



Ministério da  
Ciência, Tecnologia  
e Inovação



# The IACIT's GBAS-GSS

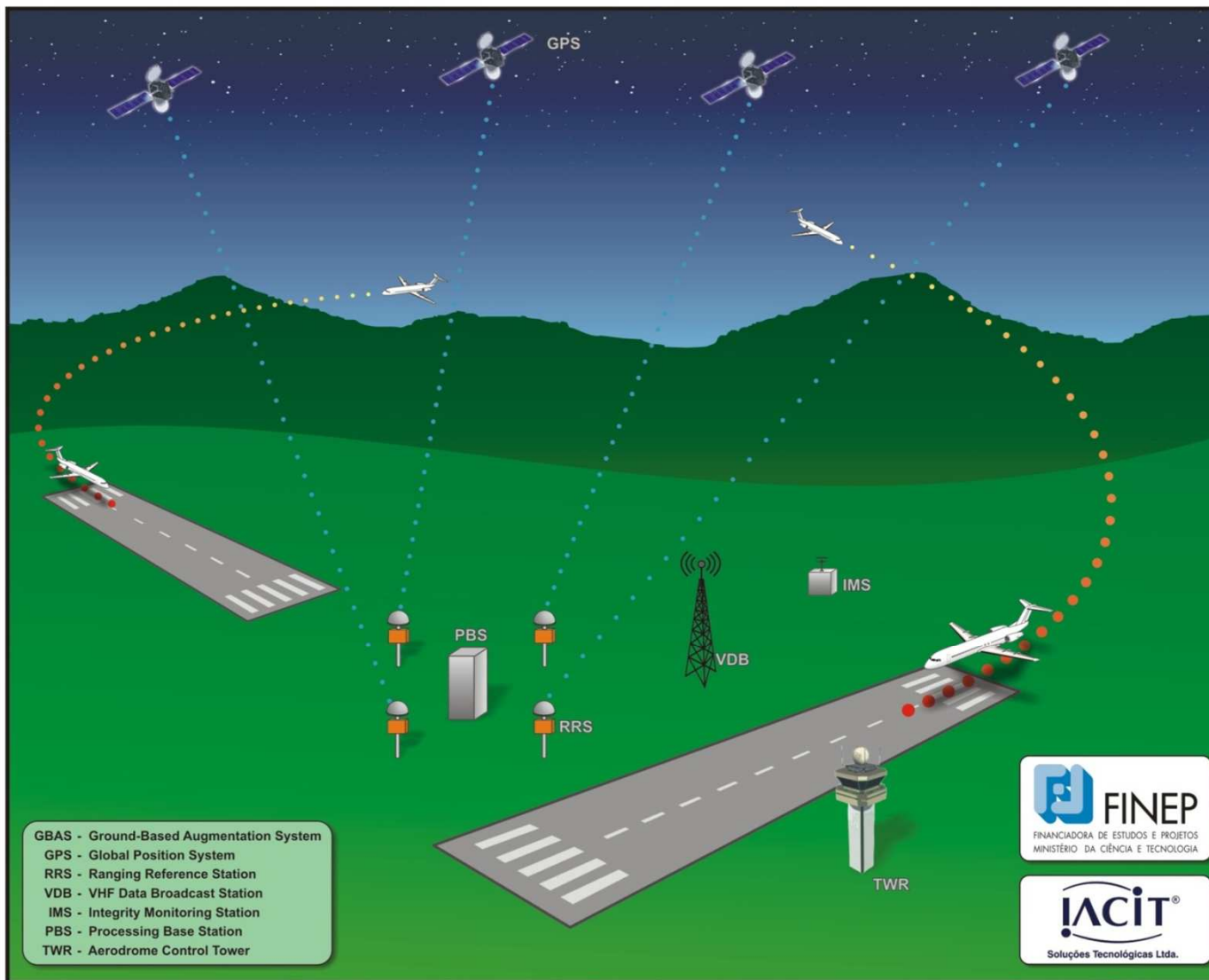


## Ground-Based Augmentation System GBAS

GBAS is a system for the augmentation of the accuracy, integrity, continuity and availability of the information for the satellite navigation using GNSS (Global Navigation Satellite Systems).



# GBAS - Ground-Based Augmentation System **!ACiT®**

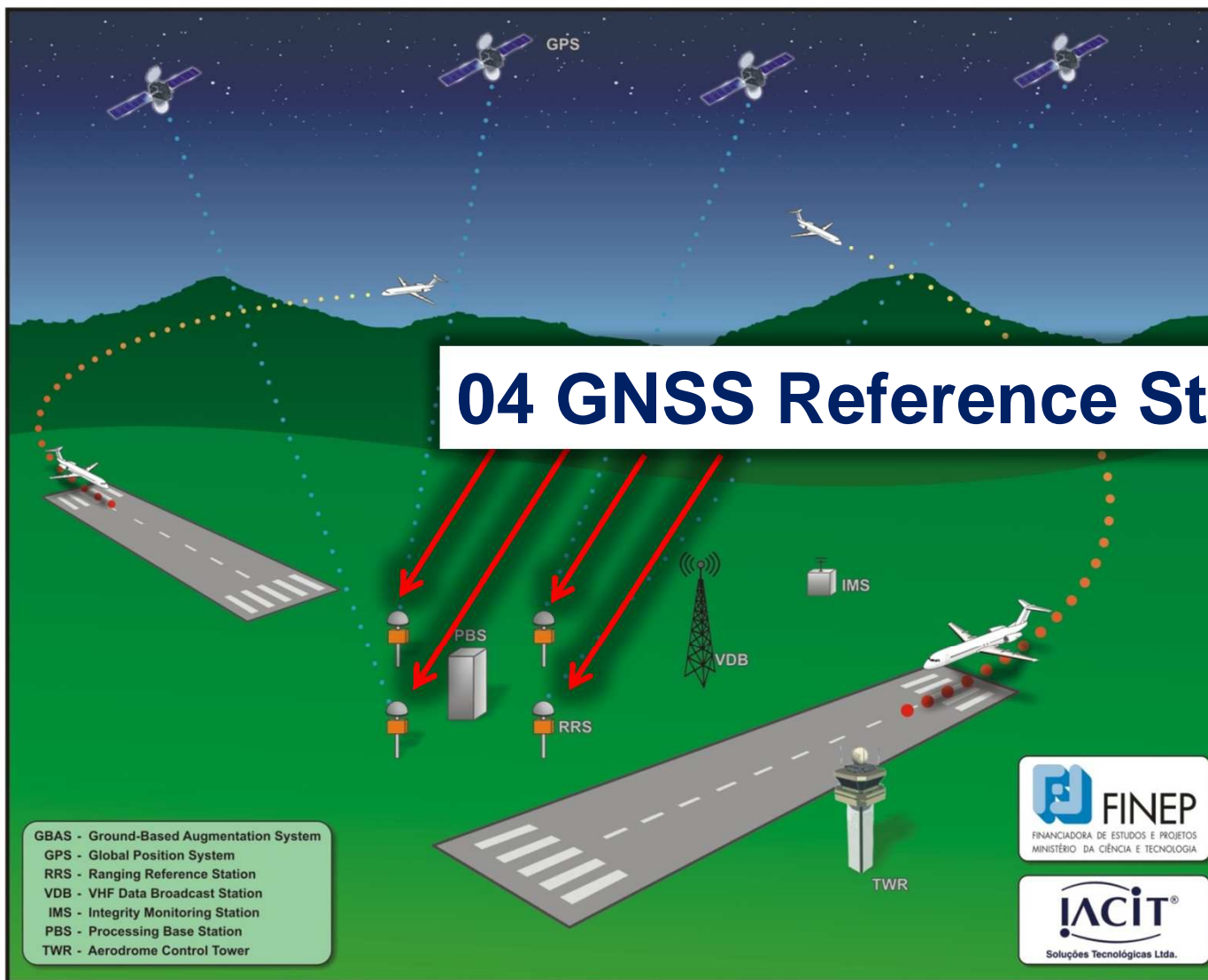




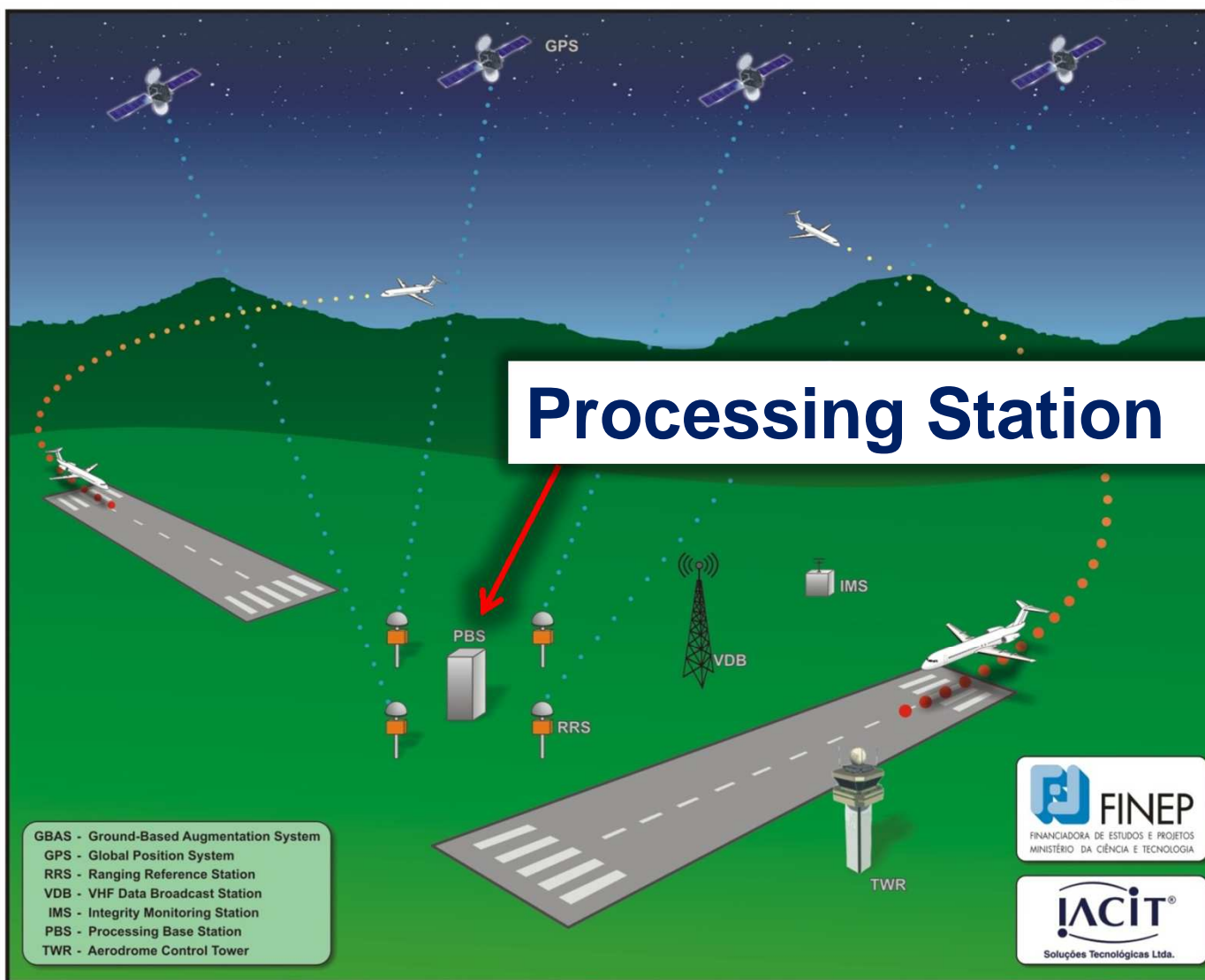
# GBAS - Ground-Based Augmentation System



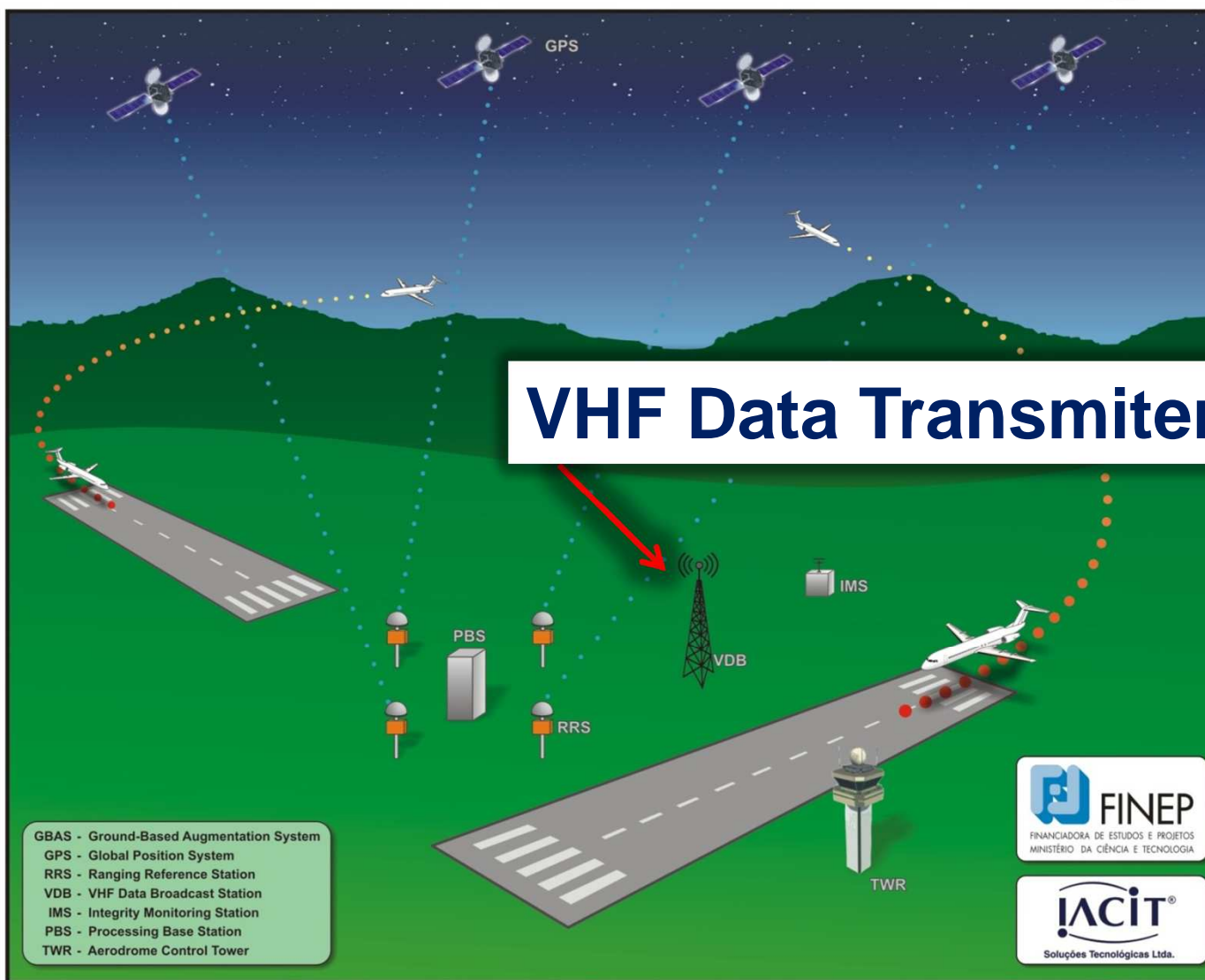
## 04 GNSS Reference Station



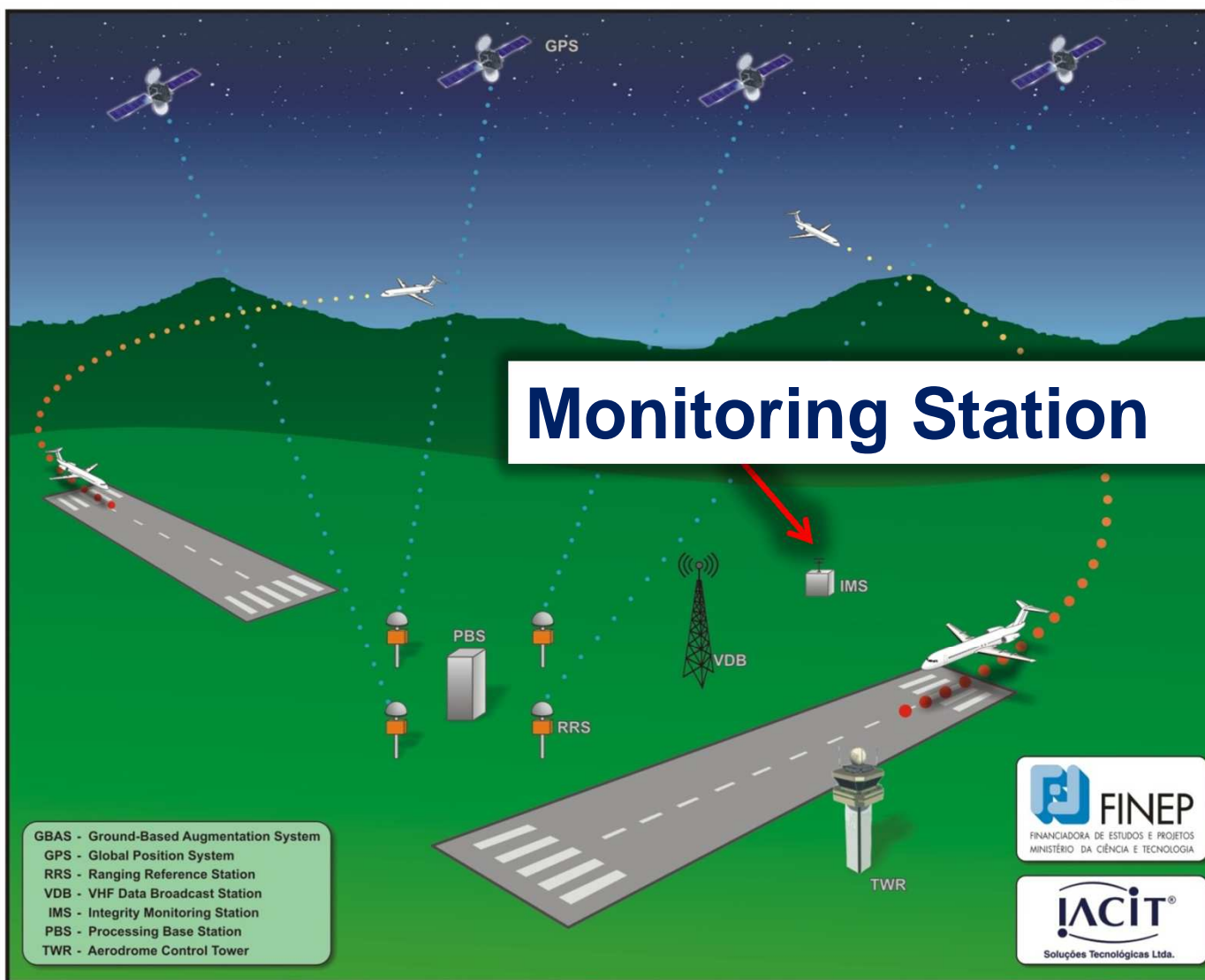
# GBAS - Ground-Based Augmentation System



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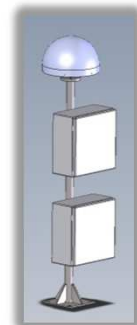


# GBAS - Ground-Based Augmentation System **IAcIT**<sup>®</sup>





# GBAS - IACIT



# Why GBAS?

GBAS is intended to support all types of approach, landing, departure and surface operations and may support en-route and terminal operations.

The following SARPs are developed to support Category I precision approach, approach with vertical guidance, and a GBAS positioning service. In order to achieve interoperability and enable efficient spectrum utilization, it is intended that the data broadcast is the same for all operations.

GBAS shall perform the following functions:

- provide locally relevant pseudo-range corrections;
- provide GBAS-related data;
- provide final approach segment data when supporting precision approach;
- provide predicted ranging source availability data; and
- provide integrity monitoring for GNSS ranging sources.

Reference: Annex 10 – Volume I



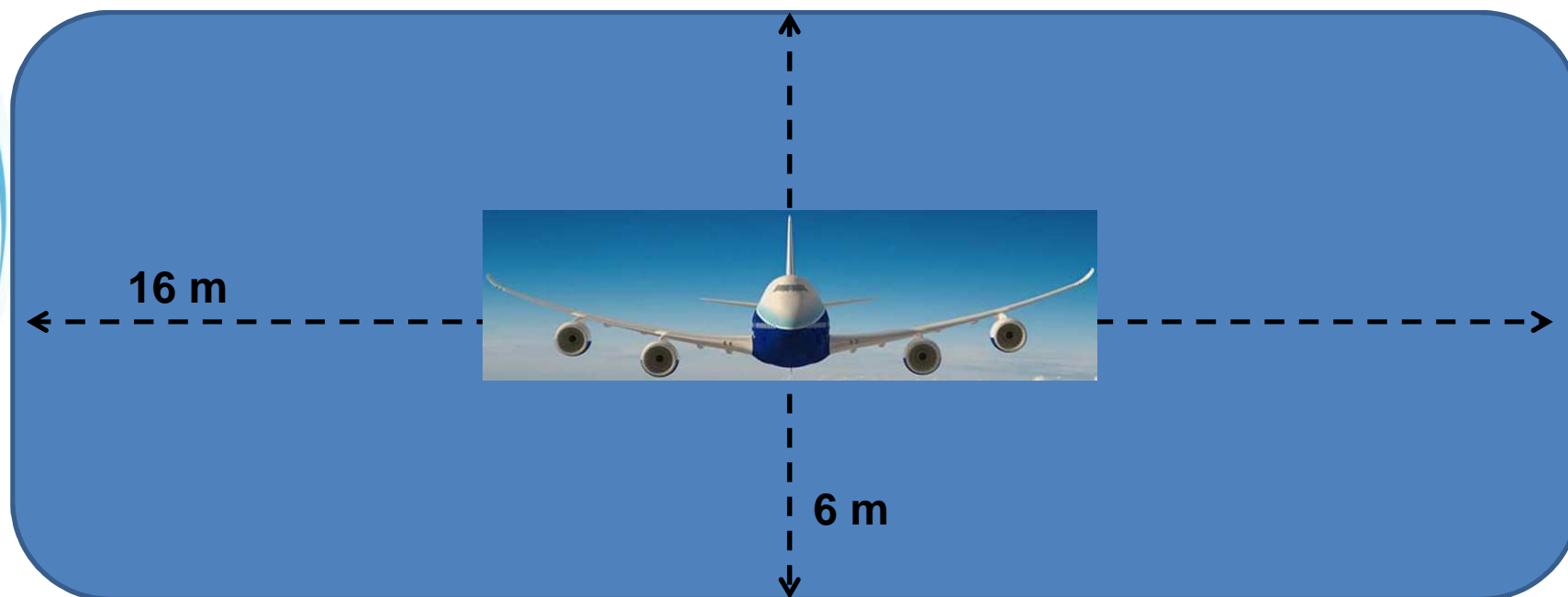
# Performance Requirements of GBAS

Typical Operation	Horizontal Accuracy	Vertical Accuracy	Integrity	Time-to-alert	Continuity	Availability
En-route	3,7 km	N/A	$1-1 \times 10^{-7}/h$	5 min	$1-1 \times 10^{-4}/h$ to $1-1 \times 10^{-8}/h$	0,99 to 0,99999
En-route, Terminal	0,74 km	N/A	$1-1 \times 10^{-7}/h$	15 s	$1-1 \times 10^{-4}/h$ to $1-1 \times 10^{-8}/h$	0,99 to 0,99999
Initial Approach, NPA, Departure	220 m	N/A	$1-1 \times 10^{-7}/h$	10 s	$1-1 \times 10^{-4}/h$ to $1-1 \times 10^{-8}/h$	0,99 to 0,99999
APV-I	16,0 m	20 m	$1-2 \times 10^{-7}/h$ in any approach	10 s	$1-8 \times 10^{-6}/h$ per 15s	0,99 to 0,99999
APV-II	16,0 m	8 m	$1-2 \times 10^{-7}/h$ in any approach	6 s	$1-8 \times 10^{-6}/h$ per 15s	0,99 to 0,99999
CAT I	16,0 m	6 – 4 m	$1-2 \times 10^{-7}/h$ in any approach	6 s	$1-8 \times 10^{-6}/h$ per 15s	0,99 to 0,99999

Reference: Annex 10 – Volume I



# Performance Requirements of GBAS



CAT I

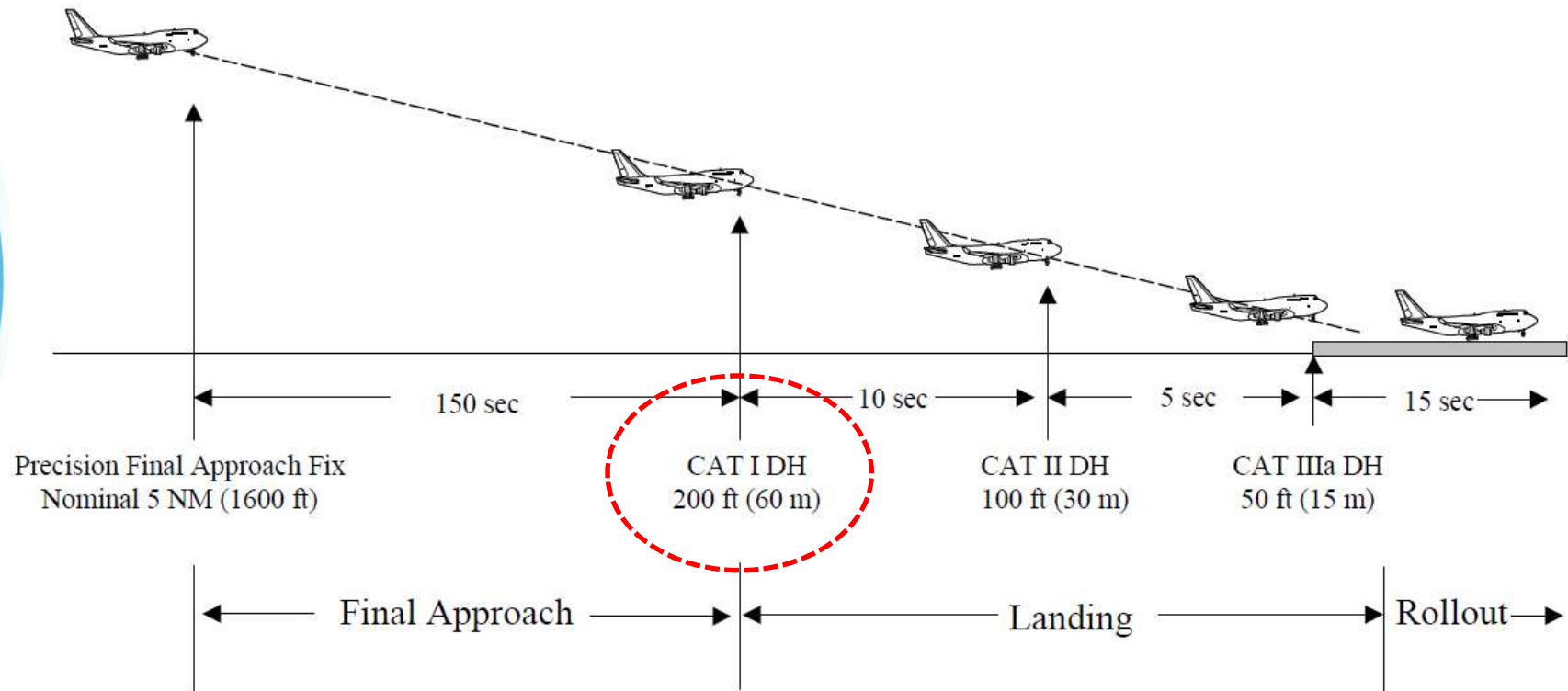
16,0 m

6 – 4 m





# Approach Operations



Reference: DO-245A



# Flexibility in compair with ILS

- **Support all runway of an airport:**
  - Operational flexibility
  - Up to 48 approach
  - Easy to chance procedure
- **Digital Radio Signals:**
  - Less suceptible to interference
  - Less atenuation in abnormal weather
  - Coverage of 23 NM
- **Approach and departure operations**
- **GNSS operation:**
  - Curved-path approach
  - RNP/RNAV
- **Flexible Sitting:**
  - Reduced Building
  - Only one transmission subsystem
- **Maintenance**



# Designed to Agree



## System GBAS

- ICAO Volume I of Annex 10
- RTCA DO-245A
- Eurocae ED-114
- FAA-E-AJW44-2937A
- CISCEA 000.13.T03.EP.003.00

## Software

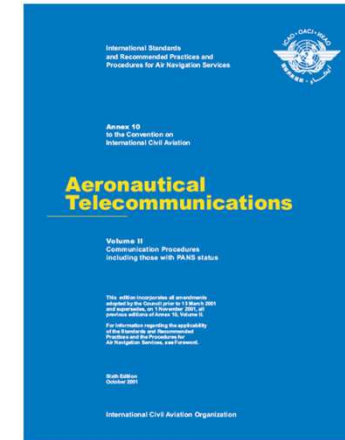
- RTCA DO-278 and DO-178B

## Safety Plan

- SAE ARP4761
- ICAO SMM

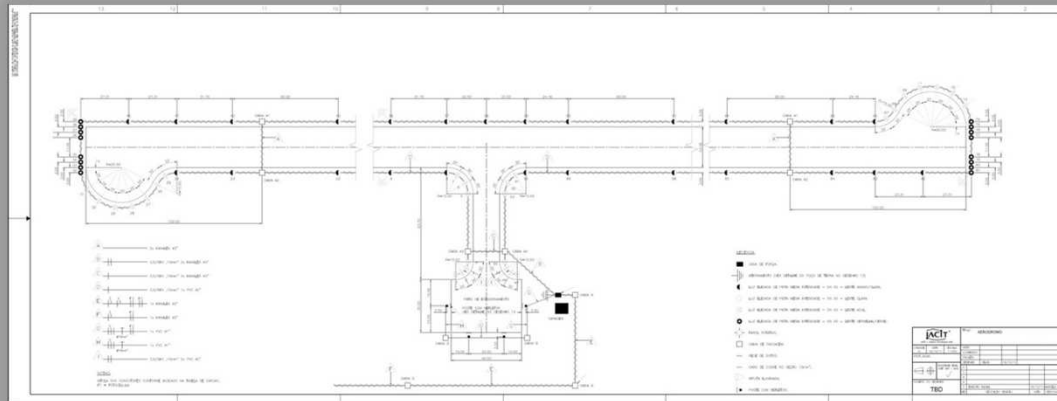
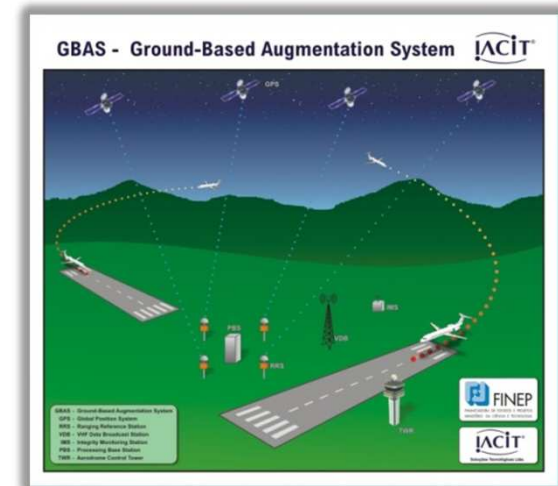
## Verification and Validation Plan

- Doc 8071
- DO-245A



# Development GBAS - Brazil

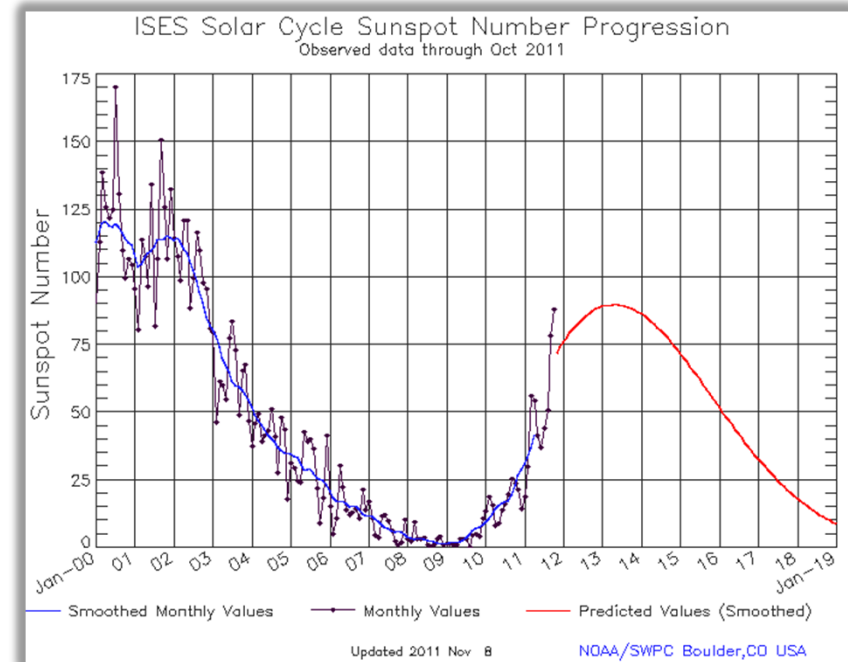
- **DECEA**
  - Validating the system at International Airport of Rio de Janeiro, Galeão
- **IACIT**
  - Mathematics algorithms validation
  - Ionosphere GNSS influences
  - Installation of prototype





# Ionosphere Studies

- Hight activity prevision of Sun for 2013 - 2014
- IACIT designed Monitoring Station to measure Ionosphere effects on GNSS for GBAS
- IACIT is collecting data to analyse Ionosphere effects
- IACIT is researching alternatives to mitigate Ionosphere effects



# Schedule of GBAS-IACIT



2011		
	December	Validation of Mathematical Algorithms
		Conclusion of the Installation at the Aerodrome
2012		
	February	Starts of Flight Tests for Validation Purpose



# IACIT Investments



## Projects already in development:

- **NextGEN Systems:**
  - ADS-B
  - Multilateration
  - DME-P

## Projects to start:

- Radio platform evolved from projects in development
- Navigation Systems for UAV (Unmanned Aerial Vehicle)



# Thank you!

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Quality Engineer

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