EGNOS in Aviation: Strategy and Implementation Status

Rome - EGNOS Service Provision Workshop
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Aviation is changing and brings new challenges.
EGNOS for approaches “everywhere”
Increasing ACCESSIBILITY

EGNOS in all instrument runways by 2024 in Europe

-> 646 EGNOS based approaches as of today
-> 51 % IRE operational

EGNOS at non-instrument runways in Europe

-> 2673 airports with non-instrument RWYs

EGNOS for rotorcraft operations

-> EGNOS for PinS in Italy!
-> Low level routes connecting hospitals
-> CS-ACNS Issue 2 (April 2019)

Towards SBAS for PinS and RNP0.3 in the whole Europe
Increasing FLEXIBILITY and complementing other technologies

Towards curved segments with SBAS
CS-ACNS Issue 2 – EGNOS used for geometric altitude for RNP-AR

Enhanced and Synthetic vision systems
minima below 200ft & reduction of RVR

SBAS receivers (ETSO C145/146) present the maximum values of accuracy & availability
EGNOS at > 50% of the European airports with instrument runways

**TODAY:** 646 EGNOS procedures @ 337 airports in Europe
AVAILABLE ONLINE on EGNOS PORTAL

By 2024
All IRE with EGNOS approaches

New countries coming soon!

**EGNOS Lithuania Project**
First EGNOS implementation in Lithuania

**OMEGA+ Project**
Nationwide implementation of EGNOS in Finland

+ others
Pioneer operators using EGNOS

<table>
<thead>
<tr>
<th>Year</th>
<th>Operators</th>
<th>Operational units</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>44</td>
<td>203</td>
</tr>
<tr>
<td>2017</td>
<td>44</td>
<td>279</td>
</tr>
<tr>
<td>2018</td>
<td>51</td>
<td>373</td>
</tr>
<tr>
<td>2019</td>
<td>62</td>
<td>443</td>
</tr>
</tbody>
</table>

Almost 450 Operational aircraft in EU
New operators funded to get EGNOS on board and develop EGNOS capable avionics

- MUSTARROW LTD
  - 1 x Cirrus SR20 G2
- widerøe
  - 9 x Bombardier Q400
- ENAV
  - 2 x Piaggio P180 Avanti II
- ASL AIRLINES BELGIUM
  - 23 x Boeing 737-400
  - 2 x Boeing 737-800
- OSM AERIAL ACADEMY
  - 2 x Diamond 42
  - 6 x Cessna 172R
- JETCALL
  - 2 x Learjet 45
- ASL AIRLINES FRANCE
  - 6 x Boeing 737-700

Including ADS-B out
Boom of EGNOS solutions coming to the market

**Airbus**
- **Customer Option in A350**
  - Available since EIS

**Boeing**
- **B777X**
  - Customer option. Available by EIS (mid-2020)
  - 325 orders
- **737MAX**
  - Customer option (Q3 2020)
  - À 4,600 orders

**Embraer**
- **ERJ-135/140/145**
  - Customer Option

**ATR 42, 72**
- **-600 series**
  - Customer Option, STC developed

**Bombardier**
- **Q series / CRJ**
  - Customer Options
  - + STCs for Avro RJ85/100
  - + STCs for Fokker 50
  - + Baseline in most business jets: Cessna Citation, Dassault Falcon, Gulfstream G’s, Bombardier Globals, Challengers…

**Baselines**
- **Baseline in A220**
  - 48 units in service in EU;
  - 83 orders
- **Under development A319/20/21 (Q2 2020)**
  - >1700 in-service in EU
  - À 5,700 NEO worldwide orders
Snowball effect of EGNOS retrofit solutions thanks to Aviation Grant Programme of €22m

<table>
<thead>
<tr>
<th>Aircraft type</th>
<th>GSA project</th>
<th>STC developer</th>
<th>Avionics</th>
<th>Estimated fleet size in Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHC8-400</td>
<td>AirBaltic</td>
<td>CanardAerospace</td>
<td>UNS1-Ew</td>
<td>140</td>
</tr>
<tr>
<td>Saab340</td>
<td>NextJet</td>
<td>Scandinavian Avionics</td>
<td>UNS1-Ew</td>
<td>54</td>
</tr>
<tr>
<td>ATR42-500</td>
<td>HOP!</td>
<td>AeroConseil</td>
<td>CMC</td>
<td>19</td>
</tr>
<tr>
<td>Embraer E145</td>
<td>HOP!</td>
<td>N/A</td>
<td>UNS</td>
<td>23</td>
</tr>
</tbody>
</table>

> 100 EGNOS based procedures
> 100 EGNOS capable aircraft/rotorcraft

The current STC development might enable retrofit solutions for almost **240 aircraft*** of more than 20 different operators. *depending on cockpit configuration
From H2020 Research project to the first EU working group on GNSS for rotorcraft

**2019 GOAL:** WGs to produce materials supporting the rotorcraft implementations and regulatory process

Contribution to ICAO, EASA (e.g., CS-ACNS Issue 2)

Harmonizing EGNOS implementation for helicopters at European level
EGNOS supports general aviation & IFR flying

**General Aviation**

6 Objectives we are committed

- **IFR Flying**
  - Easier access of GA pilots to IFR rating, as a concrete measure that will improve safety.

- **Training**
  - By end of 2018 the 3rd option for licensing will be fully developed providing a simpler system for pilot training outside ATO.

- **Part-M ‘Light’**
  - Work towards a simpler and more proportionate framework for aircraft maintenance and license: a Part M ‘Light’.

- **Technology**
  - Continue development of CS-STAN and other similar tools to enable the introduction of new technologies which contribute to safety.

- **Simpler Certification**
  - Towards a simpler certification for certifying LSA aircraft in the short term by increasing the support to applicants e.g. workshops, document templates etc. In the long term by amending applicable regulations in order to bring a radical simplification.

- **Industry standards**
  - Build on the improvements of CS-23/Part-23 on other CS or regulations in order for EASA to focus on its safety objectives and to delegate the preparation of associated standards to industry groups (ASTM, ASD etc.)

**Safety Promotion Material**
(ready, to be published 2019)

**Big thanks to contributors!**

**COMING SOON!**

Just started!

4.3. ‘Risk Assessment Guidelines to support IFR implementation’

Combined GA COM and GA TEE meeting

Katerina Strelkova, Aviation Market Development Office, GSA

Cologne - 19th September 2013

**“Network of pilot implementations”**
EGNOS entering in drones operations

Enhanced **performance** in challenging environments

**High accuracy** for new demanding applications and drone separation

Increased **accuracy and integrity** for safe UAS operations

Eurocae WG 105 SG-62: Guidelines on the use of Multi-GNSS for UAS
What else do we provide to users?

Training materials
- Compliant with the latest changes in Part-FCL
- Updated list of Learning Objectives of all GNSS and PBN

Traffic assessments
- 39 airlines requested during 2018-2019!
- 15% of destinations have at least x1 LPV procedure published
- An additional 29% of destinations will have at least x1 LPV procedure by 2020
- 48% of flights at destinations with at least x1 LPV procedure published
- An additional 7% of flights at destinations that will have at least x1 LPV procedure by 2020

Cost Benefit Analysis

Online
- Including combined upgrades of LPV+ADS-B

Offline
- Customized
Working with Aviation stakeholders to bring EGNSS to users & take their needs on board
Table of Contents

EGNOS Service Provision

Aviation users

ESP

AU
EGNOS Service Provision Scheme
EWA Signatories

ATS Environments

Signatories

Non-ATS Environments

ANSPs

AOPs

Rotorcraft
EGNOS Working Agreement

Core
Contractual document

EWA core:
• Requested by Single European Sky (SES) Regulation.
• Contractual liability.

Annex 1:
➢ SoL Service Definition Document (SDD):
  Terms, conditions and characteristics of the Service.
➢ Service Notices (SN):
  Temporary amendments to the SoL SDD.
➢ Contingency:
  Covering non-compliances with the commitment maps included within the SoL SDD during a fixed time.

Annex 2:
➢ NOTAM Proposal:
  Terms and conditions under which ESSP provides the EGNOS NOTAM Proposal to the corresponding NOF.
➢ Collaborative Decision Making (CDM):
  Involvement of both the signatory & ESSP in the EGNOS use decision making process.
➢ GNSS Data Recording:
  Terms and conditions under which ESSP provides the GNSS data recorded for occurrence investigation.

There are 80 EWAs in force:
✓ EASA oversight.
✓ 26 EU CAAs and 5 Non-EU CAAs.
✓ EC&GSA approval.
There are 80 EWAs in force:
- 71 EWAs with EU ANSPs.
- 8 EWAs with Non-EU ANSPs.
- 1 EWA with Rotorcraft operator.
Non-EU States

- EGNOS is directly usable in airspace of the EU territory

- EGNOS can be used at non-EU States providing that:
  - There is enough coverage of the EGNOS SiS.
  - Safety Levels are equivalent to SES Regulation ones.

- Process to be followed
  1. The first step is always to enquiry EC/GSA/ESSP.
  2. An International Agreement (between EC and the non-EU State → to define the overall framework for the use of the EGNOS SoL Service.
  3. If agreed, then EWA (EGNOS Working Agreement with ESSP) → established on the basis of the previous agreement.

- Liabilities and Financial aspects are key
Non-ATS environments
Non-ATS environments

**ATS**
- ATC
- AFIS
- UNICOM
- NONE

**COM**
- A/G COM
- A/A Frequency

**NAV**
- PBN
- GNSS
- LPV minima

**MET**
- MET SP
- Auto MET
- AWOS/ASOS
- Near station

**AIS**
- AIS SP
  - AIP
  - NOTAM

**ADR**
- Non-IRE
  - No RWY upgrade

**Air**
- RMZ
- CLASS G

**FDP**
- 3D
- 2D
- IFR

**Eqpt**
- SBAS capable A/C
- ETSO 145-146

**FCL**
- BIR (M/DH + 200 ft)

EGNOS Annual Workshop 2019

24/09/2019
Non-ATS environments

EWA Core:
- Identified with:
  - A licensed aerodrome
  - An AOC holder

Annex 1:
- SoL Service Definition Document (SDD).
- Service Notices (SN).
- Contingency.

Annex 2:
- Collaborative Decision Making (CDM).
- GNSS Data Recording.
  - NOTAM Proposal:
    - ESSP
    - Official NOTAM
    - Airport
    - Helipad

Same Service Provision Scheme (EWA)
Thanks your attention!