



# Brazil PNT - Deployment Plans for the Largest Nation in South America



Air Force Command  
Space Systems Commission  
(CCISE)

CLAUDIO OLANY A.O., COL AV  
Chief of the Space Systems Division

December 05<sup>th</sup>, 2018



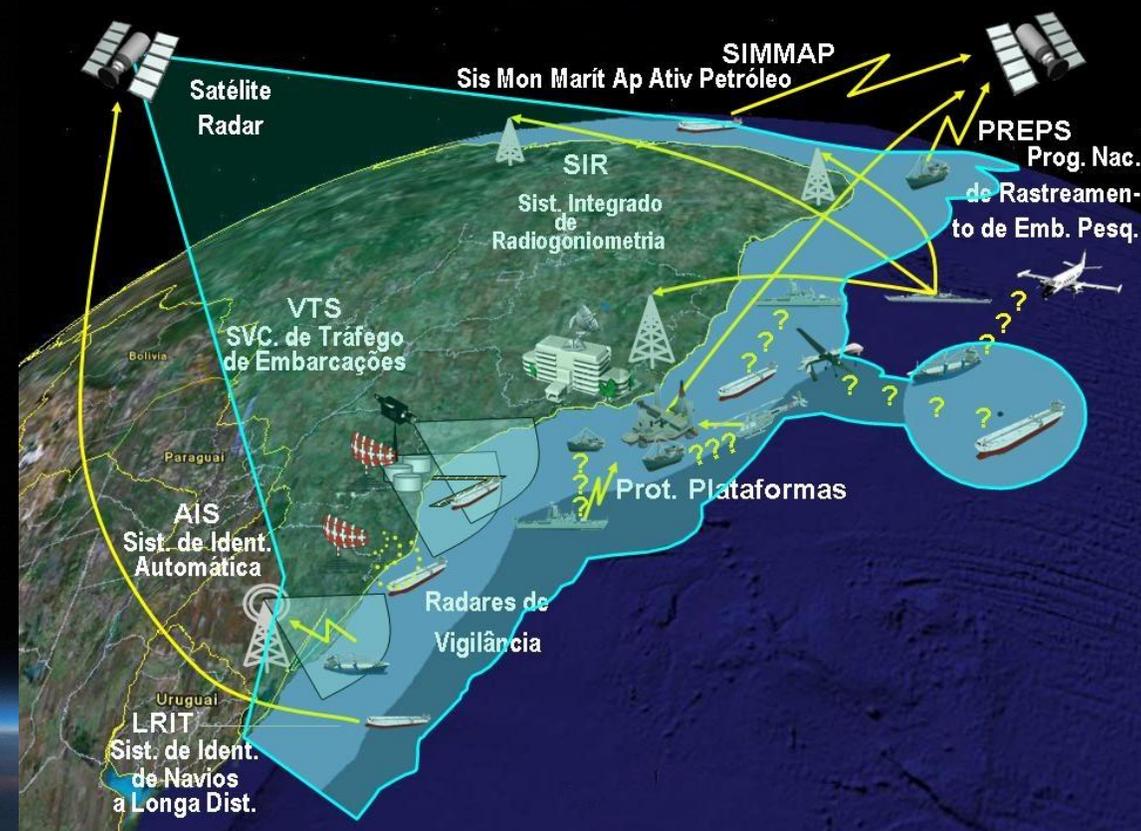
# Goal

To present selected information on the  
Brazilian Space Program and its  
positioning/navigation/timing initiatives.



# Satellite Services

Satellite Services are considered a dual use system:  
Defense and Civil





# Commercial Products and Services



## Positioning, Navigation and Timing (GPS)

Government Services

Data Services

Mobile Telephony and Internet

Satellite TV (Broadcasting)

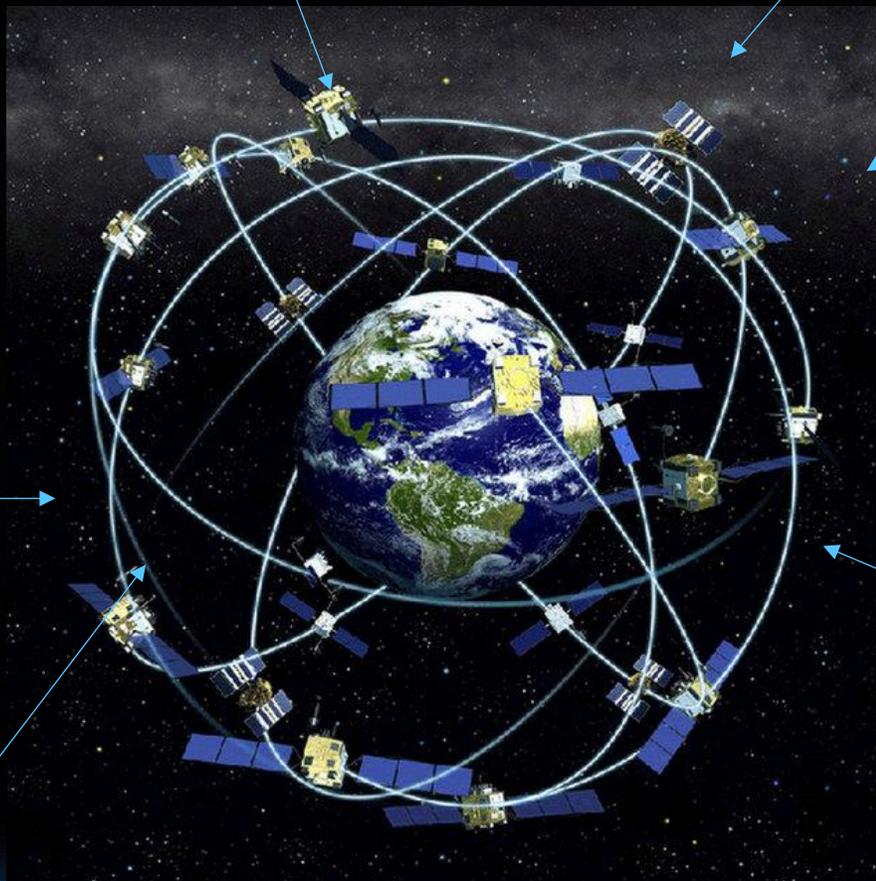
Video App

Satellite Communications

Earth Observation

Satellite Radio (Broadcasting)

Value-Added Services





# Defense Issues



Space Systems support:

Space Situational Awareness  
(SSA)

Electronics Superiority  
(Electronic Warfare)

Assure  
X  
Deny

Cyber  
Warfare

Air  
Superiority

C4ISR





# What are Brazil's Positioning, Navigation and Timing initiatives?



December 5<sup>th</sup>, 2018



# Brazil's PNT (GNSS) Activities



There are two current activities

- Operational: installation of Glonass monitoring stations in Brazil (Joint Brazil and Russia efforts)
- Scientific: CALIBRA project





# Brazil's PNT (GNSS)



Brazil hosts the largest number of Glonass sites outside of Russia, with four stations.

- **Operational:**
  - 02 at the University of Brasília (UnB)
  - 01 at the Federal University of Santa Maria (UFSM)
  - 01 at the Institute of Technology of Pernambuco
  - 01 at Brazil's North region (to be installed)





# Brazil's PNT (GNSS)



Brazilian Network for Continuous Monitoring of GNSS Systems in real time (RBMC-IP):

- A real-time positioning service from RBMC stations for users who use the RTK (real-time kinematic) or DGPS (differential GPS) technique.
- The data is made available via Networked Transport of RTCM via Internet Protocol (NTRIP).
- NTRIP is designed to disseminate differential data correction or other types of GNSS data to users, mobile or stationary, over the Internet, allowing simultaneous connections to computers, Laptops, and PDAs that have access to the wireless Internet such as GPRS, GSM or 3G modem.





# Brazil's PNT

138 stations of Brazilian Network for Continuous Monitoring of GNSS Systems (RBMC-IP) :

- 104 Post-processing stations (real-time)
- 34 Post-processing stations





# Brazil's PNT (GNSS)

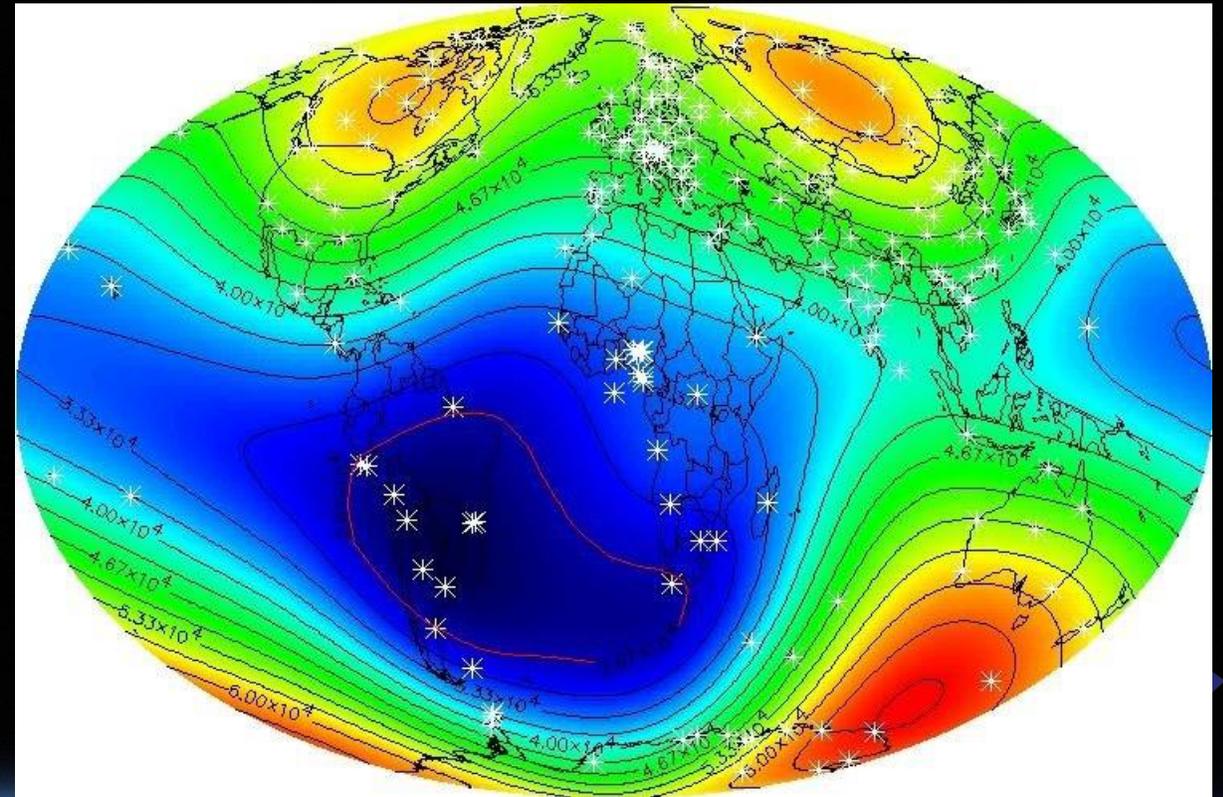


## CALIBRA PROJECT :

Brazil is located in one of Earth's most electromagnetically affected regions and is therefore an excellent place to test, as it constitutes one of the worst case scenarios (SSA).

The project aims to develop algorithms to correct the distorting effects of the ionosphere.

## SAA – South Atlantic Anomaly





# Brazil's PNT (GNSS)



## CALIBRA PROJECT :

Positioning methods such as **Real-Time Kinematic (RTK)**, **Wide Area RTK (WARTK)** and **Precise Point Positioning (PPP)**, which exploit the accuracy of GNSS signals, have provided a significant impact in supporting operations where high efficiency is required, such as:

- Presently doing topographic and geodetic surveys;
- Planning for precision agriculture, where meticulous applications of pesticides and fertilizers translate into efficiency and productivity gains; land management and offshore operations.



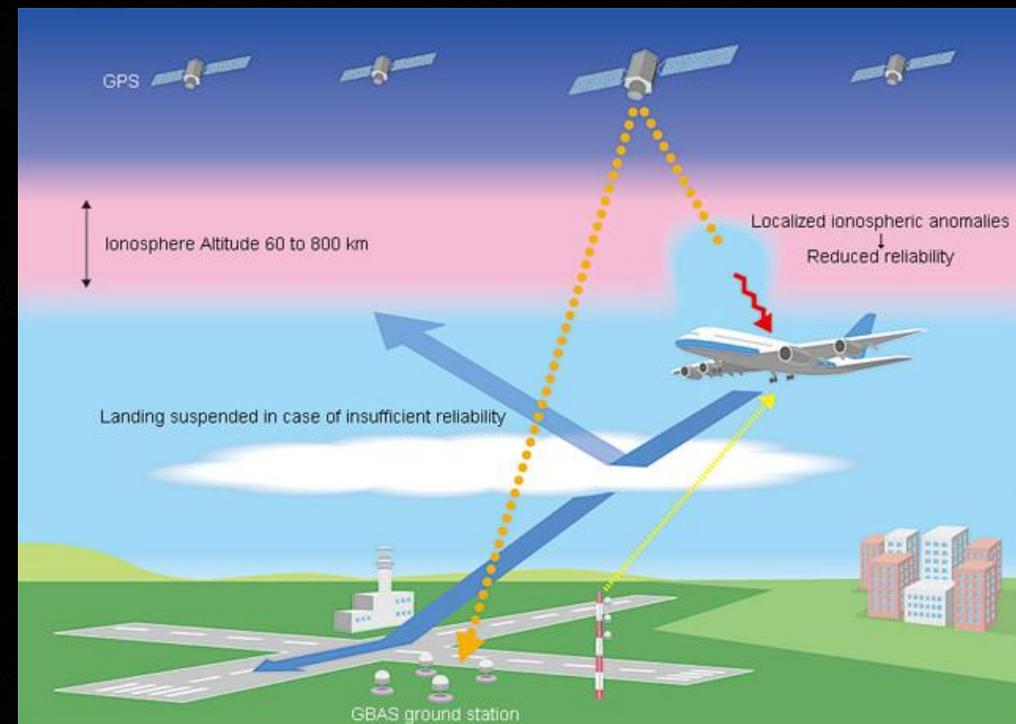


# Brazil's PNT Future Plans



## GNSS + DGNSS

- Studies are being carried out in Brazil to extend the accuracy and integrity standards of navigation assistance equipment to ensure the efficiency and safety of air operations.
- The integrated use of GNSS (GPS, GLONASS, and Galileo) and DGNSS (GBAS and SBAS) technologies for air navigation will bring significant benefits to air traffic in Brazil.





*“The nation that does not invest in the R&D of technologies, and especially the technology applied in the Space area, with the goal to achieving a relative autonomy in the international scenario, will be condemned to a secondary role, acting as a mere supplier of raw materials, agricultural products or services.”*

Gen D. Eisenhower  
(Adapted)





# Brazil PNT - Deployment Plans for the Largest Nation in South America



Air Force Command  
Space Systems Commission  
(CCISE)

CLAUDIO OLANY A.O., COL AV  
Chief of the SpaceSystems Division

December 05<sup>th</sup>, 2018