GNSS Performance Monitoring System (GPMS)

Prepared By

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Air Navigation Services

General Authority of Civil Aviation
Global Navigation Satellite System (GNSS)

• Approved by ICAO as standard navigation aid.
• Global coverage.
• Single navigation aid for all phases of flight.
  – Requires augmentation to fulfill aviation requirements.
• Multi GNSS constellations: GPS, GLONASS, Galileo (2019) and Beidau (2020).
What is GPMS?

- Allows users to comply with ICAO Guidance – Annex 10
- Monitoring and Recording of GNSS Data
- Wide Area RAIM Prediction
- GNSS NOTAMs for State ANSP and Airspace users
It is an ICAO requirement for:

- ATC shall be provided with operational status of radio navigation aids authorized to be used for civil aviation. This will include GNSS.
- State approving GNSS operations should ensure relevant GNSS data are recorded to be used in incident/accident investigation.
- State approving GNSS shall issue NOTAMs for changes on the operational status.
GNSS Performance Monitoring System (GPMS)

- GPMS continually monitors actual GNSS (GPS) satellites in view, determining real-time availability of GNSS (GPS) and alerts during periods of unavailability.
- GNSS (GPS) data recorded for playback and analysis.
- GPMS predicts GNSS (GPS) Receiver Autonomous Integrity Monitoring (RAIM) for FIR regions and airports.
KSA GPMS Architecture

GPMS composed of:

– (5) Local Monitors (LM) subsystem.
– Performance Processing (PP) subsystem.
– (2) Performance Display (PD) subsystem.
– Data Link (DL) subsystem.
KSA GPMS Functional Description

• System to monitor GPS performance in real time
• Store data for historical assessment
• Built-in GPS RAIM prediction capability
• 5 LM sites deployment:
  ➢ Receiver Sites: GPS receiver + Antenna at:
    ➢ Jeddah, Riyadh, Dammam, Abha, Al Jouf
  ➢ Central Database Server at Jeddah
  ➢ Performance Display at:
    ➢ Jeddah
    ➢ Riyadh
KSA GPMS System Overview

System

Applications

Monitoring
Aeronautical
Information

Monitoring
AIS/ATM

LM: Local Monitor
PP: Performance Processing
PD: Performance Display

General Authority of Civil Aviation
Local Area Monitor - LAM)

- Live monitoring of receiver data
- Chart and tabular display
- Rule-based alerting (includes Jamming and Ionospheric Interference)
- Historical data replay
Wide Area Monitor – WAM

- WAM Performance Data Types:
  - PBN compliant RAIM prediction capability
  - Load prediction results
  - Map display
  - Region predictions:
    - time animation
    - service assessment
  - Point predictions:
    - time series
    - service availability reports
Architecture

Typical Receiver Site
Architecture

Receiver Hardware

• NovAtel GPS Receiver ProPak-V3-RT2

• NovAtel Antenna GPS-702-GG
Architecture

Receiver Site Location

GPS Frequencies
L1 at 1575.42 MHz
L2 at 1227.60 MHz
Architecture

- 1x GPS Antenna
- 1x GPS Receiver
- 1x Server (HP Proliant DL 360 Gen8)
NOTAM Post Processing

• NOTAM is the acronym for Notice To Airmen

• NOTAMs are released to notify about issues such as:
  • Hazards
  • Temporary flight restrictions
  • Closed runways
  • Inoperable navigational aids
NOTAM Post Processing

GPMS has the ability to generate GPS NOTAMs based on outages predicted in a calculation scenario (usually airport 0.3 NM RNP Approach (NPA) NOTAMs are generated for point predictions only and are automatically sent to the GACA AIS system.
THANK YOU