16:15 – 16:25  European GNSS Services for Aviation  
C. Aguilera (GSA)

16:25 – 16:35  EGNOS Service Provision  
V. Álvarez (ESSP SAS)
Agenda

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European GNSS services for aviation

World ATM Congress
Madrid, 7th March 2017

Carmen Aguilera, Aviation & H2020 Coordinator, GSA
EGNOS and GALILEO Programme Management structure

Political Oversight

Programme Oversight and Programme management

European Council and Parliament

European Commission

European Space Agency (ESA)

European GNSS Agency (GSA)

GNSS Programme Committee; H2020 Programme Committee

Service contract

Upstream (space) industry

Downstream (applications) industry

Ensuring the Security of the EGNSS

Exploitation of Galileo

Exploitation of EGNOS

Market Development: supporting the use of EGNSS
EC declared GALILEO INITIAL SERVICES on 15 Dec 2016

<table>
<thead>
<tr>
<th>Year</th>
<th>Open Service Navigation/Timing</th>
<th>Search and Rescue Service</th>
<th>Public Regulated Service</th>
<th>Commercial Service</th>
</tr>
</thead>
</table>

Galileo Reference Documentation

A growing market with emerging innovative applications and GNSS use

WORLDWIDE GNSS MARKET IN 2016

Installed base by Application
- Regional Aviation: 8%
- Commercial Aviation: 14%
- Search and Rescue (ELT): 27%
- Search and Rescue (PLB): 47%
- General & Business Aviation: 52%
- General Aviation VFR: 2%

Core Revenue by Application
- Regional Aviation: 20% €M
- Commercial Aviation: 18% €M
- Search and Rescue (ELT): 27% €M
- Search and Rescue (PLB): 47% €M
- General & Business Aviation: 52% €M
- General Aviation VFR: 2% €M

Core Revenue by Region
- North America: 66%
- Asia-Pacific: 13%
- South America + Caribbean: 4%
- EU28: 12%
- Middle East + Africa: 3%
- Non-EU28 Europe: 2%

WORLDWIDE GNSS INSTALLED BASE EVOL. ‘16-‘20

2016
- Regional Aviation: 910 K.units
- Commercial Aviation: 999 €M
- Search and Rescue (ELT): 2%
- Search and Rescue (PLB): 9%
- General & Business Aviation: 47%
- General Aviation VFR: 2%

2020
- Regional Aviation: 1.04 M.units
- Commercial Aviation: 973 €M
- Search and Rescue (ELT): 9%
- Search and Rescue (PLB): 14%
- General & Business Aviation: 44%
- General Aviation VFR: 4%

COMPOUND ANNUAL GROWTH RATE: 3.6%

KEY MARKET AND TECHNOLOGY TRENDS

- Performance Based Navigation is driving transition from traditional routing to GNSS navigation
- SBAS based procedures availability is growing in Europe
- Multiconstellation/ Multifrequency GNSS solutions and ARAIM are enabling advanced required navigation performance, aerodrome manoeuvring, GBAS CATII/III and space based ADS-B
- GNSS is increasingly being used in surveillance applications through technologies like ADS-B, complementing radar technology
- GNSS enabled ELTs/ PLBs are becoming essential for the COSPAS-SARSAT Search & Rescue system
- GNSS is supporting recreational pilots using VFR with moving maps, infringements alarms and increasing also their operational awareness
- Unmanned Vehicles Systems: an emerging and promising market estimated CAGR of 52%, thanks to their need for precise positioning and orientation

GBAS = Ground Based Augmentation System, SBAS = Satellite Based Augmentation System, ARAIM = Advanced Receiver/Ranging Autonomous Integrity Monitoring
EGNOS based OPS in the EU Regulatory framework

• Global and European Air Navigation Strategy is moving to GNSS based solutions

  o **PBN IR (NPA 2015/01/Opinion 10/2016):**
    ✓ PBN SIDs/STARs/ATS routes/Transitions by **06/12/2018** -> minimum RNAV 1 (RNP1 welcome)
    ✓ PBN RNP APCH vertically guided (LNAV/VNAV or LPV) at all IREs with no PA by **30/12/2020**
    ✓ PBN RNP APCH vertically guided (LNAV/VNAV or LPV) at all IREs with PA by **01/01/2024**
    ✓ Specific PBN procedures in support of rotorcraft operations - > RNP **0.3**

  o **REGULATION (EU) No 716/2014 (PCP):**
    ✓ PBN SIDs/STARs/Transitions (with RF leg) by **01/01/2024** -> RNP1
    ✓ PBN RNP APCH vertically guided (LNAV/VNAV or LPV) at all 24+1 airports by **01/01/2024**

• Commission Regulation (EU) 2016/539 (Crew training) & 2016/1199 (Air Ops)
  o 2016/539 PBN on regular training before **25/8/2020**
  o PBN as standard procedures for authorities and operators (vs previous SPA.)
ICAO requirement for in-flight tracking of aircraft in distress by 2021

Galileo contribution
- Galileo SAR Forward Link Initial services
- Galileo as a position source
- Galileo RLS as acknowledge of distress alert
- Galileo Return Link to support remote activation of the beacon

Challenges and opportunities ahead

Meet ICAO GADSS and Annex 6 requirements with a Cospas Sarsat device
Define operational concept of new uses of RLM
Ensure compatibility with MEOSAR Environment with approved beacons
### EU available funding for EGNOS operational implementation

<table>
<thead>
<tr>
<th>Call</th>
<th>Topics</th>
<th>Funding rate</th>
<th>Publication date</th>
<th>Deadline for submission</th>
<th>Indicative budget</th>
</tr>
</thead>
</table>
| **GSA Aviation grants** | - LPV implementation  
- Aircraft retro/forward-fit  
- STC/SB developments  
- Simulators upgrades and other EGNOS enablers | 60% + 7% of indirect costs | 2014-2015 Calls ongoing |  | 12 Mil EUR (2014-2015)  
6 Mil EUR (2017) |
| **H2020-SESAR-2016-2** | - Increased access to airports for low visibility mixed fleet operations.  
- Applications for trajectory based and queue management: inter-continental trajectory based operations enabled by Satellite based CNS  
- Solutions for General Aviation and Rotorcraft;  
- Safe integration of drones  
- Advanced Air Traffic Services: Separation Management  
- Enabling Aviation Infrastructure: CNS for General Av.  
- Enabling Aviation Infrastructure: CNS | 70%  
70%  
70%  
100% | 15th December 2016  
11th May 2017 |  | 10 Mil EUR  
3 Mil EUR  
5 Mil EUR  
6 Mil EUR |
Fundamental elements
Open calls for GNSS receivers

Programme created by the 2013 GNSS Regulation

High-level objectives:

- Facilitate the adoption of the European GNSS Systems building on innovative services and differentiators
- Increase the EU industry competitiveness
- Address the user needs in priority market segments, maximising the benefits for citizens

Budget envelope of 111.5 million € (2014 and 2020)

<table>
<thead>
<tr>
<th>Name</th>
<th>Funding rate</th>
<th>Publication date</th>
<th>Deadline for applications</th>
<th>Indicative budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced RAIM (ARAIM) Multiconstellation Receiver</td>
<td>70%</td>
<td>28 Feb 2017</td>
<td>19 May 2017</td>
<td>2.5 Million €</td>
</tr>
<tr>
<td>MEOSAR Beacon prototyping</td>
<td>70%</td>
<td>28 Feb 2017</td>
<td>31 May 2017</td>
<td>4 Million €</td>
</tr>
</tbody>
</table>

Apply here: https://www.gsa.europa.eu/gsa/grants
Online information sessions

24th and 29th March 2017

ARAIM 10:00 – 11:00
MEOSAR 11:30 – 12:30

Registration open: https://www.gsa.europa.eu/fe_webinar_2017

THANK YOU FOR YOUR ATTENTION

Carmen Aguilera
Aviation and H2020 Coordinator, GSA
Carmen.Aguilera@gsa.europa.eu
www.gsa.europa.eu
16:15 – 16:25  **European GNSS Services for Aviation**  
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EGNOS Service Provision
Roadmap and Implementation Status

Presented by Mr. Víctor Álvarez,
European Satellite Services Provider SAS
Contents

• ESSP, the EGNOS Service Provider
• SoL Service Status and Roadmap
• Implementation Status
ESSP, the EGNOS Service Provider

Our mission is to deliver **precise** and **safe** satellite positioning services

- deliver EGNOS services 24/7
- operate and maintain EGNOS system
- promote EGNOS and its applications
- support and interface with users
- monitor & analyse EGNOS performance
- support in the development of EGNOS-based applications

100 highly skilled professionals on 2 sites

Our mission is to deliver **precise** and **safe** satellite positioning services
EGNOS SoL Service Commitment

Non Precision Approach

*NPA APCH*

Approach with Vertical Guidance

*RNP APCH operations down to LPV minima (250ft)*

Precision Approach

*RNP APCH operations down to LPV minima (200ft). ILS CAT-I look alike.*

Current SoL SDD commitment Maps (SoL SDD v3.1, Sept 2016)

https://egnos-user-support.essp-sas.eu

Historical data on airports with EGNOS procedures:

- Availability > 99.8% in all the airports within the Service Area
- Continuity risk < 5\cdot e^{-4} in all the airports within the Service Area
EGNOS SoL Service: Roadmap 2016 - 2018

EGNOS SoL Service Roadmap (v3.4) published in the EGNOS User Support website.
Next update in April 2017

• 2017
  – Main evolutions in the EGNOS Space segment (SN #15 v1.2 to be published on March 13th)

<table>
<thead>
<tr>
<th>PRN Number</th>
<th>BEFORE 20th March 2017</th>
<th>FROM 21th March 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRN 136</td>
<td>Operational</td>
<td>Test*</td>
</tr>
<tr>
<td>PRN 120</td>
<td>Operational</td>
<td>Operational*</td>
</tr>
<tr>
<td>PRN 123</td>
<td>Test</td>
<td>Operational</td>
</tr>
<tr>
<td>PRN 126</td>
<td>Test</td>
<td>Test</td>
</tr>
</tbody>
</table>

Three operational EGNOS GEO satellites in the operational platform during a period of approximately eighteen hours

• 2018
  – New EGNOS release deployment, extending NPA, APV-I and LPV-200 coverage
    • Service area extension to 72°N ensuring extended coverage for Finland and Norway
    • Inclusion of one new RIMS in Haifa increasing APV-I coverage in the South East in Greek islands and also Cyprus. LPV-200 coverage extension following APV-I trend

* Until Q4 2017
EGNOS Implementation Status

2016/2017 HIGHLIGHTS:

- First approaches in Hungary and Romania
- LPV-200s in Switzerland, France, Norway, Hungary, Austria and Slovak Rep
- Significant increase of new plans

As of March 2017
341 LPV approaches (30 LPV200)
90 ‘EGNOS enabled’ LNAV/VNAV

Plans by 2020
956 LPV procedures planned

Check link: http://egnos-user-support.essp-sas.eu/egnos_ops/lpv_map/map.php
EGNOS Implementation Status

EASA certified SBAS solutions availability (STC, SB, forward-fit) for IATA fleet (EU28 December flights):

- Airbus A318, A319, A320, A321
- EGNOS

% a/c models

- Available: 49%
- Planned: 40%
- N/A: 11%

% flights

- Available: 25%
- Planned: 31%
- N/A: 43%

96 total models
317,227 total flights

Other ready units:
- BAE Avro RJ85/100
- Fokker 50
- Cessna Citation, Dassault Falcon, Gulfstream, Learjet, Socata

Planned:
- Airbus A318, A319, A320, A321
- Bombardier DCH-8-Q100/200/300
- Sukhoi Superjet 100
- Saab 340, 2000
- BAE Jetstream 41, ATP

Embraer E170/175/190/195, RJ135/145 and EMB110/550
Bombardier DCH-8-Q400, CRJ700/900/1000, CS100/300
ATR 42-2/3/4/5/600s, ATR 72-1/2/5/600s
Boeing 737-300/400/500
Airbus A300-600ST, A350
THANKS FOR YOUR ATTENTION

For more information on EGNOS...

- EGNOS User Support Website
  http://egnos-user-support.essp-sas.eu

- EGNOS Helpdesk
  egnos-helpdesk@essp-sas.eu
  +34 911 236 555 (24/7)

Víctor ÁLVAREZ
Service Adoption Expert @ESSP SAS
EGNOS
Status Update and Next Steps