Aviation powered by EGNOS

EGNOS as an enabler of PBN

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Aviation Market Development Innovation Officer

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Outline

GSA role & mission

EGNOS for aviation

• How it works & How it fits into PBN

EGNOS Benefits

LPV Implementation status

GSA available instruments to foster EGNOS implementation
GSA role within EU GNSS programmes

Political Oversight

Programme Oversight and Programme management

Execution

European Space Agency (ESA)

delegation

delegation assistance

European GNSS Agency (GSA)

Ensuring the Security of the EGNSS
Exploitation of Galileo
Exploitation of EGNOS

Market Development: supporting the use of EGNSS

Upstream (space) industry

Downstream (applications) industry

European Council and Parliament

European Commission

GNSS Programme Committee; H2020 Programme Committee

IOV Contracts

FOC Contracts
European contribution to satellite navigation consists of two systems

- **EGNOS**
  - SBAS
  - Improves GPS performance
  - 3 services (operational since 2009)
  - Continental coverage

- **Galileo**
  - Autonomous infrastructure
  - Performances similar to GPS
  - 5 services (under development)
  - Worldwide coverage
Why EGNOS?

• Augmenting GPS L1 signal over the ECAC area
• Guarantee of performance parameters: accuracy, availability, integrity, reliability
• 2\textsuperscript{nd} March 2011 – EGNOS Safety of Life
• ESSP has been certified based on the Single European Sky Regulatory
• EGNOS landing procedures being developed around EU for their benefits:
  o Precise vertical guidance
  o Safer landings at airports not equipped with ground-based navigation aids (e.g. ILS)
  o Increased airports capacity
EGNOS enables approaches down to LPV minima

- Freely offered for all phases of flight to airspace users and air navigation service providers (ANSPs)
- Enabler for PBN implementation and SBAS Approach with Vertical Guidance (LPV)

EGNOS enables approaches with comparable performance to ILS CAT I, without the need for ground infrastructure

- Decision heights can be reduced to:
  - NPA: 450ft
  - LPV: 250ft (200ft soon)

- Procedures can be implemented for all runways, both ends, at little or no extra cost

Example of Decision Height Minimum

LPV = Localiser Performance with Vertical guidance
EGNOS as enabler of PBN

ICAO NAVIGATION SPECIFICATIONS

RNAV SPECIFICATIONS
- Designation
  - RNAV 10
  - For Oceanic and Remote Continental navigation applications
- Designation
  - RNAV 5
  - RNAV 2
  - RNAV 1
  - For En Route & Terminal navigation applications

RNP SPECIFICATIONS
- Designation
  - RNP 4
  - For Oceanic & Remote Continental navigation applications
- Designation
  - RNP 2
  - B-RNP 1
  - A-RNP
  - RNP 0.3
  - RNP APCH
  - RNP AR APCH
  - for various phases of flight
- Designation
  - RNP with additional requirements to be determined (e.g. 3D, 4D etc)

EGNOS is an enabler of PBN
Why shall we be INTERESTED in EGNOS?

EGNOS provides operational, environmental, safety and economical benefits
Operational benefits from EGNOS

• **Reduction in CFIT (Controlled Flight Into Terrain)**
  - More accurate lateral and vertical guidance
  - Enhanced situational awareness
  - Increased automation (reduced cockpit workload)
  - Stabilized approaches (reducing runway excursions)

• **Enable advanced arrival and departure procedures**
  - Curved approach procedures
  - Separation minima reduction
  - IAP in non-instrumental aerodromes

(1) Airlines/ANSP/Eurocontrol estimate
Source: “EGNOS Cost Benefit Analysis in Aviation”
Courtesy: L.E.K / GSA
Economic EGNOS LPV benefits

- **Reduction in DDC (Delays, Diversions & Cancelations) of 48%**
  - Increased accessibility to airports not equipped with ILS or during ILS outages
  - Reduction in the decision height (DH)
  - No temperature restriction (compared to APV Baro)
  - Lower number of cancelled flights and landings in case of bad weather conditions and poor equipment of airport

- **Increase airport capacity**
  - Possibility to use both direction of runway
  - Development of small airports and regional airports (new operators)

- **Decrease of operational costs for inspections, maintenance and workforce**
  - EGNOS is a low cost alternative to ILS
    - EGNOS LPV one-off cost ≈ yearly ILS maintenance ≈ 32 K€

2 – EuroControl estimate
Environmental impacts

- **Reduced costs and environmental impact**
  - Reduced fuel burn (saving money and decreasing emissions)
  - Help to avoid urban areas and reduce noise footprints
  - Use of more flexible route and procedure designs
  - Continuous descent path CDFA (avoiding dive-and-drive)
  - ANSP and Airport savings in infrastructure (installation and calibration of navaids) → reduced airport fees:

![Continuous descent operation = CD](image)
What do you need to fly LPV approaches?

- ANSP/Airports
  - Plans
  - Operational implementation

- Operators
  - Equipped aircraft and trained pilot
  - Avionics available and certified
  - Aircraft equipped and certified
  - Flight crew capability
  - ETSO C145/C146
  - Airworthiness approval and operational criteria
  - AMC 20-28
  - Operational approval
Adoption Results in Aviation
LPV Airport Implementation

As of 2\textsuperscript{nd} April 2015
181 LPV approaches at 116 APs
86 'EGNOS enabled' APV Baro

Plans by 2018
\textgreater{} 440 LPV procedures

http://egnos-user-support.essp-sas.eu/egnos_ops/lpv_map/map.php
Ongoing LPV implementation projects: ACCEPTA project

ACCelerating EGNOS adoPTion in Aviation

Publication year:
- 2011
- 2012
- 2013-2015

Total of:
- 80 procedures
- 44 airports
- 5 heliports
- 8 countries

First procedure to:
What do you need to fly LPV approaches?

ANSP/Airports
- Plans
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Operators
- Equipped aircraft and trained pilot
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  - Aircraft equipped and certified
  - Flight crew capability

Flairworthiness approval and operational criteria
- AMC 20-28
- Operational approval
## Operators upgrade to LPV funded by GSA

### REGIONAL

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<thead>
<tr>
<th>Operator</th>
<th>Aircraft(s)</th>
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<tr>
<td>Aurigny</td>
<td>2x BN2B Trislander</td>
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<tr>
<td>Air Nostrum</td>
<td>5x ATR 72-600</td>
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<tr>
<td>Hebridean Air</td>
<td>15x CRJ 1000</td>
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<td>Twin-Otter</td>
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<td>Chalair</td>
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<td>Wideroe</td>
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### BUSINESS

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<td>Hawker 750</td>
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<tr>
<td>Specsavers</td>
<td>2x Beech 350</td>
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<tr>
<td>REGA</td>
<td>Eurocopter EC135</td>
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### GENERAL

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<td>King Air 300</td>
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<td>Aviation South West</td>
<td>Piper P28A</td>
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<td>Royal Star-Aero</td>
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<td>Dutch &amp; MartinAir Flight Academies</td>
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<td>Ljungbyheds Flygklubb</td>
<td>DA40-180</td>
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GSA stays close to the aviation users and stakeholders to reap full EGNOS benefits

Implementing a new technology in the aviation world: Act on all stakeholders!

Device manufacturers
- Technical & financial support for STC and AML development
- Contribution to standards
- Prototyping

Aircraft manufacturers
- Cost benefit analysis
- Co-funding of Service Bulletin
- Facilitate operators’ request for LPV

Airlines/Aircraft owners
- Technical & financial support for equipment upgrade to LPV capabilities
- Dedicated training
- Cost benefit analysis

Air Navigation Service Provider
- Dedicated Training
- Technical & financial support
- Contribution to regulation evolution
- Cost benefit analysis
- Co-funding of Service Bulletin
- Facilitate operators’ request for LPV

Aerodromes
- Main Categories:
  - International airports
  - Regional airports
  - Private airports

GSA provides:
GSA AVAILABLE INSTRUMENTS TO FOSTER EGNOS BASED OPERATIONS IMPLEMENTATION
H2020

A core part of Europe 2020, Innovation Union and European Research Area
the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years from 2014 to 2020

- Responding to the economic crisis to invest in future jobs and growth
- Addressing peoples’ concerns about their livelihoods, safety and environment
- Strengthening the EU’s global position in research, innovation and technology
H2020-Galileo-2015 Call opened 04/11/2014

Deadline for submission: 8\textsuperscript{th} April 2015

H2020-Galileo-2015-1 Call overview
Indicative Projects Size and Funding

1 - EGNSS applications (15 m€)
Indicative projects size: 1.5 - 4 m€

2 - SME based EGNSS applications (5 m€)
Indicative projects size: 0.5 - 1 m€

3 - Releasing the potential of EGNSS applications through international cooperation (5 m€)
Indicative projects size: 0.5 – 1.5 m€

EGNSS Apps development
Innovation Action*: up to 70% funding
(exception: up to 100% for non-profit)

* for indirect cost: flat rate of 25% with some exceptions e.g. subcontracting

25 m€ for Second Call

Deadline for submission of proposals for second call: April 8th 2015
Example of H2020 call winning project: e-airport

Increase airport capacity, safety and security using European GNSS

Proposed solution

Objectives

- Attract the interest of final users (ANSP, airport operators on EGNSS benefits
- Involve ANSP and AH from the definition of the application to field demonstrations
- Implement a technical solution where GPS and Galileo solution can be obtained using low cost GNSS receivers in airport vehicles
- Experiment in an airport scenario the effectiveness of multiconstellation integrity algorithms for land users
- Define and implement solutions that will be exploited in EU countries
- Dissemination of technical solutions and results

Test campaigns in Bucharest airport and Bari airport
2014 Aviation Call for Grants

EGNOS

European Global Navigation Satellite Systems Agency

6 M€ in grants
2014 Call for proposals to foster EGNOS adoption in aviation

Objectives

- Foster the implementation of EGNOS based operations
- Development and/or installation of GPS/EGNOS enabled avionics
- Approval of Air Operator Certificate for LPV operations of aircraft already equipped with SBAS capabilities
- Development of enablers to accelerate EGNOS adoption and preparation for future capabilities

EU Funding

- Maximum budget of this call: 6 M€
- Maximum EU financing rate:
  Direct costs: 60% funding; Indirect costs: flat rate 7% of the direct costs

Timing

- Publication: 4 August 2014
- Deadline for submitting applications: 31 October 2014 – at 16:00 Prague time
- Signature of Grant Agreement: December 2014
2014 Aviation call for proposals: projects selection

Summary

- Number of received proposals: **38**
- Approximately total requested EU contribution in the proposals: **12 million EUR**

Tentative timing

- **Admissibility**: 10 Nov 2014
- **Eligibility check**: End Nov 2014
- **Technical evaluation**: Dec 2014
- **Notification to applicants**: Q2 2015

- **Request for info** (optional)
- **Proposal adjustment** (optional)
- **Grant agreement Signature**

Project starts
New 2015 Call for proposals to co-fund EGNOS operational implementation in aviation

Publication expected in May 2015

Available budget: 6 Million €
Latest information at GSA website and social networks

www.gsa.europa.eu
http://www.gsa.europa.eu/gsa/grants
https://www.facebook.com/EuropeanGnssAgency
https://twitter.com/EGNOSPortal
THANK YOU

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