EGNOS

- **EGNOS**
  - European
  - Geostationary
  - Navigation
  - Overlay
  - System

- Europe’s first step towards independent satellite navigation
- The European SBAS (satellite-based augmentation system)
- EGNOS improves GPS (and Galileo in the future) over Europe
EGNOS PROGRAMME TIMELINE

- **ESA Programme**
  - Definition
  - Initial Operations
  - Exploitation Phase (incl. extensions, replenishments)

- **COM Programme**
  - OS Service
  - SoL Service
  - EDAS Service
  - GSA as Programme Manager
  - COM as Programme Manager
HOW DOES EGNOS WORK?

EGNOS
• Improves position accuracy
• Provides position integrity

EGNOS Geostationary Satellites

GPS

RIMS (GNSS Stations)

MCC (Master Control Centres)

NLES (Uplink Stations)
EGNOS SYSTEM ARCHITECTURE AND SERVICE AREA

6 Navigation Land Earth Stations

40 Ranging & Integrity Monitoring Stations (RIMS)

GPS signals

2 Support Facilities

4 Mission Control Centres

Geostationary satellites
• INMARSAT AOR-E 3F2 (15.5 W)
• INMARSAT IOR-W 4F2 (25 E)
• SES 5 – (5 E)
• ASTRA 5B – commissioning phase (31.5 E)
EGNOS SPACE SEGMENT

3 GEO satellites:
★ INMARSAT 3F2 (15.5°W)
★ SES-5 (5°E)
★ INMARSAT 4F2 (25°E)

Upcoming GEO satellite replacements:
★ ASTRA 5B (31.5°E)
★ GEO-3
EGNOS services will be delivered on a long-term basis

<table>
<thead>
<tr>
<th>Service</th>
<th>Accuracy/Details</th>
<th>Availability</th>
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<tbody>
<tr>
<td>Open Service (OS)</td>
<td>Accuracy ~1m, free</td>
<td>Available since October 2009</td>
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<tr>
<td>Safety of Life Service (SoL)</td>
<td>Accuracy ~1m, compliant to aviation standards</td>
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<td>EGNOS Data Access Service (EDAS)</td>
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EGNOS OPEN SERVICE GREATLY IMPROVES GPS OVER EUROPE

EGNOS Open Service (OS)

CHARACTERISTICS:
• Provides signals for timing and positioning to be used for non-safety critical applications

USERS:
• Intended for general purpose applications accessible freely using a SBAS compatible receiver within the EGNOS OS area without any direct charge

Open Service (OS) | Accuracy ~1m, free | Available since October 2009
EGNOS SAFETY OF LIFE SERVICE  SoL

EGNOS Safety-of-Life was specifically conceived for aviation

Benefits:
- Reduction of the decision height by providing vertical guidance
- Optimisation of angle of approach (direct and curved)
- Better lateral guidance
- Allows for IFR-like operation in smaller (non ILS-equipped) airports
- Increase in airports capacity, safety and flight capability

EGNOS competitive space

EGNOS Safety-of-Life Service (SoL)  Accuracy ~1m, compliant to aviation standards  Available since March 2011

EDAS improves GPS accuracy

- EDAS disseminates EGNOS data in real time through Internet
  - EGNOS augmentation messages
  - RIMS raw GPS data

EGNOS Data Access Service (EDAS)
- Accuracy <1m, corrections provided by terrestrial networks
- Available since July 2012
EGNOS MAIN FIELD OF APPLICATION

- **Aviation**: LPV procedures: 294 operational; 251 planned to 2016

- **Road**: e.g., the Slovak Republic will introduce EGNOS into the GNSS based road tolling system to increase accuracy

- **Agriculture**: Today in Europe 60% of all tractors equipped with GNSS use EGNOS
EGNOS BENEFITS

EGNOS is used to:

• make aviation safer and more efficient
• allow farmers to save costs and reduce the quantities of fertilizers and pesticides
• track hazardous goods
• empower accurate and reliable mapping
• make shipping safer and port management more effective
EGNOS PROGRAMME PRIORITY

★ Ensure that EGNOS is used
  – Fostering procedures and receivers in aviation domain
  – Communication plan & EGNOS branding in other domains

• Ensure the continuity of the EGNOS services
  – Maintain the certificate of Safety of Life service, process and resolution of safety incidents
  – Deploy and declare new system versions and master the Obsolescence and the Maintainability
  – Continuity of Performances and Operations

★ Extend EGNOS coverage
  – Complete full EU-28 coverage
  – Work on the extension of EGNOS to Africa
SERVICES PERFORMANCE
APV-I PERFORMANCE
DECISION HEIGHT DOWN TO 250 FEET)

SoL SDD (March 2011)

SoL SDD (June 2013)

- latest plots show even better coverage, eg Canary Islands
EGNOS IN AVIATION: LPV PROCEDURES TRENDS

LPV Procedures evolution

Date

LPV Procedures

Jan-11 Jul-11 Jan-12 Jul-12 Jan-13 Jul-13 Jan-14 Jul-14 Jan-15 Jul-15

> 250
EGNOS contributes to worldwide SBAS coverage.
“IT’S THERE, USE IT”