NAVISAT Middle East & Africa

12th March, 2014
Historical Background

NAVISAT services

NAVISAT Navigation Service

SBAS ground segments projects in Africa & Middle East

SIRAJ / SAFIR

EGNOS extension coverage over Africa and Middle East

NAVISAT – future SBAS over Africa & Middle East cooperation
Historical Background
### NAVISAT Background

NAVISAT project is an initiative to provide Satellite Services dedicated to the Aeronautical users.

The system is envisaged to provide safety communication and augmented navigation signals to the users over the Middle East and Africa.

NAVISAT aims to be interoperable with other systems to facilitate their combined use.

### NAVISAT Mission Statement

NAVISAT is an international organization that fills the regional gap in worldwide satellite-based Air Traffic Management services for the Africa and Middle East region with a safe, dependable and economically viable satellite system, and which provides value-maximizing services to adjacent markets.

*NAVISAT is currently finalizing the Fund Raising and will launch it’s Satellites by Mid 2016*
NAVISAT Services

AERONAUTICAL MISSION
- Mobile Comms. for civil aviation's and airlines
  - Ground-air voice and data communications for air traffic control and operational services
- Fixed Comms. for civil aviation's
  - Ground-ground voice and data links for air traffic services and operational services

COMPLEMENTARY MISSION
- Navigation Payload
  - • GPS-like signals
    - • Integrity data
    - • Correction data
    - • Enhancement of GPS availability
- Telecommunication

Different service offerings for different applications and different users

- Airlines
  - Service Providers
  - Aeronautical Communication
- State ATS providers
  - Aeronautical VSAT Network Operators
- Air Traffic Services
  - SBAS Service Providers
- Remote CNS infrastructure operations
NAVISAT Services
Coverage Area (AFI/MID FIR's)
NAVISAT Navigation Service
Aeronautical Navigation Service SBAS Signal Broadcast

Service Description

• Provision of SBAS Aeronautical navigation signal between:
  - SBAS Service provider and equipped Aircraft in the region
• Communications
  - SBAS signal(s) originally acquired by RIMS
• Coverage of the Service:
  - Africa & Middle East Regions
  - Global beam
• Frequency band:
  - C band uplink
  - L-Band downlink (GPS & Galileo L1 (1575.42 MHz) and L5 (1176.45 MHz) in separate PRN codes)
• Availability
  - Very High availability achieved with system redundancy
SBAS ground segments projects in Africa & Middle East

SIRAJ / SAFIR
In April 2010, **EGNOS** provided a certified signal in space for **safety-of-life** service for the European continent, whereas a potential extension to other areas, such as the Mediterranean, most of Africa and the Arabian peninsula, was studied by several European and local institutions.

**Civil Aviation** is the sector that will benefit the most and should be the precursor to extending EGNOS-based applications. It was the time to disseminate and prove the benefits of EGNOS to the decision-makers in areas outside Europe.

**SIRAJ** (*October 2010 – April 2012*) is a project funded by the European Commission under the European Research & Development Framework Program (FP7).

**Main objective**: to evaluate the opportunities for EGNOS service extension to the areas covered by the **ACAC** and **ASECNA**, in the **Civil Aviation** domain.
The **SAFIR** is a two year project (*starting 15th of January 2013*), implemented by **ASECNA** and its European partners.

**Main objective**: The development of core technical competences through establishing EGNOS-Africa Joint Program Office within the relevant ACP organizations, which would constitute a “GNSS Program management capacity “in Sub-Saharan Africa.

**APIRG/19 Conclusion 19/29**: In order to enable States to make informed decision, concerning the implementation of GNSS satellite-based augmentation system (SBAS) in the AFI Region, ICAO Regional Offices should facilitate the search for the funding of an impact analysis related to SBAS, that covers operational, technical and economic aspects of this GNSS augmentation system.

**ASECNA** in conjunction with the European Commission (EC) organized on October 1st, 2013, Addis Ababa, Ethiopia, an event in order to initiate and boost the process towards financing scheme structure for the pan-African satellite navigation infrastructure deployment.

**follow-up event is already planned to take place in Africa, first trimester 2014.**
ACAC future SBAS plan

Short / Medium term:
To extend current European EGNOS service to the MEDA region with minimum added infrastructure

Long term:
Independent SBAS infrastructure
ASECNA future SBAS plan

**Short/ Medium term**
To extend current European EGNOS service to the region with minimum added infrastructure

**Long term**
Independent SBAS possibly mixed with partial EGNOS v3 extension, with maximum AFI infrastructure
Current EGNOS coverage over Africa and Middle East
| Typical Operation | Accuracy | | Integrity | | Time-To-Alert (TTA) | | Horizontal Alert Limit (HAL) | | Vertical Alert Limit (VAL) | | Continuity | | Availability |
|---|---|---|---|---|---|---|---|---|---|
| En-route (oceanic / continental low density) | 3.7 km (2.0 NM) | N/A | 1 - 1 x 10^{-7}/h | 5 min | 7.4 km (4 NM) | N/A | 1 - 1 x 10^{-4}/h to 1 - 1 x 10^{-8}/h | 0.99 to 0.99999 |
| En-route (continental) | 3.7 km (2 NM) | N/A | | | | | |
| En-route, Terminal | 0.74 km (0.4 NM) | N/A | 1 - 1 x 10^{-7}/h | 15s | 1.85 km (1 NM) | N/A | 1 - 1 x 10^{-4}/h to 1 - 1 x 10^{-8}/h | 0.99 to 0.99999 |
| Initial approach, Intermediate approach, Non-precision approach (NPA), Departure | 220 m (720 ft) | N/A | 1 - 1 x 10^{-7}/h | 10s | 556 m (0.3 NM) | N/A | 1 - 1 x 10^{-4}/h to 1 - 1 x 10^{-8}/h | 0.99 to 0.99999 |
| Approach operations with vertical guidance (APV-I) | 16.0 m (52 ft) | 20 m (66 ft) | 1 - 2 x 10^{-7} in any approach | 10s | 40 m (130 ft) | 50 m (164 ft) | 1 - 8 x 10^{-8}/15s | 0.99 to 0.99999 |

ICAO Annex 10 Volume 1 Radio Navigation Aids - SiS performance requirements
# EGNOS SoL Service Performance Values

## EGNOS Safety of Life Service Definition Document (Ref: EGN-SDD SoL, V2.0)

<table>
<thead>
<tr>
<th>Performance</th>
<th>Accuracy</th>
<th>Integrity</th>
<th>Continuity</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Horizontal (95%)</td>
<td>Vertical (95%)</td>
<td>1 - 2 x 10^-7/ approach</td>
<td>Less than 6 seconds</td>
</tr>
<tr>
<td>Comment</td>
<td>Accuracy values at given locations are available at: <a href="http://www.essp-sas.eu">http://www.essp-sas.eu</a></td>
<td>N/A</td>
<td>For NPA: &gt; 1 - 2.5 x 10^-4 per hour in most of ECAC &gt; 1 - 2.5 x 10^-3 per hour in other areas of ECAC</td>
<td>99.9% for NPA in all the ECAC</td>
</tr>
<tr>
<td></td>
<td>For APV-I: &gt; 1 - 1 x 10^-4 per 15 seconds in the core ECAC 1 - 5 x 10^-4 per 15 seconds in most ECAC 1 - 1 x 10^-3 per 15 seconds in other areas of ECAC</td>
<td>99% for APV-I in most ECAC</td>
<td>99.9% for NPA in all the ECAC</td>
<td></td>
</tr>
</tbody>
</table>
- **Compliant with SoL SDD:**
  The part of the Service Area where availability is at least 99%.

- **Non compliant with SoL SDD:**
  The part of the Service Area where availability is lower than 99%.

- **Compliant out of SDD:**
  Area not included in the Service Area where availability is higher than 99%.

- **Non compliant out of SDD:**
  Any other area outside the Service Area where availability is lower than 99%.

[egnos-user-support.essp-sas.eu/egnos_ops/node/975]
NAVISAT – future SBAS over Africa & Middle East cooperation
• For short term plans

- NAVISAT is capable of connecting SBAS ground segment element (RIMS: Ranging Integrity Monitoring Station, MCC: Mission Control Centers and the NLES using it’s dedicated Aeronautical Fixed Communications for civil aviation's with high availability.
- NAVISAT can act as a backup for SBAS signal in space to limit the effect of signal in space outage on the required availability for SOL.

• For long term plans

- NAVISAT is capable of broadcasting SBAS signal in space over the region of Africa and the Middle East as an space segment for EGNOS like independent system.
- NAVISAT is capable of connecting SBAS ground segment over the landmass of Africa/MEA region.
NAVISAT – future SBAS cooperation

Diagram showing the integration of GNSS (GPS & Galileo) satellites, RIM stations, NAVISAT stations, and SBAS-equipped aircraft, illustrating the process of satellite-based augmented service (SBAS) cooperation.
WAY FORWARD

▪ NAVISAT could enhance the availability of SIS required for SOL application of EGNOS

▪ NAVISAT could be an enabler to the extension of EGNOS over EUROMED region.

▪ For the long term, NAVISAT will be the major contributor to the independent SBAS system which will be established over AFRICA & MIDDLE EAST region.