GNSS Information System for Europe - GISE

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Agenda

• Introduction
• Background
• Architecture
• User Interface
• NOTAMs
• EGNOS NOTAM Proposals
• Summary
Introduction

• AUGUR → GPS RAIM Availability prediction outages operated by DWI
• EURONOTAM → EGNOS Availability outages operated by ESSP
• GISE combines the services:
  • GPS RAIM & EGNOS outage information available through AUGUR website and via NOTAM Proposals

• GNSS Information Service for Europe
Functional Requirements

• Calculate GPS RAIM availability for various service levels at various airport locations
• Disseminate the GPS RAIM availability predictions to end users as NOTAM Proposals
• Process update of messages as underlying assumptions change - primarily constellation data monitored for change
• Provide additional AUGUR UI components to access EGNOS prediction information from EURONOTAM
• Provide GPS constellation information to EURONOTAM via web service
Functional Requirements

• Ensure updates to disseminated predictions are identified correctly and disseminated in timely manner
• Provide management capability to allow configuration of calculation behaviour and monitoring of calculation success / failure
Existing Functionality

• Existing AUGUR requirements:
  • Route calculations – ECAC waypoint lookup, worldwide capability
  • Aerodrome lookup – worldwide
  • Visibility Mode
  • GPS Constellation Status
# Existing Functionality – Route Tool

## AUGUR GPS RAIM Prediction Tool - Route Tool

### Route

The Time Offset field holds the total time, in minutes from the start time, for each waypoint.

<table>
<thead>
<tr>
<th>Waypoint #</th>
<th>ICAO Identifier</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Mode</th>
<th>Time Offset</th>
<th>State</th>
<th>Type</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>EGLL</td>
<td>51.4775</td>
<td>-0.46139</td>
<td>ROUTE</td>
<td>0 mins</td>
<td>EG</td>
<td>Airport</td>
<td>[Lookup</td>
</tr>
<tr>
<td>1</td>
<td>LFPG</td>
<td>49.00972</td>
<td>2.54778</td>
<td>ROUTE</td>
<td>60 mins</td>
<td>LF</td>
<td>Airport</td>
<td>[Lookup</td>
</tr>
</tbody>
</table>

[Lookup Waypoint] [New Route] [Save Route to Session] [Session data]

### Scenario

- **Start Date**: 26/01/2011
- **Start Time**: 16:11

### Configuration

- **Mask Angle**: 5.0 degrees
- **Algorithm**: FD

### Result

- **Graphic Width (Minimum applies)**: 750 pixels

[Check Route]
Existing Functionality – Waypoint

AUGUR  GPS RAIM Prediction Tool - Route Tool

Waypoint Lookup

Partial/Full ICAO Identifier
State

EG

Note:
The Route Tool database only contains data for en-route waypoints and navais in the ECAC area. En-route waypoints and navais are updated every AIRAC (current cycle is 1101). Users may define their own waypoints for the session but these will not be saved once the session is closed. The list of States includes only those that contain any waypoints. Those States that contain only user waypoints are appended onto the end of the list. A maximum of 250 waypoints will be returned.

Lookup

<table>
<thead>
<tr>
<th>ICAO Identifier</th>
<th>State</th>
<th>Latitude Decimal Deg</th>
<th>Latitude Deg Min Sec</th>
<th>Longitude Decimal Deg</th>
<th>Longitude Deg Min Sec</th>
<th>Type</th>
<th>User</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADN</td>
<td>EG</td>
<td>57.31045</td>
<td>N571837.62</td>
<td>-2.26721</td>
<td>W0021601.95</td>
<td>VHFNavaid</td>
<td>public</td>
</tr>
<tr>
<td>BCL</td>
<td>EG</td>
<td>57.47509</td>
<td>N572830.31</td>
<td>-7.37032</td>
<td>W0072213.16</td>
<td>VHFNavaid</td>
<td>public</td>
</tr>
<tr>
<td>BCN</td>
<td>EG</td>
<td>51.72556</td>
<td>N514332.00</td>
<td>-3.26306</td>
<td>W0031547.00</td>
<td>VHFNavaid</td>
<td>public</td>
</tr>
</tbody>
</table>
Existing Functionality – Visibility Tool

AUGUR GPS RAIM Prediction Tool - Visibility Tool

**Receiver Position**

- **Latitude**: 51 deg
- **Longitude**: -1 deg
- **Altitude**: 15 m
- **Mask Angle**: 5 deg

**Output**

**GPS Satellite Visibility**

Generated: 26/01/2011 16:20:16 UTC

Scenario Start: 26/01/2011 16:20:16 UTC  Scenario Stop: 26/01/2011 17:35:16 UTC

**Scenario**

- **Duration (HH:MM)**: 01 : 15
- **Samples (1-20)**: 20
- **Time Selection**: Automatic

**Manual Time Selection**

- **Date (DD/MM/YYYY)**: 26 / 01 / 2011
- **Time (HH:MM:SS)**: 16 : 18 : 22

**Result**

- **Format**: Graphic

**Check Visibility**

This plot shows only healthy and visible satellites.
Existing Functionality – GPS Status

AUGUR   GPS RAIM Prediction Tool - GPS Status

GPS Status  Terminal/Approach Tool  Visibility Tool  Route Tool  Nav Domain Home  Mirror Site  Help

A minimum of 30 satellites are available during the query period.

B-RNAV en-route predictive RAIM check not required.

Scenario Information

<table>
<thead>
<tr>
<th>Start Time</th>
<th>26/01/2011 00:00:00 UTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>End Time</td>
<td>29/01/2011 00:00:00 UTC</td>
</tr>
<tr>
<td>Request Time</td>
<td>26/01/2011 16:21:29 UTC</td>
</tr>
</tbody>
</table>

Current Almanac

<table>
<thead>
<tr>
<th>GPS Week</th>
<th>GPS TOA</th>
<th>Total Satellites</th>
<th>Unhealthy Satellite PRNs</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>596</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>503808</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>31</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Current NANUs

<table>
<thead>
<tr>
<th>Number</th>
<th>PRN</th>
<th>Start Time</th>
<th>Stop Time</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011009</td>
<td>12</td>
<td>26/01/2011 09:15:00 UTC</td>
<td>26/01/2011 21:15:00 UTC</td>
<td>FCSTDV</td>
</tr>
</tbody>
</table>

AUGUR Disclaimer
Terminal/Approach Tool Prediction

GPS RAIM Prediction Tool - Terminal/Approach Tool

Airports

Airport 01  ...  ...
Airport 02  ...  ...
Airport 03  ...  ...
Airport 04  ...  ...
Airport 05  ...  ...
Airport 06  ...  ...
Airport 07  ...  ...
Airport 08  ...  ...
Airport 09  ...  ...
Airport 10  ...  ...

Prediction Type

Type  GPS RAIM  

Configuration

Mask Angle  Default  
Algorithm  FD  
Mode  APPROACH  

Result

Format  Graphic  

Check Terminal/Approach
### AUGUR Prediction Results GPS RAIM

#### AUGUR GPS RAIM Prediction Tool - Terminal/Approach Tool

**Airports**

<table>
<thead>
<tr>
<th>Airport</th>
<th>LFGP</th>
<th>...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport 01</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Airport 02</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Airport 03</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Airport 04</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Airport 05</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Airport 06</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Airport 07</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Airport 08</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Airport 09</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Airport 10</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

**Prediction Type**

- GPS RAIM

**Configuration**

- **Mask Angle**: 5.0 degrees
- **Algorithm**: FD
- **Integrity Level**: APPROACH

**Result**

- **Format**: Graphic

**Terminal/Approach Check**

- **Scenario Start**: 02/02/2011 00:00:00 UTC
- **Scenario Stop**: 05/02/2011 00:00:00 UTC
- **Mask Angle**: 5.00
- **Algorithm**: Fault Detection Only (FD)
- **Integrity Level**: APPROACH
- **Active NALUS**: 2011013

**Output**

<table>
<thead>
<tr>
<th>Time (UTC)</th>
<th>LFPG</th>
</tr>
</thead>
<tbody>
<tr>
<td>02/02 00:00</td>
<td></td>
</tr>
<tr>
<td>02/02 12:00</td>
<td></td>
</tr>
<tr>
<td>03/02 00:00</td>
<td></td>
</tr>
<tr>
<td>03/02 12:00</td>
<td></td>
</tr>
<tr>
<td>04/02 00:00</td>
<td></td>
</tr>
<tr>
<td>04/02 12:00</td>
<td></td>
</tr>
<tr>
<td>05/02 00:00</td>
<td></td>
</tr>
</tbody>
</table>

- **RAIM Unavailable**
- **Baro Aided**
- **Non Baro Aided**

**Almanac**

- **Week**: 597
- **TOA**: 405504

---

*AUGUR Disclaimer*
**AUGUR Prediction Results GPS RAIM**

### AUGUR GPS RAIM Prediction Tool - Terminal/Approach Tool

#### Output

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>26/01/2011 00:00:00 UTC</td>
</tr>
<tr>
<td>Stop</td>
<td>29/01/2011 00:00:00 UTC</td>
</tr>
<tr>
<td>Request</td>
<td>26/01/2011 16:35:13 UTC</td>
</tr>
</tbody>
</table>

#### Configuration

- **Mask Angle:** 5.0 degrees
- **Algorithm:** FD
- **Integrity Level:** APPROACH

#### Constellation

- Almanac: Week:420, TOA:405504
- NANUs: 2007136

### LFPG (Charles-De-Gaulle, 49.00972, 2.54778, 119.4816)

<table>
<thead>
<tr>
<th>Baro Aided Outages</th>
<th>Non Baro Aided Outages</th>
</tr>
</thead>
<tbody>
<tr>
<td>25/01/2011 23:59:30 until 26/01/2011 00:04:30</td>
<td>25/01/2011 23:59:30 until 26/01/2011 00:08:30</td>
</tr>
<tr>
<td>26/01/2011 00:42:30 until 26/01/2011 01:19:30</td>
<td>26/01/2011 00:42:30 until 26/01/2011 04:48:30</td>
</tr>
</tbody>
</table>
### AUGUR GPS RAIM Prediction Tool - Terminal/Approach Tool

#### Airports

<table>
<thead>
<tr>
<th>Airport</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td></td>
</tr>
<tr>
<td>07</td>
<td></td>
</tr>
<tr>
<td>08</td>
<td></td>
</tr>
<tr>
<td>09</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

#### Prediction Type

*Type: EGNOS*

#### Result

*Format: Graphic*

*Check Terminal/Approach*
AUGUR Prediction Results EGNOS

AUGUR  GPS RAIM Prediction Tool - Terminal/Approach Tool

Airports

<table>
<thead>
<tr>
<th>Airport</th>
<th>Prediction Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport 01</td>
<td>EGNOS</td>
</tr>
<tr>
<td>Airport 02</td>
<td>...</td>
</tr>
<tr>
<td>Airport 03</td>
<td>...</td>
</tr>
<tr>
<td>Airport 04</td>
<td>...</td>
</tr>
<tr>
<td>Airport 05</td>
<td>...</td>
</tr>
<tr>
<td>Airport 06</td>
<td>...</td>
</tr>
<tr>
<td>Airport 07</td>
<td>...</td>
</tr>
<tr>
<td>Airport 08</td>
<td>...</td>
</tr>
<tr>
<td>Airport 09</td>
<td>...</td>
</tr>
<tr>
<td>Airport 10</td>
<td>...</td>
</tr>
</tbody>
</table>

Output

Scenario

- Start: 26/01/2011 00:00:00 UTC
- Stop: 29/01/2011 00:00:00 UTC
- Request: 26/01/2011 16:36:30 UTC

LFPG (Charles-De-Gaulle, 49.00972, 2.54778, 119.4816)

EGNOS Outages

- 2011-01-27 00:00 until 00:05

Result

Format: Text

Check Terminal/Approach
NOTAMs

- Using information from Almanacs and NANUs, GISE issues NOTAM Proposals

- EAD relays the Proposal to subscribing State NOTAM Offices (NOFs)

- NOF then creates a NOTAM based on this Proposal

End users
NOTAM Example 1

- NOTAM showing GPS RAIM outage

<table>
<thead>
<tr>
<th>NOTAM N example</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1234/09 NOTAM N</td>
</tr>
<tr>
<td>Q) LFBB/QGAAU/ V NBO/ A/ 000/999/ 4100N00200E005</td>
</tr>
<tr>
<td>A) LFBO</td>
</tr>
<tr>
<td>B) 0908240145</td>
</tr>
<tr>
<td>C) 0908250225</td>
</tr>
<tr>
<td>D) 24 0145-0230 0630-0645 25 0155-0225</td>
</tr>
<tr>
<td>E) GPS RAIM IS NOT AVAILABLE FOR LNAV</td>
</tr>
</tbody>
</table>

This NOTAM is a new NOTAM (NOTAMN). Its reference is A1234/09
NOTAM Example 2

- NOTAM Proposal showing GPS RAIM outage

```
NOTAM N proposal example

Q) LFBB/ QGAAU/ I/ NBO/ A/ 000/ 999/ 4100N00200E005
A) LFBO
B) 0908240145
C) 0908250225
D) 24 0145-0230 0630-0645 250155-0225
E) NOTAMPN 0001/1 0
GPS RAIM IS NOT AVAILABLE FOR LNAV
```
Roles & Responsibilities

Courtesy Eurocontrol
• GISE makes GPS RAIM and EGNOS availability information available to users via
  o AUGUR website
  o NOTAM Proposals
• AUGUR has been updated to accept EGNOS availability data from EURONOTAM
• AUGUR Website will offer EGNOS availability prediction in the Terminal/Approach Tool
• AUGUR issues GPS RAIM NOTAM proposals in ICAO format to NOF via AFTN/EAD
Thank you for listening - Any questions?

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