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LAAS/GBAS Operational Evaluation Project (OVP) Brazil

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LAAS/GBAS Operational Evaluation Project (OVP) Goals

- **Collect flight data from 3 different types of aircraft on procedures for straight-in approaches and terminal area operations at the primary airfield**
- **Collect data at the adjacent airport, which has commercial service applications**
  - Use the protocol established by AFS-420 and their recommended data collection sheets and debriefings.
- **Develop descending curved approach into commercial field**
  - Intersect a final approach segment that will be less then 3 miles
- **Data collected from the Brazilian aircraft**
  - Data from pilots' flyability
  - Data from on-board data collection systems for future TERPS considerations
- **A factor will be to gain international acceptance for the criteria and standards that we will develop and propose to ICAO**

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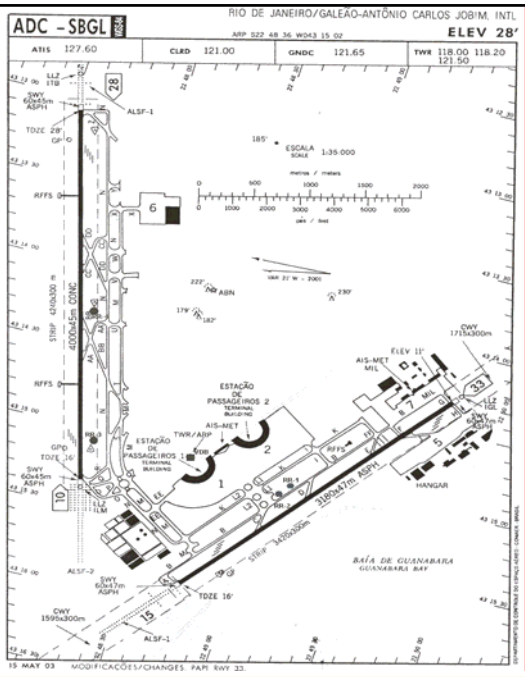
Rio De Janeiro Galeao-Antonio Jobim Intl



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LTP

- Characterize current installation performance
- Develop optimum installation desired for coverage of operational installation at GIG
- Work closely with LAAS team to develop understanding of integrity issues
- Identify locations for remote VDB during Phase III testing
- Identify infrastructure requirements of remote VDB

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Infrastructure

- **SBAS Test Bed**
- **GBAS Test Bed**
- **Airborne Platforms**
  - -- Hawker
  - -- Embraer Jet
  - -- Helicopter (s)
- **Performance Monitoring**
  - -- Aeronautical Information Generation for NOTAMS

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Products

- **Validation of LAAS/GBAS Siting Criteria**
- **Validation of LAAS/GBAS Installation Criteria**
- **TERPS/ICAO Criteria – CAT I/RNP .2 (.06)**
  - -- Data to support Complex Procedures
- **Minimum Supportable RNP - .2 (.06)**
- **GBAS Concept of Operations**
- **Validation of integrated GBAS/SBAS Concept of Operations**
- **Characterization of Scintillation effects for input to RTCA/ICAO standards**

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Schedule

Phased Approach

- **Phase I – Jul- Sep 04**
  -- Straight in finals – TERPS Data Collection
- **Phase II – Oct – Feb 04**
  -- Ionospheric Data Collection
  -- Complex Procedures
  -- Adjacent Airport Ops
- **Phase III – Mar - Jun 05**
  -- Complex Procedures – TERPS Data Collection
  -- Airspace Design
  -- Adjacent Airport Ops
- **Deliver Concept of Operations – Jun 05**
- **Analysis – Jun – Aug 05**
- **Final Iono Report – Sep 05**
- **Concept of Operations Validation – Dec 05**

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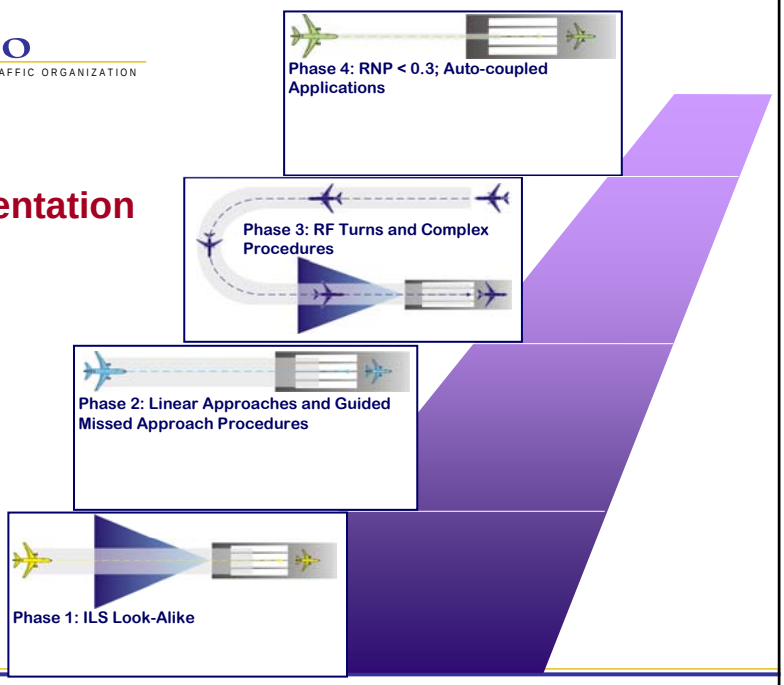
Implementation



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Operational Considerations

- **At GIG the LTP is required to support**:
  - coverage to all runway ends
  - coverage to 20 nmi on all qualified runway ends
  - positive guidance in all/any missed approach regions
  - advanced procedures
  - coverage to adjacent airports – Santos Dumont
- **The siting philosophy is that operational requirements, not system capabilities, drive the siting decision.**

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Procedure Development

- **Survey data validation**
- **Airspace design**
  - -- Guided Miss
  - -- RNP arrivals
  - -- Guided departure
- **Applied criteria – start with baseline**
  - -- Phased in conjunction with test plan
  - -- RNP arrivals to complex approaches
- **Development of approach concepts**
  - -- Specific to each phase
- **Develop specific approaches for each phase of testing**
  - Phase I – RNP (.3) Full approaches to include RNP and Baro VNAV
    - Identify air space actions
  - Phase II – RNP (.2) SIDS/STARS, guided miss
  - Phase III – RNP (.2) Complex approaches, vertical flight testing

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Master Test Plan

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Purpose

- **Collect Flight Data to support GNSS TERPS/PANS OPS Development – Complex Approaches**
- **Define effects of Iono on Avionics and GBAS/SBAS performance**
- **Vertical Flight Operational Requirements**
- **Quantify technical system requirements for CONOPS**
  - -- Certification
  - -- System Performance
  - -- Operational Service Level Requirements
    - --- Air Space Structure
    - --- Adjacent Airport Operations
    - --- Approach Service – LNAV, LNAV/VNAV, APV, GLS
- **Quantify Operational Benefits**

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Flight Test

The following was decided as a result of the flight conducted during initial flight test Dec 03.

- There should be 60 – 100 runs for each part of the instrument procedure:
- GBAS final approach – 1 to 2 miles outside FAF on centerline prior to decent.
- (60-100) Follow glide slope to MAP, at MAP execute to go-around
- (60-100) Follow glide slope MAP, transition to 50' run down runway.
- SBAS Approach 1-2 miles outside of IAF and begin recording fly entire procedure to FAF + 1 mile and then return to IAF.
- (60-100) Final - 1-2 miles outside FAF and record to MAP and the go-around.
- (60-100) 1-2 miles outside FAF and continue after MAP – transition to 50' down runway
- RNAV approach – same as SBAS only use FMS with Baro VNAV for vertical guidance.

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Progress to Date

- **Completed Activities**
  - LTP installation
  - Training at FAATC
  - UHF coverage and interference test
  - Validation of ARP, PAC's, SAC's
  - Avionics Installation for Hawker
  - Avionics Integration related to FMS
- **NEXT**
  - The LTP at Galeão is functioning with equivalent performance to the system installed in Atlantic City, and should provide adequate performance for the scheduled ionosphere tests.
  - All additional ionosphere reference stations are installed and operating.
  - Flight Testing In-Progress

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Reference Receiver

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IONO

Ionosphere Research for SBAS/GBAS Precision Approaches in Brazil/South America

- Iono research for SBAS/GBAS continues to be a very active project between the FAA (including the FAATC, Stanford, and NASA JPL) and DECEA (including INPE)
- Data collection continues at all Brazil Test Bed (BTB) reference station locations, and other regional RLA/00/009 reference station sites
- WJHTC is using in further characterization of the equatorial ionosphere situation and development of possible solutions for operational SBAS and GBAS

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Final Observations

- Brazilian team for SBAS/BTB and LTP installation is the same
- The FAA technical support is decisive
- LTP is working properly
- Iono Data Collection Actively Underway
- DECEA is also fully committed to the implementation of the new CNS/ATM systems and is taking all possible steps to reach the related ICAO common goals.
- DECEA and FAA recognize that GNSS technologies are critical to creating a successful regional and global CNS/ATM system

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Questions?