EGNOS FOR AVIATION

High Precision, Low investment

EGNOS benefits for general aviation

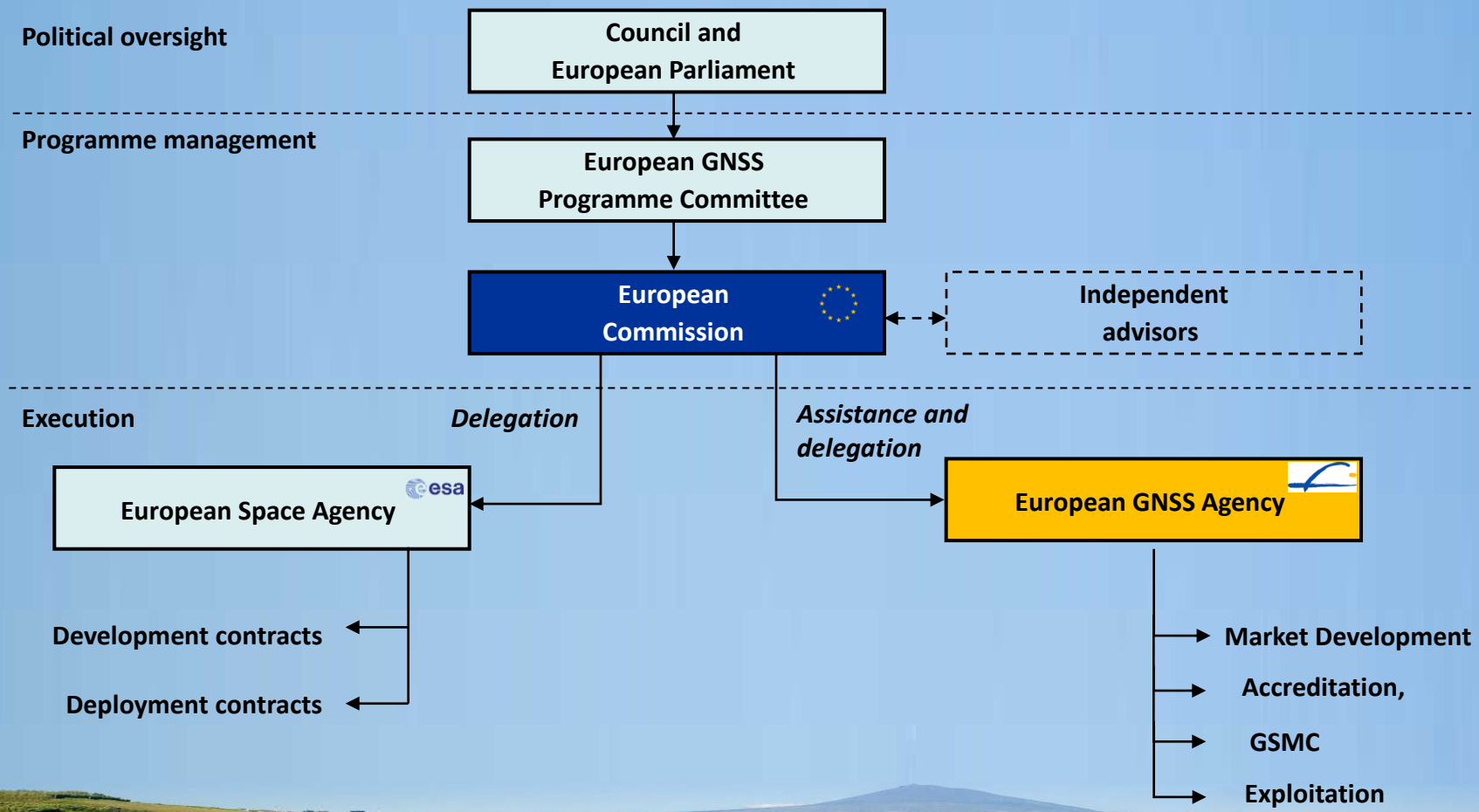
MMIG46

Bremen, 12 October 2013

Agenda

1. European GNSS Agency - About us
2. EGNOS contribution to PBN
3. LPV implementation in ECAC
4. Next steps

About the European GNSS Agency



Europe's contribution to satellite navigation

Galileo

- Worldwide navigation system "made in EU"
- Fully compatible with GPS
- Early services starting from 2014
- Open service free of charge and delivering dual frequencies (better performances)

EGNOS

- Augmentation system of GPS
- Improves GPS performance
- European coverage (but under extension in other regions, e.g. North Africa)
- Available NOW, free of charge and widely available. Certified for civil aviation in 2011.

'It's there, use it'

Galileo has already taken-off

- 4 **operational satellites** have been launched, as 12 October 2012 (in addition to the 2 test satellites launched in 2005/2008)

- All **industrial contracts** necessary have been signed to ensure up to **26 satellites**:
  - ✓ Early Galileo services in 2014
  - ✓ 18 satellites are expected in 2015/16

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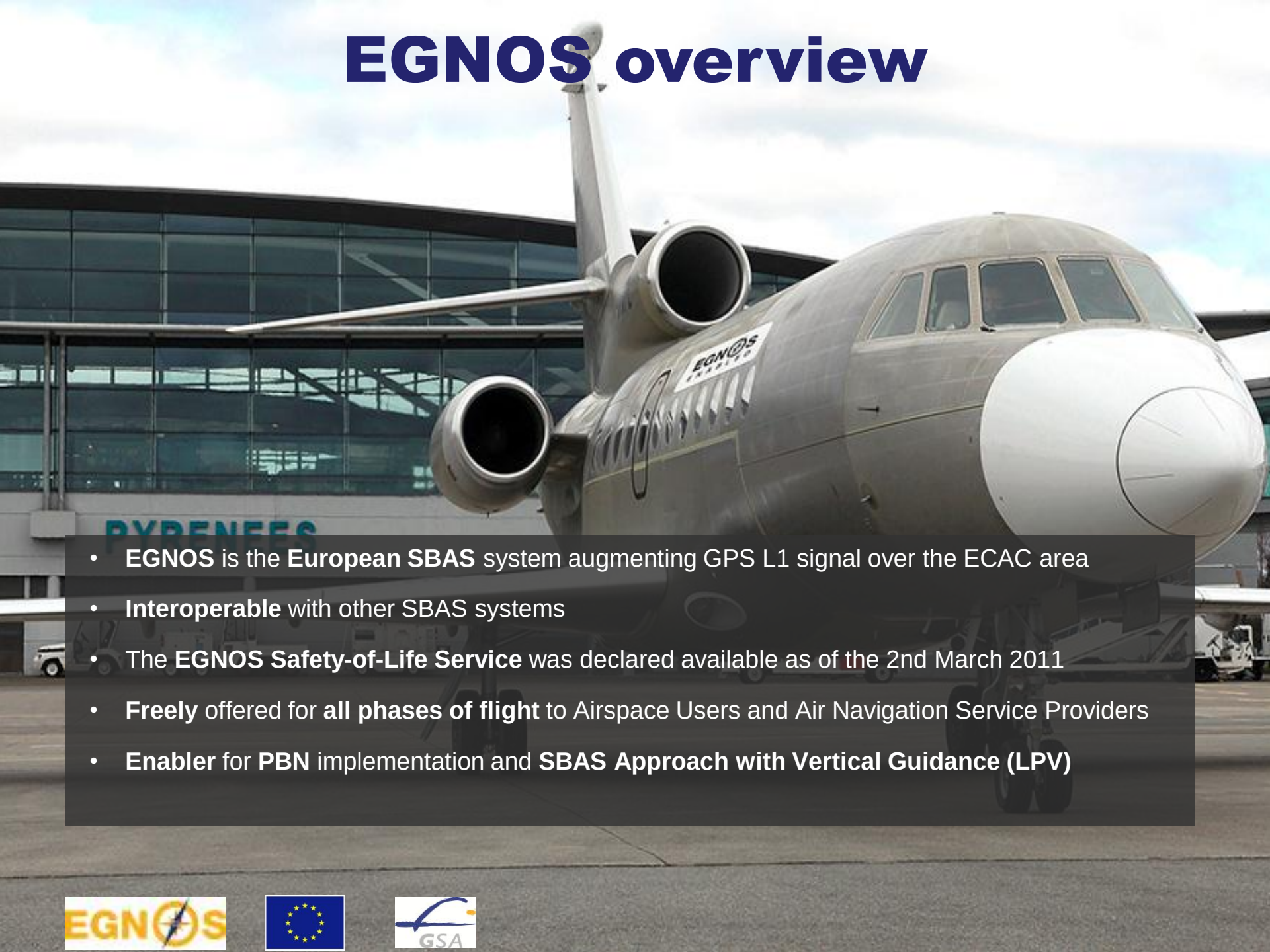
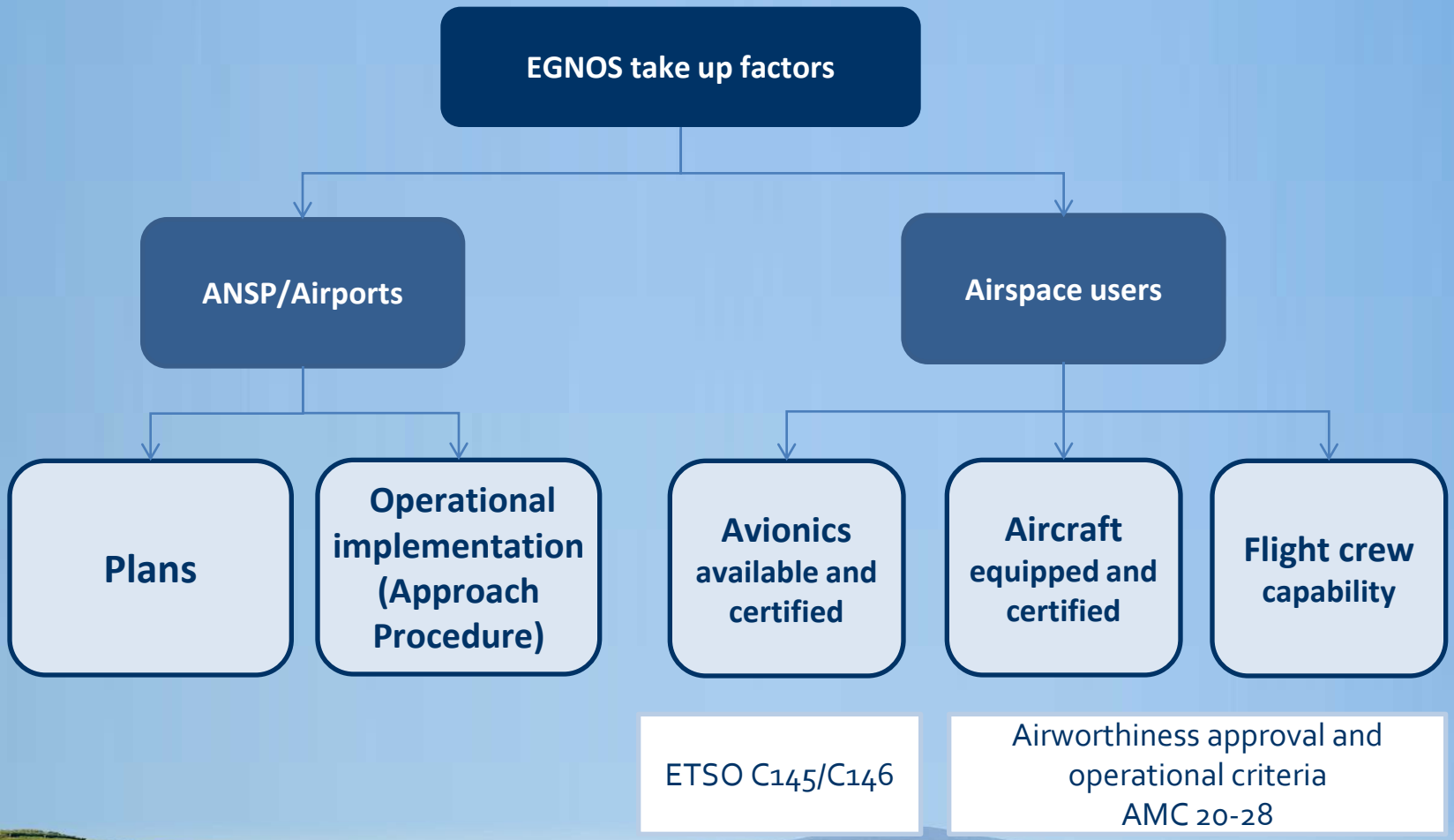
EGNOS overview



- **EGNOS** is the **European SBAS** system augmenting GPS L1 signal over the ECAC area
- **Interoperable** with other SBAS systems
- The **EGNOS Safety-of-Life Service** was declared available as of the 2nd March 2011
- **Freely** offered for **all phases of flight** to Airspace Users and Air Navigation Service Providers
- **Enabler** for **PBN** implementation and **SBAS Approach with Vertical Guidance (LPV)**

How to benefit from EGNOS

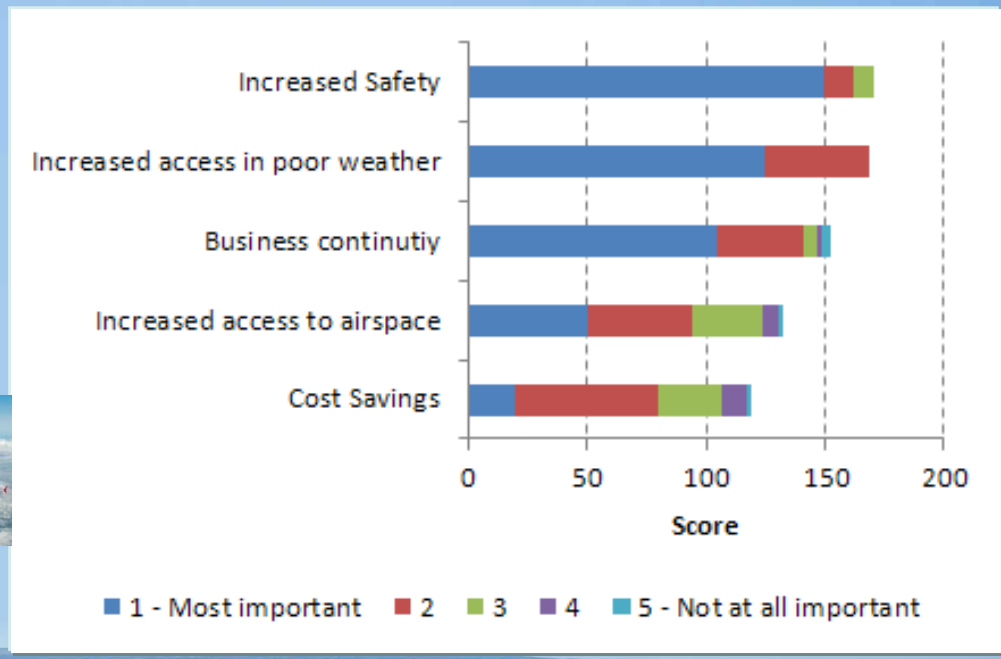


EGNOS Value proposition is acknowledged by GA

Benefits are provided across all market segments, especially at aerodromes without precision approach capabilities

- Reduced risk of Controlled Flight into Terrain (CFIT)
- Improved certainty of access
- Reduced fuel burn
- Reduced CO2 emission

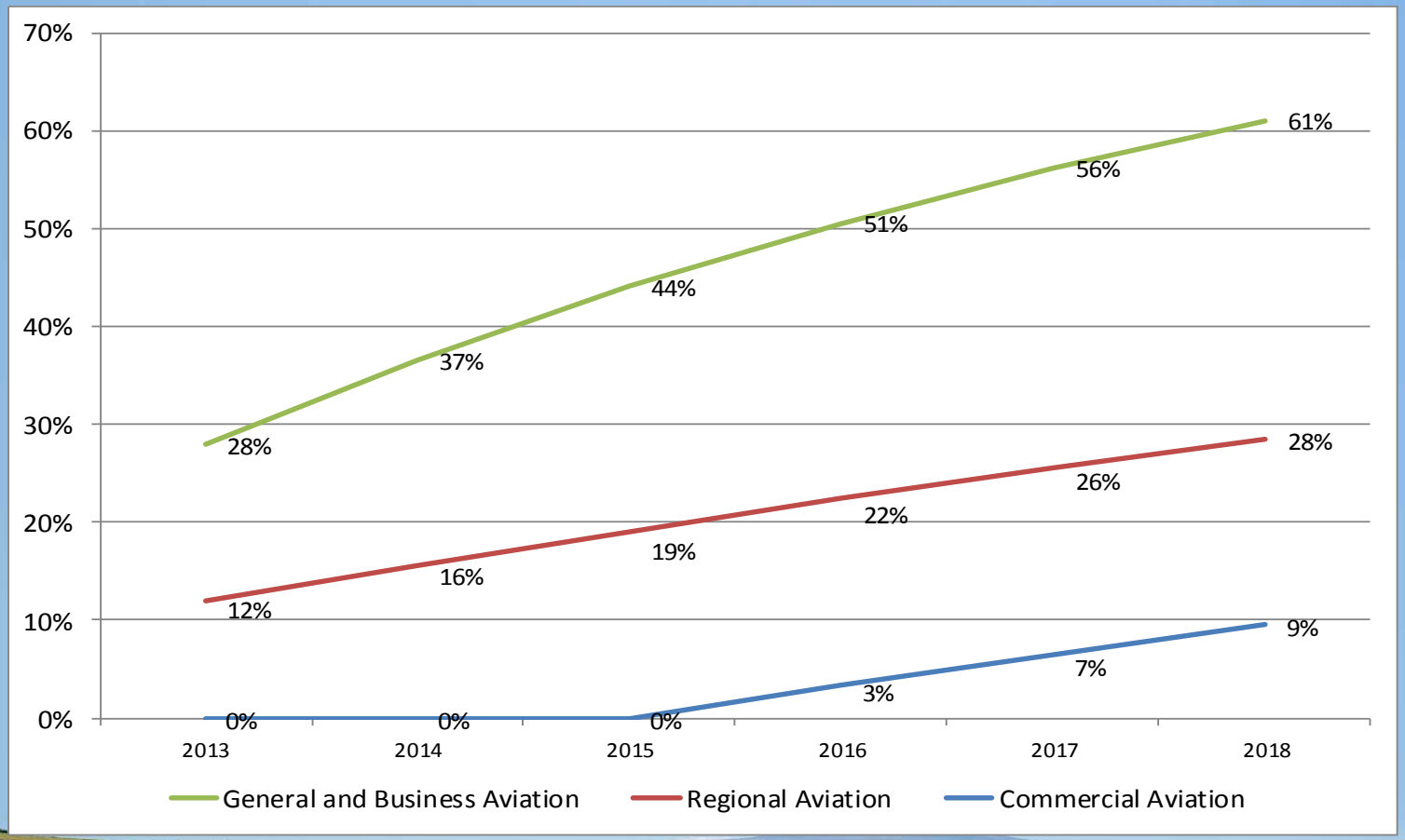
Supported by GSA survey of General and Business aviation users (August 2012)



Operators are equipping their fleet…

Forecast for EGNOS penetration

(% of total aircraft equipped with EGNOS enabled avionics)



Source: HELIOS analysis based on industry interviews

Excludes General aviation Visual Flight Rules

Operators are benefiting from EGNOS

REGIONAL

Aurigny

2x BN2B Trislander

CityJet (VLM)

8x Fokker 50

Air Nostrum

5xATR 72-600

15x CRJ 1000

Loganair

2x Twin Otter

Hebridean Air

2x BN2B Islander

Skybus

Twin-Otter

Danish Air Transport

DHC8

BUSINESS

Inaer

Bell 412

NetJets

Hawker 750

Specsavers

2x Beech 350

REGA/Geneva University Hospit

Eurocopter EC13

GENERAL

NLR

Fairchild Metro II

Cessna Citation II

Air Charters Europe

King Air 300

King Air 1900D

Aviation South West

Piper P28A

Beechcraft 76

Royal Star-Aero

Piper PA-34 Seneca II

Dutch & MartinAir Flight Academies

4x Diamond DA42

GSA study shows strong General aviation's willingness to adopt…

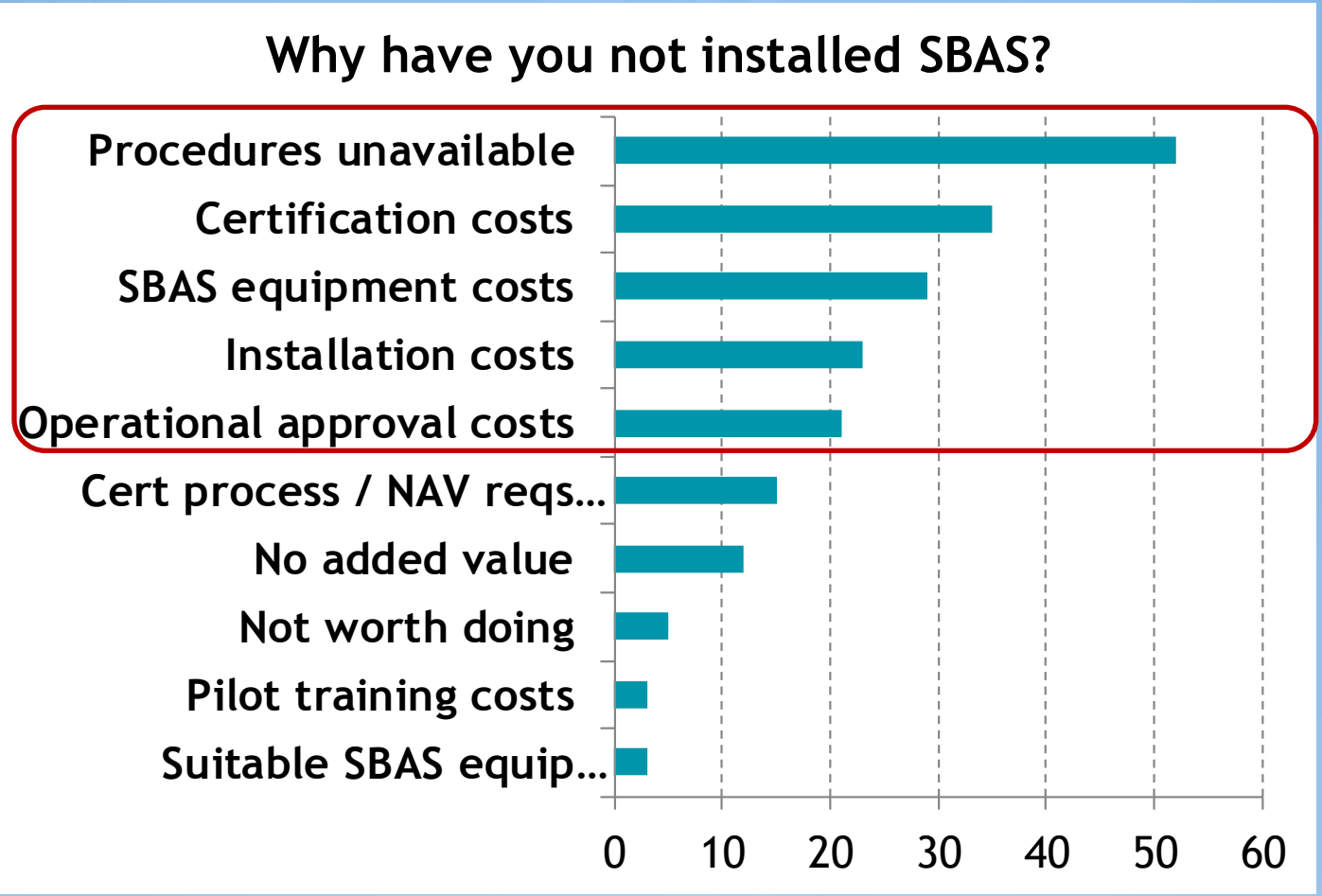
- 235 Responses collected from 19 different Countries
  - **40% of respondents already equipped (partially pending certification)**
  - **85% of respondents familiar with SBAS**
  - **83% of respondents considered using SBAS**

- Most popular equipment:
  - GNS 430 / GNS 530
  - GNS 430W / GNS 530W
  - G1000

- Most popular aircraft types:
  - Piper PA-28
  - Cessna 172
  - Diamond DA-40
  - CIRRUS SR22

Source: Survey IFR General Aviation in Europe, GSA, August 2012

… and also showing need for procedures, cheaper certification and equipment



Source: Survey IFR General Aviation in Europe, GSA, August 2012

Strengthening collaboration to foster GA adoption

Workshops for users in partnership with **IAOPA** and **EASA**

- EASA publication of **European All Model List (AML) for Garmin for the GTN 650/750** panel mount series provides potentially significant cost savings for aircraft upgrades (removes requirement for individual STC development)
- Evaluation of the feasibility of an All Model List (AML) for other equipment to support EGNOS users
- Increased awareness of SBAS benefits, certification, airworthiness and operational requirements still needed in collaboration with EASA and AOPA to dispel misconceptions of cost and complexity of requirements

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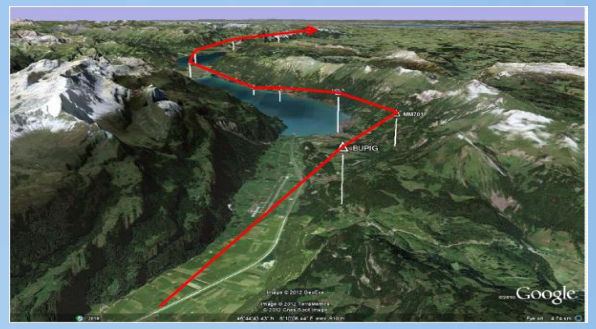
LPV approaches (I)

EGNOS provides access to:

- **Non-ILS equipped** aerodromes
- Aerodromes **during ILS outages** (backup)
- Small/medium aerodromes in **poor weather conditions** and in **challenging terrain environments**

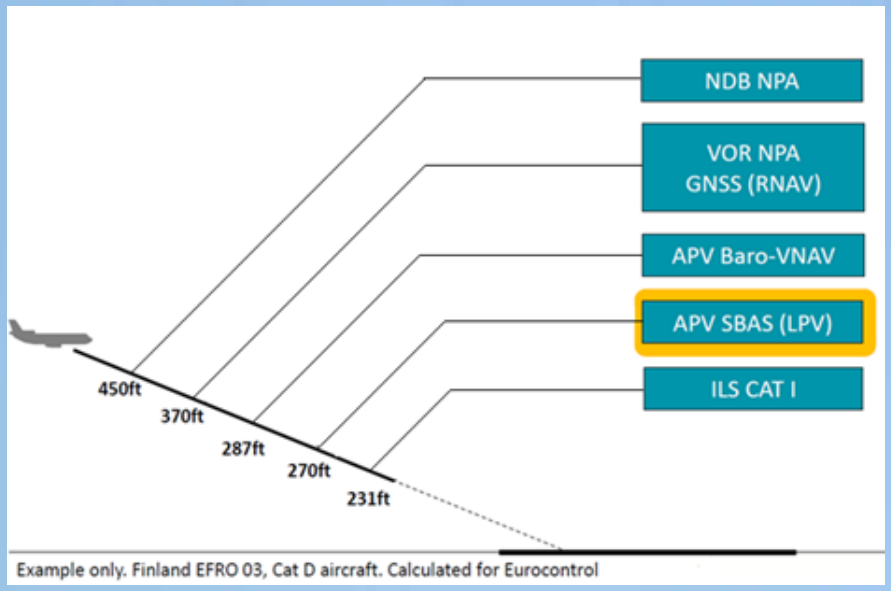
Barra Airport (UK)



Meiringen/Alpnach (CH)

LPV approaches (II)

EGNOS enables a reduction in the decision height (DH)

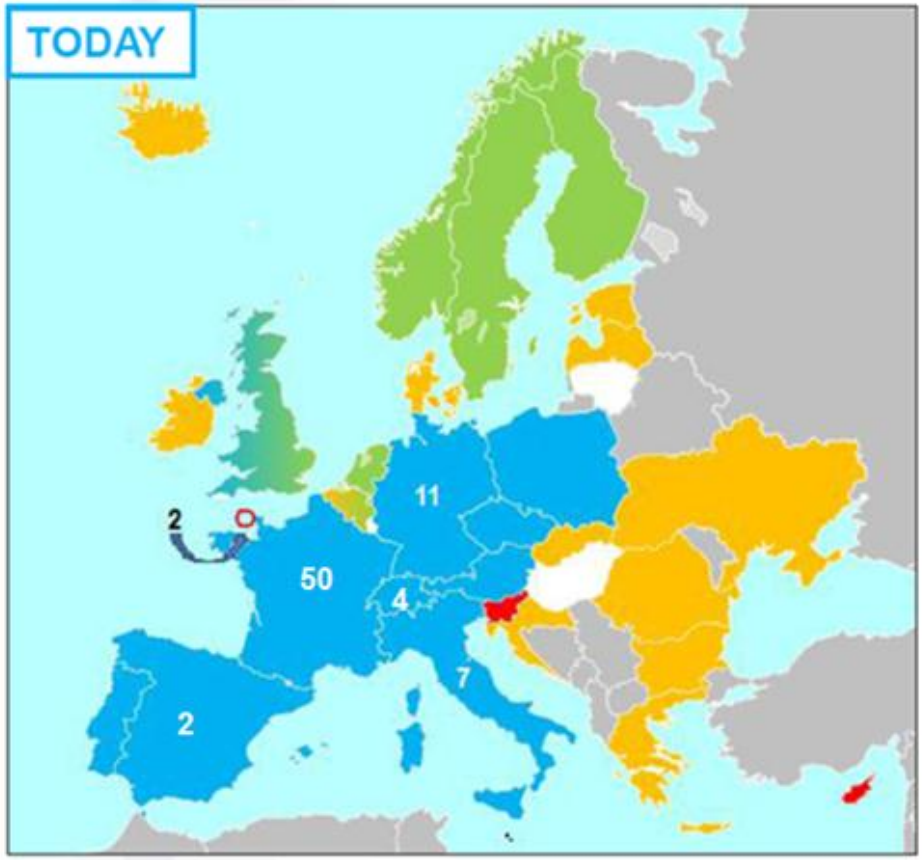


Minimun OCH per Approach Type

Example of DH Minimum

- Current OCH for LPV is 250 ft
- OCH will be reduced to 200 ft in 2015

LPV Implementation Status (Oct 2013)

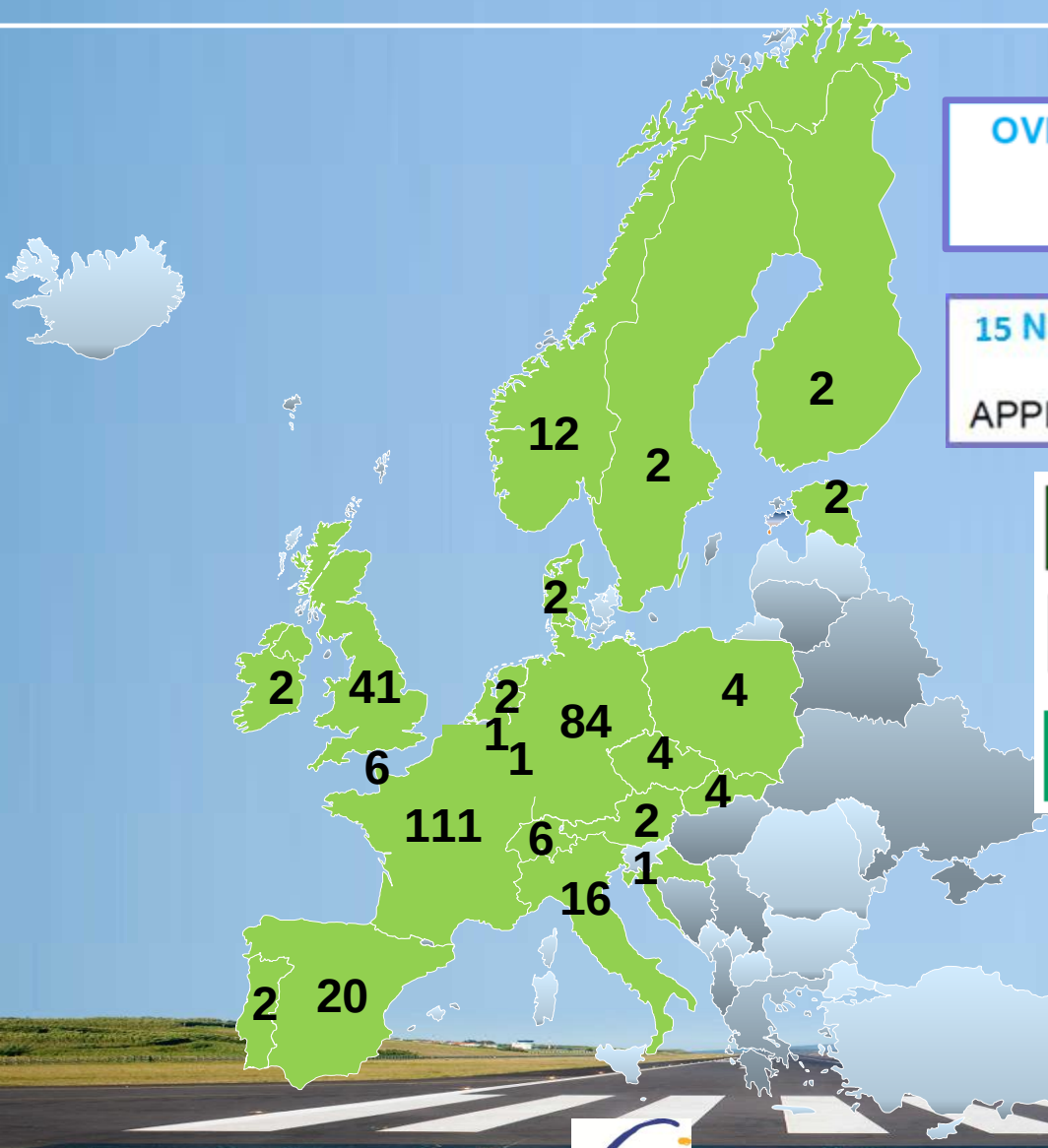


	Airports	LPV	APV Baro
	39	50	1 *
	4	4	0
	1	2	0
	4	7	0
	39	11	73 *
	1	2	0

	Rejection to discuss / EWA not needed
	Discussions paused
	Discussions on going
	EWA signed
3	Number of published LPV procedures
	No feedback

* APV-Baro procedures where EGNOS has been authorized for vertical guidance

LPV Implementation Plan for 2014



OVER 200 NEW EGNOS BASED PROCEDURES IN MORE THAN 100 AIRPORTS EXPECTED BEFORE END OF 2014

15 NEW EUROPEAN COUNTRIES EXPECTED TO PUBLISH THEIR FIRST EGNOS BASED APPROACH PROCEDURE BEFORE END OF 2014

EGNOS

GSA
GSA

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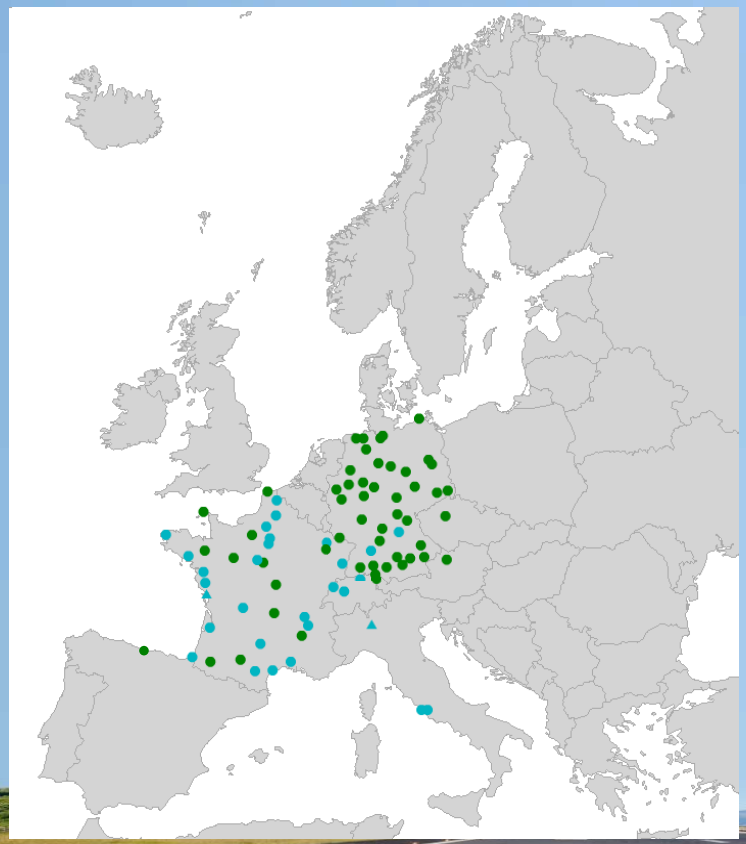
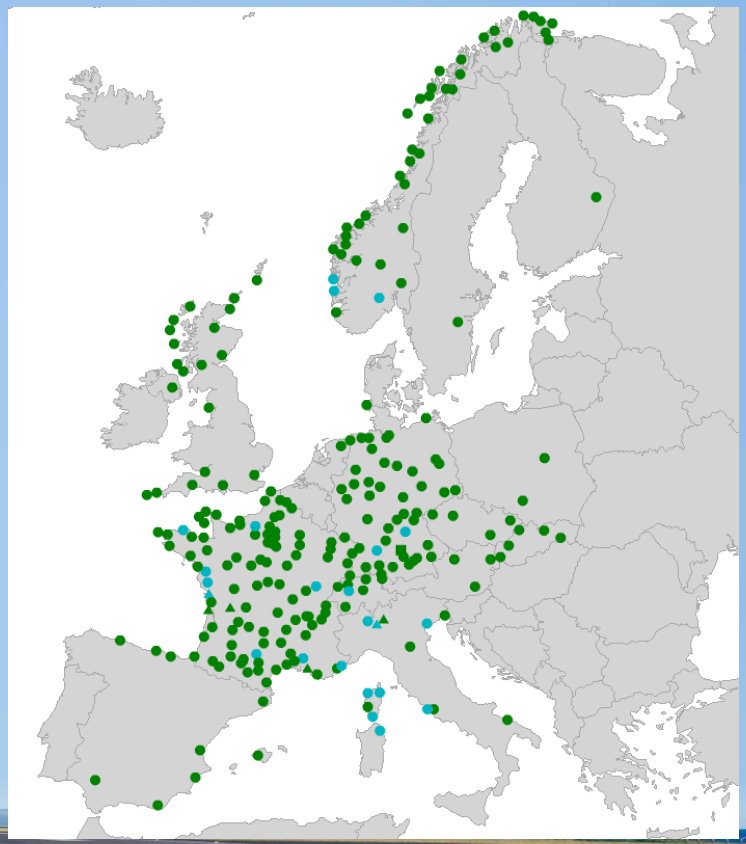
Current shared plans show growth by 2018 for procedures…

Plans for EGNOS published procedures
LPV + 'EGNOS enabled' LNAV/VNAV

146 procedures on July 3rd

> 400 Procedures by 2018





Source: EUROCONTROL PBN Map Tool and GSA analysis

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HORIZON 2020: Your way to EU GNSS

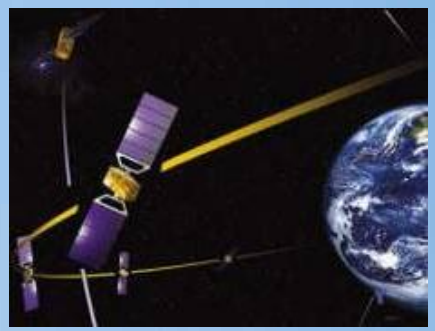
- **H2020: EU research and innovation funding programme**

- European GNSS Call for proposals
- Complementary to SESAR

- Open from **Dec 2013-April 2014**

- Budget: **aprox 40 million €**

- Topics:
  - **Applications, such as EGNOS in aviation**
  - SME led projects
  - International cooperation
  - Awareness actions



Thank you

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