



registration

7-8 October
Lisbon

The **EGNOS** Service Provision
workshop



We certify you're there.



European
Global Navigation
Satellite Systems
Agency

Jointly by the



AGENDA – October 7, 2014

08:30-00:00	Registration
09:00-09:30	Welcome and Introduction
09:30-10:00	EGNOS Programme Update
10:00-11:30	EGNOS Services Status
11:30-12:00	Coffee break
12:00-13:30	EGNOS Safety-of-Life Service for Aviation
13:30-14:30	Lunch
14:30-15:45	Successful EGNOS implementation stories in Aviation (I)
15:45-16:15	Coffee break
16:15-17:15	Successful EGNOS implementation stories in Aviation (II)
16:45-17:00	EGNOS awards and Conclusions

AGENDA (09:00 – 10:00)

08:30-00:00 **Registration**

09:00-09:30 **Welcome and Introduction**

***Carlo des Dorides** – Executive Director (European GNSS Agency)*

***Thierry Racaud** – CEO (ESSP)*

***Ignacio Alcantarilla** – EGNOS Project Officer (EC)*

***General Luis Palma de Figueiredo** – Board of Directors (NAV-PT)*

09:30-10:00 **EGNOS Programme Update**

☞ EGNOS exploitation programme update

***Jean-Marc Pieplu** – GNSS Exploitation Program Manager (GSA)*

☞ EGNOS market strategy and achievements

***Gian-Gherardo Calini** – Head of Market Development (GSA)*

AGENDA (09:00 – 10:00)

08:30-00:00 **Registration**

09:00-09:30 **Welcome and Introduction**

Carlo des Dorides – Executive Director (European GNSS Agency)

Thierry Racaud – CEO (ESSP)

Ignacio Alcantarilla – EGNOS Project Officer (EC)

General Luis Palma de Figueiredo – Board of Directors (NAV-PT)

09:30-10:00 **EGNOS Programme Update**

☞ EGNOS exploitation programme update

Jean-Marc Pieplu – GNSS Exploitation Program Manager (GSA)

☞ EGNOS market strategy and achievements

Gian-Gherardo Calini – Head of Market Development (GSA)

AGENDA (09:00 – 10:00)

08:30-00:00 **Registration**

09:00-09:30 **Welcome and Introduction**

***Carlo des Dorides** – Executive Director (European GNSS Agency)*

***Thierry Racaud** – CEO (ESSP)*

***Ignacio Alcantarilla** – EGNOS Project Officer (EC)*

***General Luis Palma de Figueiredo** – Board of Directors (NAV-PT)*

09:30-10:00 **EGNOS Programme Update**

☞ EGNOS exploitation programme update

***Jean-Marc Pieplu** – GNSS Exploitation Program Manager (GSA)*

☞ EGNOS market strategy and achievements

***Gian-Gherardo Calini** – Head of Market Development (GSA)*

AGENDA (09:00 – 10:00)

08:30-09:00 **Registration**

09:00-09:30 **Welcome and Introduction**

***Carlo des Dorides** – Executive Director (European GNSS Agency)*

***Thierry Racaud** – CEO (ESSP)*

***Ignacio Alcantarilla** – EGNOS Project Officer (EC)*

***General Luis Palma de Figueiredo** – Board of Directors (NAV-PT)*

09:30-10:00 **EGNOS Programme Update**

☞ EGNOS exploitation programme update

***Jean-Marc Pieplu** – GNSS Exploitation Program Manager (GSA)*

☞ EGNOS market strategy and achievements

***Gian-Gherardo Calini** – Head of Market Development (GSA)*

EGNOS Exploitation Programme Update

EGNOS Service Provision Workshop

7 October 2014



European
Global Navigation
Satellite Systems
Agency

1. New Multi-annual Financial Framework for EU

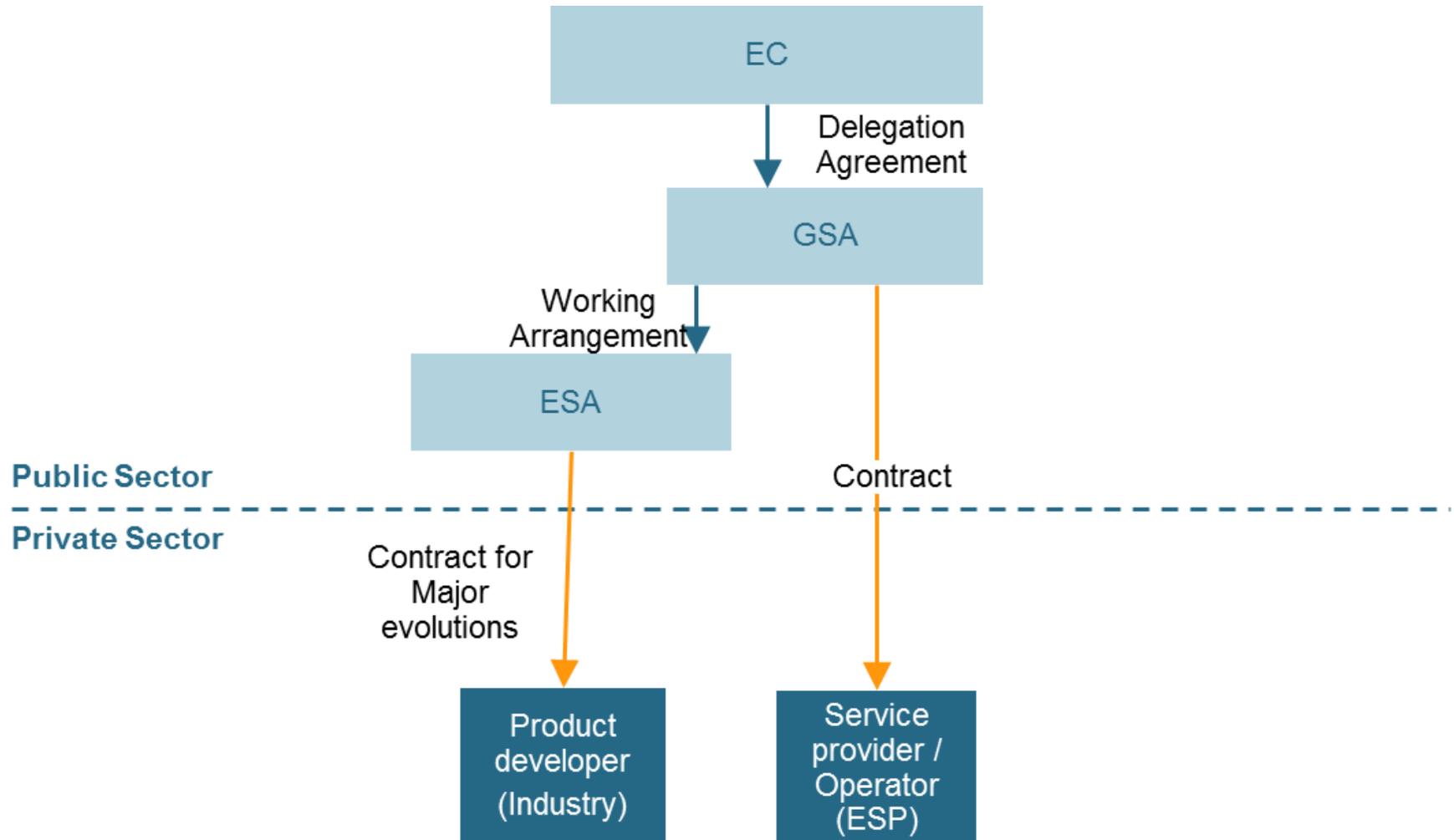
- Adopted by EU Budgetary Authority end 2013
- Covers period 2014-2020
- Ensure funding of:
 - EGNOS Exploitation (incl. « EGNOS V3 » development)
 - Galileo full deployment
 - Galileo Exploitation

2. New GNSS Regulation (1285/2013, 11 Dec. 2013)

- EGNOS shall:
 - augment existing GNSS and Galileo Open signals
 - provide OS, SOL and EDAS services
 - over EU States territories geographically located in Europe
- EGNOS may be extended to other regions (neighbourhood policy)
- New public sector governance

3. Commission-GSA Delegation Agreement (April 2014)

New public sector governance

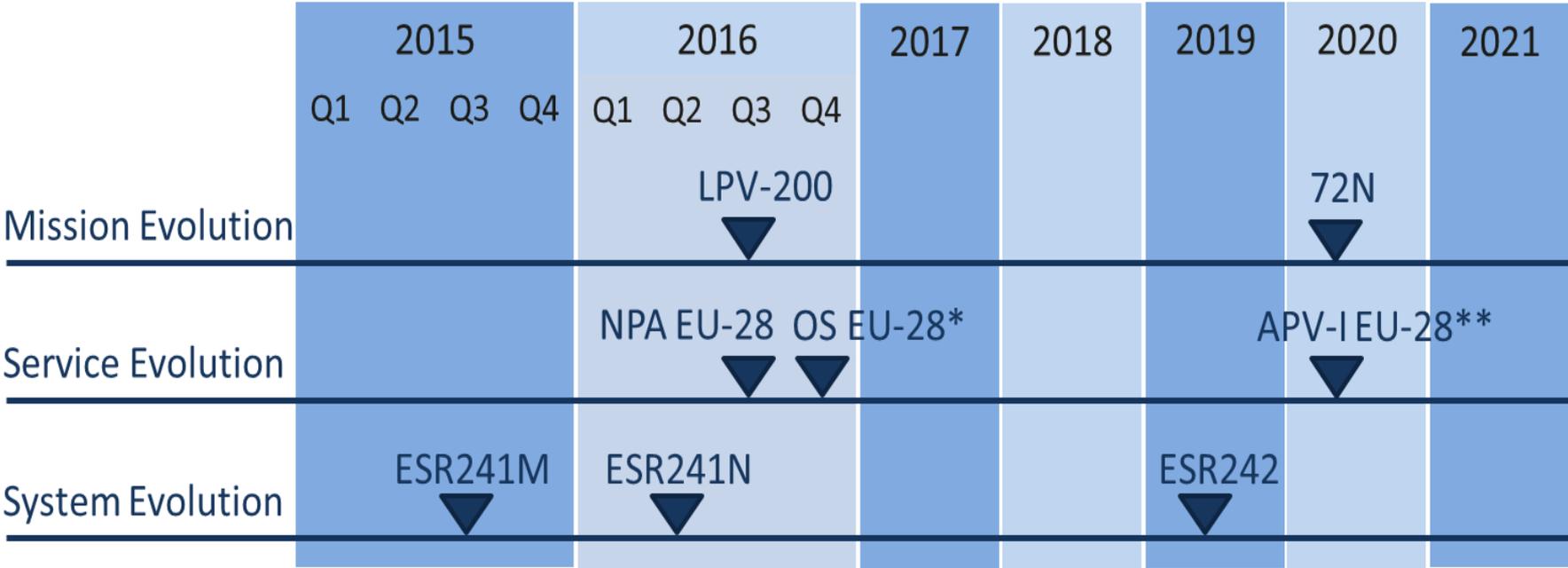


EGNOS Exploitation objectives

1. Deliver continuous and safe signals & services, compliant with International Standards:
 - Augmentation to GPS
 - EASA certification, EU security accreditation
2. Maintain & renew the Space & Ground infrastructure:
 - Manage obsolescence (Ground & Space Evolutions)
3. Improve services (design&deploy evolutions):
 - Extend coverage area: EU-28 priority
 - Improve performance delivered to users (e.g. LPV-200)
 - Improve resilience: multi-frequency, multi-constellation capacity
4. Enable the use of EGNOS
 - Develop user standards
 - Ensure inter-operability
5. Develop EGNOS Market Adoption (Aviation, Maritime, others)



Service Evolution Plan



* ** Performance levels reachable in this timeframe for Azores, Madeira and Canary are still under consolidation

Note: Scenarios to accelerate EU-28 service coverage extension are under study



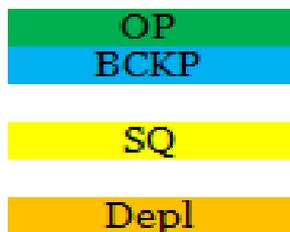
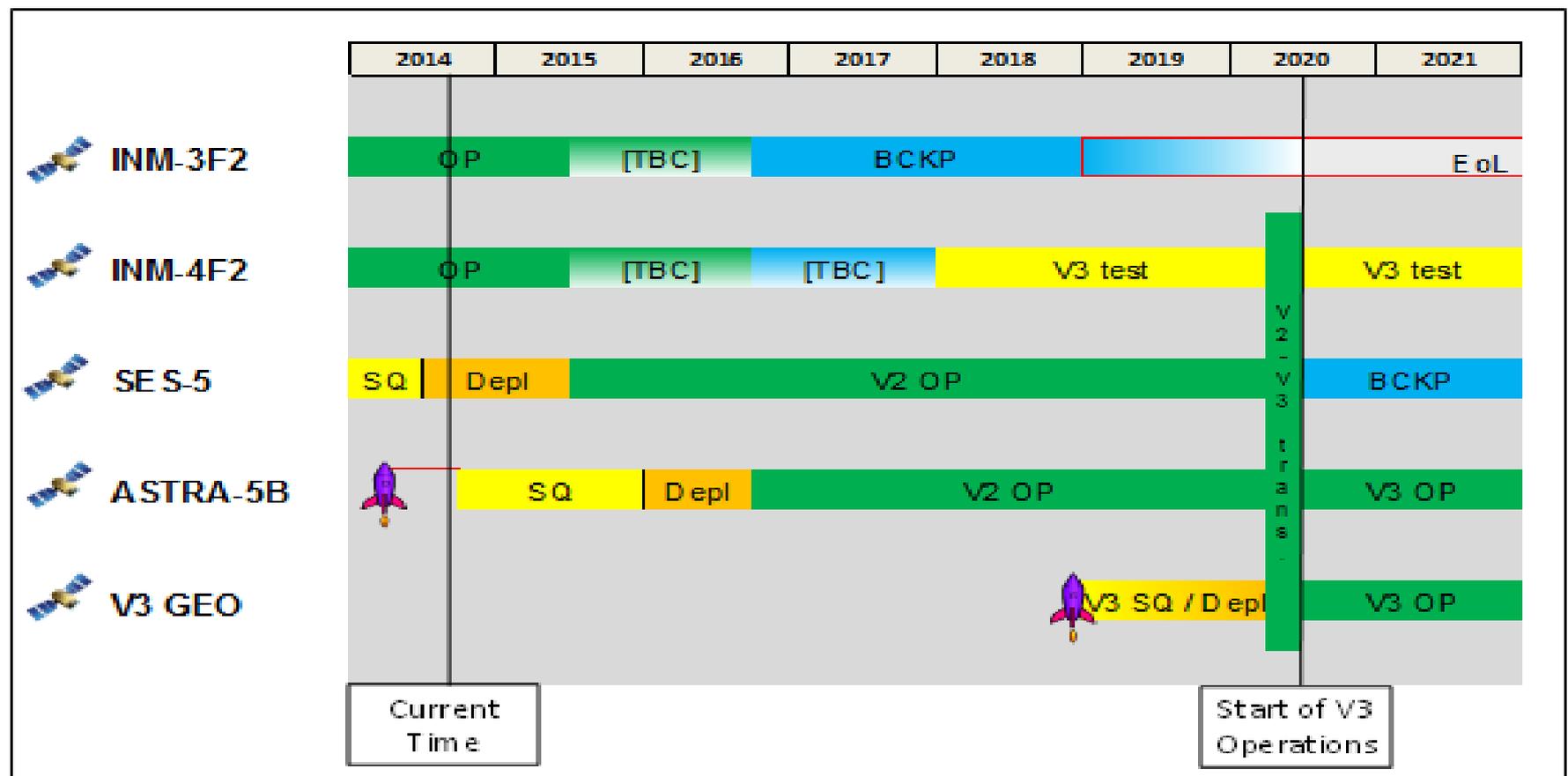
System Evolution Plan

Release	V241M	V241N	V242
Qualification Review	July 2014	November 2015	Mid-2018
Entry in operations	August 2015	April 2016	2019
OS SDD	January 2016	September 2016	End-2019
SOL SDD	July 2016	March 2017	2020
Features	<ul style="list-style-type: none">• GEO-1 (SES-5) Qualification• LPV-200 service declaration• Continuity improvements	<ul style="list-style-type: none">• GEO-2 (ASTRA-5B) Qualification• RIMS Haifa	<ul style="list-style-type: none">• CPF release to include iono robustness and extension of EGNOS Service Area to 72° Latitude• Introduction of two RIMS• CPF new tech. solves obsolescence

Under study: New intermediate System Release before 2.4.2 to introduce:

- 2 new RIMS
- Extension to 72°N

GEO Roadmap



OP Operational configuration, providing the Safety-of-Life service

BCKP Backup (in-orbit spare) for the operational configuration, also used for testing/qualification of new system releases (TEST)

SQ System Qualification prior to enter the operational configuration, or to qualify as backup

Depl Operational deployment

- Mission/Security requirements:
 - MRD V3 and HLSS initial baseline has been established
 - Points under consolidation:
 - L5-only operating mode
 - Galileo-only operating mode
 - Maritime requirements
 - Security requirements
 - European Commission & Member States to establish EGNOS v3 Mission Statement Implementing Act in Q1 2015
- Development status
 - EGNOS v3 Phase B studies will reach PDR mid 2015
 - Phase C/D procurement approach is under preparation



Exploring new opportunities

- Interest to design new services and standards:
 - Maritime
 - Rail
- Interest to extend EGNOS coverage to neighbouring countries (beyond EU-28):
 - Mediterranean neighbours
 - Ukraine
- Interest to cooperate with and deploy SBAS/EGNOS into other regions (e.g. ASECNA)



AGENDA (09:00 – 10:00)

08:30-09:00 **Registration**

09:00-09:30 **Welcome and Introduction**

***Carlo des Dorides** – Executive Director (European GNSS Agency)*

***Thierry Racaud** – CEO (ESSP)*

***Ignacio Alcantarilla** – EGNOS Project Officer (EC)*

***General Luis Palma de Figueiredo** – Board of Directors (NAV-PT)*

09:30-10:00 **EGNOS Programme Update**

☞ EGNOS exploitation programme update

***Jean-Marc Pieplu** – GNSS Exploitation Program Manager (GSA)*

☞ EGNOS market strategy and achievements

***Gian-Gherardo Calini** – Head of Market Development (GSA)*



European
Global Navigation
Satellite Systems
Agency

GSA USER AND MARKET RELATED STRATEGY AND ACHIEVEMENTS

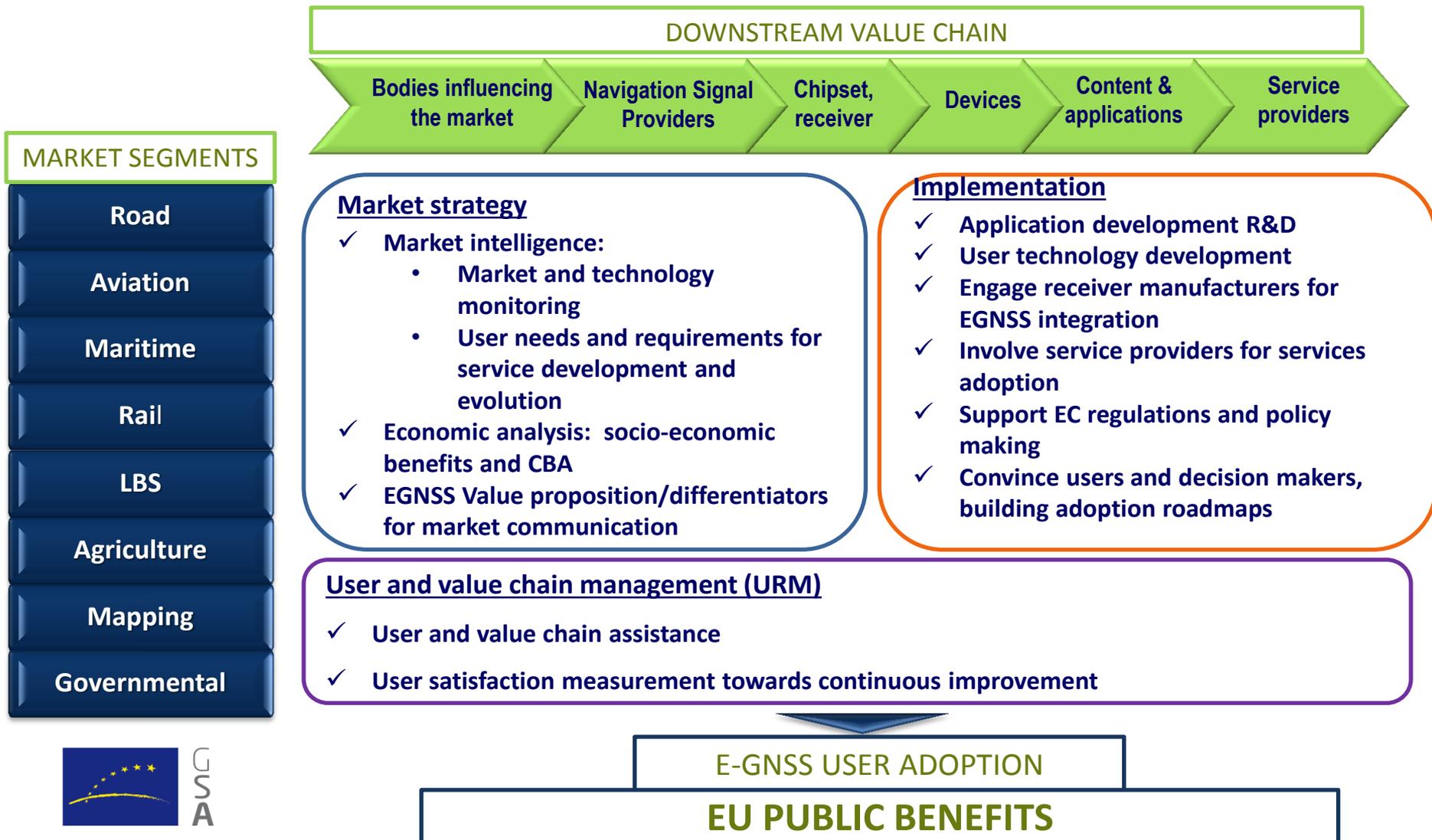
EGNOS Service Provision Workshop

Lisbon, 7th October 2014

Gian Gherardo Calini

Head of Market Development Department

Integrated market development for E-GNSS adoption



Where we want to be in 2020

Aviation



- **More than 440 EGNOS-based LPV procedures** planned by 2018
- GNSS devices to reach **90% penetration in installed base** as an enabler of Performance Based Navigation

Maritime



- **EGNOS adopted as complementary system to DGNSS infrastructure** ensuring its role in the future e-Navigation concept
- **Galileo recognized by IMO** as part of World Wide Radionavigation System

Rail



- **E-GNSS based train positioning included in ERTMS** and adopted as a solution for safety critical railway applications such as signalling
- **E-GNSS** adopted as a part of **railway asset and cargo tracking solutions**

Surveying & Mapping



- Wide spread use of EGNOS for mapping and Galileo for surveying
- **100% penetration** of Galileo on surveying devices
- Vast majority of ground infrastructure reference service providers integrating Galileo

Agriculture



- **EGNOS preferred entry technology for precision agriculture** in Europe and neighbour countries
- **Galileo / Copernicus joint adoption** providing undisputed added value

Road



- **E-GNSS multipurpose receiver in every vehicle** for V2V and V2I communications (e.g. eCall, PAYD, Infotainment)
- **E-GNSS in every new commercial truck** in Europe (Digital Tachograph, dangerous goods and/ or Road Tolling)

LBS



- Galileo adopted by main market players (i.e. **70% penetration in mobile phones**)
- Galileo **adopted for 112** as a way to provide precise caller location information

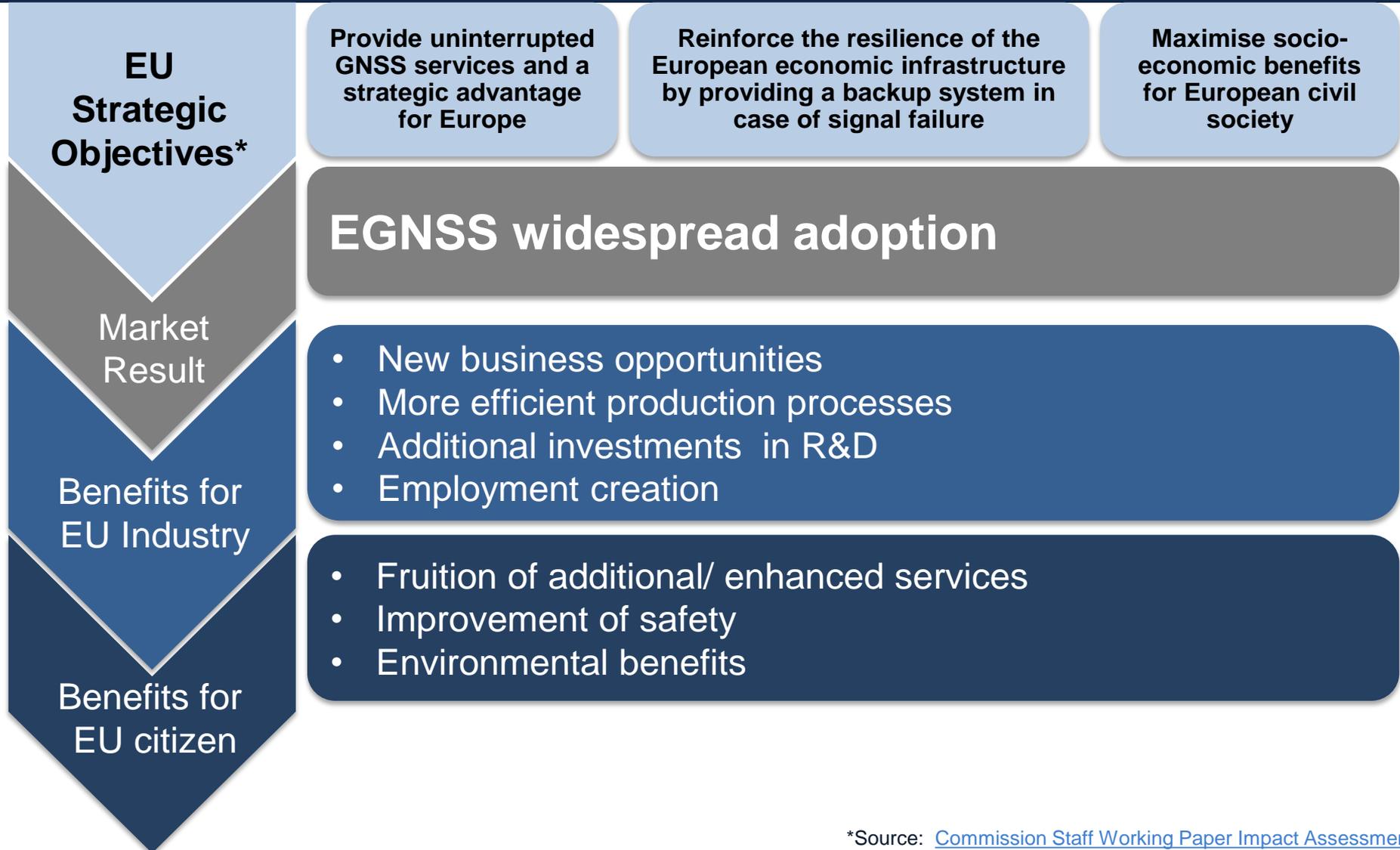
GSA MKD strategy adopts a user market driven approach



GSA MKD strategy adopts a user market driven approach



The implementation of market-oriented actions enables EU industry and citizen benefits, achieving EU strategic objectives



Users do not discriminate services or systems, thus we focus on vertical market segments...

Segment Service		Aviation	Maritime	Rail	Surveying/ Mapping	Agriculture	Road	LBS
		EGNOS	Open Service		Operational		Operational	Operational
Safety of Life	Operational		Galileo FOC/EGNOS V3	Galileo FOC/EGNOS V3				
GALILEO	Open Service	Galileo Early Services						
	OS/CS Authentication		Galileo FOC/EGNOS V3	Galileo FOC/EGNOS V3	Galileo FOC/EGNOS V3		Galileo FOC/EGNOS V3	Galileo FOC/EGNOS V3
	CS High Precision		Galileo FOC/EGNOS V3		Galileo FOC/EGNOS V3	Galileo FOC/EGNOS V3	Galileo FOC/EGNOS V3	
	Public Regulated Service							
	Search and Rescue	Galileo Early Services	Galileo Early Services					Galileo Early Services



Operational



Galileo Early Services



Galileo FOC/
EGNOS V3

...that are targeted via a tailored strategy: Aviation

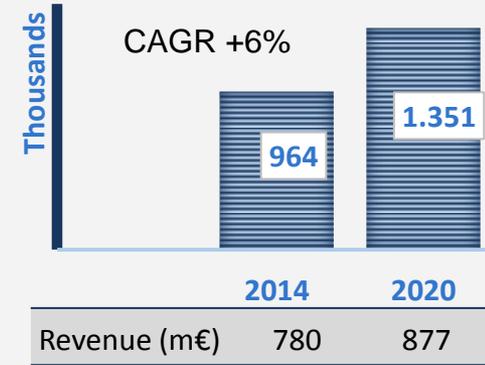
Where
we
want
to be



- GNSS devices to reach **90% penetration in installed base by 2020** as an enabler of **Performance Based Navigation**
- **More than 440 LPV planned by 2018**

2020
TARGET

WORLDWIDE INSTALLED BASE



How
to
get
there

- Foster **EGNOS adoption** through:
 - *Enablers/Tools/methodologies to facilitate **LPV implementation***
 - *Increase availability of efficient avionics solutions*
 - *Include EGNOS in training syllabus*
 - *Increasing **helicopters adoption***
- Get ready for **LPV-200 capability** (ready by 2015)
- Explore **E-GNSS potential for Communication, Navigation and Surveillance for all flight phases**
- Exploit **advanced operations using GNSS as enabler** (e.g. 4D)
- Get ready for **multi-constellation/multi-frequency solutions**

STRATEGY

Maritime

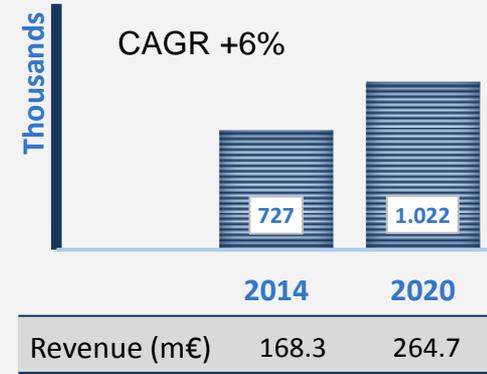
Where
we
want
to be



- Galileo for navigation in ocean, coastal and restricted waters using **double frequency receivers** and RAIM (penetration in Rx similar to GLONASS)
- DGalileo (incl. RTK) available for **high precision operations in ports**
- **Galileo-SAR return link capability** adopted in beacons
- EGNOS complementing IALA beacon infrastructure providing integrity information

2020
TARGET

WORLDWIDE INSTALLED BASE



How
to
get
there

- **Galileo to be recognized by IMO** as part of the WWRNS
- Support the preparation of **IMO performance standards for multi-system shipborne navigation receivers**
- Differential Galileo to be included in **Maritime standards**
- Promotion campaign of **Galileo/SAR return link** capability to beacon manufacturers and users
- Launch EGNOS/EDAS demonstration project and awareness campaign with the support of EMRF/IALA.

STRATEGY

Rail

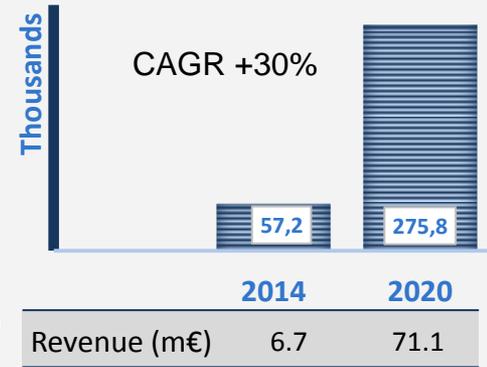
Where we want to be



- E-GNSS adopted as one of the key elements of the train **command and control solutions** enabling safe and efficient operations **on low density lines**
- E-GNSS adopted as a **complementary or backup solution in ERTMS Level 2 on main lines**
- E-GNSS adopted for **train positioning subsystem** fostering adoption of **ERTMS Level 3 on main freight lines**
- **Multi-constellation use of GNSS for multimodal logistics applications**

2020
TARGET

WORLDWIDE INSTALLED BASE



How to get there

- Support UNISIG and Next Generation Train Control project in their effort to define requirements in the difficult railway environment and defining virtual balise
- Cooperate with railway associations and EC to **foster the role of E-GNSS in the evolutions of ERTMS standard**
- Support EC in the **standardization and certification of EGNOS receivers** as a component of the **train positioning subsystem**
- Collaborate with **logistics industry associations** supporting the role of E-GNSS in **supply chain standards**
- Support the establishment of E-GNSS enabled asset and cargo tracking solutions for positioning of rail as a key player in the future European multimodal transport

STRATEGY

High precision

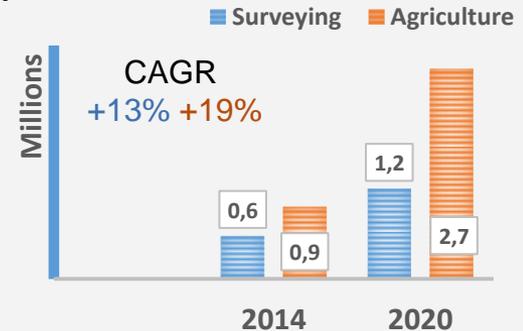
Where we want to be



- **EGNOS preferred entry technology** in the high precision domain through Europe and neighbour countries
- **Galileo preferred solution for CAP field boundary measurements** leveraging on OS and CS authentication
- **E-GNSS/ Copernicus joint adoption** providing undisputed added value
- **Galileo provider of a reliable high accuracy service** for the surveyors community **via reference ground infrastructure**

2020
TARGET

WORLDWIDE INSTALLED BASE



Revenue (b€)	3.0	3.8
Revenue (b€)	0.7	1.5

How to get there

- **Common action: Incentivize and support GNSS related R&D in High Precision segment** (e.g. through H2020 and partnership with research & centres and universities) **to create innovative solutions**
- Encourage the **adoption of E-GNSS by the agricultural user community** leveraging on **Galileo CS High Precision (from 2016) and EGNOS**
- Integrate **value proposition with Copernicus**
- Establishment of **Galileo CS Triple Frequency speeding up ambiguity resolution** for both PPP and DGNSS
- Implementation of **Galileo CS High Precision and Authentication**
- Incentive **integration of Galileo in all** (private and public) **ground infrastructure reference service providers**

STRATEGY

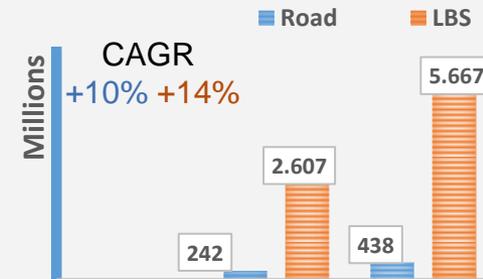
Mass Market

Where we want to be



- **E-GNSS multipurpose receivers in every vehicle** for V2V and V2I communications (e.g. RUC, eCall, PAYD)
- **E-GNSS in every new commercial truck in Europe** (Digital Tachograph)
- **E-GNSS used in the vast majority of lorries** transporting dangerous goods in Europe
- Galileo saving lives being adopted within **emergency caller location (E112)**
- **Galileo adopted by main market** players leveraging on its differentiators

WORLDWIDE INSTALLED BASE



2020 TARGET

	2014	2020
Revenue (b€)	36.5	39.9
Revenue (b€)	19.6	57.9

How to get there

- **RUC**: Promotion of **EGNSS adoption in the EETS regulation framework** and joint actions with road tollers
- **Connected Vehicles and ADAS**: Market development activities towards car makers, OEM, Tier 1 suppliers, decision/standard makers about EGNSS adoption
- **eCall/DT**: Facilitate **EGNSS adoption in the eCall regulation delegated acts** and in the **Digital Tachograph technical annex** leveraging on authentication
- Supporting **EC in mandating Galileo compatibility in mobile phones**
- Actions targeting Galileo adoption:
 - Manage key **business development activities toward chipset manufacturers**
 - **Develop adoption roadmap** involving relevant stakeholders in the Value Chain (e.g. device manufacturers)

Common actions:

- Manage **ESA testing with both regards to LBS** (Galileo chipsets) and **road** (eCall/ DT devices)
- **Incentivize and support GNSS related R&D**

STRATEGY

User Satisfaction

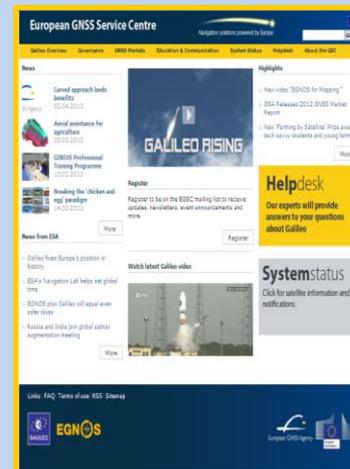
EGNOS User Satisfaction Process

- GSA monitors EGNOS User Satisfaction via a yearly User Satisfaction Survey evaluating:
 - Contractual KPI to the EGNOS service provider
 - Metrics to improve the service provision
- Based on this, the EGNOS Service provider will build a continuous user support improvement process



Galileo User Support

- GSA built the first User Centre for
 - Providing information via a web site
 - Answering user requests
 - Publication of NAGUs (Notification Advisory to Galileo Users)



- Website visited from **83** countries in the latest month
- **152** users registered

Recent Achievements

Aviation



- **EGNOS based procedures in 12 countries for a total of 209 EGNOS-based** (+ 13 procedures in the last 3 months)
- Sweden and UK published their first LPV procedure in the last month
- **Strategic alliance with Business Operators** to promote EGNOS based operations

Maritime



- **IMO recognition process initiated for Galileo as part of the World Wide Radio Navigation System**, following the acceptance of the EC proposal, drafted with GSA support, matching Beidou first move

Rail



- **Confirmed interest in EGNOS performance testing by UNISIG**, the leading railway signalling group, which will pave the way towards use of EGNOS in railway signalling

Surveying & Mapping



- Confirmed **interest of service providers in Galileo triple frequency capacities** in on-going consultation

Agriculture



- EGNOS adopted by **80% of EU farmers using GNSS**

Road



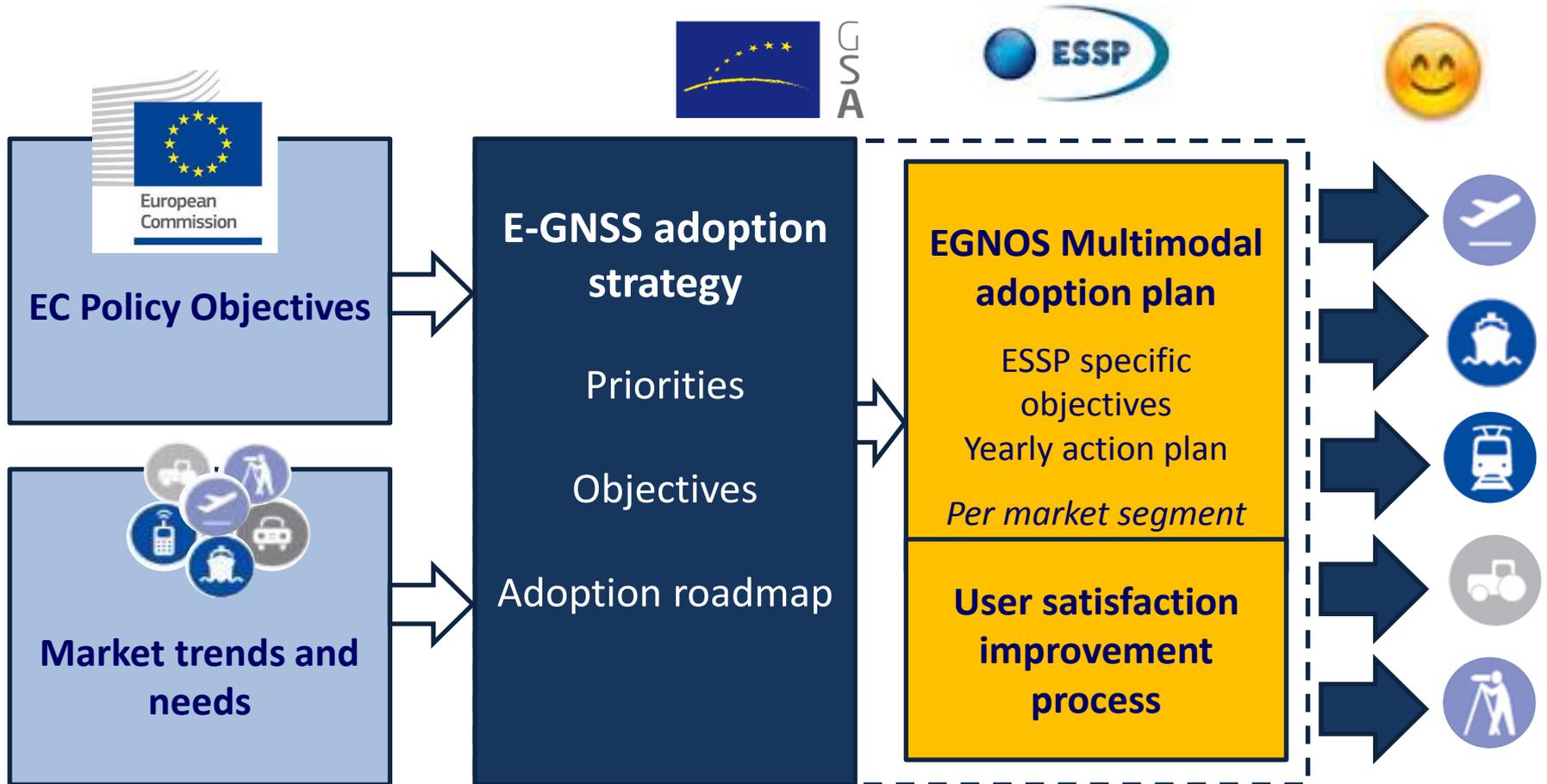
- **Slovakia to adopt EGNOS this year in 17.500 Km tolled roads**
- **Belgium selected the consortium that will adopt a EGNSS based tolling** solution for trucks under operation in 2016

LBS



- Tests conducted by Rx Networks and the GSA confirm **Galileo value added in challenging environments** (i.e. urban canyon and indoor) when used in Multi-GNSS (to be used as a lever to stimulate EGNSS adoption in LBS)
- September 2th 2014: **first Galileo enabled smartphone** was presented to the market (Meizu MX4)

GSA and ESSP Working together in achieving EGNOS market adoption and User Satisfaction





Thank you

www.egnos-portal.eu

For further information contact:

Gian Gherardo Calini

Gian-Gherardo.CALINI@gsa.europa.eu

AGENDA (10:00 – 12:00)

10:00-11:30

EGNOS Services Status

- ☞ Overview of last 12 months performance
Javier Gómez – Mission Performance Manager (ESSP)
- ☞ User Satisfaction Surveys 2013
Miguel-Ángel Sánchez – Service Adoption and Support Mngr (ESSP)
- ☞ EGNOS Services Evolution Roadmap
Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)
- ☞ Towards EGNOS in Africa: Emergence of JPO, ASECNA Program
Ladislaus Matindi – EGNOS Africa JPO Director (JPO)
Julien Lapie – Technical Advisor (ASECNA)

11:30-12:00

Coffee break

AGENDA (10:00 – 12:00)

10:00-11:30

EGNOS Services Status

- ☞ Overview of last 12 months performance
Javier Gómez – Mission Performance Manager (ESSP)
- ☞ User Satisfaction Surveys 2013
Miguel-Ángel Sánchez – Service Adoption and Support Mngr (ESSP)
- ☞ EGNOS Services Evolution Roadmap
Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)
- ☞ Towards EGNOS in Africa: Emergence of JPO, ASECNA Program
Ladislaus Matindi – EGNOS Africa JPO Director (JPO)
Julien Lapie – Technical Advisor (ASECNA)

11:30-12:00

Coffee break

AGENDA (10:00 – 12:00)

10:00-11:30

EGNOS Services Status

- ☞ Overview of last 12 months performance

Javier Gómez – Mission Performance Manager (ESSP)

- ☞ User Satisfaction Surveys 2013

Miguel-Ángel Sánchez – Service Adoption and Support Mngr (ESSP)

- ☞ EGNOS Services Evolution Roadmap

Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)

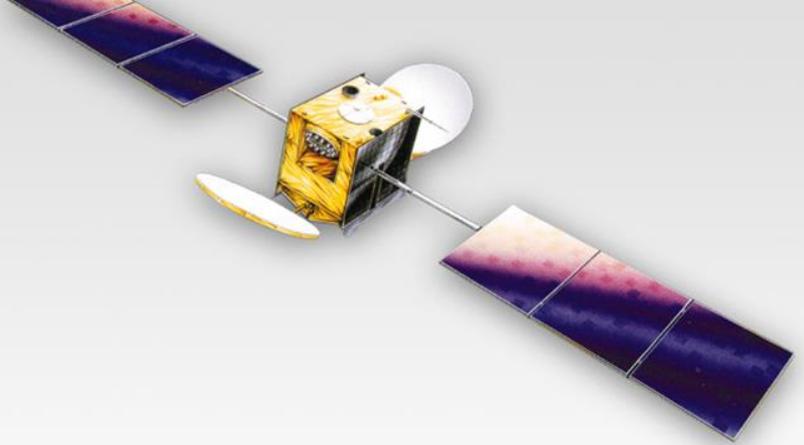
- ☞ Towards EGNOS in Africa: Emergence of JPO, ASECNA Program

Ladislaus Matindi – EGNOS Africa JPO Director (JPO)

Julien Lapie – Technical Advisor (ASECNA)

11:30-12:00

Coffee break



Service Performance Overview from 01 April 2013 to 31 March 2014

Javier Gómez, ESSP SAS, javier.gomez@essp-sas.eu



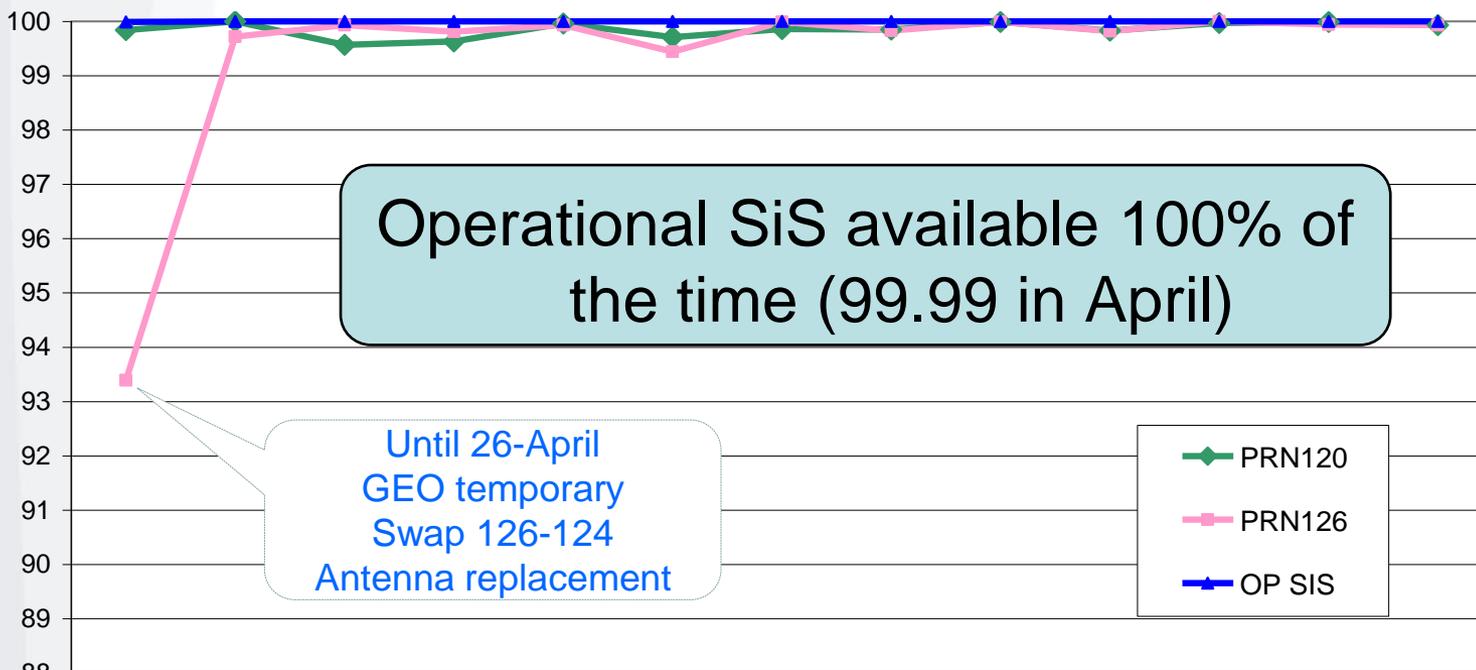
The **EGNOS** Service Provider

Service Performance Overview

- SIS Broadcast Availability
- EGNOS APV-1 availability, continuity, integrity
- EGNOS Open Service (Accuracy)
- EDAS Service Availability
- Main Performance Milestones

SIS Broadcast Availability

EGNOS SIS availability trending

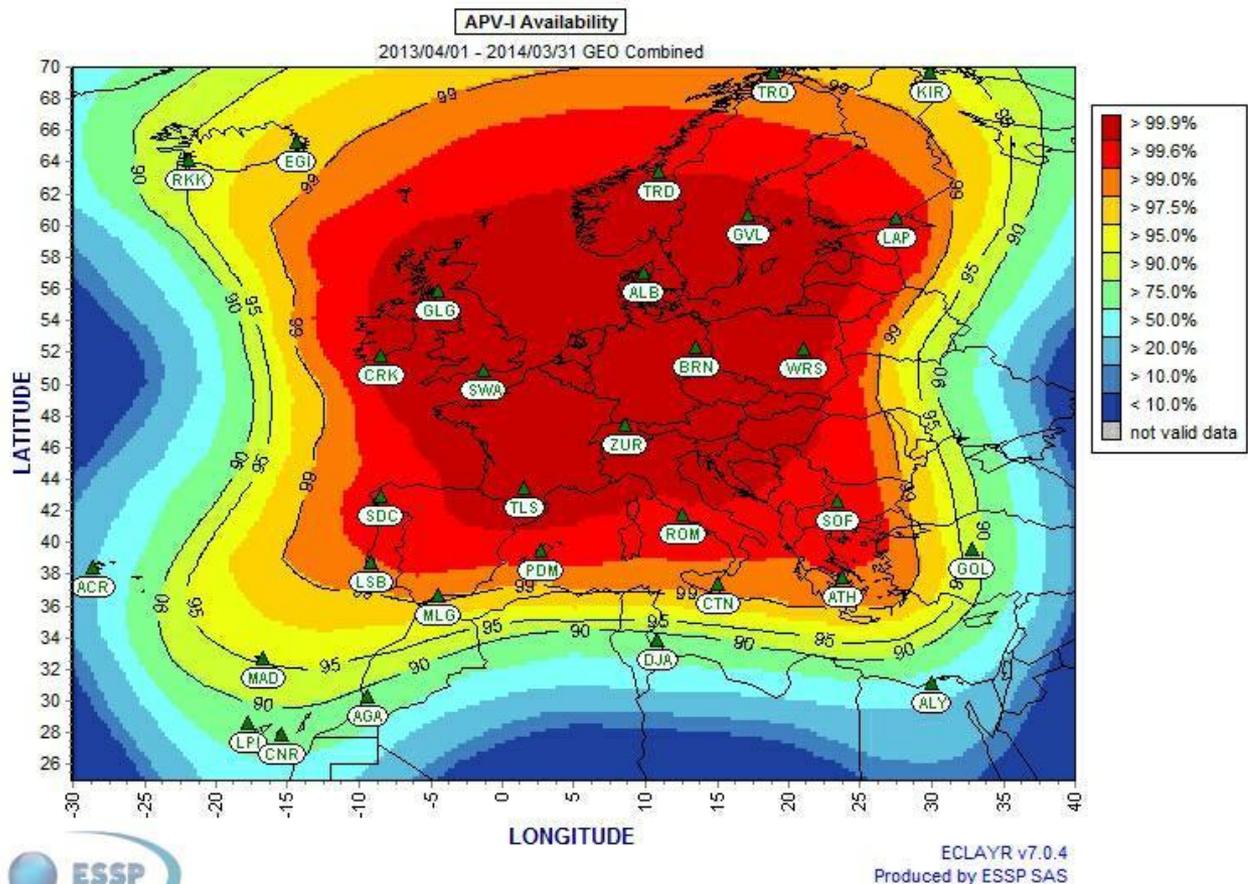


	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sept-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14
PRN120	99,84	100	99,57	99,63	99,96	99,71	99,86	99,85	99,99	99,83	99,97	99,99	99,93
PRN126	93,39	99,72	99,93	99,81	99,93	99,44	99,99	99,83	99,99	99,82	100	99,94	99,93
OP SIS	99,99	100	100	100	100	100	100	100	100	100	100	100	100

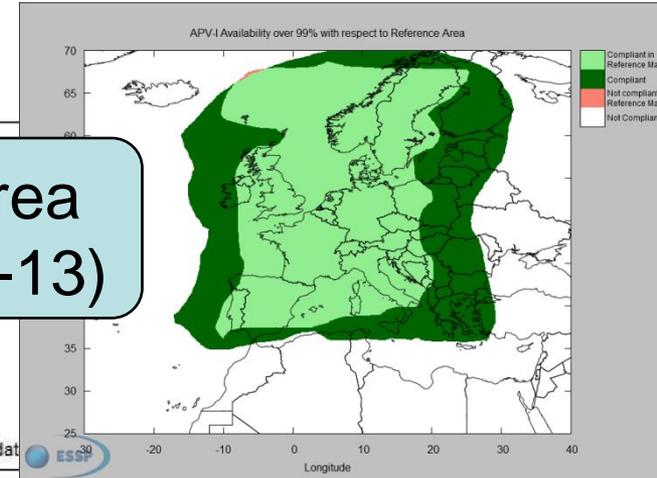
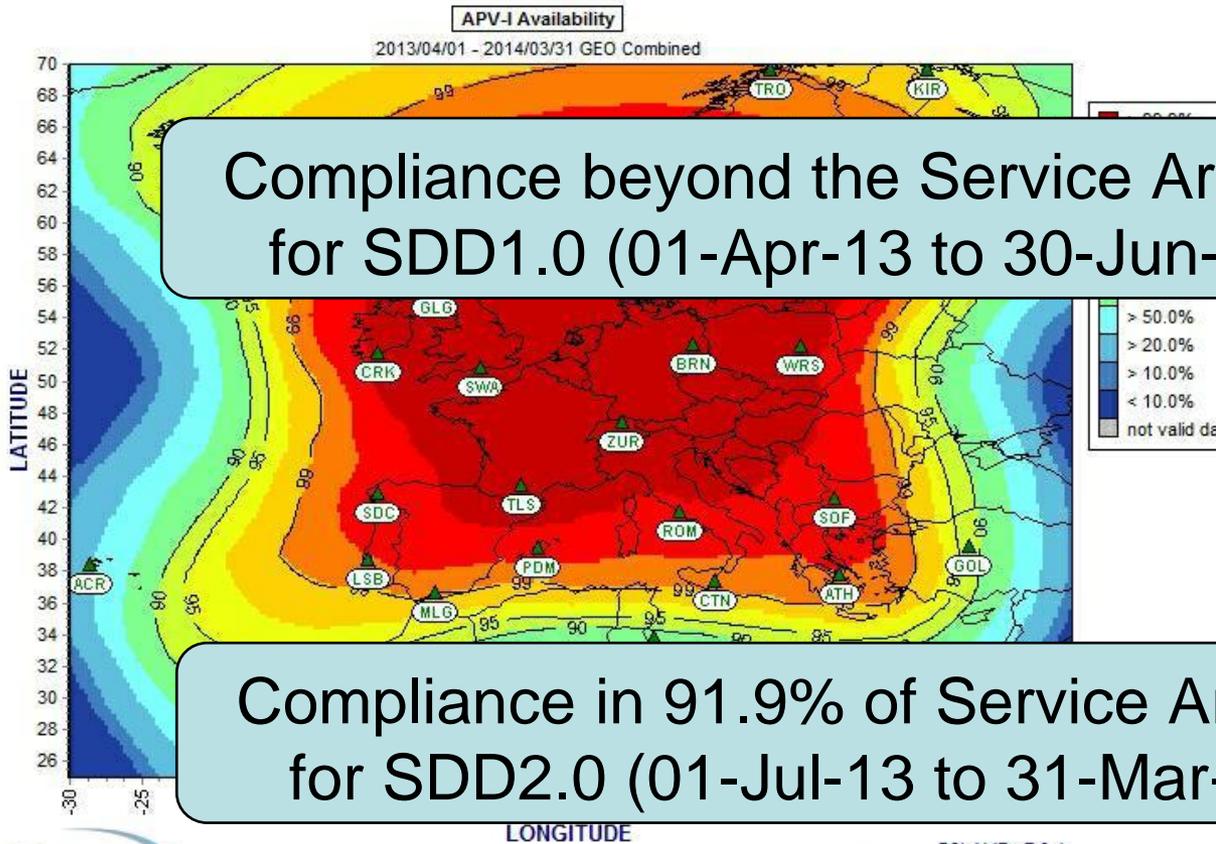
TABLE OF CONTENT

- SIS Broadcast Availability
- EGNOS APV-1 availability, continuity, integrity
- EGNOS Open Service (Accuracy)
- EDAS Service Availability
- Main Performance Milestones

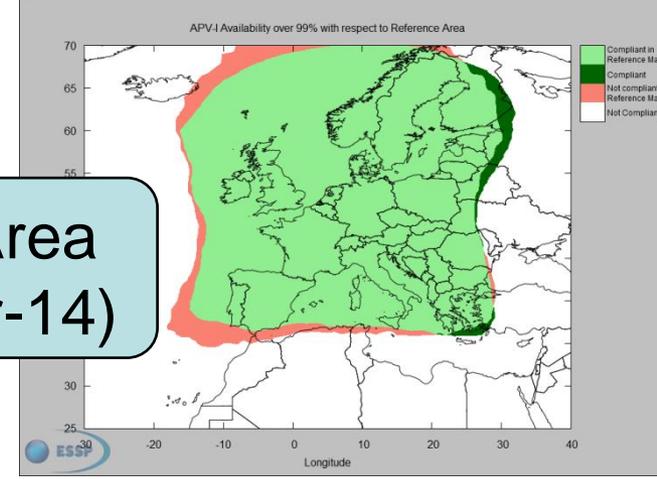
EGNOS APV-1 Availability



EGNOS APV-1 Availability

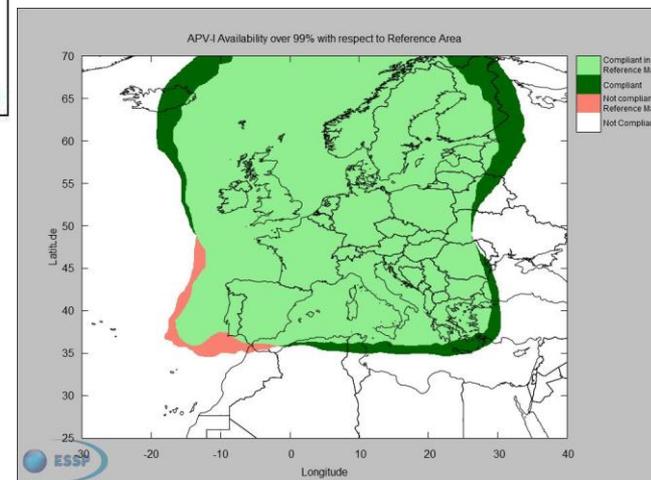
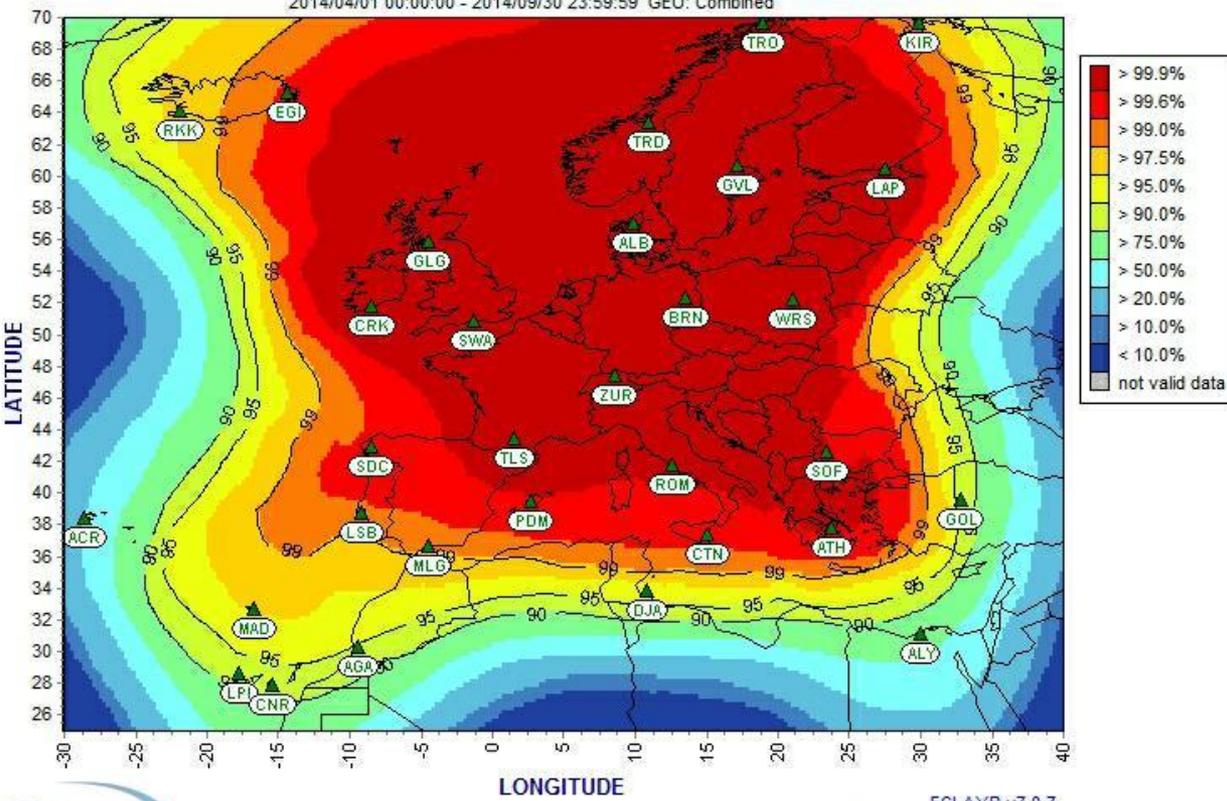


Compliance in 91.9% of Service Area for SDD2.0 (01-Jul-13 to 31-Mar-14)



EGNOS APV-1 Availability latest months (from April to September 2014)

APV-1 Availability
2014/04/01 00:00:00 - 2014/09/30 23:59:59 GEO: Combined

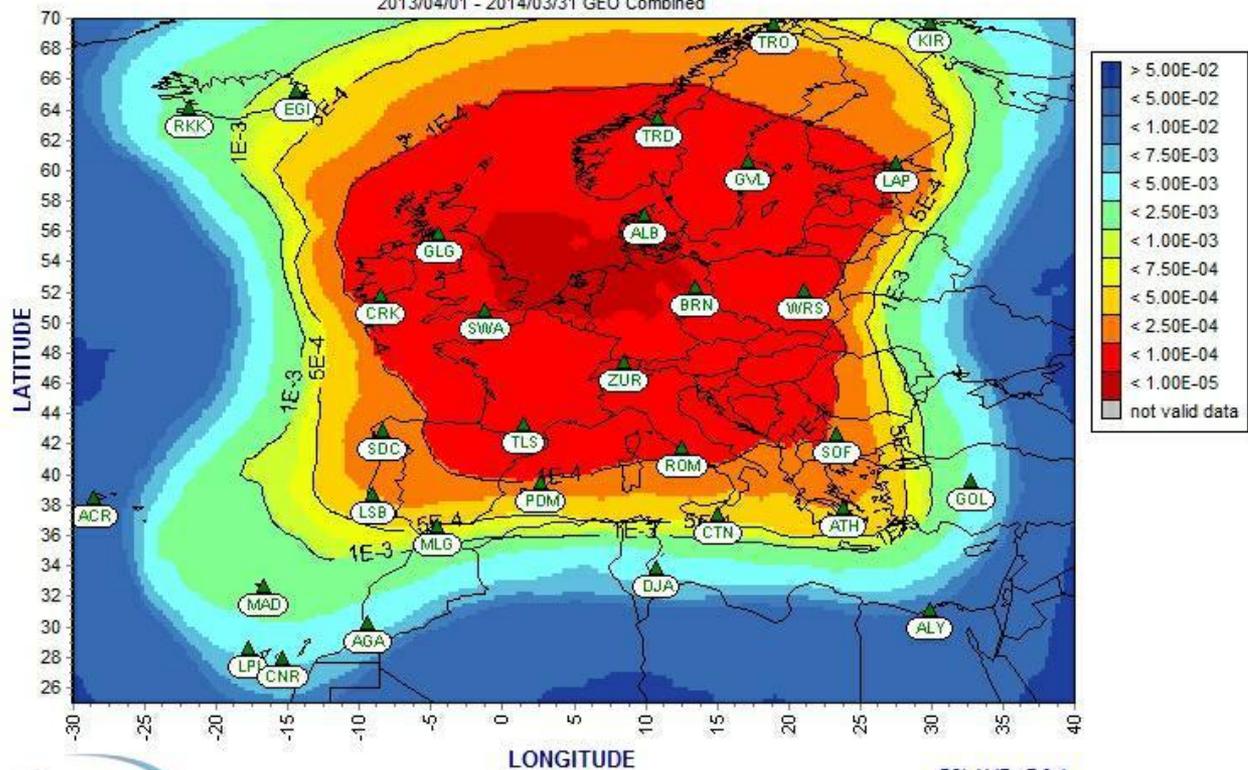


ECLAYR v7.0.7
Produced by ESSP SAS

EGNOS APV-1 Continuity

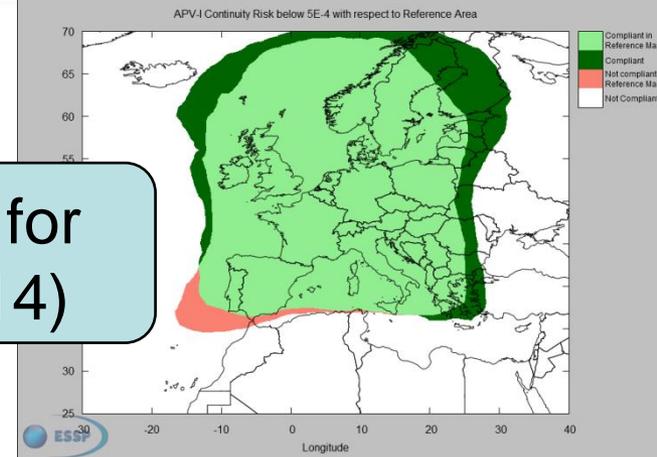
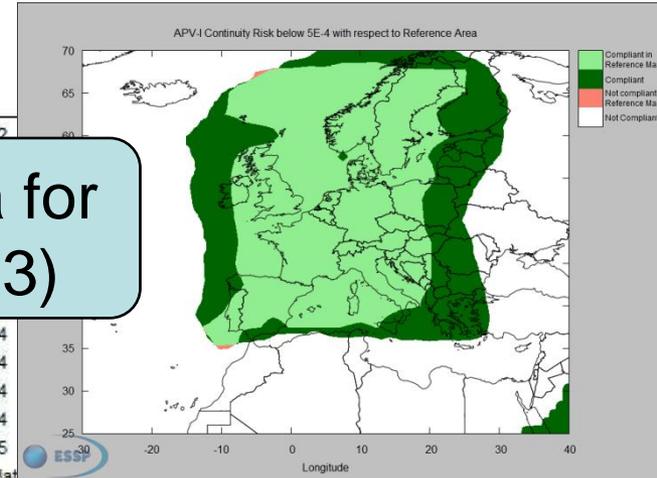
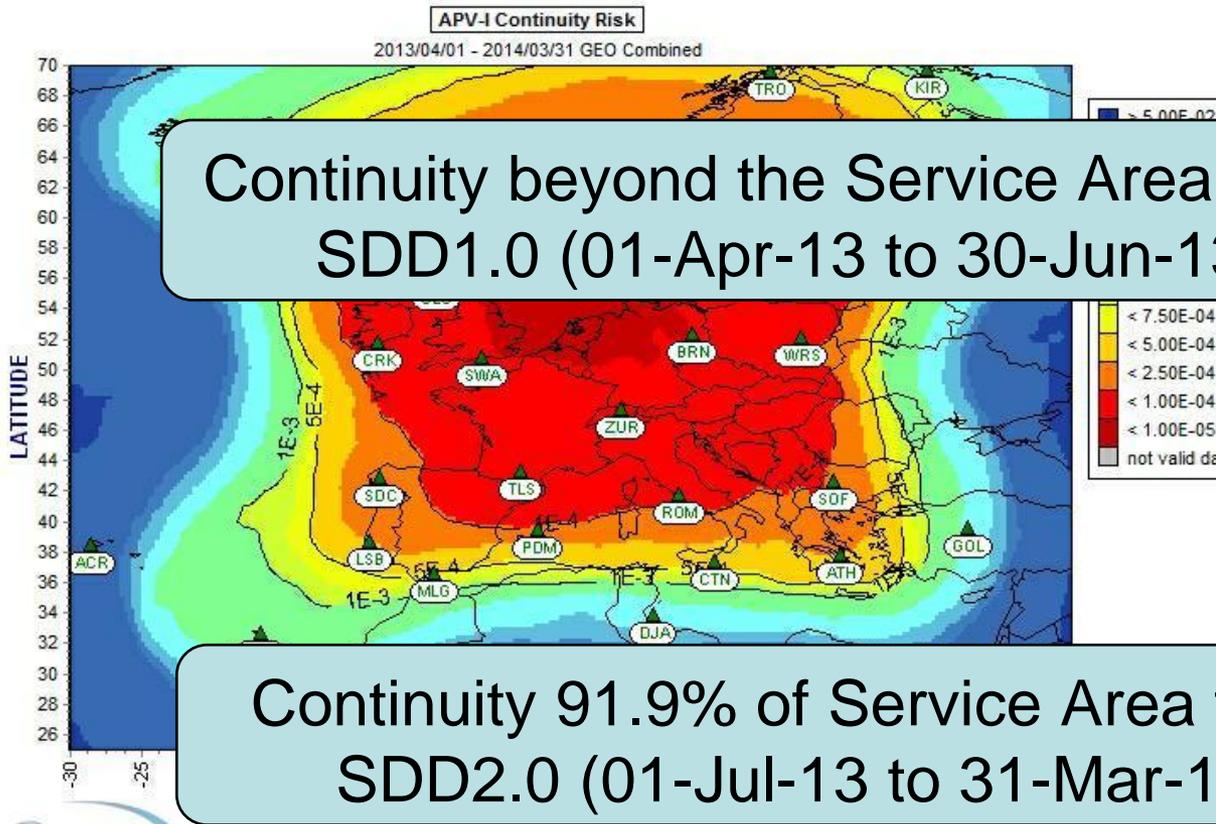
APV-1 Continuity Risk

2013/04/01 - 2014/03/31 GEO Combined

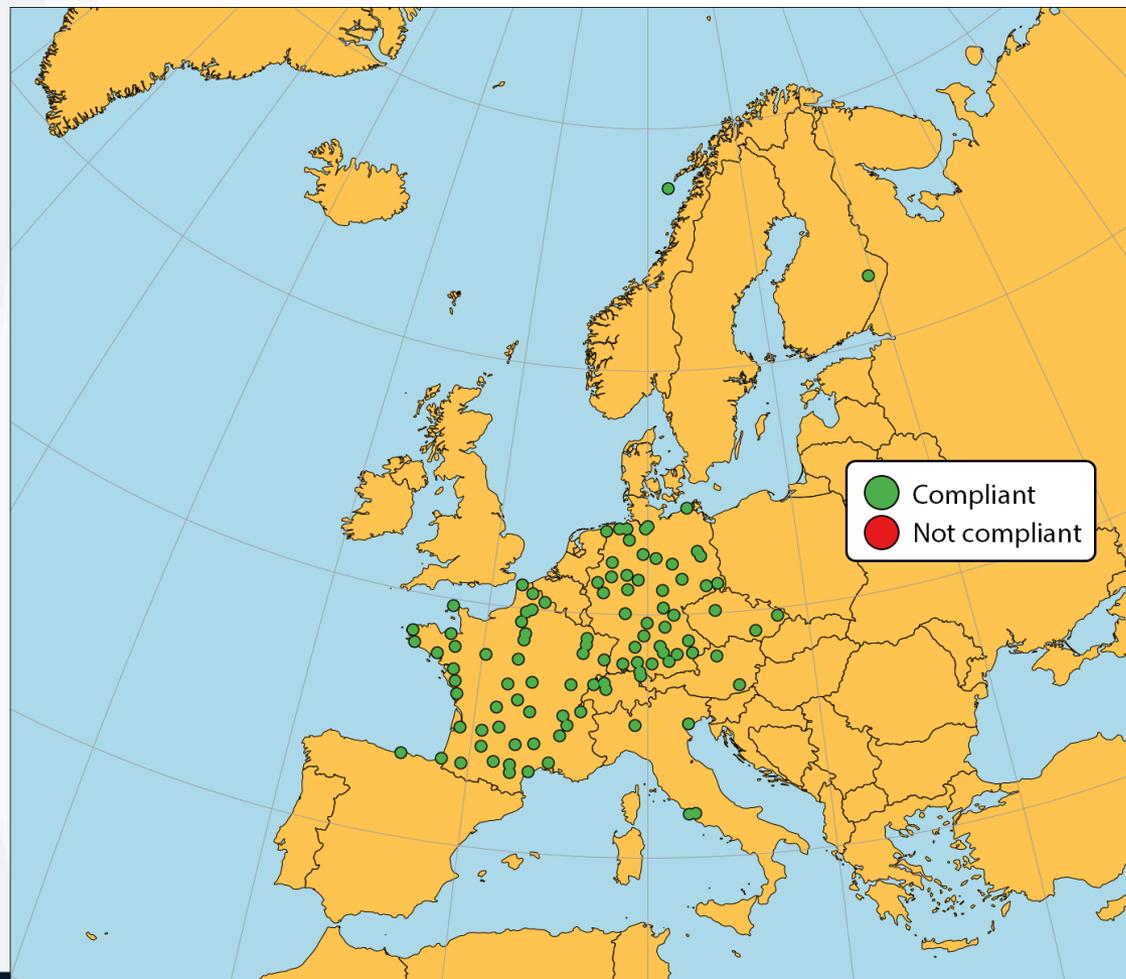


ECLAYR v7.0.4
Produced by ESSP SAS

EGNOS APV-1 Continuity



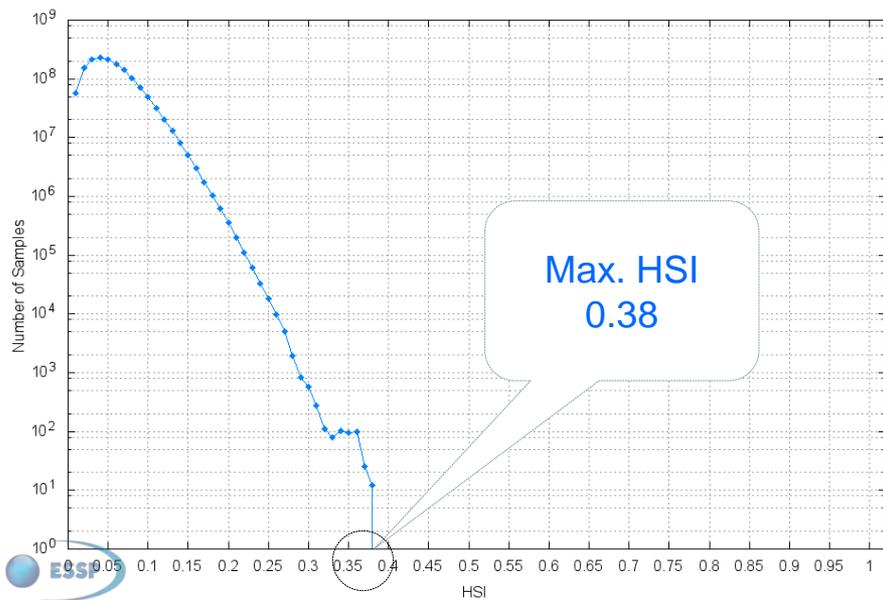
EGNOS APV-1 Availability at airports with LPV procedures



EGNOS APV-1 Integrity

- The measurements of the **Safety Index** demonstrate very **good confidence**
- Safety index (PE/PL):

APV1 HSI Histogram
01/04/2013 - 31/03/2014



APV1 VSI Histogram
01/04/2013 - 31/03/2014

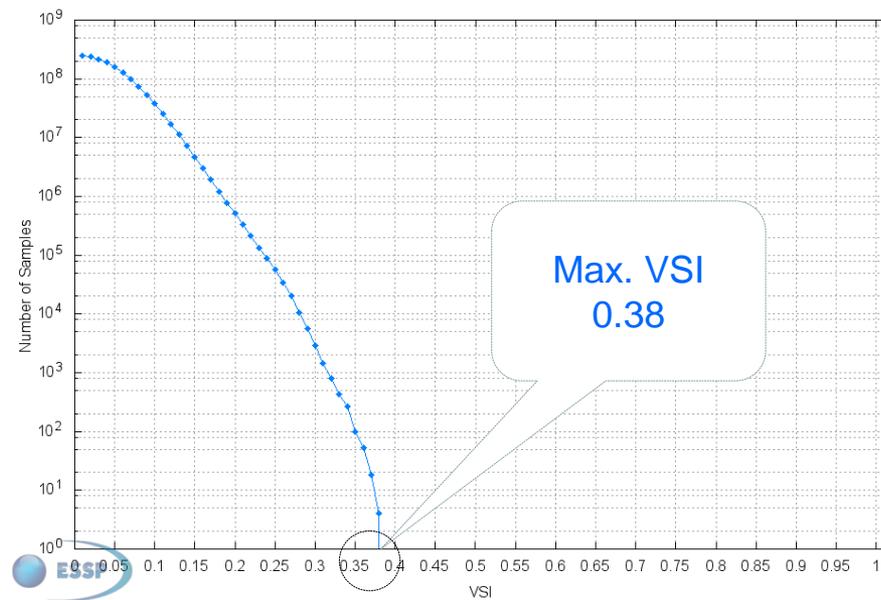


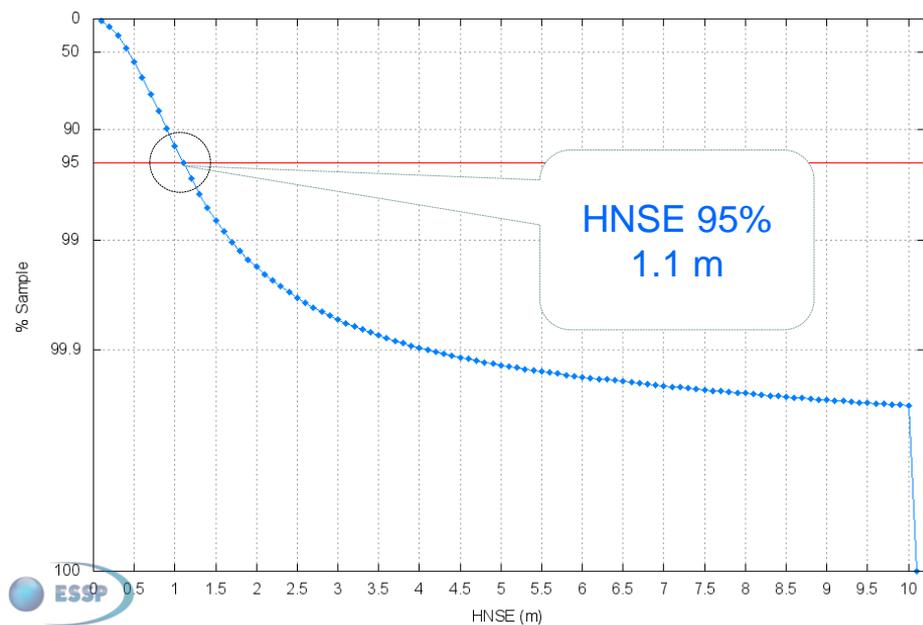
TABLE OF CONTENT

- SIS Broadcast Availability
- EGNOS APV-1 availability, continuity, integrity
- EGNOS Open Service (Accuracy)
- EDAS Service Availability
- Main Performance Milestones

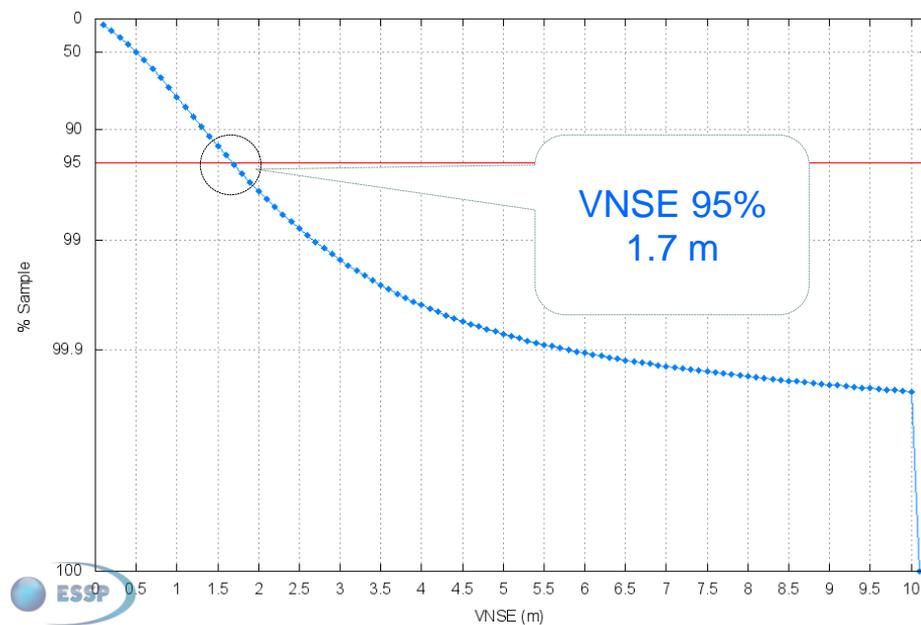
EGNOS Open Service (accuracy)

- **Open Service** horizontal and vertical error below 3m and 4m respectively.

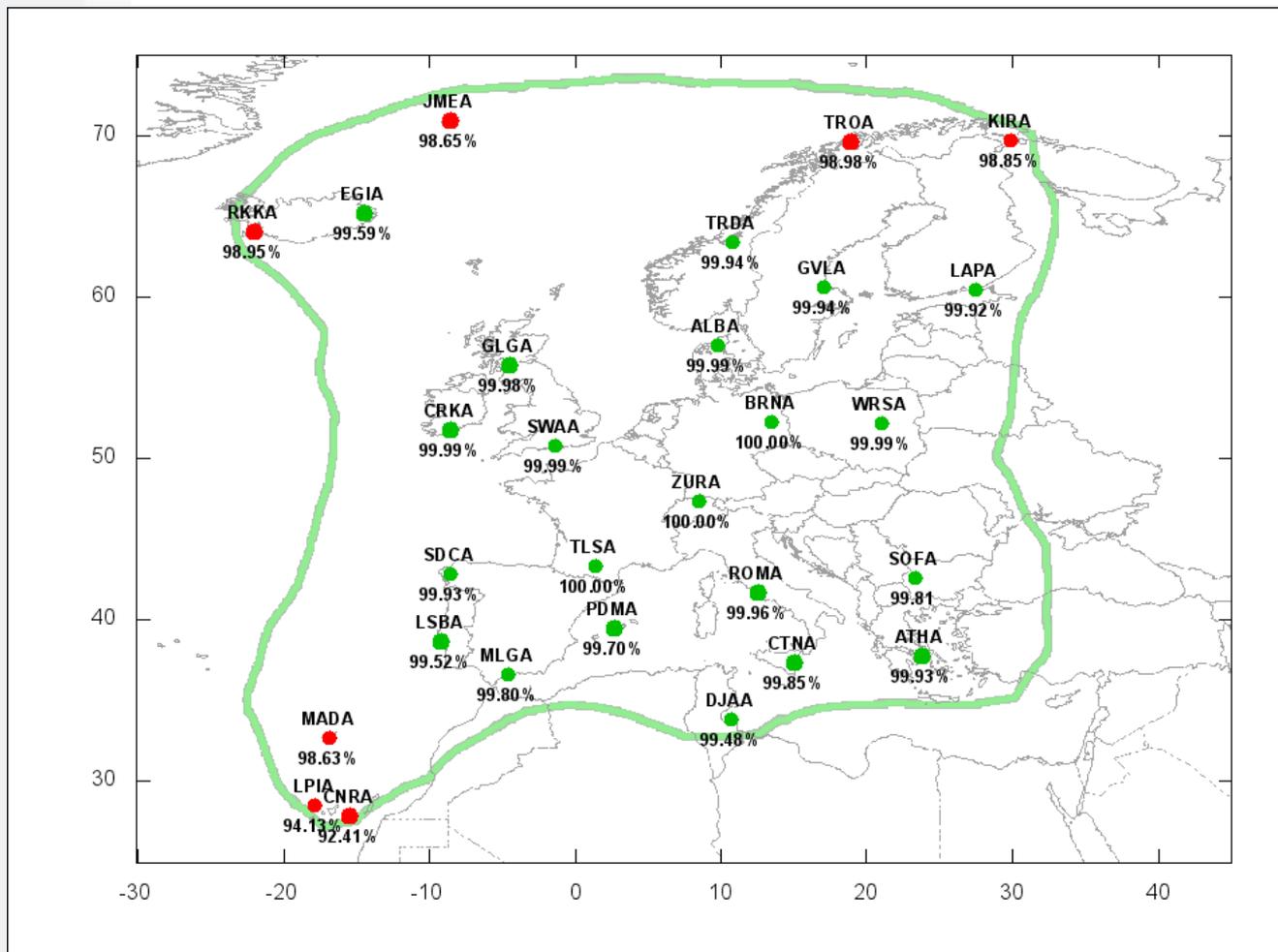
PA HNSE Cumulative Histogram
01/04/2013 - 31/03/2014



PA VNSE Cumulative Histogram
01/04/2013 - 31/03/2014

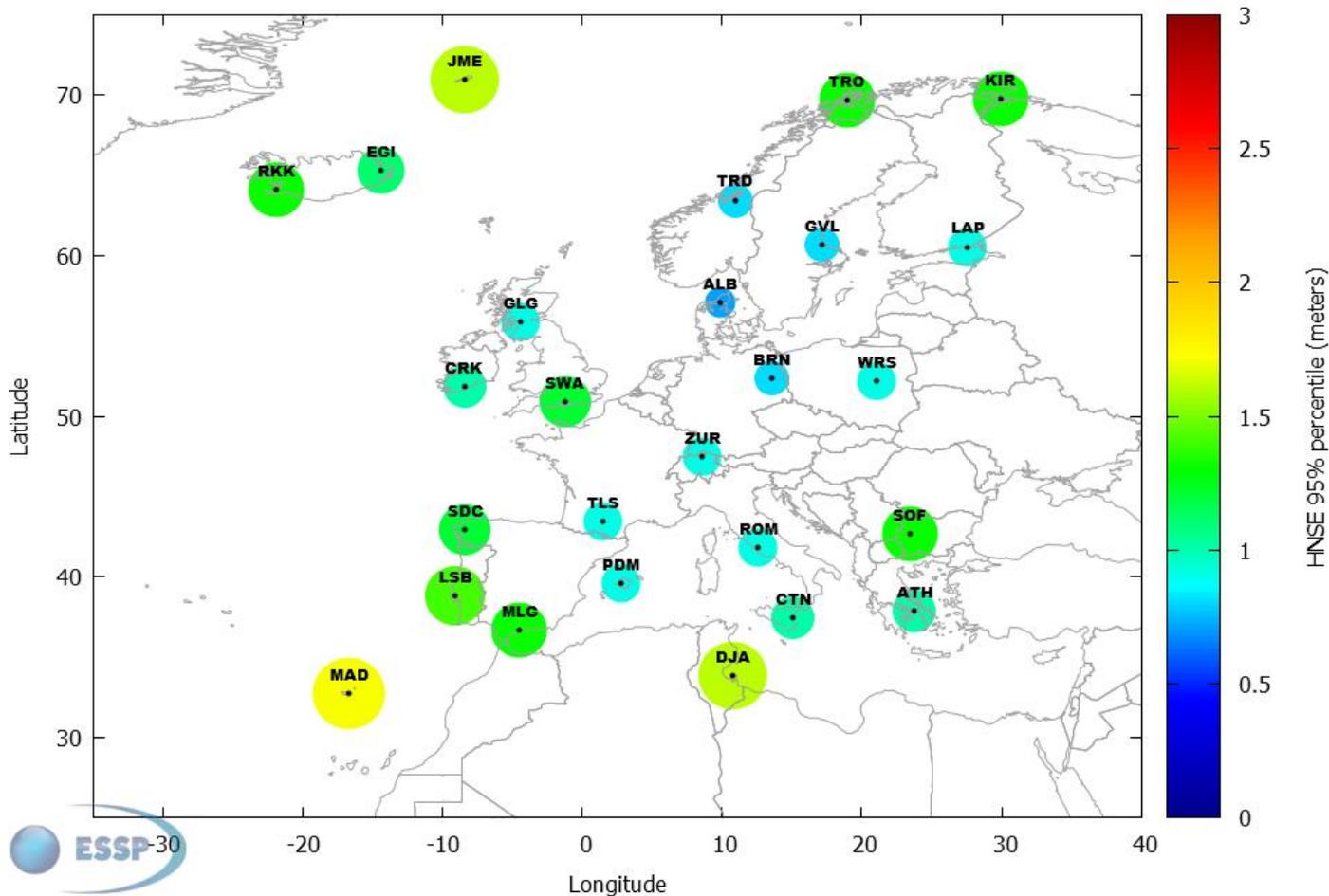


EGNOS Open Service Availability



EGNOS Open Service horizontal accuracy

Accuracy - 95th percentile for HNSE



EGNOS Open Service vertical accuracy

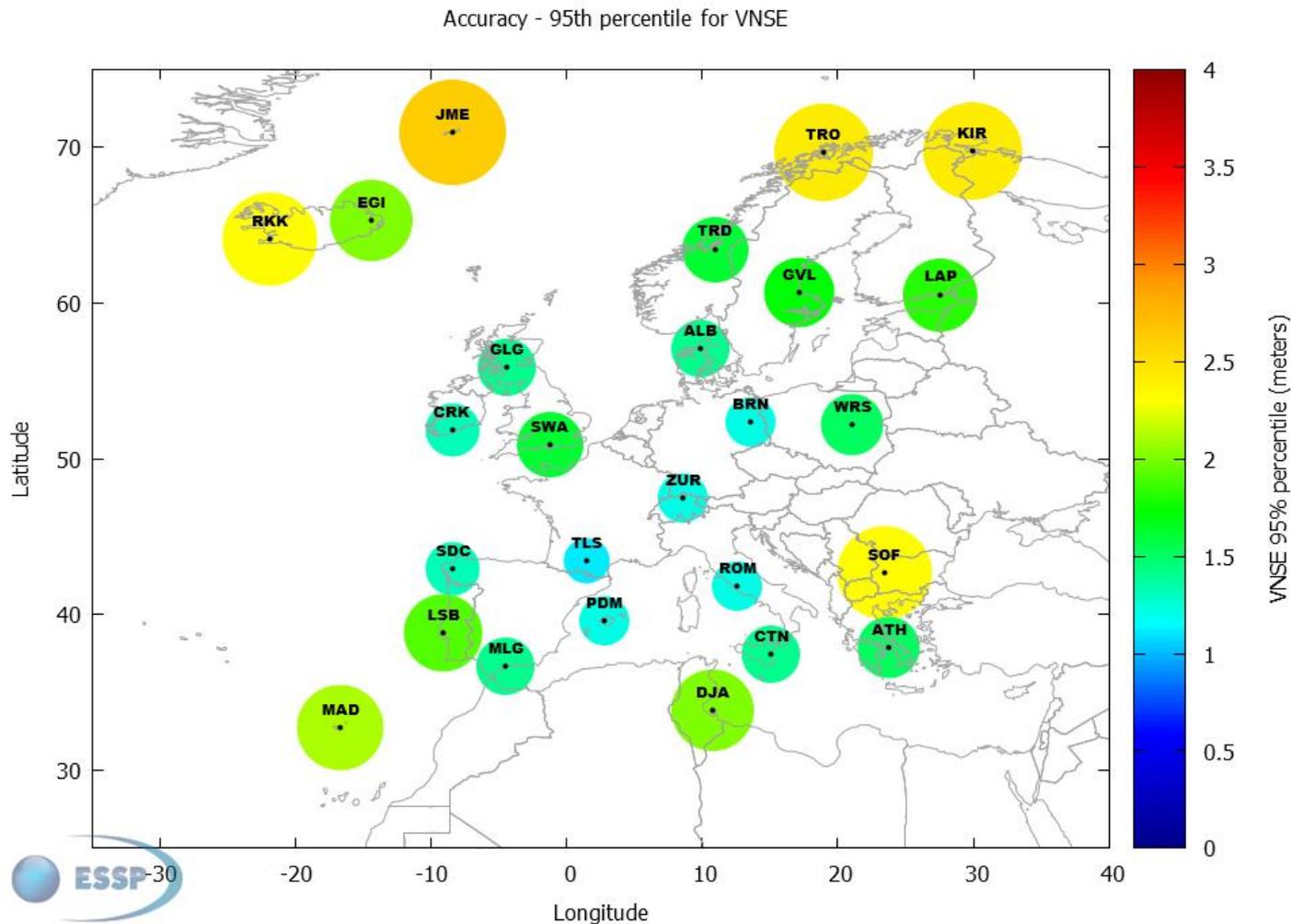
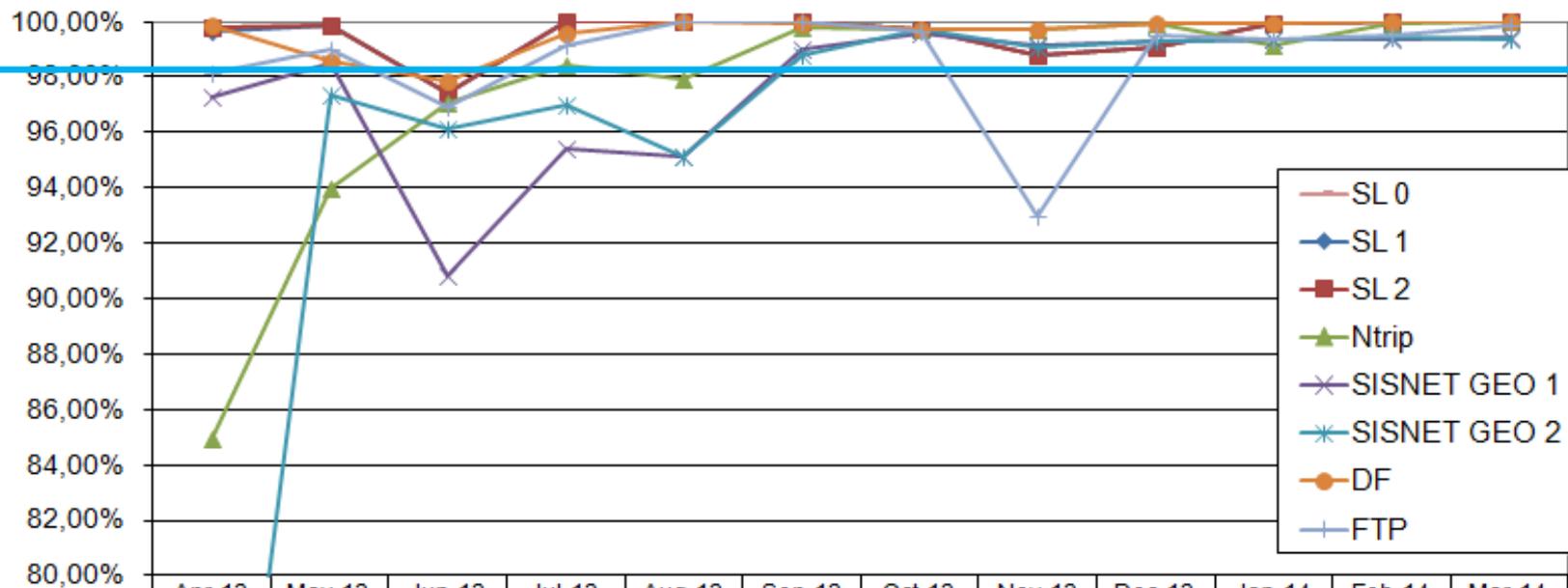


TABLE OF CONTENT

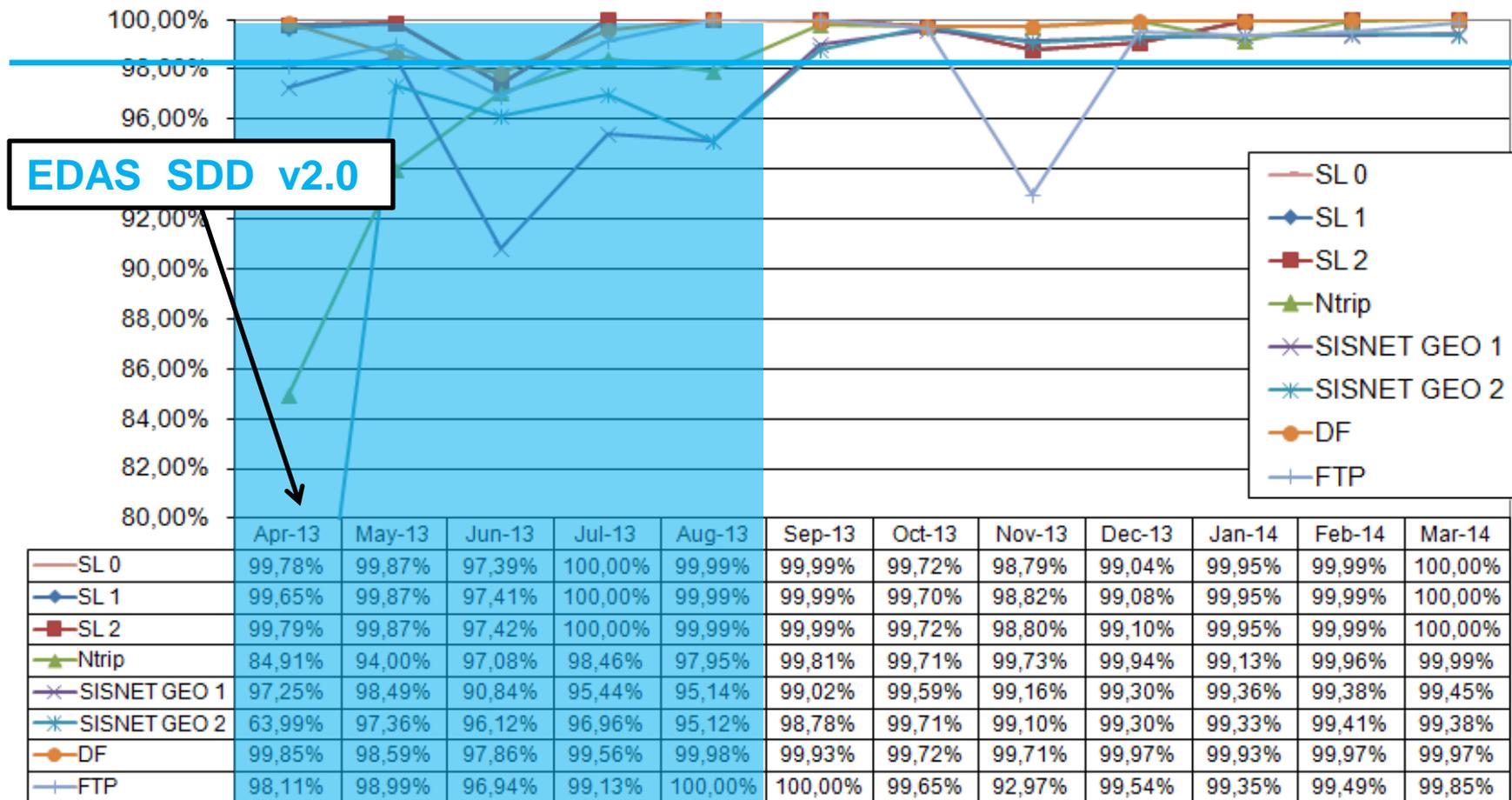
- SIS Broadcast Availability
- EGNOS APV-1 availability, continuity, integrity
- EGNOS Open Service (Accuracy)
- EDAS Service Availability
- Main Performance Milestones

EDAS Services Availability Trending



	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14
— SL 0	99,78%	99,87%	97,39%	100,00%	99,99%	99,99%	99,72%	98,79%	99,04%	99,95%	99,99%	100,00%
— SL 1	99,65%	99,87%	97,41%	100,00%	99,99%	99,99%	99,70%	98,82%	99,08%	99,95%	99,99%	100,00%
— SL 2	99,79%	99,87%	97,42%	100,00%	99,99%	99,99%	99,72%	98,80%	99,10%	99,95%	99,99%	100,00%
— Ntrip	84,91%	94,00%	97,08%	98,46%	97,95%	99,81%	99,71%	99,73%	99,94%	99,13%	99,96%	99,99%
— SISNET GEO 1	97,25%	98,49%	90,84%	95,44%	95,14%	99,02%	99,59%	99,16%	99,30%	99,36%	99,38%	99,45%
— SISNET GEO 2	63,99%	97,36%	96,12%	96,96%	95,12%	98,78%	99,71%	99,10%	99,30%	99,33%	99,41%	99,38%
— DF	99,85%	98,59%	97,86%	99,56%	99,98%	99,93%	99,72%	99,71%	99,97%	99,93%	99,97%	99,97%
— FTP	98,11%	98,99%	96,94%	99,13%	100,00%	100,00%	99,65%	92,97%	99,54%	99,35%	99,49%	99,85%

EDAS Services Availability Trending



EDAS SDD v2.0

EDAS Services Latency Trending (ms)

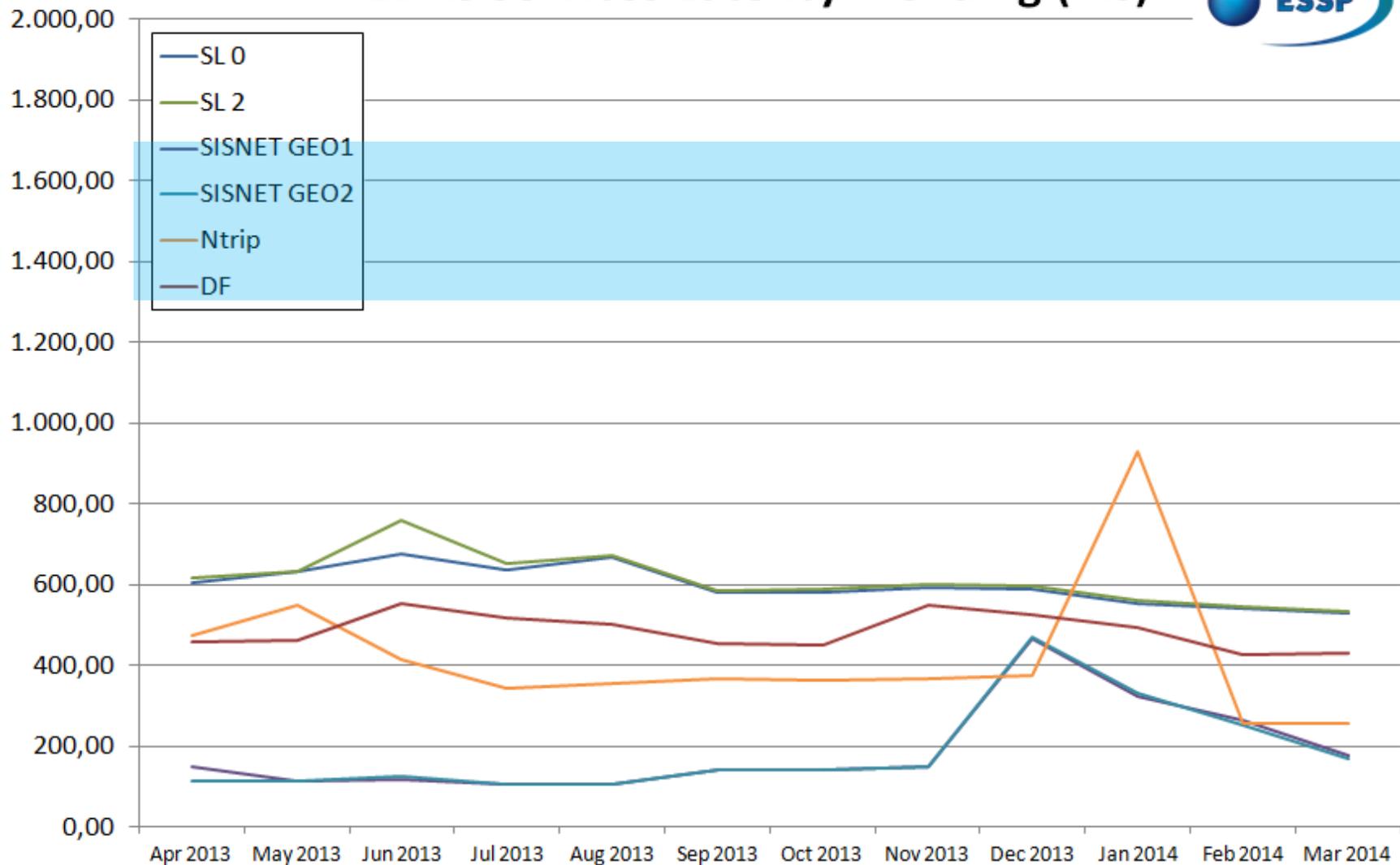


TABLE OF CONTENT

- SIS Broadcast Availability
- EGNOS APV-1 availability, continuity, integrity
- EGNOS Open Service (Accuracy)
- EDAS Service Availability
- Main Performance Milestones

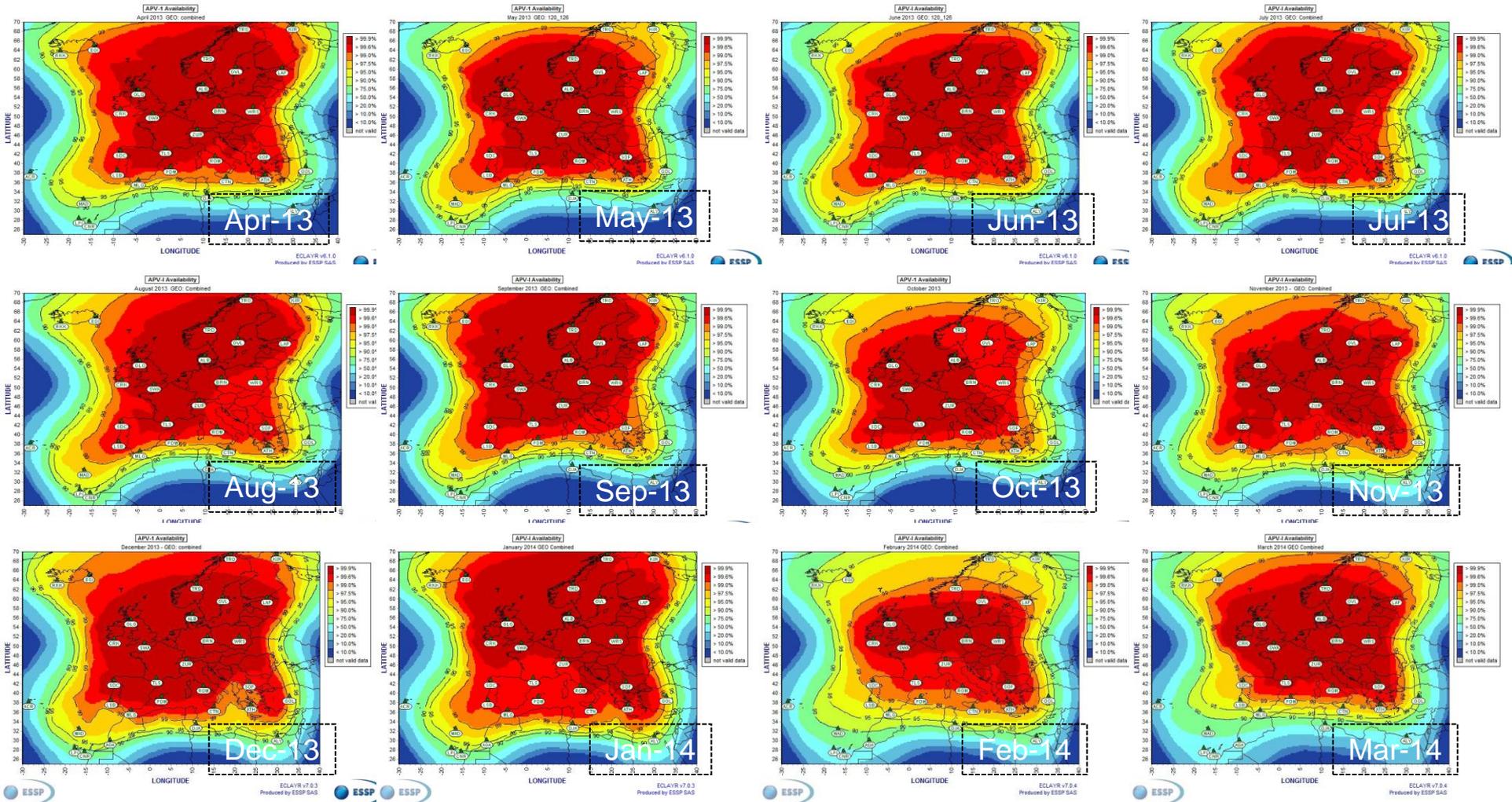
EGNOS APV1 availability trend

Video of yearly performances
From 01st April 2013 to 31st March 2014



2013-2014_DailyAv99_wmv_1m13s.avi

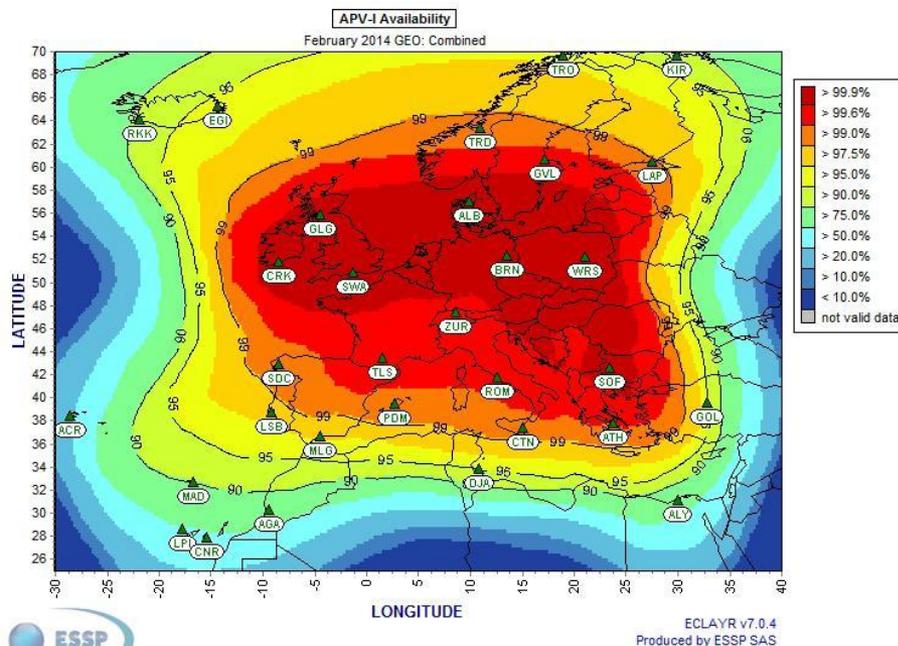
EGNOS APV1 availability trend



EGNOS APV1 availability trend

Main underperformances

Degradation in February 2014

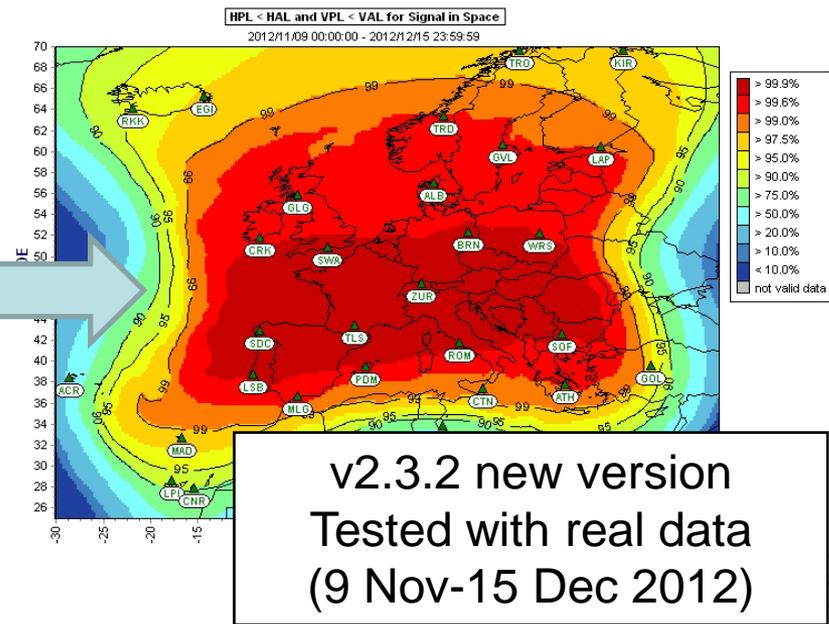
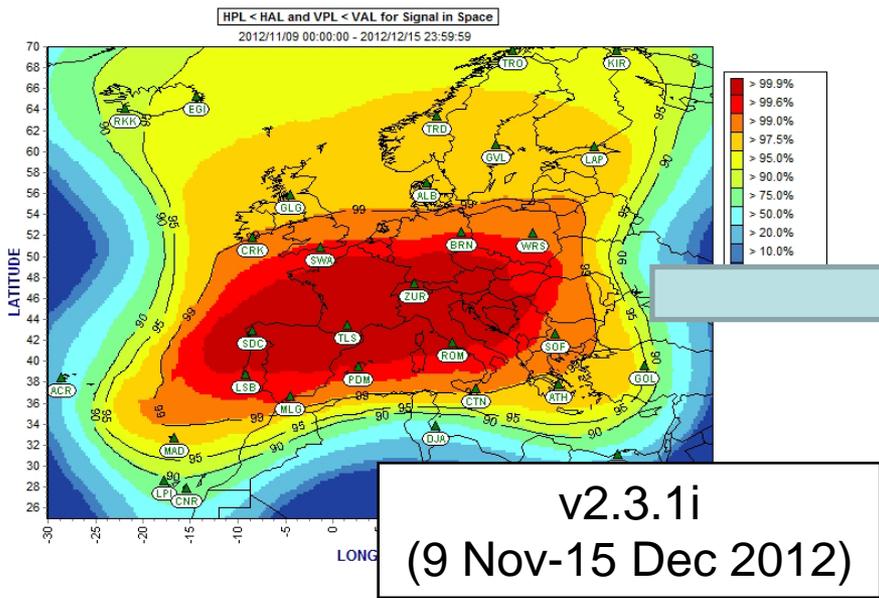


- **Communicated** to users SN-10 IONO monitoring issues:
 - High geomagnetic activity in the North.
 - High variability of the ionosphere in the South
- **v2.3.1i and v2.3.2 mitigated the impact** compared with the effect of IONO in 2011

MAIN PERFORMANCE MILESTONES

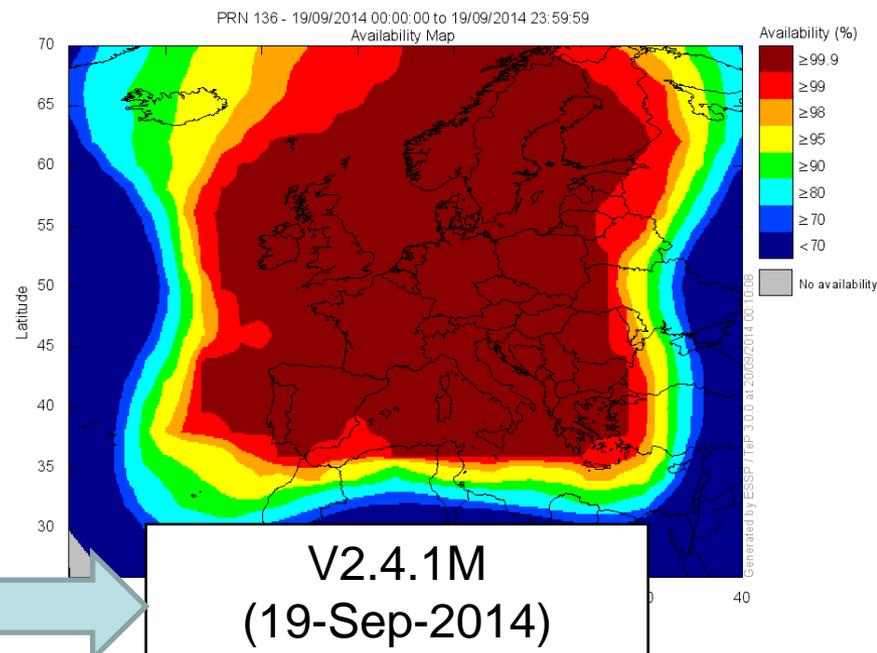
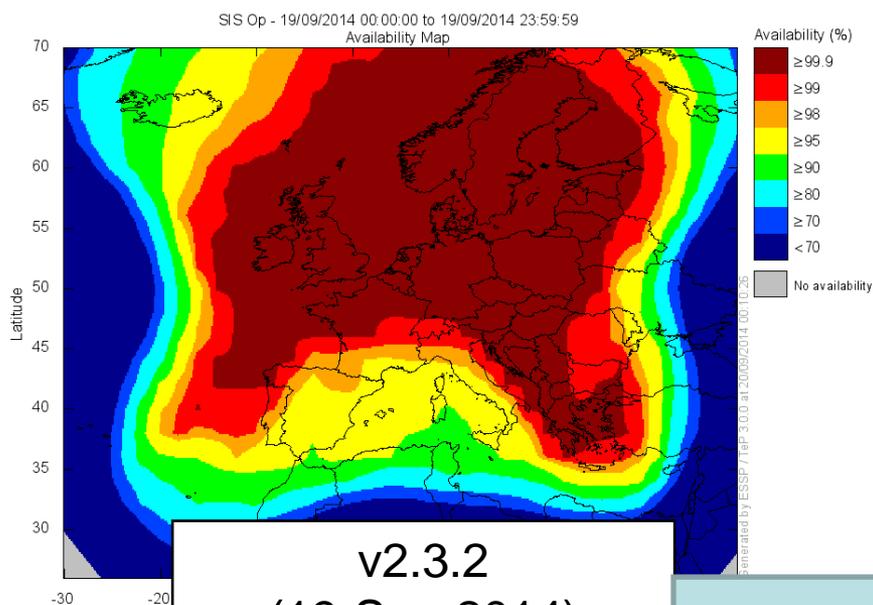
Deployment 2.3.2 in October (27/10/2013)

Increase of robustness in front of ionosphere activity



NEXT PERFORMANCE MILESTONES

IONO monitoring improvement
expected in ESR v2.4.1M



Similar improvements observed in the course of September

7-8 October
Lisbon

The **EGNOS** Service Provision
workshop



We certify you're there.



AGENDA (10:00 – 12:00)

10:00-11:30

EGNOS Services Status

- ☞ Overview of last 12 months performance

Javier Gómez – Mission Performance Manager (ESSP)

- ☞ User Satisfaction Surveys 2013

Miguel-Ángel Sánchez – Service Adoption and Support Mngr (ESSP)

- ☞ EGNOS Services Evolution Roadmap

Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)

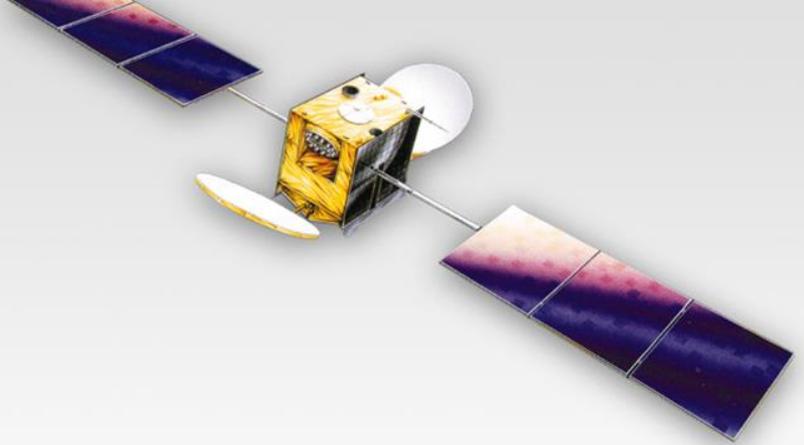
- ☞ Towards EGNOS in Africa: Emergence of JPO, ASECNA Program

Ladislaus Matindi – EGNOS Africa JPO Director (JPO)

Julien Lapie – Technical Advisor (ASECNA)

11:30-12:00

Coffee break



EGNOS Users' Satisfaction

Miguel Ángel Sánchez, ESSP SAS,
miguel-angel.sanchez@essp-sas.eu



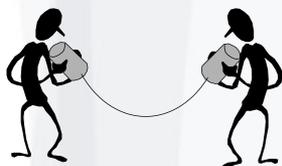
The **EGNOS** Service Provider



EGNOS Users' Satisfaction Pillars



Understand
user needs



Communicate

EGNOS Users
Satisfaction
Pillars

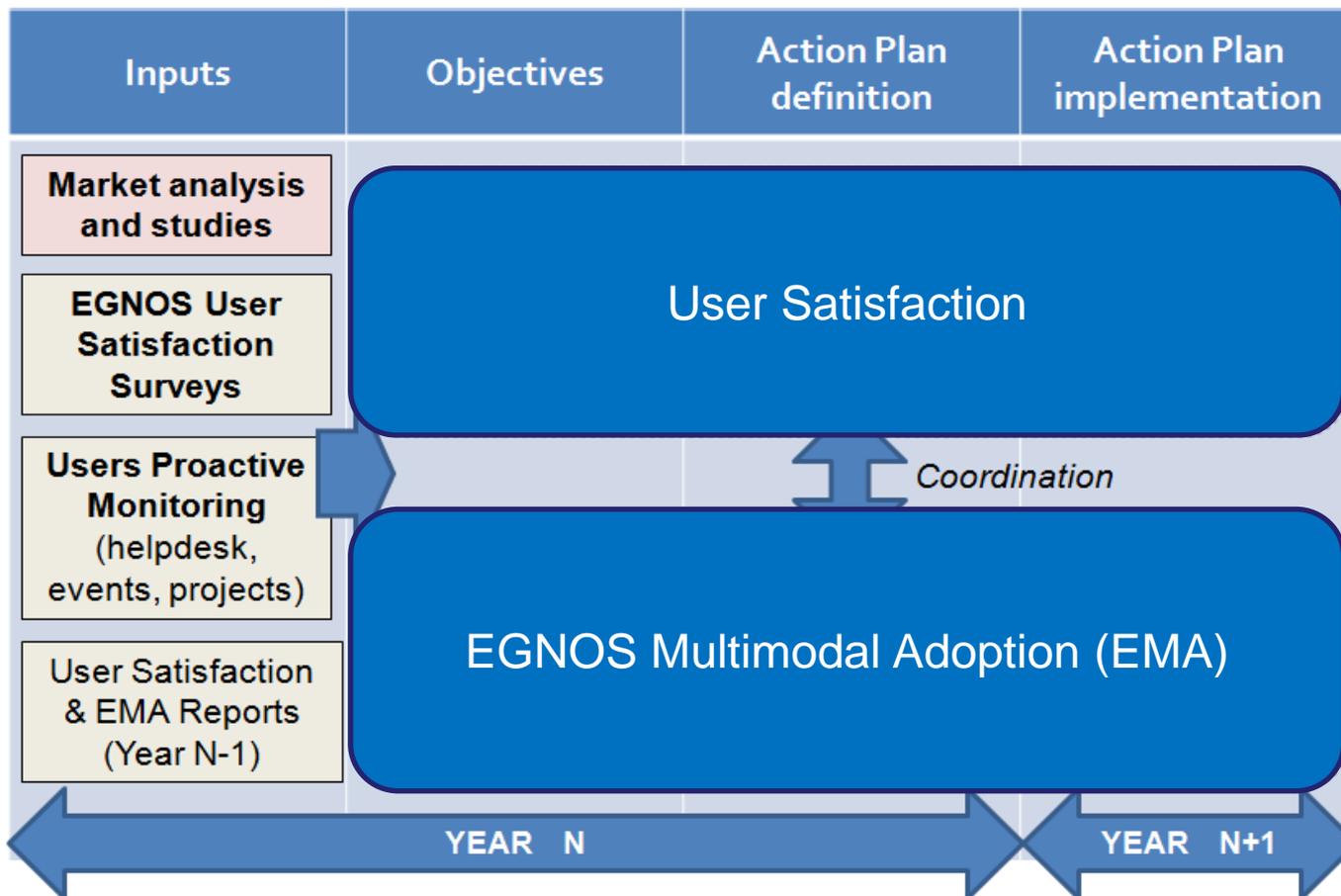
Engage &
Satisfy users



Get user
feedback



User Support Improvement Process



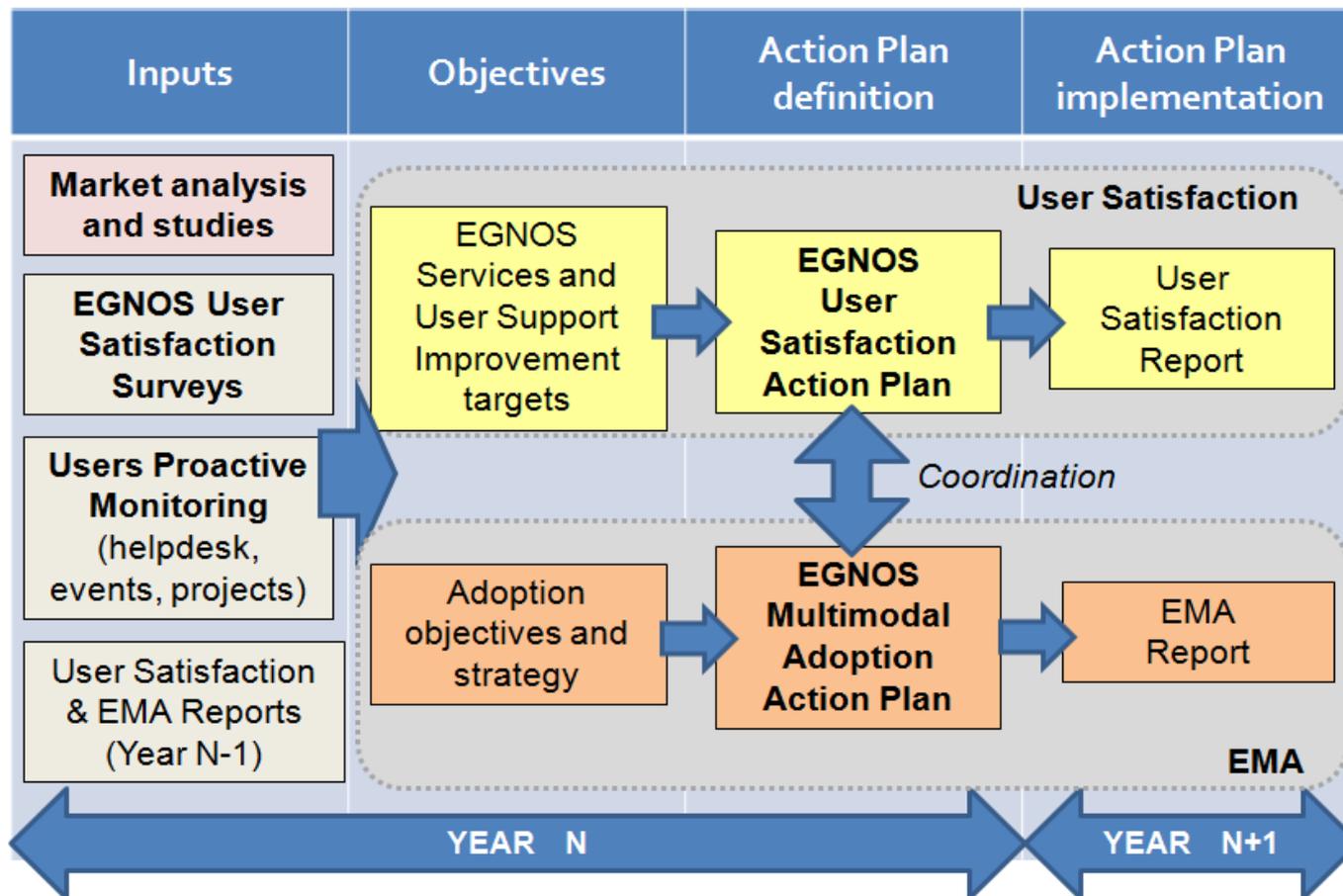
User Satisfaction:

Activities addressed to improve users' perception on EGNOS service provision (especially those aspects directly related with ESSP & GSA responsibilities).

EMA:

Activities addressed to promote EGNOS and foster its adoption in different application domains.

User Support Improvement Process



User Satisfaction:

Activities addressed to improve users' perception on EGNOS service provision (especially those aspects directly related with ESSP core responsibilities).

EMA:

Activities addressed to promote EGNOS and foster its adoption in different application domains.

EGNOS Users' Satisfaction

- The **EGNOS users' satisfaction** process covers **ESSP & GSA** objectives to identify and satisfy user needs:

- EGNOS SoL Users
- EGNOS OS Users
- EDAS Users

SES Regulation
“User Consultation Process”

ESSP Quality Management System
ISO 9001:2008

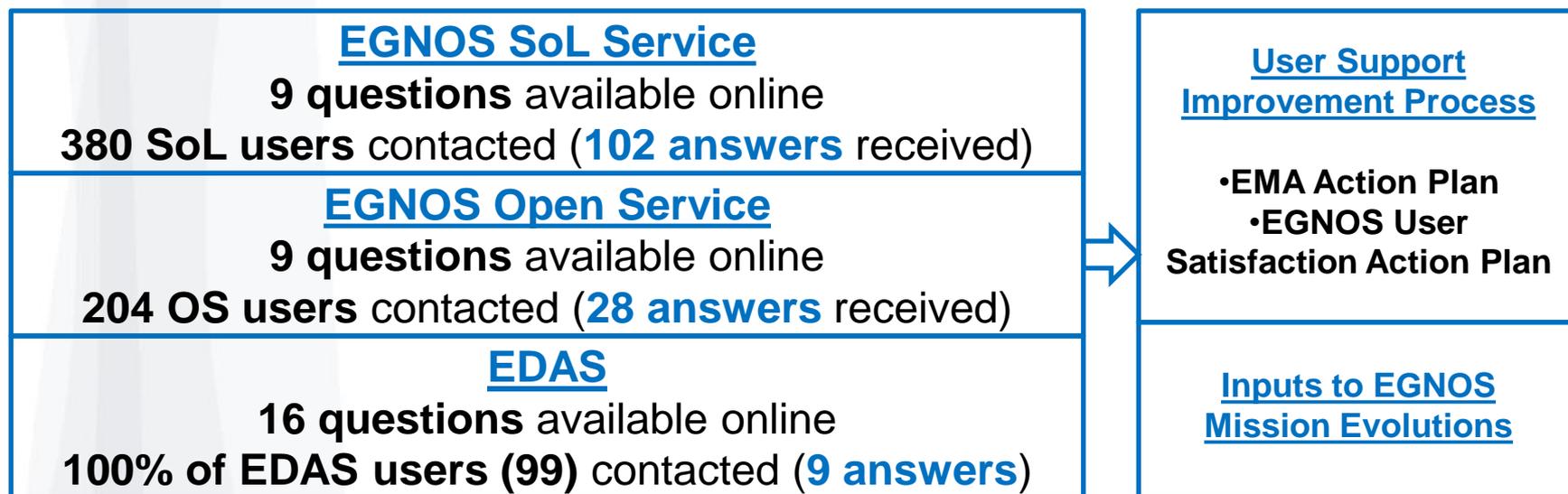
- How to assess the level of **satisfaction** of this **heterogeneous** group of **Users**?

ESSP & GSA INTERFACES (EGNOS HELPDESK, EVENTS, PROJECTS, ADOPTION ACTIVITIES, EGNOS SERVICE PROVISION WS...)

SPECIFIC USER ORIENTED SATISFACTION SURVEYS

EGNOS Users' Satisfaction

- **EGNOS Users Satisfaction Process** first launched in **2012** covering EGNOS SoL Service users during 2011 (SoL Declaration)
- **Also implemented in 2013 (SoL, OS & EDAS)** with outstanding results and **improved answer rate and representativeness:**



EGNOS Users' Satisfaction in figures

EGNOS SoL Service Satisfaction

8 recommendations raised & covered by:
EMA Action Plan +
6 satisfaction actions

EDAS Satisfaction

8 recommendations raised & covered by:
EMA Action Plan +
5 satisfaction actions

EGNOS Open Service Satisfaction

8 recommendations raised & covered by:
EMA Action Plan +
3 satisfaction actions



User Satisfaction Action Plan

15 actions :
4 closed
11 ongoing

EGNOS Users' Satisfaction Analysis

ID	Recommendation
R-SoL-1	Increase ESSP presence/support to multimodal domains
R-SoL-2	Increase ESSP support/link with EGNOS SoL Service final users
R-SoL-3	EGNOS Helpdesk and User Support features improvements
R-SoL-4	EGNOS SoL SDD required improvements
R-SoL-5	Improve ESSP support to ANSPs in EGNOS based operations implementation
R-SoL-6	More effort on guidelines / awareness material generation and dissemination
R-SoL-7	Improve EGNOS APV-I continuity and availability
R-SoL-8	Improvement of the Collaborative Decision Making (CDM) process

ID	Recommendation
R-EDAS-1	Increase EDAS promotion and awareness
R-EDAS-2	Clarification and communication of the EDAS pricing policy in the long term
R-EDAS-3	Give more weight to EDAS in the EGNOS Service provision workshop
R-EDAS-4	Upgrade EGNOS user support website
R-EDAS-5	Keep the EGNOS and EDAS services roadmap up to date and available to users
R-EDAS-6	Improvement of EDAS outages notifications.
R-EDAS-7	Improvement of EDAS data quality
R-EDAS-8	Provide Client Software with command-line interface

EGNOS OS Users' Satisfaction Analysis

ID	Recommendation
R-OS-1	Adequate awareness should be raised on EGNOS focus in all domains (not only aviation)
R-OS-2	Increase ESSP's presence in the different mass market segments to promote EGNOS and provide further support in the implementation of EGNOS-based applications.
R-OS-3	Awareness and promotion activities need to be tailored to user and dissemination channel
R-OS-4	The EGNOS Service Provision Workshop need to be further promoted
R-OS-5	<p>The EGNOS OS SDD should be simplified and updated more frequently.</p> <p>The Service Notices should be published more quickly and the information should be improved.</p>
R-OS-6	<p>Additional awareness is required about the EGNOS Helpdesk and the EGNOS User Support website</p> <p>EGNOS Helpdesk response time should be reduced</p> <p>The EGNOS User Support website contents should be improved. Bring together all available EGNOS-related information into one single website, or at least coordinate information sources.</p>
R-OS-7	<p>To extend the OS service area to cover northern latitudes in Europe and also additional areas in North Africa.</p> <p>Evolve the system in order to provide sub-metric accuracy and better availability.</p> <p>Improve information describing EGNOS services roadmap and evolutions.</p>
R-OS-8	<p>Improve the EGNOS system real-time alerting system</p> <p>Reduce response times and define a "standard" format allowing alerts to be directly processed by machines.</p>



EGNOS Survey open !!

- **EGNOS Survey (GSA-ESSP) launched in 2014 (10/07)** covering EGNOS Services' users during 2013 and first part of 2014

Take Part in the EGNOS User Satisfaction Survey!

Dear EGNOS User/Stakeholder,

The actual EGNOS services are currently delivered by European Satellite Services Provider (ESSP SAS) under contract with the European GNSS Agency (GSA) for the period 2014 – 2021. Together, GSA and ESSP work to meet and improve EGNOS users' needs and expectations and to support the promotion and marketing of the services offered by the EGNOS programme.

The **EGNOS User Satisfaction Survey*** is intended to measure EGNOS user satisfaction and gather valuable suggestions to improve the quality of the EGNOS services and to measure the ESSP performance as EGNOS Service Provider. Your opinions are important to us, and will help EGNOS continue to improve, meet and hopefully exceed your expectations.

Completing the survey should only take about 15 minutes and all responses will be treated under applicable European Data Protection law.

• <http://egnos-portal.gsa.europa.eu/egnos-users-satisfaction-survey>

7-8 October
Lisbon

The **EGNOS** Service Provision
workshop



We certify you're there.



AGENDA (10:00 – 12:00)

10:00-11:30

EGNOS Services Status

- ☞ Overview of last 12 months performance

Javier Gómez – Mission Performance Manager (ESSP)

- ☞ User Satisfaction Surveys 2013

Miguel-Ángel Sánchez – Service Adoption and Support Mngr (ESSP)

- ☞ EGNOS Services Evolution Roadmap

Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)

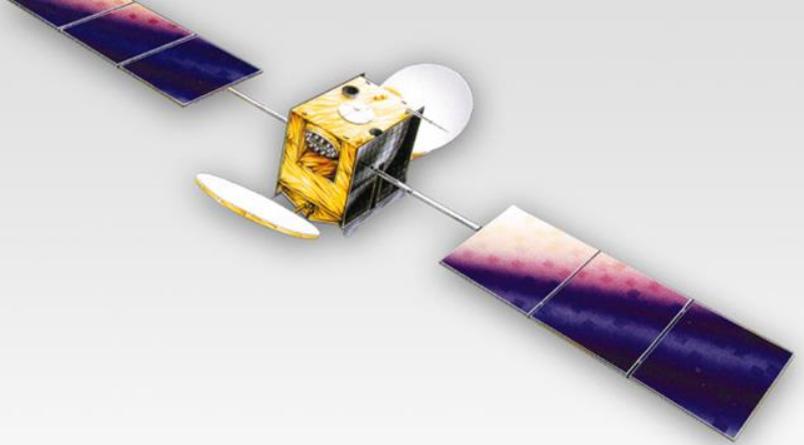
- ☞ Towards EGNOS in Africa: Emergence of JPO, ASECNA Program

Ladislaus Matindi – EGNOS Africa JPO Director (JPO)

Julien Lapie – Technical Advisor (ASECNA)

11:30-12:00

Coffee break



EGNOS Services (SoL, OS, EDAS) Roadmap

Javier de Blas, ESSP SAS,
francisco-javier.deblas@essp-sas.eu



The **EGNOS** Service Provider

TABLE OF CONTENT

- **EGNOS Services** related documents
- **EGNOS Services Roadmap (2014-2016):**
 - EGNOS SoL service
 - EGNOS Open Service
 - EDAS Service

EGNOS Services related publications

- **EGNOS Service Definition Documents (SDD)** describing the characteristics and conditions of access to each EGNOS service (EDAS, OS, SoL).
http://www.essp-sas.eu/service_definition_documents
- **EGNOS Service Notices** generated whenever there is any complementary information to be provided to users that could affect any SDD content. Eleven Service Notices published (with several updates)
http://www.essp-sas.eu/service_notices
- **EGNOS Service Roadmaps** providing a high-level overview of the EGNOS Services' status and its expected evolution
http://www.essp-sas.eu/printed_documents
- **EGNOS Performance reports:**
 - **Monthly Performance Reports**
www.essp-sas.eu/monthly_performance_reports
 - **Yearly Service Provision Reports**
http://www.essp-sas.eu/printed_documents

EGNOS Service Definition Documents

- **EGNOS Open Service (OS)**

- First issue v1.0 published on the *1st October 2009*
- Last issue v2.0 (in-force) published on the 18th March 2013



- **EGNOS Safety-of-Life (SoL) Service**

- First issue v1.0 published on the *2nd March 2011*
- Last issue v2.0 (in-force) published on the 28th June 2013



- **EGNOS Data Access Service (EDAS)**

- First issue v1.0 published on the *26th July 2012*
- Last issue v2.0 (the applicable) published on the 10th April 2013



EGNOS Service Definition Documents

- **EGNOS Open Service (OS)**

- First issue v1.0 published on the 1st October 2007
- Last issue v2.0 (in-force) published on the 28th June 2013



- **EGNOS Safety-of-Flight (SoF) Service**

- First issue v1.0 published on the 2nd March 2011
- Last issue v2.0 published on the 28th June 2013



New EGNOS OS, SoL and EDAS SDDs to be published in 2014!

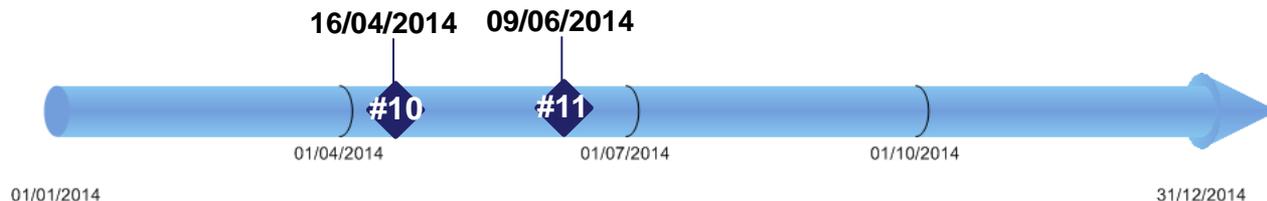
- **EGNOS Data Access Service (EDAS)**

- First issue v1.0 published on the 26th July 2012
- Last issue v2.0 (the applicable) published on the 10th April 2013



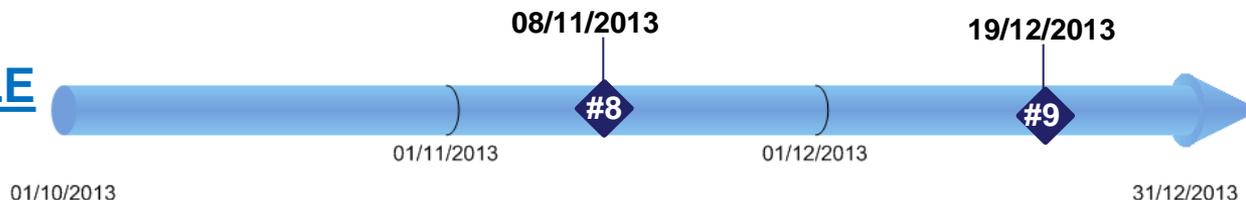
EGNOS Service Notices

PUBLISHED THIS YEAR



- **Service Notices #11 v1.0** EGNOS GEO PRN 124 Decommissioning and Space Segment Update - EGNOS SoL, OS & EDAS Users
- **Service Notice #10 v1.1** Updated Status EGNOS performances - North and South West of Service Area - EGNOS SoL & OS Users

OTHERS STILL APPLICABLE



- **Service Notice #9 v1.0** Upgrade of the EGNOS communication network (TWAN) in January 2014 - EGNOS SoL, OS & EDAS Users
- **Service Notice #8 V1.0** EGNOS System Release v2.3.2 deployment - EGNOS SoL & OS Users

Monthly Performance Report

Table of Content

EXECUTIVE SUMMARY	5
1 EGNOS SIS AVAILABILITY	6
2 OPEN SERVICE (OS)	7
2.1 OPEN SERVICE HORIZONTAL AND VERTICAL ACCURACY	7
2.2 EGNOS OPEN SERVICE AVAILABILITY.....	9
3 SAFETY-OF-LIFE SERVICE (SOL)	10
3.1 EGNOS NON PRECISION APPROACH (NPA)	10
3.1.1 EGNOS NPA availability	10
3.1.2 EGNOS NPA Continuity.....	11
3.1.3 EGNOS NPA Integrity Events.....	12
3.1.4 EGNOS NPA Accuracy.....	13
3.2 EGNOS APPROACH WITH VERTICAL GUIDANCE (APV-I)	15
3.2.1 EGNOS APV-I Availability	15
3.2.2 EGNOS APV-I Continuity Risk	16
3.2.3 EGNOS APV-I Integrity	17
3.2.4 EGNOS APV-I Accuracy.....	19
4 APV-I PERFORMANCES AT AIRPORTS	21
5 EGNOS DATA ACCESS SERVICE (EDAS)	25
6 EGNOS TIME SERVICE	26
APPENDIX A RECEIVER MONITORING NETWORK	28
APPENDIX B REFERENCE DOCUMENTS	30
APPENDIX C LIST OF ACRONYMS	31

New section since July 2014

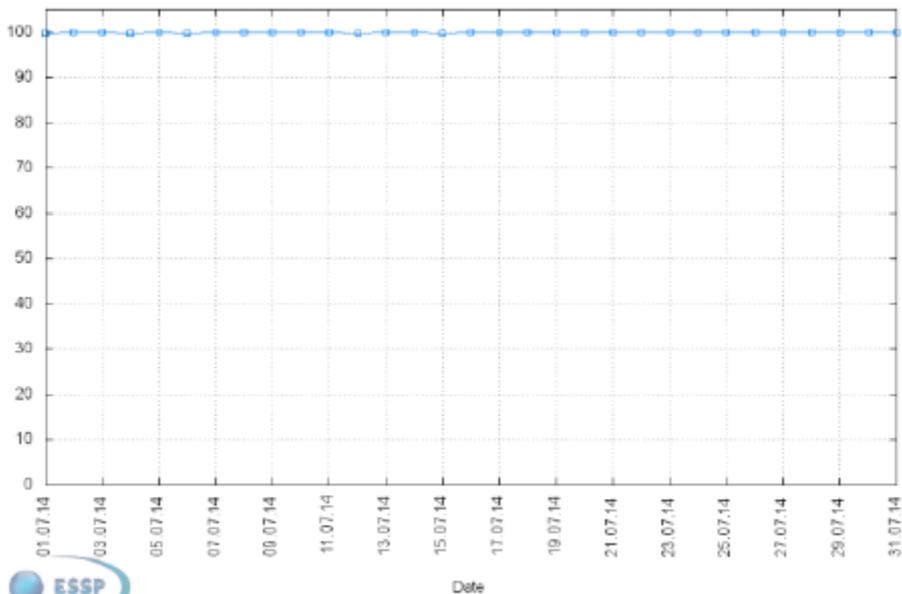


Monthly Performance Report

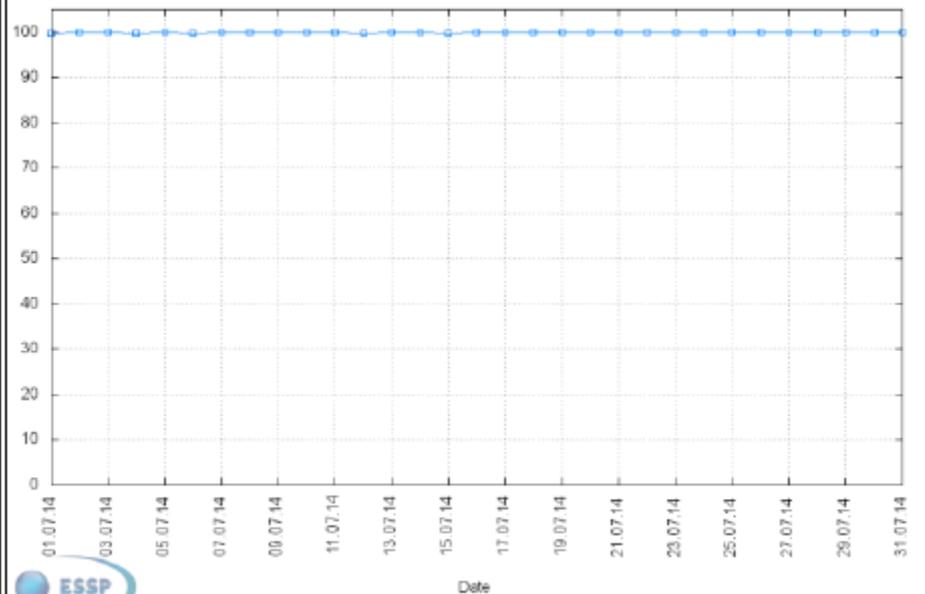


The **EGNOS** Service Provider

ENT Availability from 01.07.2014 to 31.07.2014 for PRN120



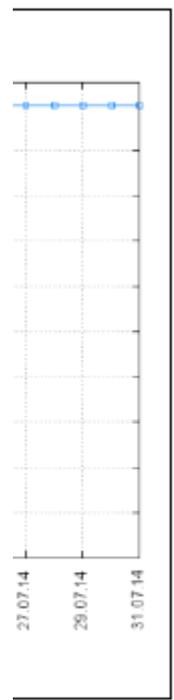
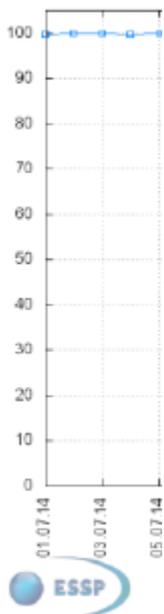
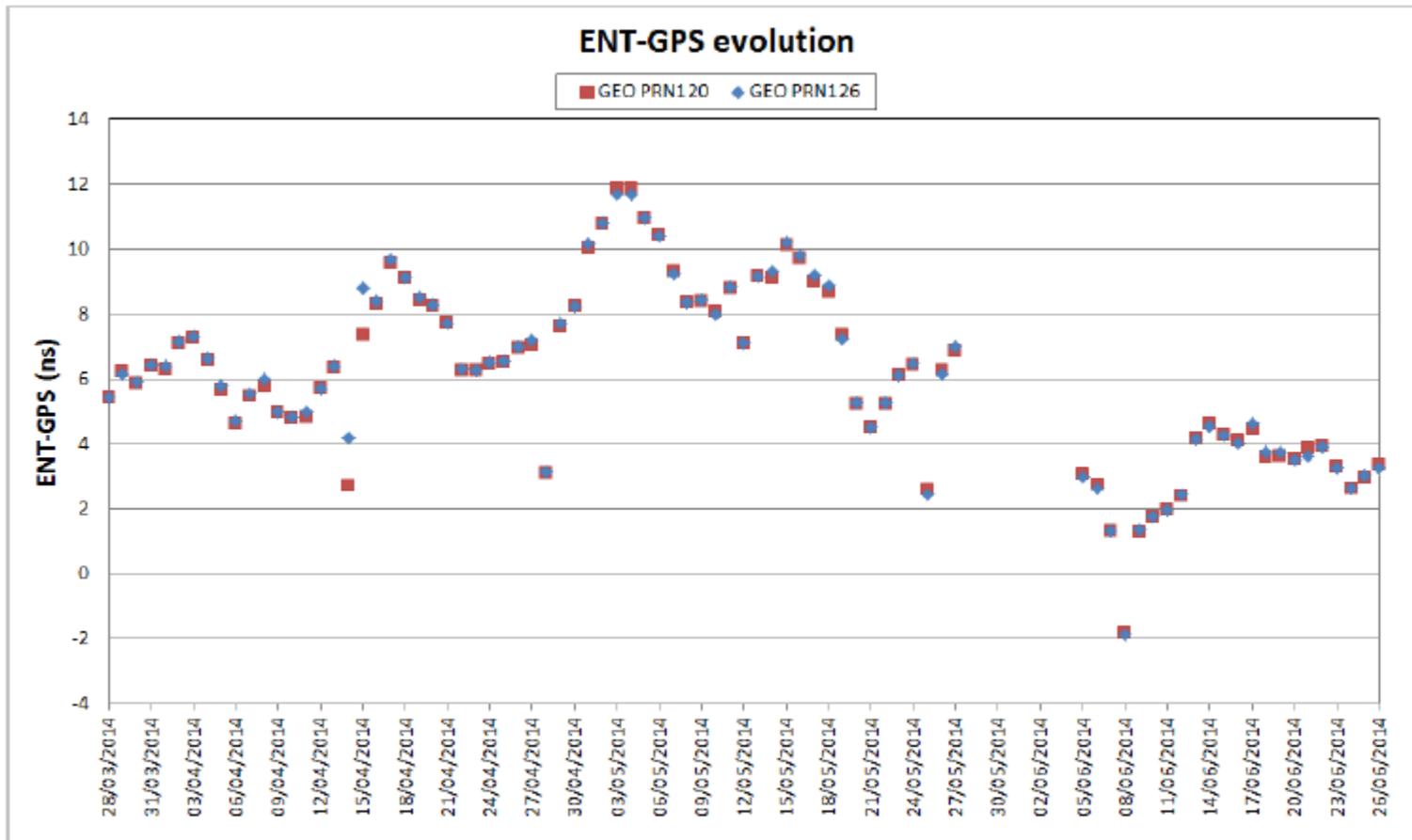
ENT Availability from 01.07.2014 to 31.07.2014 for PRN126



EGNOS Time Service availability

APPENDIX B	REFERENCE DOCUMENTS	30
APPENDIX C	LIST OF ACRONYMS.....	31

Monthly Performance Report



ENT-GPS offset evolution

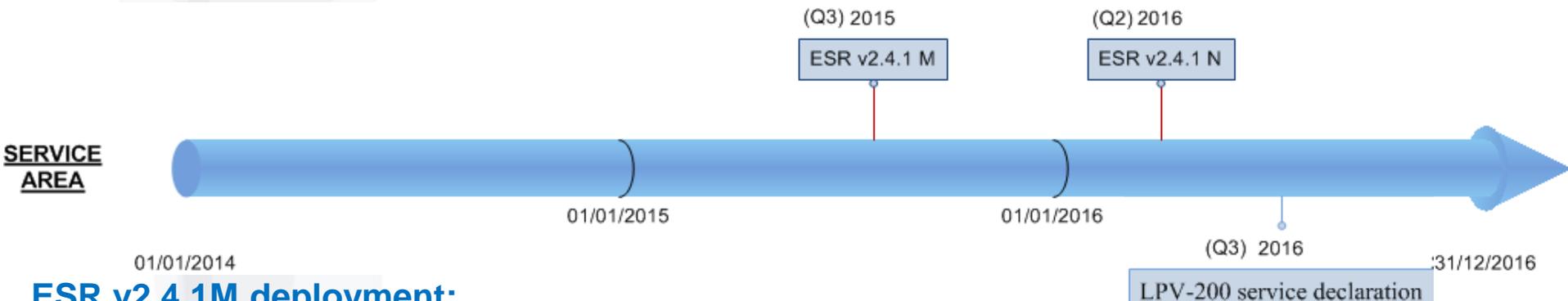
APPENDIX C LIST OF ACRONYMS.....31

TABLE OF CONTENT

- **EGNOS Services** related documents
- **EGNOS Services Roadmap (2014-2016):**
 - EGNOS SoL service
 - EGNOS Open Service
 - EDAS Service

EGNOS Services Roadmaps (2014-2016)

Service Area



ESR v2.4.1M deployment:

- **Deployment timeline:** Q3 2015
- **Services Improved:** SoL, OS

ESR v2.4.1N deployment:

- **Deployment timeline:** Q2 2016
- **Services Improved:** SoL, OS

- General improvement in coverage area and in particular in south-east of Europe for both OS and SoL services
- Target full NPA coverage area in EU 28

- Inclusion of RIMS Haifa improving coverage in the south-east of Europe
- Target full OS coverage area in EU 28 (excluding Azores)

E

SERVICE AREA



01/01/2014

ESR v2.4.1M

- Deployment
- Services

ESR v2.4.1N

- Deployment
- Services



/12/2016

and
for

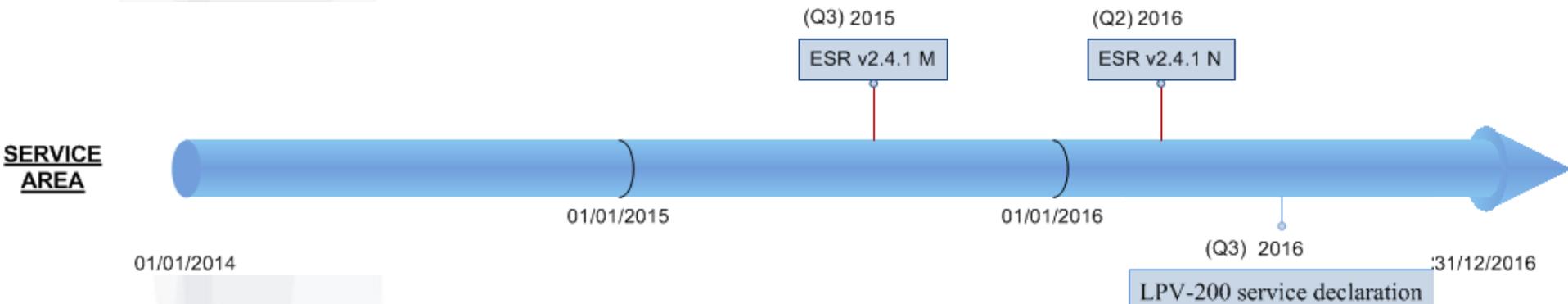
ving

28

Full NPA in EU28 + Switzerland, Balkan States, Norway

EGNOS Services Roadmaps (2014-2016)

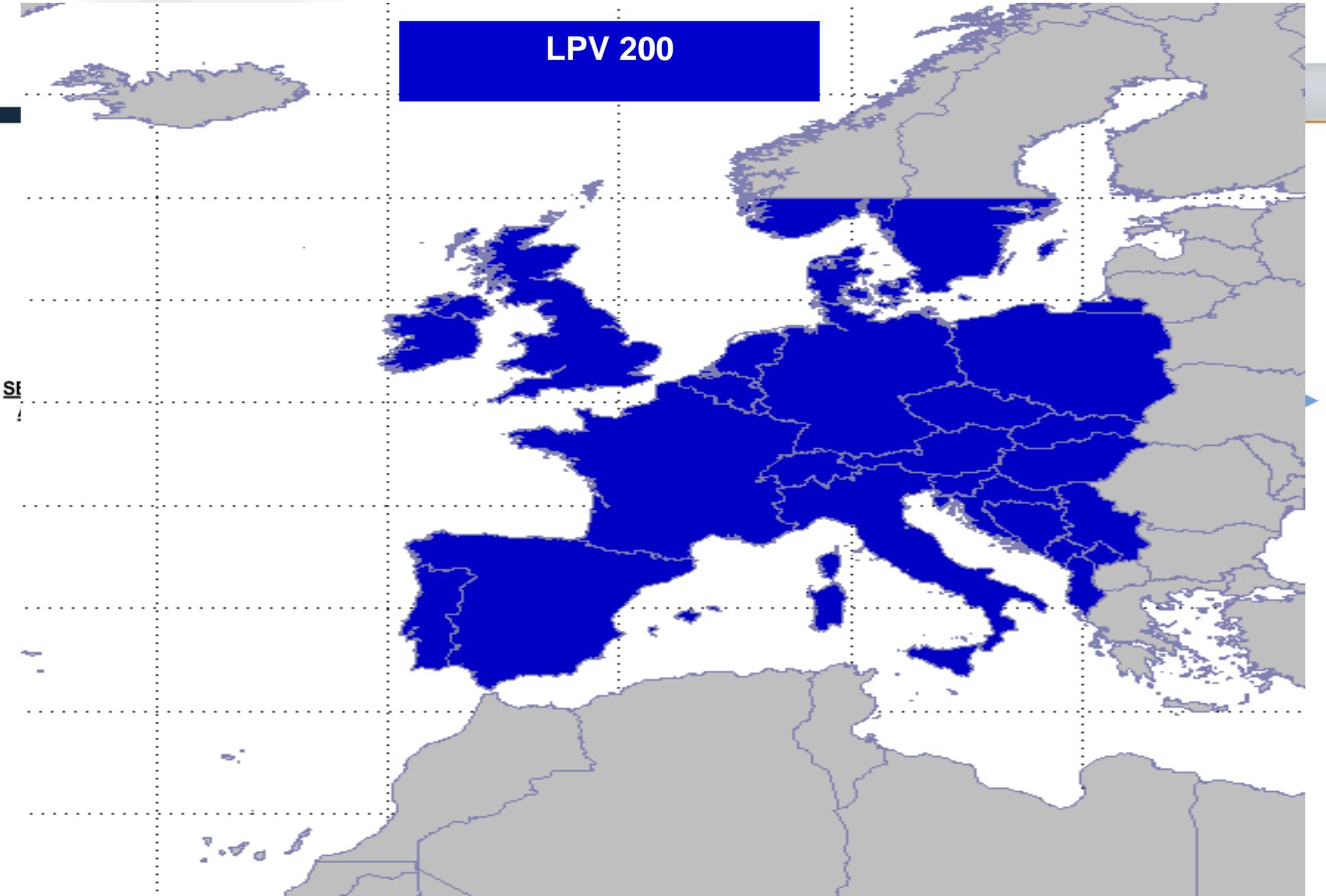
Service Area



LPV-200 availability:

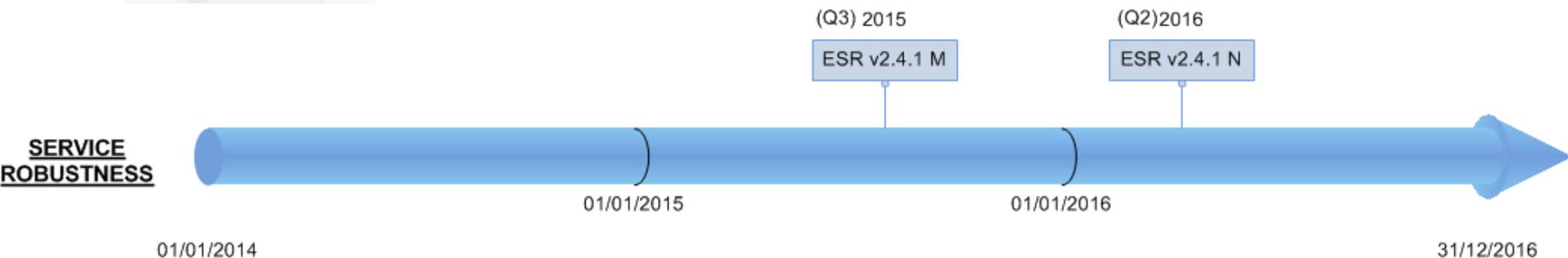
- **Deployment timeline:** Q3 2016
- **Services Improved:** SoL
- LPV-200 target coverage area...

LPV 200



EGNOS Services Roadmaps (2014-2016)

Service Robustness



ESR v2.4.1M deployment:

- **Deployment timeline:** Q3 2015
- **Services Improved:** SoL, OS

- PRN 120 replacement by new ASTRA-4B (PRN136)
- Increased robustness against ionosphere disturbances

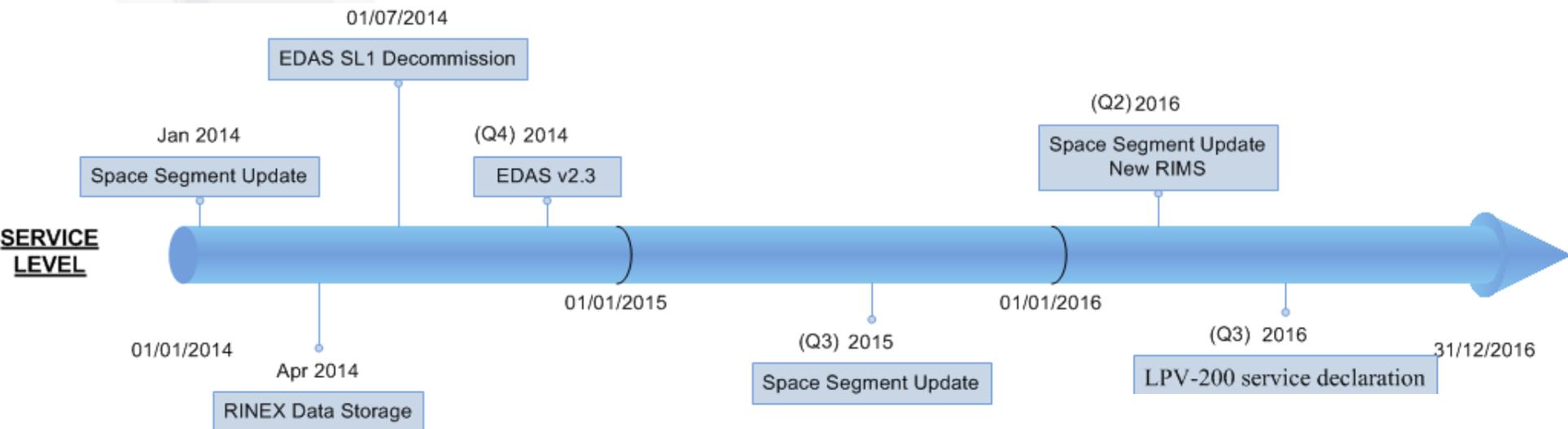
ESR v2.4.1N deployment:

- **Deployment timeline:** Q2 2016
- **Services Improved:** SoL, OS

- Improvement in SV monitoring
- SES ASTRA 5-B PRN 123 replacing PRN 126

EGNOS Services Roadmaps (2014-2016)

Service Level

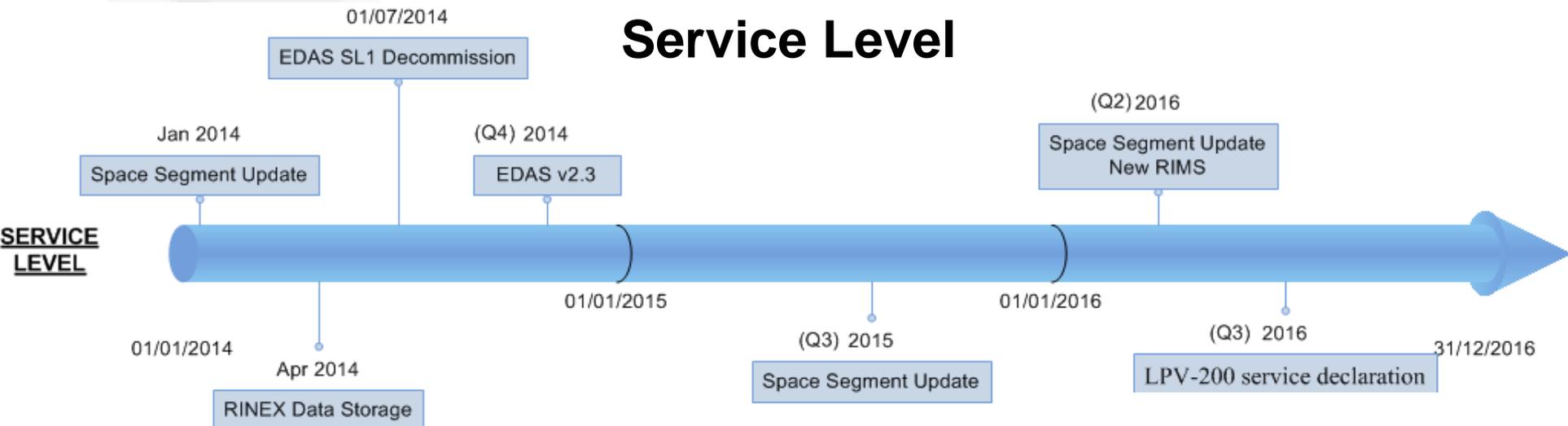


LPV-200 service declaration:

- Deployment timeline: Q3 2016
- Services Improved: SoL

EGNOS Services Roadmaps (2014-2016)

Service Level



EDAS SL1 Decommission:

- **Deployment timeline:** 01/07/2014
- **Services Impacted:** EDAS

- All messages provided by SL1, including some new ones, now covered by SL2

RINEX Data Storage:

- **Deployment timeline:** April 2014
- **Services Improved:** EDAS

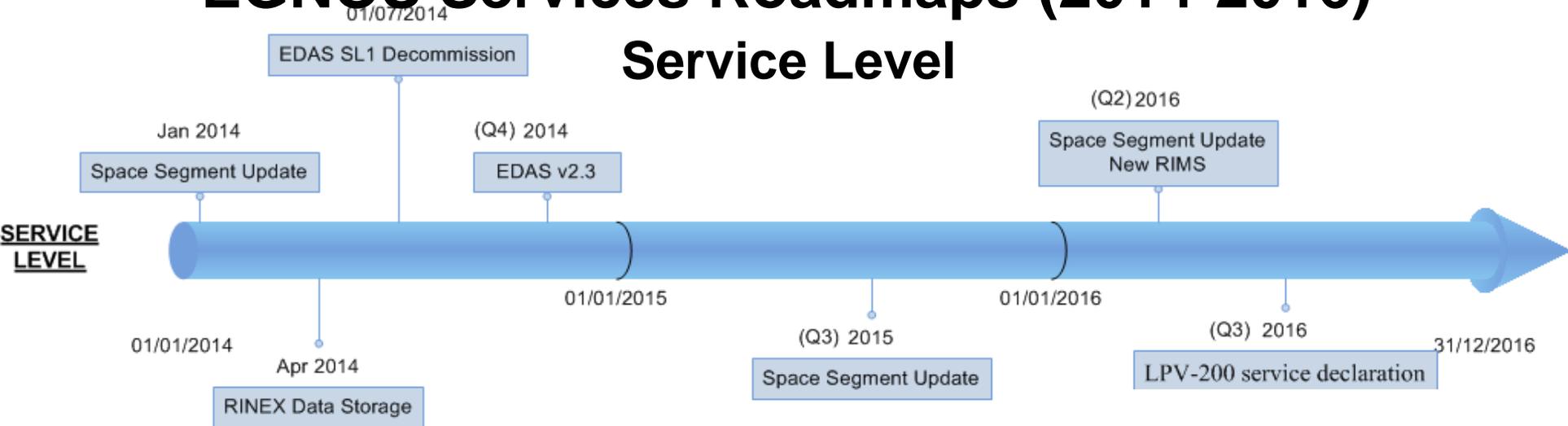
- RINEX Data Storage for GPS & GLONASS Observations from RIMS A&B stations now available to users up to 2 years on EDAS FTP site

EDAS v2.3:

- **Deployment timeline:** End 2014
- **Services Impacted:** EDAS

- Upgrade EDAS Hardware platform (replacement of EDAS V1 legacy HW) expected to improve the EDAS Services robustness.

EGNOS Services Roadmaps (2014-2016)



Space Segment consecutive Updates:

• **Deployment timeline:** January 2014 / Q3 2015 / Q2 2016

• **Services Impacted:** EDAS

Ground Segment Update:

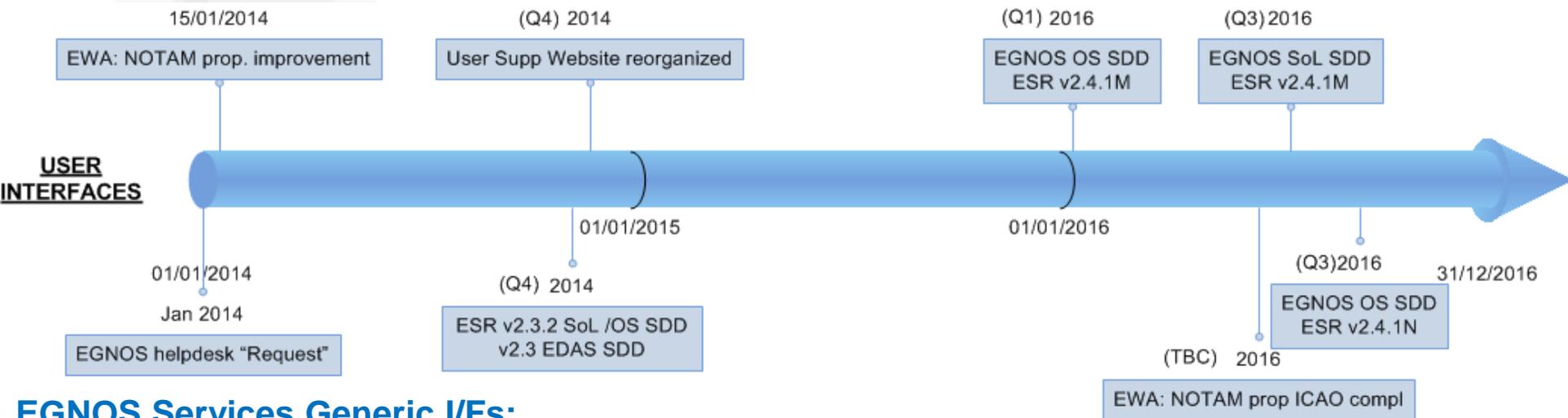
• **Deployment timeline:** Q2 2016

• **Services Improved:** EDAS

- SBAS messages through EDAS from decommissioned PRN to be ceased and replaced by those from new PRN:
 - OP P/F: PRN120 and PRN126 and TEST P/F: PRN 136 -> Jan 2014
 - PRN 120 replacement by new ASTRA-4B (PRN136) -> Q3 2015
 - PRN 123 replacement by new INMARSAT 4F2 EMEA (PRN 126) -> Q2 2016
- New RIMS leading to more information offered through EDAS service

EGNOS Services Roadmaps (2014-2016)

Interfaces with Users



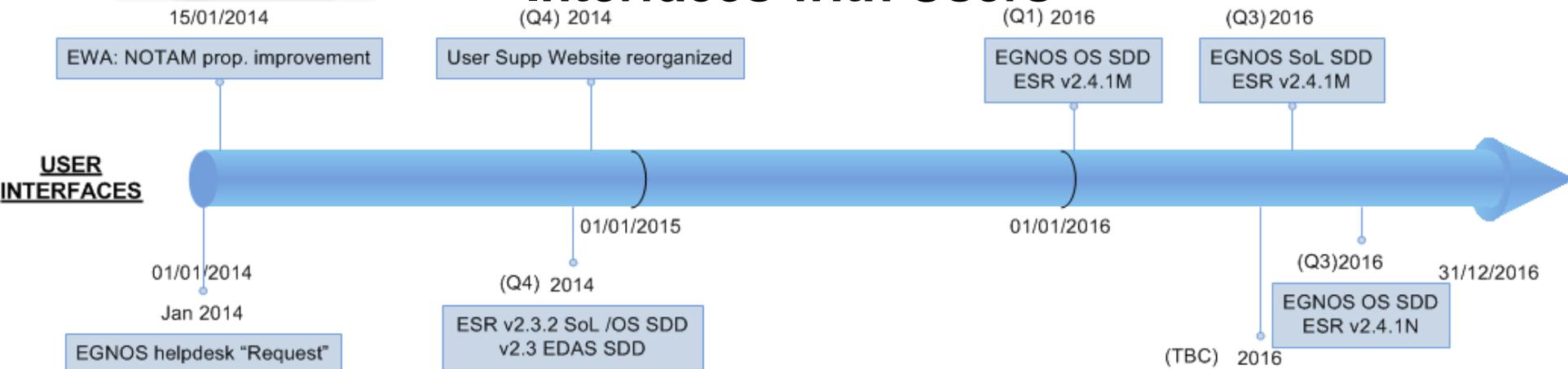
EGNOS Services Generic I/Fs:

- **Helpdesk H24:** Reduced reaction times
6 to 3 working days for regular requests
24 hours to 1 hour for urgent requests.
- **User Support Website:** from Q4 2014 onwards
reorganised per EGNOS Service
Improved usability, availability and robustness

- **EGNOS Service Definition Documents:**
 - EGNOS services (SoL / OS / EDAS) SDD v2.0 in force
 - New versions to be published in Q4 2014
 - Following SDDs versions after the deployment of new ESRs

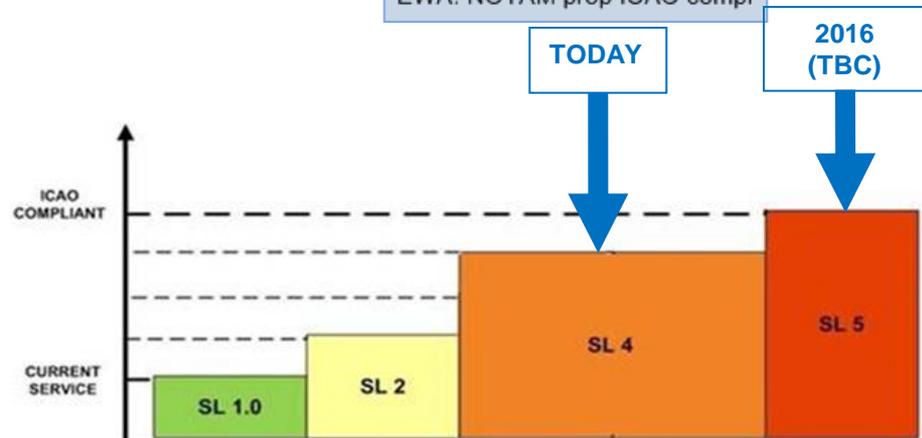
EGNOS Services Roadmaps (2014-2016)

Interfaces with Users



EGNOS SoL Specific I/Fs (EWA):

- **NOTAM proposals:** Continuous improvement
- SL2 to SL4 – 2014
- Target compliance with ICAO (SL5) - 2016



7-8 October
Lisbon

The **EGNOS** Service Provision
workshop



We certify you're there.



AGENDA (10:00 – 12:00)

10:00-11:30

EGNOS Services Status

- ☞ Overview of last 12 months performance
Javier Gómez – Mission Performance Manager (ESSP)
- ☞ User Satisfaction Surveys 2013
Miguel-Ángel Sánchez – Service Adoption and Support Mngr (ESSP)
- ☞ EGNOS Services Evolution Roadmap
Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)
- ☞ Towards EGNOS in Africa: Emergence of JPO, ASECNA Program
Ladislaus Matindi – EGNOS Africa JPO Director (JPO)
Julien Lapie – Technical Advisor (ASECNA)

11:30-12:00

Coffee break



EGNOS–Africa Joint Programme Office (JPO)

2014 EGNOS Service Provision Workshop

Lisbon, 7- 8 October 2014

**“Towards EGNOS in Africa: Emergence
of JPO”**

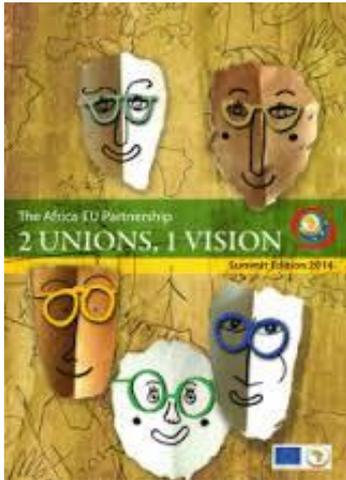
OUTLINE

- **Background**
- **Joint Africa-EU strategy: the foundation of JPO**
- **SAFIR and TREGA Projects**
- **The EGNOS Africa Joint Programme Office (JPO)**
- **JPO Functions**
- **JPO Work Programme 2014+ - Overview**
- **EGNOS implementation scenarios in Africa under consideration**
- **Conclusion**

Background

- ❑ **Extension of EGNOS to Africa**
 - ❑ Operationalisation of the Joint EU-Africa Partnership (2007)
 - ❑ Aviation component is being addressed through a framework Programme “Support to the Air Transport and Satellite services applications in Africa”, funded by EC (10th EDF) and managed by ACP.
 - ❑ **SAFIR** and **TREGA** projects - specific projects of the Framework Programme to build the capacity of Sub-Saharan Africa for the future deployment of GNSS/EGNOS in the region.
 - ❑ **The EGNOS Africa Joint Programme Office (JPO)** - created under SAFIR project as a regional structure to coordinate the deployment of GNSS/EGNOS services in Sub-Saharan Africa.

Joint Africa-EU strategy: the foundation of JPO



- Adopted by the Summit of the Heads of State and Government from Africa and Europe – Lisbon, December 2007
- It sets basis for cooperation in Infrastructure development “....Partners shall also focus on enhancing port efficiency, and supporting measures for improving air and maritime safety

Joint Africa-EU strategy: the foundation of JPO



- Second Action Plan 2011-2013 of the Joint Africa-EU strategy adopted by the 3rd Africa-EU summit in Tripoli (Nov 2010) - Priority N°2 defines actions to support Air Transport Sector and Satellite Navigation:
 - For SBAS, setup and activity of Working Groups, **staffing of African GNSS programme management entity**, training of African experts, preliminary backbone infrastructure development and initial operations.
 - Actors identified: AUC, RECs, UNECA, AFCAC, ASECNA, ACAC, EC and EU related institutions (ESA, EASA, SESAR)

- 4th Africa-EU Summit, April 2014 Brussels, Way Forward Declaration, paragraph 47 of the Roadmap 2014-2017: Commitment of African and EU leaders to provide sustainable and adequate financial and human resources for the deployment of satellite navigation infrastructure based on EGNOS

Emergent of the EGNOS Africa Joint Programme Office (JPO)

Two projects to build capacity within African ACP countries (Sub-Saharan Africa) for the future deployment of GNSS/EGNOS in the region

SAFIR Project
implemented by consortium (ASECNA, EgisAvia, Pildo Labs, ESSP)

Set-up, staffing and operations of an EGNOS-Africa Joint Programme Office (JPO) with a proper regional participation.

Organisation of technical Working Sessions composed of regional stakeholders concerned with GNSS/EGNOS in sub-Saharan Africa

TREGA Project
implemented by the International Centre for Theoretical Physics (ICTP)

Train the JPO staff at the UNESCO-International Centre for Theoretical Physics (ICTP) facilities in Trieste, Italy

Procurement of a Testing-platform/Software simulator to address specific ionospheric conditions in the equatorial region over Africa and training of two African GNSS experts to work on the simulation platform

The EGNOS Africa Joint Programme Office (JPO)

- ❑ Commenced operations in December, 2013,
- ❑ **Main objective** – to define the baseline and to oversee/coordinate the subsequent implementation phase for the specification and procurement of the development and the deployment of GNSS/EGNOS in Sub-Saharan Africa
- ❑ **The goal** - to manage/coordinate future programmes related to GNSS/EGNOS in Africa for all types of applications with a particular attention given to aviation as a main driver.

JPO Functions

**Coordination
GNSS/EGNOS
implementation**

**Assistance &
support**

**Communication
Awareness**

**Capacity
building**

Studies

- ❑ Work programmes to facilitate implementation of the JPO functions during the SAFIR project has been developed and is being implemented
- ❑ Deliverables at the end of SAFIR : April 2015
 - ❑ GNSS/EGNOS services implementation roadmap
 - ❑ JPO action plan (2015+)

JPO Work Programme - Overview

1. Management

1.1 Staff performance & skills management

1.2 Operations Management

1.3 Management of JPO processes and procedures

2. Communication and awareness

2.1 Promotion of JPO and support to EGNOS awareness activities

3. Strategic support to the definition of the governance and financing of EGNOS

3.1 Strategic support to the definition of the governance scheme of EGNOS

3.2 Strategic support to the definition of the financing of EGNOS

4. Technical activities for the development of the EGNOS service implementation Roadmap for Africa

4.1 Development of EGNOS services implementation roadmap

5. Legal issues related to the implementation of EGNOS

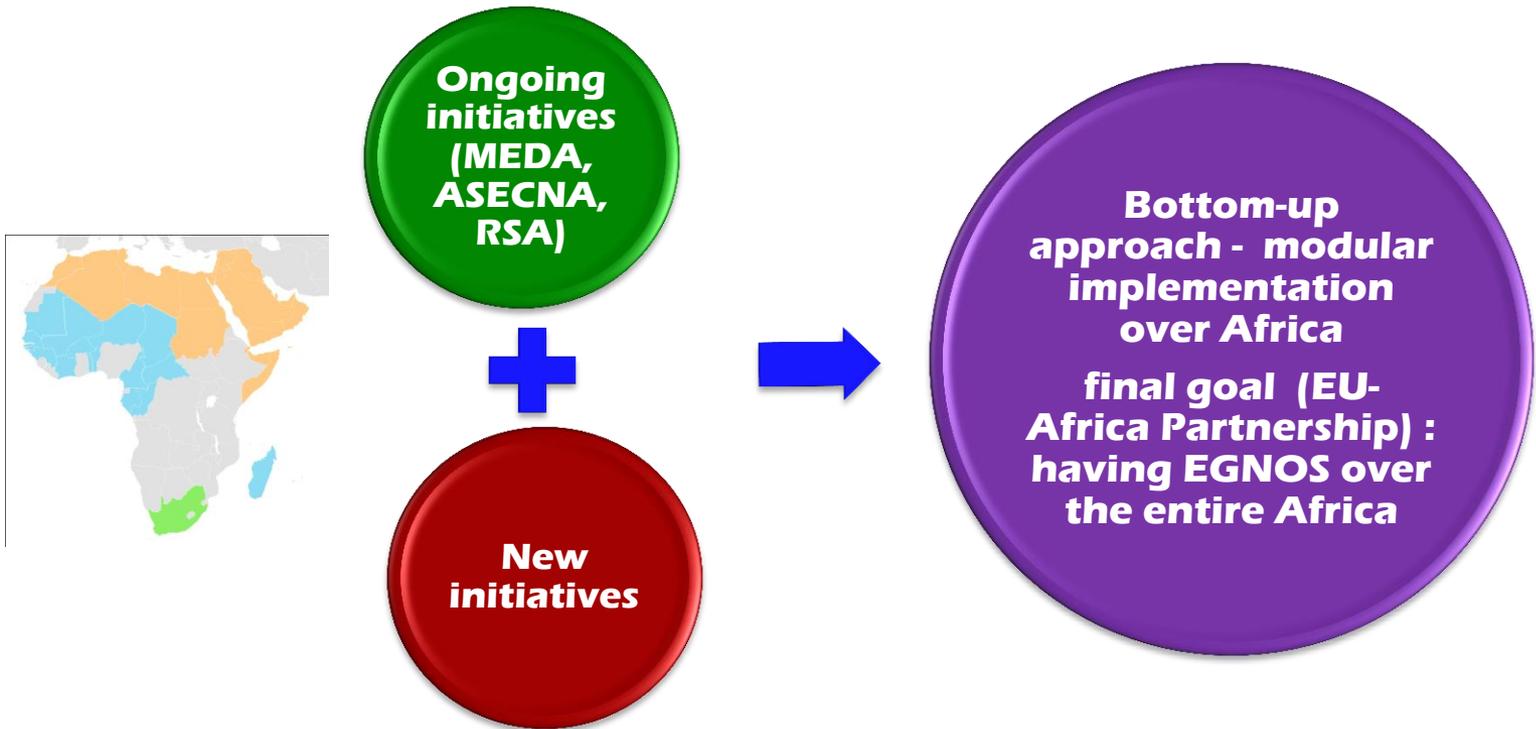
5.1 Legal issues related to the implementation of EGNOS in Africa

6. Prospective view of the future JPO

6.1 Legal issues

6.2 Definition of future JPO Action Plan and Budget (2015-2018)

EGNOS Africa initiative



EGNOS implementation scenarios in Africa under consideration

- Three scenarios are being considered targeting EGNOS V3

Scenario A

- Dependent scenario
- All services provision centralised by Europe (ESSP)
- Africa is owner of the main infrastructures (RIMS) and the Network

Scenario B

- Ramp up scenario
- SiS centralised in Europe
Service provision by Africa owned service center(s) to define (Notam, data archiving, CDM, user support)

Scenario C

- Independent scenario
- Signal in Space, ops, service provision by Africa
Geo sharing ?, use of Europe RIMS
- The elements that could be shared with Europe will be the geostationary satellites (and perhaps the sharing of some RIMS).

All scenarios need to be discussed and agreed between European and African counterparts.

CONCLUSION

- JPO as part of the joint EU-Africa initiative intends to facilitate extension of EGNOS services to Sub-Saharan Africa on top of the ongoing initiatives in ASECNA, South Africa and North Africa.
- Establishment of JPO is an opportunity for Africa to implement EGNOS in a coordinated and efficient manner.
- ESSP and other service providers are invited to share experiences with JPO on the GNSS/EGNOS services provision activities.

EGNOS-Africa Joint Programme Office

Ladislaus MATINDI
Director

ladislaus.matindi@egnos-africa.com



info@egnos-africa.com



+221 33 820 9366



www.aviation-africa.eu





EGNOS -AFRICA
JPO

THANK YOU



Towards EGNOS in Africa: ASECNA Satellite Navigation Programme (EGNOS)

EGNOS Service Provision Workshop

7-8 October, 2014

Lisbon



Contents

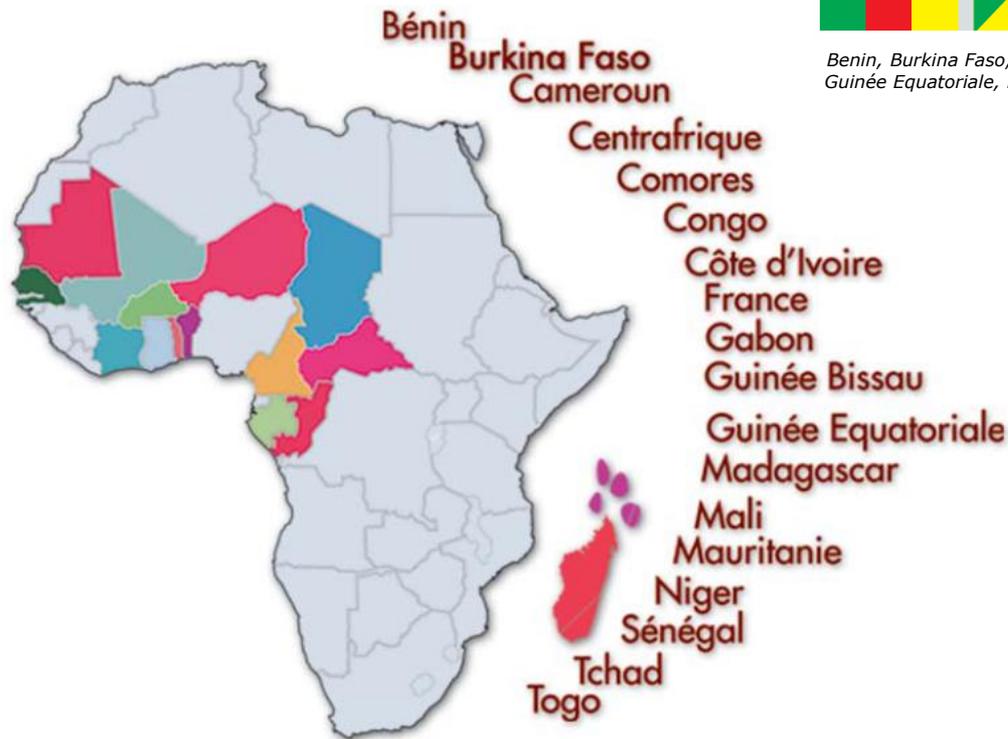
- ASECNA at a glance
- Policy background
- Strategic directions
- Objectives and milestones
- High-level roadmap
- Towards early services
- Cooperation and external relations

ASECNA at a glance

- Member States



Benin, Burkina Faso, Cameroun, Centrafrique, Congo, Côte d'Ivoire, France, Gabon, Guinée Bissau, Guinée Equatoriale, Madagascar, Mali, Mauritanie, Niger, Sénégal, Tchad, Togo, Union des Comores



Policy background



Amadou Ousmane Guitteye

- July 2010: Mr Guitteye is elected by the ASECNA Ministers Committee as Director General:
 - 6-years mandate
 - Ambitious programme « Renewal of the Agency »
 - Strategic direction for the use of innovative and enabling technologies
 - Support and promotion of the extended use of satellite navigation services over the African Continent
- January 2011: Mr Guitteye enters in duty

Policy background



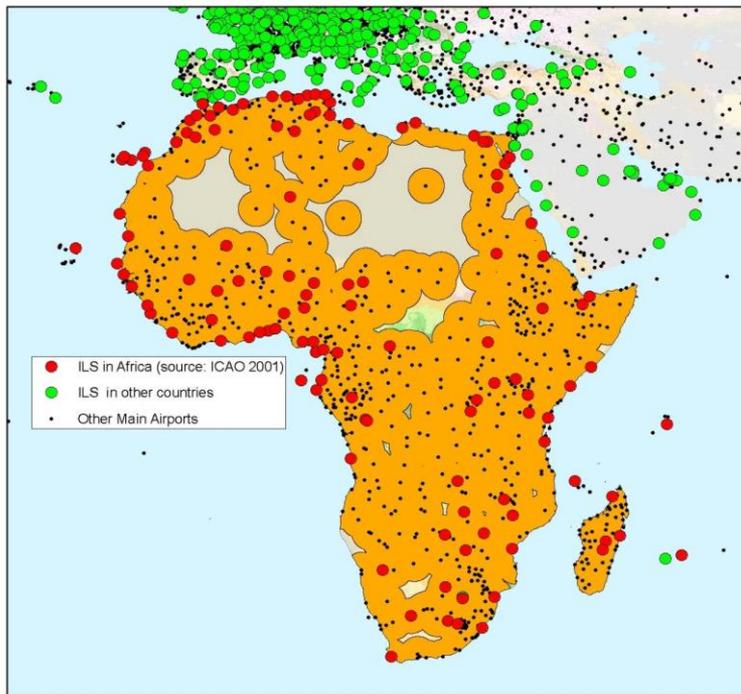
ASECNA Governing Body (18 Member States)

- 120th Session
- July 2011, Ndjamena, Chad

- Resolution n° 2011 CA 120-18:
 - Supports the involvement of the Agency in the implementation of EGNOS/GALILEO satellite navigation services
 - Requests the Director General to continue proceedings with the relevant European Organisations for the effective participation of the Agency in the initiatives aiming at deploying EGNOS/GALILEO over the AFI (Africa & Indian Ocean) Region

=> **ASECNA Satellite Navigation (GNSS) Programme
(EGNOS/GALILEO)**

Strategic directions



Safety lessons learned

37% of Africa is 250 km from ILS equipped airport:

- main international airports
- only one runway end

87% of Africa is 250 km from a main or regional airport

IATA forecasting 2013-17 CAGR : 5,3%

ASECNA strategic directions

LNAV/VNAV (Baro) (short-term)
LPV (SBAS) (medium-term)

Need for RNP APCH APV :

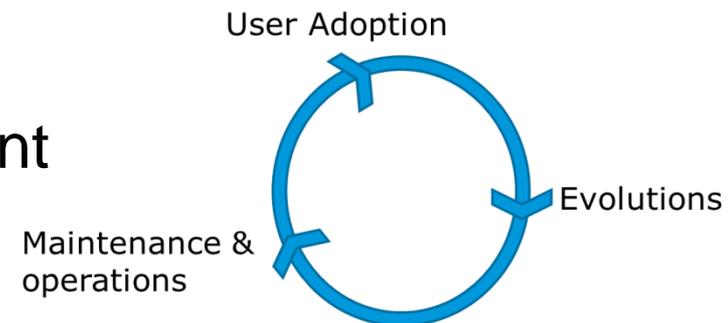
Strategic directions

- Towards SBAS:
 - Prepare the future
 - Anticipate and manage of a major technological leap, leading to a sound change in the nature of services and of their model of governance due to their global character
 - Strengthen the positioning of the Agency as a services producer, in an increasing competitive environment
- Pursuing:
 - Ownership of the infrastructure
 - Control and provision of Signal in Space (SiS)
 - Provision of services to end users

Objectives and milestones

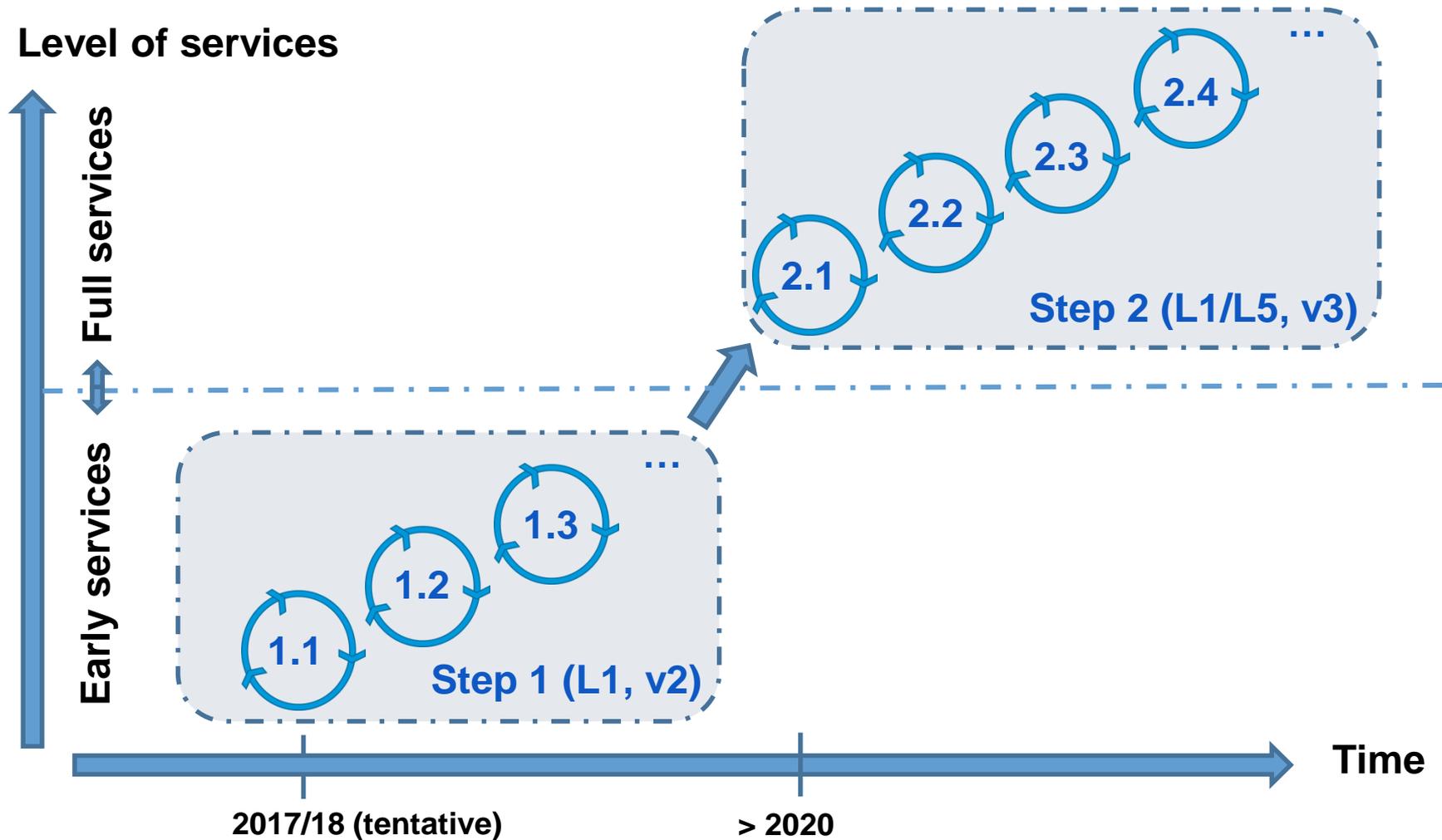
- A two-fold progressive approach:
 - **Step 1:**
 - Provision to airspace users of **early services** (APV/LPV, L1, EGNOS v2) by 2017/18 (tentative)
 - **Step 2:**
 - Provision to airspace users of **full services** (APV/LPV, L1/L5, EGNOS v3) by 2020 onwards

- Principle of evolutionary development

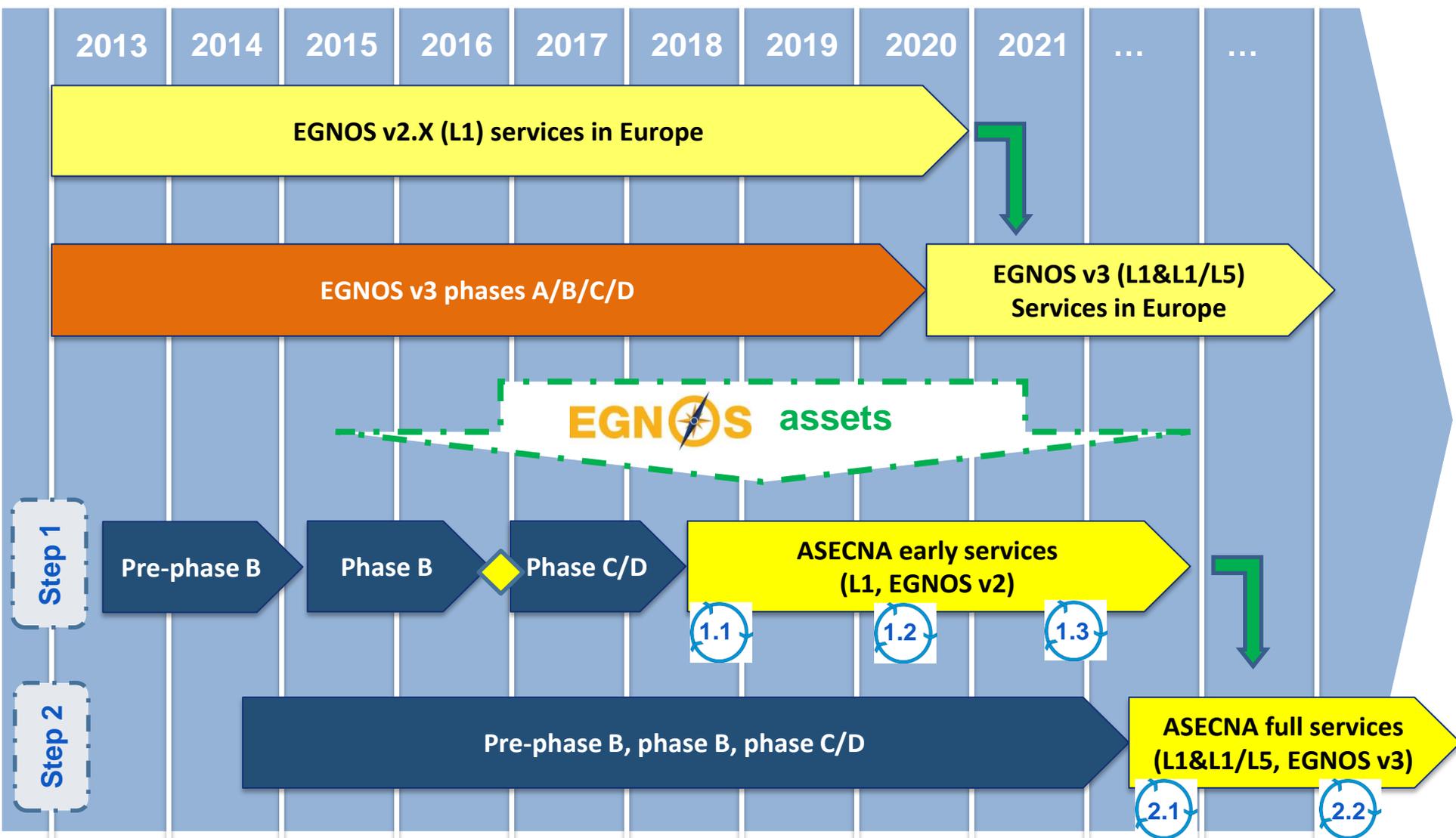


Objectives and milestones

- Incremental path :



High-level roadmap

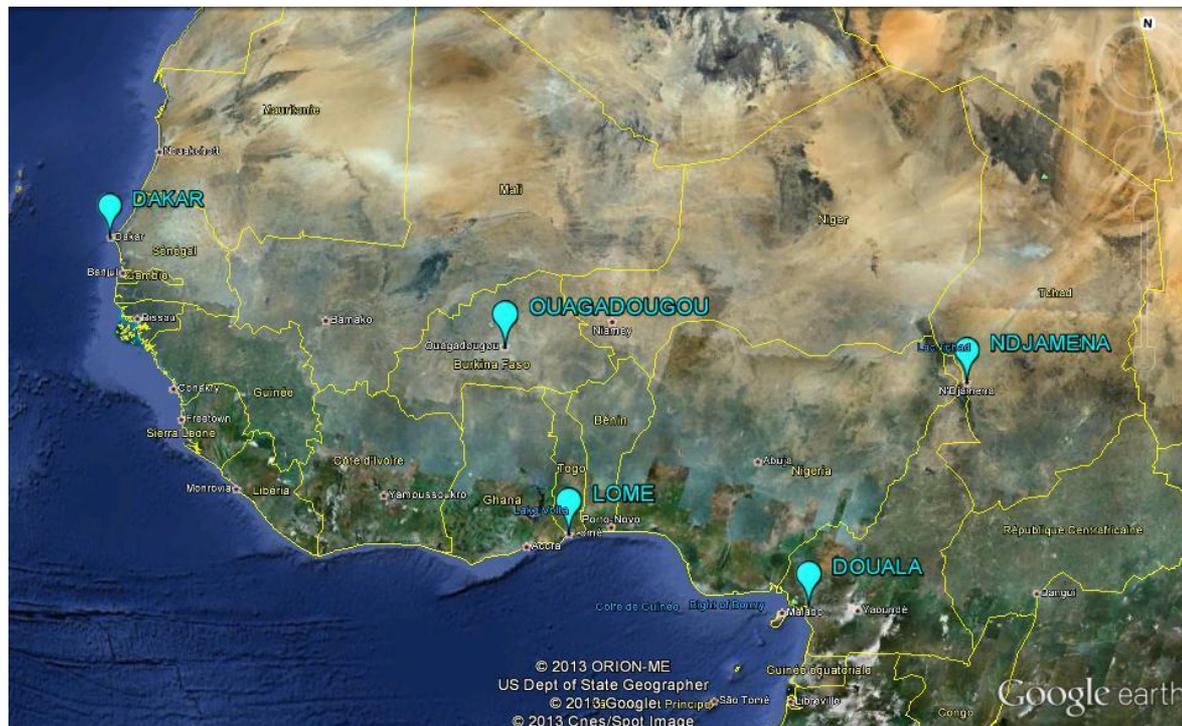


Towards early services



• Ionosphere characterisation: SAGAIE

- ASECNA-CNES cooperation (started March 2013)
- Exploitation of a network of 5 GNSS stations deployed on ASECNA sites:
- Collection of GNSS (GPS/GAL/GLO) raw data for ionospheric studies



Towards early services

• **Ionosphere characterisation: MONITOR II**

- ASECNA-ESA-CNES cooperation
 - Ionospheric studies, GNSS measurement activities and data exchange to support SBAS evolution in ASECNA
 - EGEP Programme: MONITOR II - Support to EGNOS v3 and other activities
- Addition of MONITOR Stations complementing the SAGAIE network
- Processing of SAGAIE and MONITOR raw data => MONITOR II

Products:

- Regional TEC maps, ionospheric scintillation statistics and analysis, ionospheric reference scenarios etc.
- MONITOR II products will support
 - ASECNA phase B study (e.g. performance assessment, scenario validation)
 - EGNOS v3 developments, related test-beds and activities
 - Improvement of EGNOS performances in the ECAC region



Towards early services

- **Preliminary Architecture Definition Study (phase B)**



- To define an incremental path for Step 1 with the best architecture options and to provide detailed development and implementation plans taking into consideration:

- coverage * performances
- benefits / costs (CAPEX/OPEX)
- expendability and upgradability towards EGNOS v3
- schedule of development of EGNOS assets
- complementarity with GBAS
- etc.

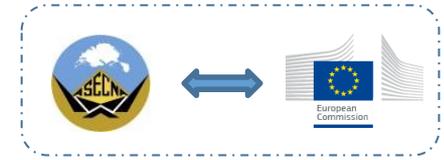
- Technical officer:



- Procurement officer

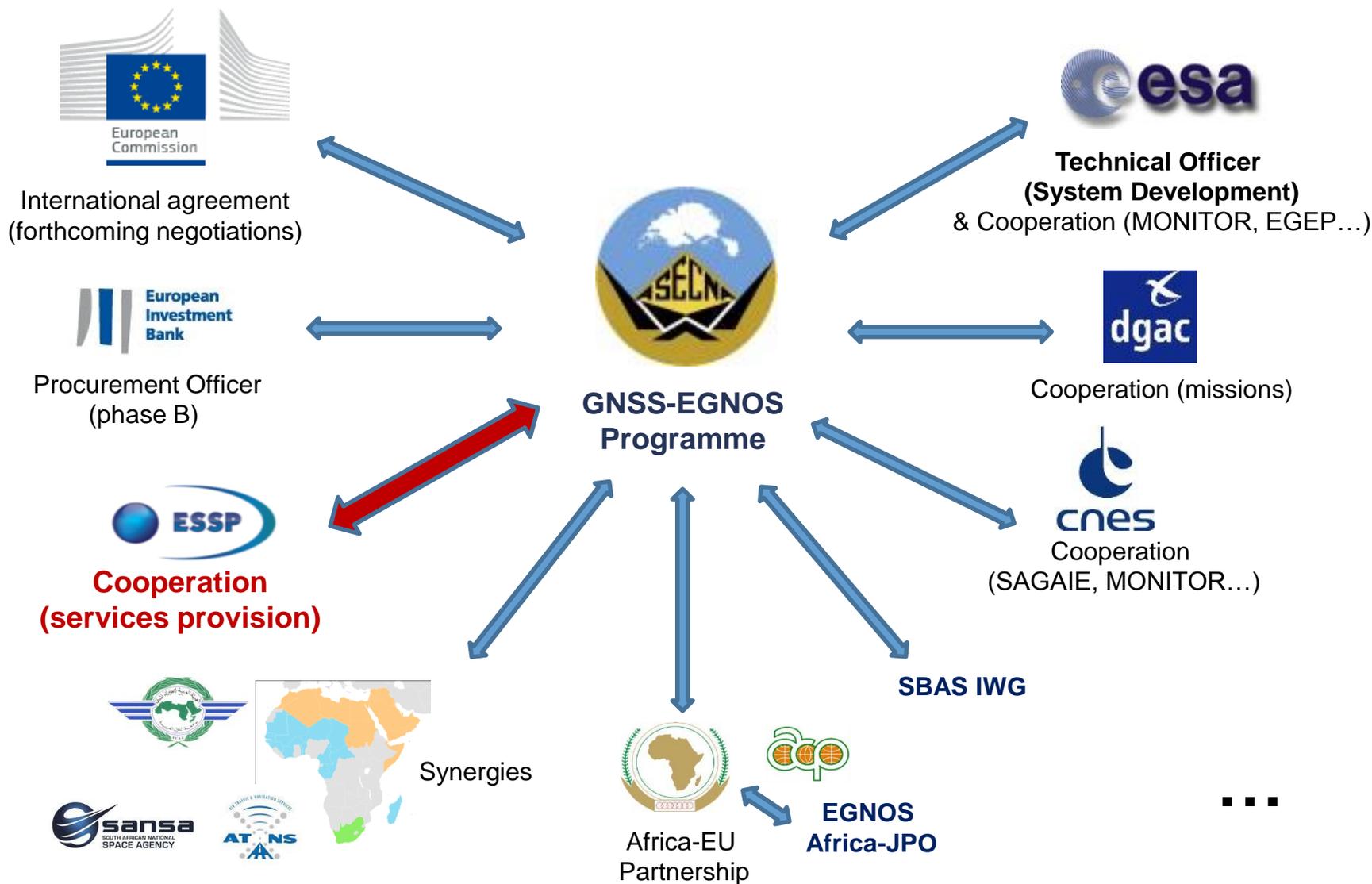


Towards early services



- **Negotiations on an ASECNA-EU international agreement:**
 - To lay down the terms and conditions for the provision of SBAS services in Africa based on the European Satellite Navigation Programme EGNOS
 - As per Regulation (EU) 1285/2013 of the European Parliament and of the Council on the implementation & exploitation of European Satellite Navigation Systems
 - In accordance with Article 218 of the Treaty on the Functioning of the European Union (TFEU)
 - Opening of negotiations authorised by the Council of EU (Competitiveness Council, 25-26 September 2014)
 - Kick-off of negotiations by end of this year

Cooperation and external relations





THANK YOU FOR YOUR ATTENTION

Contact:

Julien Lapie

Office of the Director General

Technical Advisor - GNSS-EGNOS programme manager

lapiejul@asecna.org

+221 77 333 27 66

www.asecna.aero



coffee break

EGNOS survey open!

<http://egnos-portal.gsa.europa.eu/egnos-users-satisfaction-survey>

7-8 October
Lisbon



The **EGNOS** Service Provision
workshop



We certify you're there.



AGENDA (12:00 – 14:30)

12:00-13:30

EGNOS Safety-of-Life Service for Aviation

- ☞ Europe's LPV implementation status and plans for 2015
Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)
- ☞ EGNOS Adoption in Aviation: strategies and main achievements
Carmen Aguilera – Market Development Officer (GSA)
- ☞ Overview of the approach to PBN Implementation in Europe
Lorenzo Bella – Satellite Navigation Expert (EUROCONTROL)
- ☞ EASA role in EGNOS-based aircraft operations
Ivan Ferencz – ATM/ANS Organisation Approval Team Leader (EASA)
- ☞ CAP1122 LPV for visual airfields
Paul Fraser-Bennison – Policy Specialist -Aerodromes- (UK CAA)

13:30-14:30

Lunch

AGENDA (12:00 – 14:30)

12:00-13:30

EGNOS Safety-of-Life Service for Aviation

- ☞ Europe's LPV implementation status and plans for 2015
Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)
- ☞ EGNOS Adoption in Aviation: strategies and main achievements
Carmen Aguilera – Market Development Officer (GSA)
- ☞ Overview of the approach to PBN Implementation in Europe
Lorenzo Bella – Satellite Navigation Expert (EUROCONTROL)
- ☞ EASA role in EGNOS-based aircraft operations
Ivan Ferencz – ATM/ANS Organisation Approval Team Leader (EASA)
- ☞ CAP1122 LPV for visual airfields
Paul Fraser-Bennison – Policy Specialist -Aerodromes- (UK CAA)

13:30-14:30

Lunch

AGENDA (12:00 – 14:30)

12:00-13:30

EGNOS Safety-of-Life Service for Aviation

- ☞ Europe's LPV implementation status and plans for 2015

Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)

- ☞ EGNOS Adoption in Aviation: strategies and main achievements

Carmen Aguilera – Market Development Officer (GSA)

- ☞ Overview of the approach to PBN Implementation in Europe

Lorenzo Bella – Satellite Navigation Expert (EUROCONTROL)

- ☞ EASA role in EGNOS-based aircraft operations

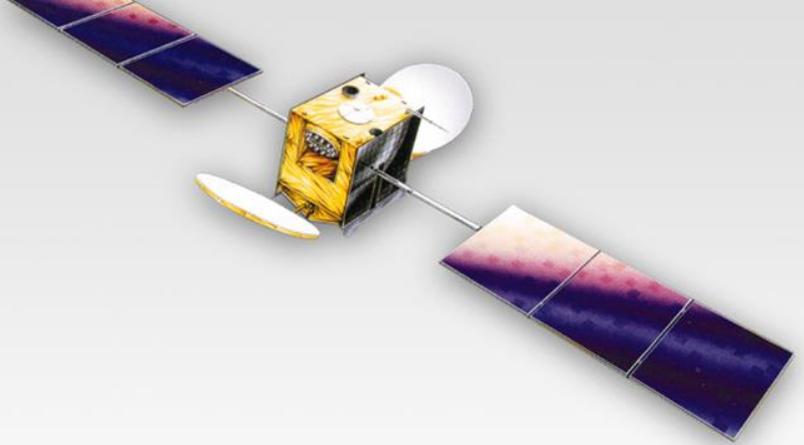
Ivan Ferencz – ATM/ANS Organisation Approval Team Leader (EASA)

- ☞ CAP1122 LPV for visual airfields

Paul Fraser-Bennison – Policy Specialist -Aerodromes- (UK CAA)

13:30-14:30

Lunch



Europe's LPV Implementation Status and Plans for 2015

EGNOS Service Provision Workshop
Lisbon 7th - 8th October 2014



The **EGNOS** Service Provider

- Drivers for APV Implementation
- LPV Implementations: WHO DOES WHAT?
- Guidance Material and Supporting Cells
- LPV Implementation Status (September 2014)
- Further Plans
- LPV Activities in Non EU Countries
- Challenges for Europe's LPV implementation

- Drivers for APV Implementation
- LPV Implementations: WHO DOES WHAT?
- Guidance Material and Supporting Cells
- LPV Implementation Status (September 2014)
- Further Plans
- LPV Activities in Non EU Countries
- Challenges for Europe's LPV implementation

- **ICAO Assembly (36th Assembly Oct 2007) resolutions:**

Implementation of APVs (Baro-VNAV and/or augmented GNSS) for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows:

- **30% by 2010**
- **70% by 2014**

- **ICAO Assembly (37th Assembly Oct 2010) resolutions:**

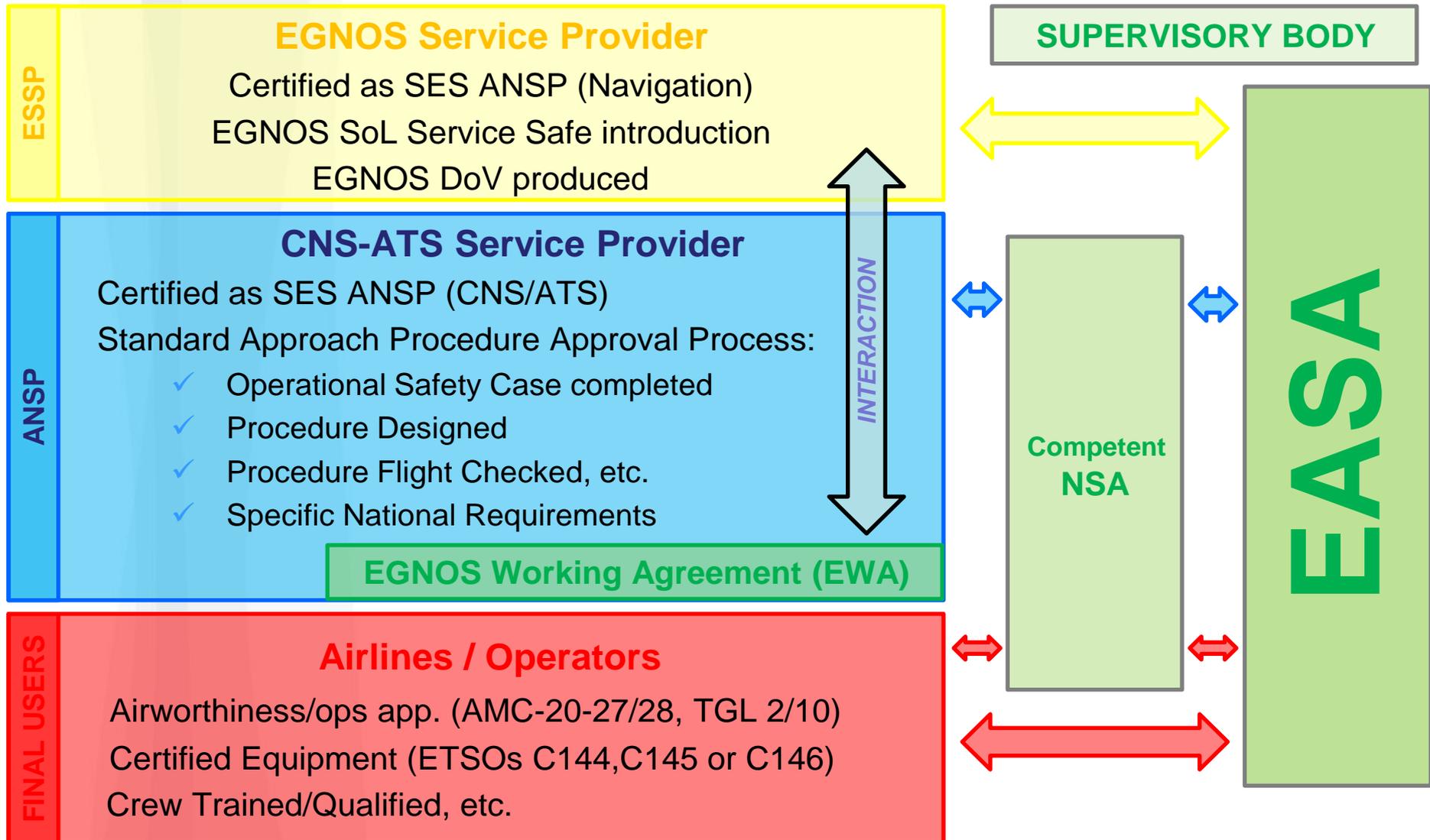
*“The implementation of RNP APCH procedures with vertical guidance (APV) to all instrument runway **ends by 2016**, either as primary or as backup approach procedures. RNP APCH to LNAV/VNAV and RNP APCH to LPV minima were the two options to fulfil the resolution.*

*RNP APCH to **LNAV minima acceptable** in places where APV implementation **is not possible or does not make sense** as no aircraft are suitably equipped for APV operations.”*

- **PBN Implementing Rule (PBN IR):**
 - **EGNOS will be a key enabler for the APV objectives achievement in the frame of the PBN IR.**
 - **EASA will now take the lead in the development of the IR** within the EASA regulatory framework with the technical support from EUROCONTROL.
 - **The PBN IR will be published under EASA formats and proceedings** (NPA, rule making arrangements), in the current regulation context (including Commission Implementing Regulation (EU) 716/2014 PCP supporting the implementation of the EATM Master Plan).

- **ATM Master plan and SESAR deployment.**

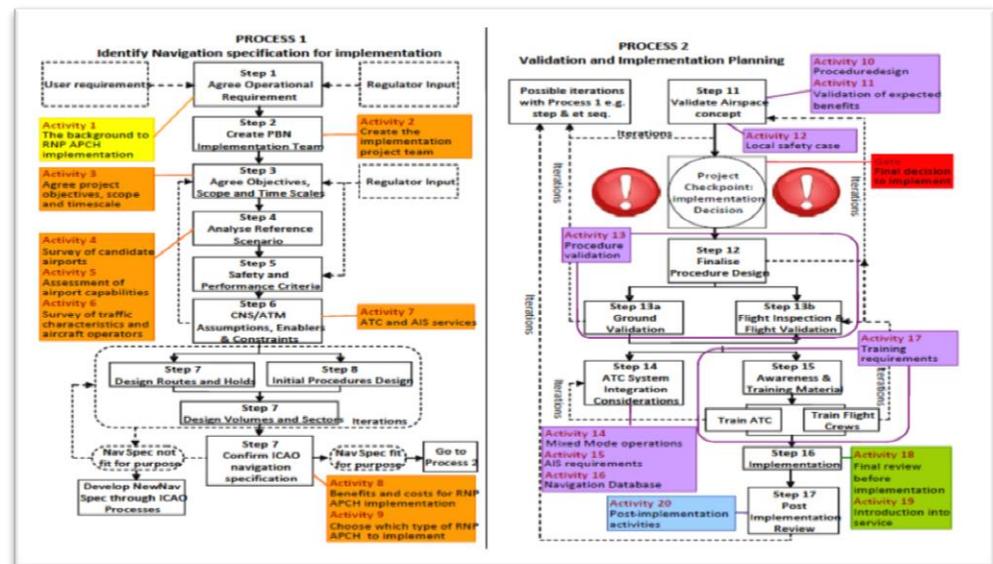
- Drivers for APV Implementation
- LPV Implementations: WHO DOES WHAT?
- Guidance Material and Supporting Cells
- LPV Implementation Status (September 2014)
- Further Plans
- LPV Activities in Non EU Countries
- Challenges for Europe's LPV implementation



- Drivers for APV Implementation
- LPV Implementations: WHO DOES WHAT?
- Guidance Material and Supporting Cells
- LPV Implementation Status (September 2014)
- Further Plans
- LPV Activities in Non EU Countries
- Challenges for Europe's LPV implementation

● **ICAO EUR RNP APCH Guidance Material (EUR Doc 025):**

- **Background** on RNP APCH operations as a brief introduction.
- The implementation described through **a set of 20 activities**.
- The Activities are mapped to the ICAO PBN implementation **Processes and Steps**.
- Provides reference to applicable **standards and regulatory documents** for each Activity.



- **ICAO EUR RNP APCH Guidance Material (EUR Doc 025):**
 - **Background** on RNP APCH operations as a brief introduction.
 - The implementation described through **a set of 20 activities**.
 - The Activities are mapped to the ICAO PBN implementation **Processes and Steps**.
 - Provides reference to applicable **standards and regulatory documents** for each Activity.

- **GSA and ESSP supporting material available at:**
 - **EGNOS Portal:** <http://egnos-portal.gsa.europa.eu/>
 - **ESSP Website.** <http://www.essp-sas.eu>

- **Main European LPV supporting cells:**
 - **Joint ICAO PBN TF / EUROCONTROL Navigation Steering Group (NSG) meetings.**
 - **EUROCONTROL Rnav Approach Implementation Support Group (RAISG).**
 - **GSA & ESSP teams! → we are available to support.**
 - ESSP presence in TF & WGs.
 - EMA Action Plan activities.
 - ESSP EWA interfaces/support.
 - GSA EGNOS implementation projects & initiatives.

- Drivers for APV Implementation
- LPV Implementations: WHO DOES WHAT?
- Guidance Material and Supporting Cells
- LPV Implementation Status (September 2014)
- Further Plans
- LPV Activities in Non EU Countries
- Challenges for Europe's LPV implementation

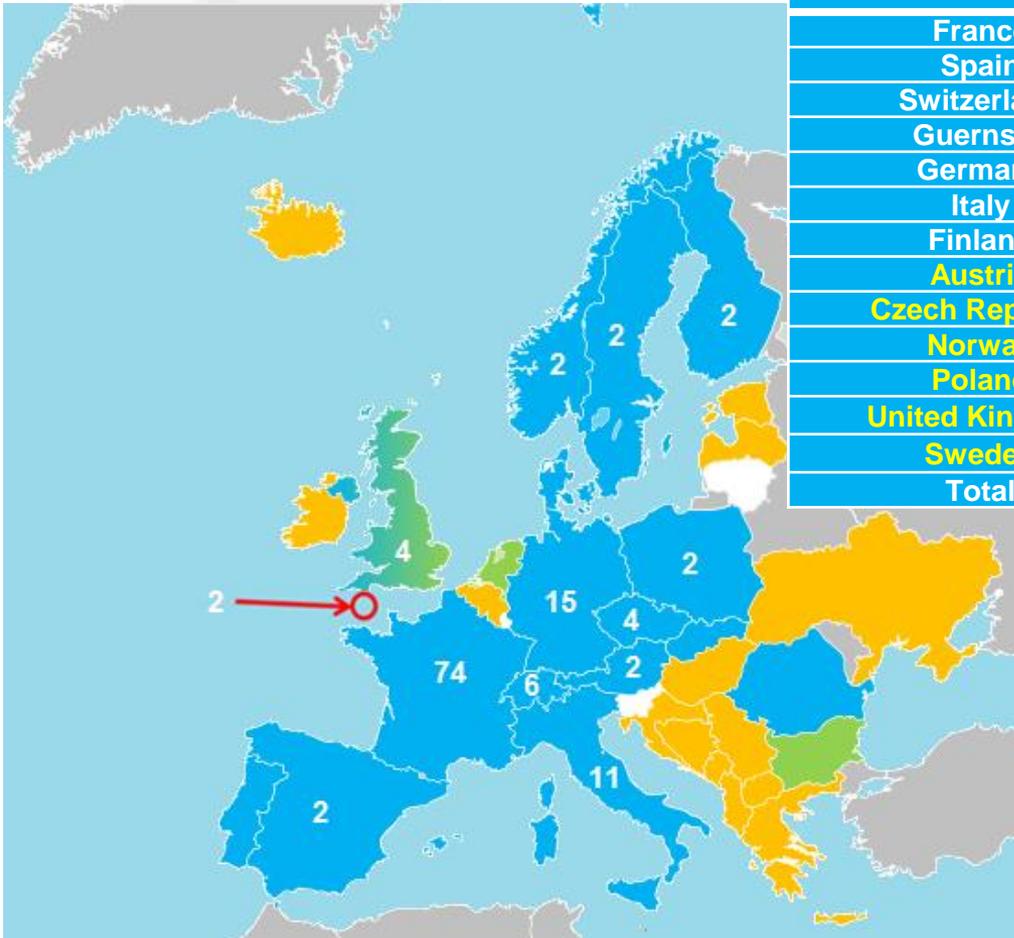
- **EWAs signed after The SoL Service Declaration:**
 - Latest: Naviar, Wolverhampton Airport Ltd, LPS SR, Romatsa.

- **(+2) Under signature or ready to be signed:**
 - Jersey, Bulatsa.

- **In progress:**
 - LVNL (NLD).
 - Land's End (GBR).
 - Booker Airfield (GBR).
 - Dutch Military airports (for Civil Operations - NLD).

- **Starting:**
 - Estonia
 - Ireland

**24 EWAs
already signed!**



Country	Airports	LPV Procedures	APV baro Procedures (EGNOS enabled)
France	55	74	1
Spain	1	2	0
Switzerland	6	6	0
Guernsey	1	2	0
Germany	40	15	71
Italy	5	11	0
Finland	1	2	0
Austria	2	2	0
Czech Republic	3	4	4
Norway	1	2	0
Poland	1	2	0
United Kingdom	2	4	0
Sweden	1	2	0
Total	121	128	76

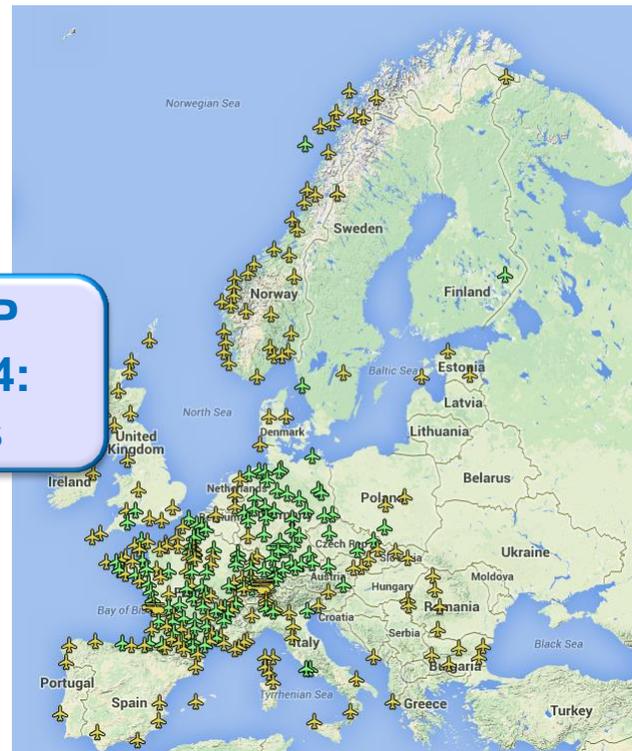
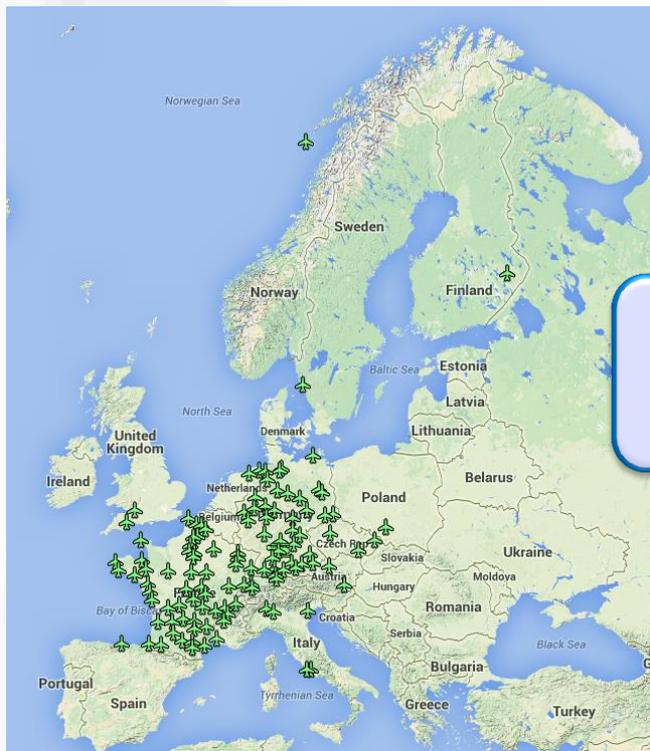
	Discussions paused
	Discussions on going
	EWA signed
3	Number of published LPV procedures
	No feedback

As of 18th Sept 2014

128 LPV serving 86 airports
76 runways served by EGNOS enabled APV Baro

Plans by 2016

>320 LPV planned by 2016

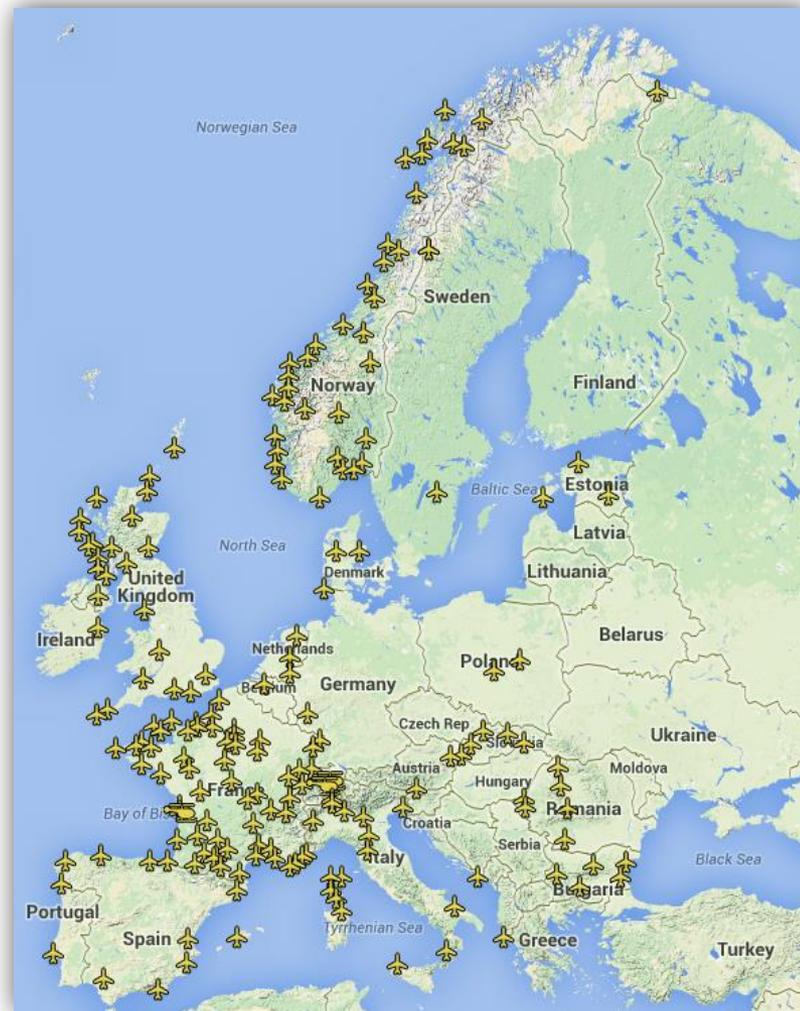
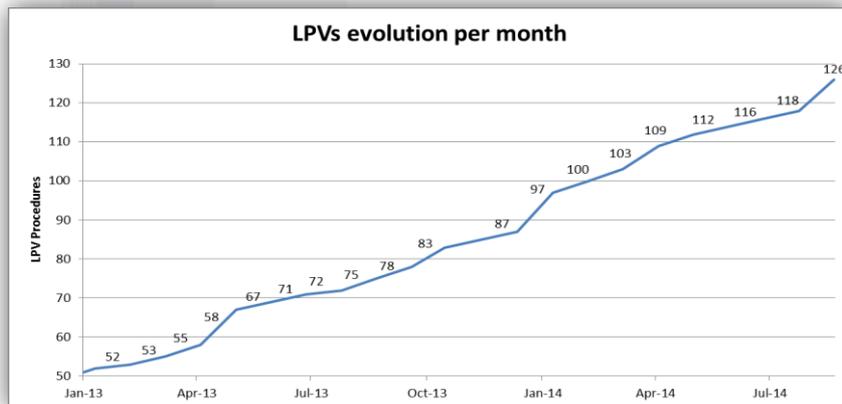


Check link: http://egnos-user-support.essp-sas.eu/egnos_ops/lpv_map/map.php

- Drivers for APV Implementation
- LPV Implementations: WHO DOES WHAT?
- Guidance Material and Supporting Cells
- LPV Implementation Status (September 2014)
- Further Plans
- LPV Activities in Non EU Countries
- Challenges for Europe's LPV implementation

SIGNIFICANT HIGHLIGHTS:

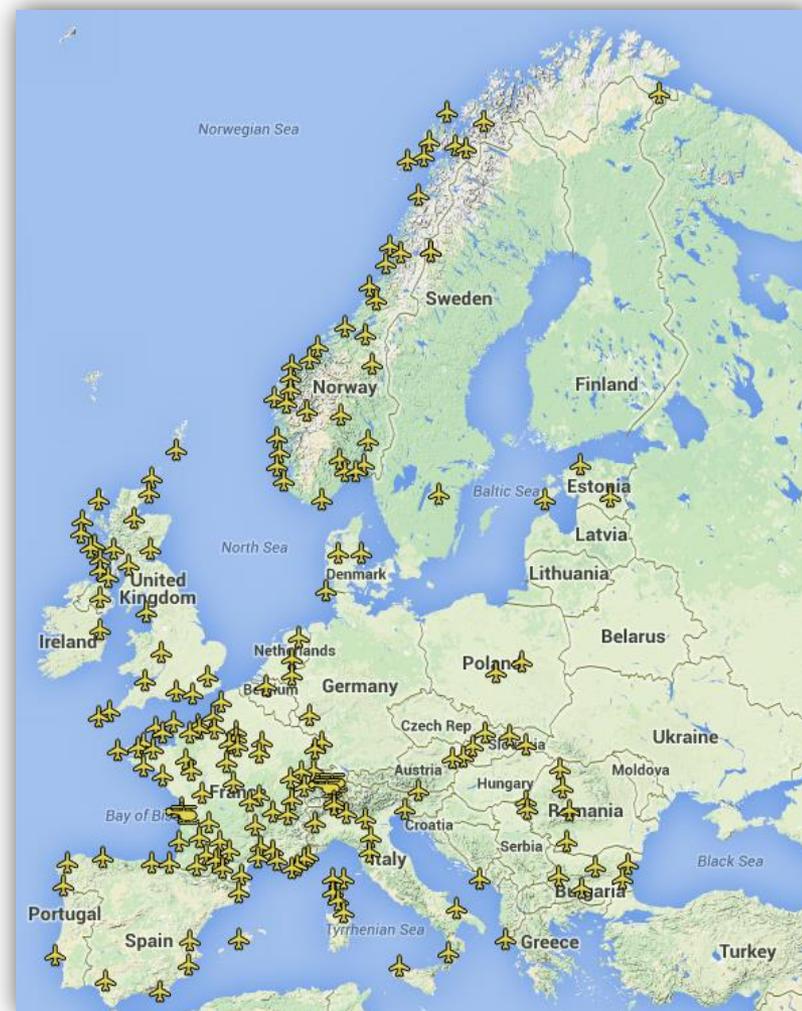
- **Massive boost** in southern **Norway**
>20 new airports by Q1 2015.
- **Growing interest** detected in **Sweden**
Following CAA's policy on APV implementation to all instrument RWY ends by 2016.
- **Numerous LPV publications** expected in **UK**
As a result of FP7 ACCEPTA project and other enablers like CAP 1122 policy.



SIGNIFICANT HIGHLIGHTS:

EGNOS newcomers publishing their first LPVs by end-2014 or 2015:

- **Ireland:** Dublin
- **Netherlands:** Teuge, Groningen
- **Denmark:** Aarhus, Karup
- **Portugal:** Lisbon
- **Croatia:** Dubrovnik
- **Bulgaria:** Burgas
- **Romania:** Cluj Napoca
- **Belgium:** Antwerp
- **Slovak Republic:** Bratislava, Kosice



- **EGNOS-based procedures implementation map and detailed list included in the ESSP website:**

http://egnos-user-support.essp-sas.eu/egnos_ops/lpv_map/map.php

- **All information coordinated with Eurocontrol's PBN Approach Map Tool available at:**

<https://extranet.eurocontrol.int/http://prisme-newgis.hq.corp.eurocontrol.int/pbn/>

- Drivers for APV Implementation
- LPV Implementations: WHO DOES WHAT?
- Guidance Material and Supporting Cells
- LPV Implementation Status (September 2014)
- Further Plans
- LPV Activities in Non EU Countries
- Challenges for Europe's LPV implementation

- **Non-EU EWA countries (within SES framework):**
 - **Bailiwick of GUERNSEY** (Channel Islands - 2011)
 - **SWITZERLAND** (2011)
 - **NORWAY** (2013)
 - **Bailiwick of JERSEY** (Channel Islands – 2014)

- **Non-EU (out of SES framework):**
 - **Explicit interest expressed by several neighbouring regions/countries.**
 - **On going discussions at EC level:**
 - A bilateral International/Institutional Agreement (between EC and the non-EU State) is required, defining the overall framework for the use of the EGNOS.
 - An agreement/coordination scheme: Deemed necessary between EASA and the Civil Aviation Authority of the non-EU country.
 - EWA ESSP / non-EU ANSP: Based on the previous agreement/s.

- Drivers for APV Implementation
- LPV Implementations: WHO DOES WHAT?
- Guidance Material and Supporting Cells
- LPV Implementation Status (September 2014)
- Further Plans
- LPV Activities in Non EU Countries
- Challenges for Europe's LPV implementation

- **Increase the number of EGNOS-enabled aircraft.**

- **Increase the number of published EGNOS based operations:**
 - Support to ANSPs PBN implementation / infrastructure rationalization strategies – **ANSPs LPV implementation plans.**

 - Implementation of **Instrument Approaches at VFR airfields.**

 - Implementation of **LPV/PiNS procedures for rotorcraft.**

 - LPV implementation / use in the **military domain.**

- **EGNOS based operations other than LPV:**
 - LP approach procedures
 - RNP 0.3 routes
 - Implementation of EGNOS LPV-200 operations
 - Potential EGNOS based RNP ARs
- **Support the development/use of EGNOS in new operational concepts:** Surveillance, advanced approach and departure procedures, military missions, RPAS, etc.

7-8 October
Lisbon

The **EGNOS** Service Provision
workshop



We certify you're there.



AGENDA (12:00 – 14:30)

12:00-13:30

EGNOS Safety-of-Life Service for Aviation

- ☞ Europe's LPV implementation status and plans for 2015

Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)

- ☞ EGNOS Adoption in Aviation: strategies and main achievements

Carmen Aguilera – Market Development Officer (GSA)

- ☞ Overview of the approach to PBN Implementation in Europe

Lorenzo Bella – Satellite Navigation Expert (EUROCONTROL)

- ☞ EASA role in EGNOS-based aircraft operations

Ivan Ferencz – ATM/ANS Organisation Approval Team Leader (EASA)

- ☞ CAP1122 LPV for visual airfields

Paul Fraser-Bennison – Policy Specialist -Aerodromes- (UK CAA)

13:30-14:30

Lunch



European
Global Navigation
Satellite Systems
Agency

EGNOS ADOPTION IN AVIATION: STRATEGY & MAIN ACHIEVEMENTS

EGNOS Service Provision Workshop

Lisbon, 7 October 2014

Carmen Aguilera
Market Development Department



GNSS aviation market overview



Bringing EGNOS to aviation community



Opportunities to take EGNOS onboard now!



Conclusions



GNSS aviation market overview

Communication, Navigation and Surveillance applications will rely on E-GNSS

Navigation

PBN Enabler

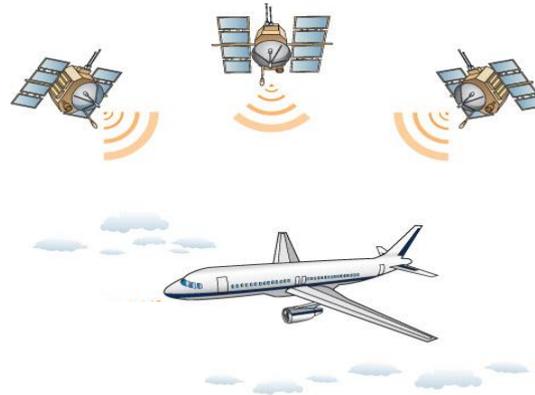
Navigation support in all phases of flight

Fleet management

Surveillance

Reliable PVT for
cooperative ADS-B

Location Protocol
Emergency locator &
Personal Locator Beacon

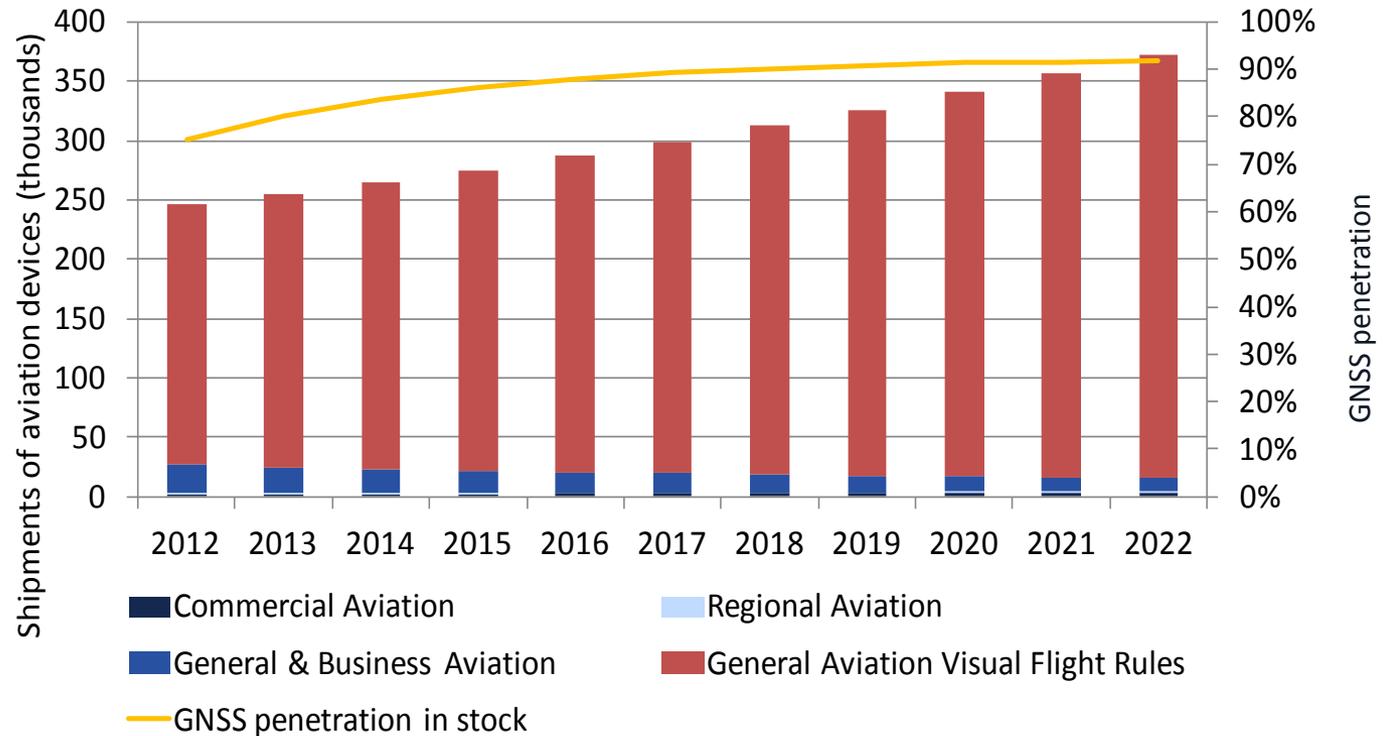


Communication

System and ATM
synchronisation

GNSS is expected to reach over 90% penetration by 2022 as an enabler of Performance Based Navigation

Shipments of GNSS devices by segment



Key market trends:

- Transition from traditional routing to GNSS navigation solutions for all phases of flight.
- New operational requirements driving the growth of GNSS avionics use.
- Growing availability of SBAS-based procedures in European aerodromes.





Bringing EGNOS to aviation community

Why EGNOS SoL for aviation users?

EGNOS is an 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 enables RNP APCH down to LPV minima

Chart: RNAV (GNSS)

RNP APCH

Chart: RNAV (RNP)

RNP AR APCH

WITHOUT VERTICAL GUIDANCE

WITH VERTICAL GUIDANCE

WITH VERTICAL GUIDANCE

LNAV

LP

LNAV/VNAV

LPV

LNAV/VNAV

GPS NPA
Expected to be
flown with CDFA

NPA SBAS supported
Localiser Performance

APV Baro
(can also be
supported by
SBAS)

APV SBAS supported
Localiser Performance
with Vertical Guidance

Authorisation
required, RF

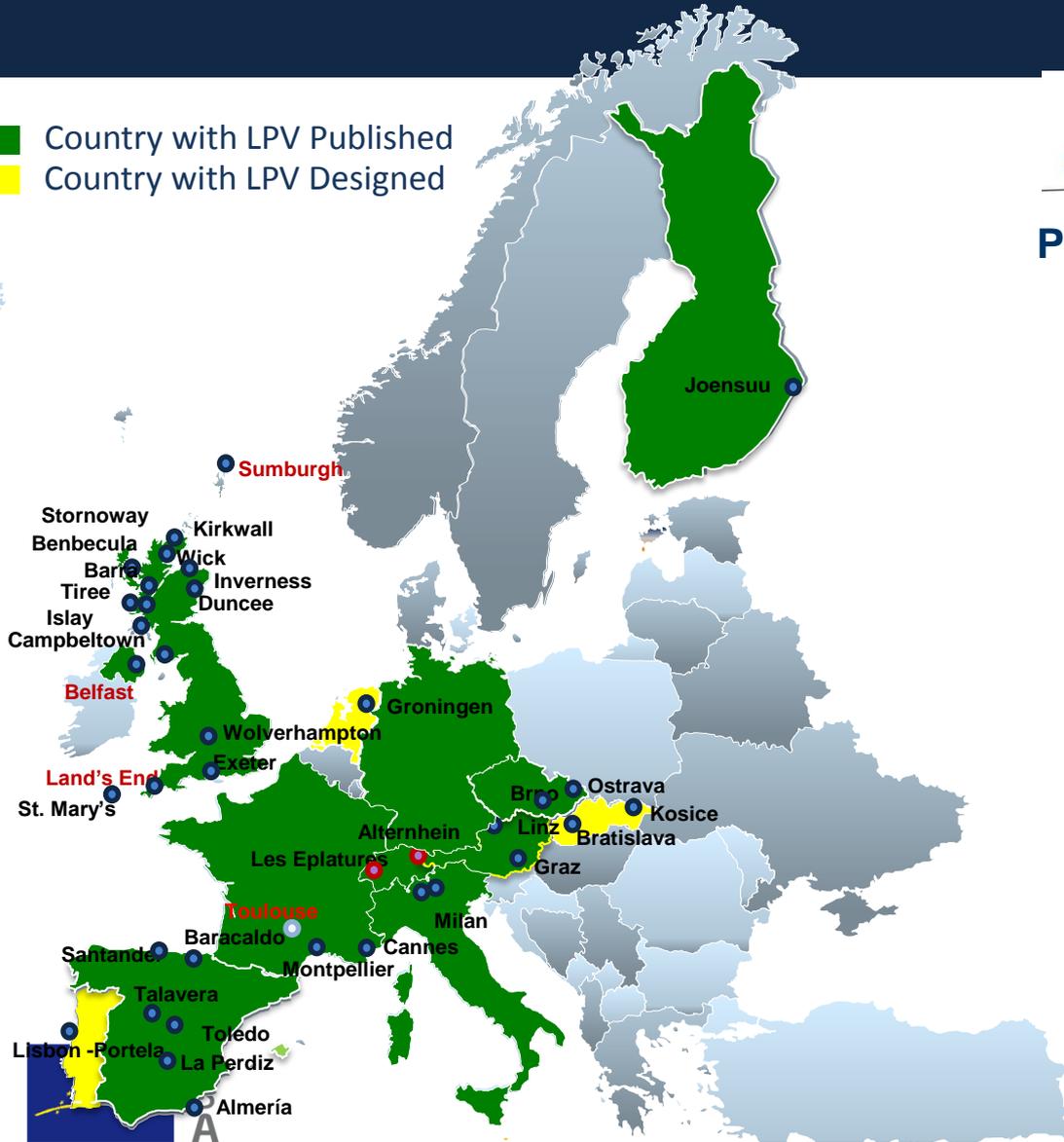


GSA strategy to foster EGNOS adoption in aviation

Procedures	EGNOS in PBN Plans	Analysis of where EGNOS can bring most benefits Regulatory enablers. E.g. LPV to non instrumental runways? Training to ANSP/CAA	Continuous user needs monitoring	Funding schemes	R&D for new concept validation
	Operational implementation	Technical assistance, e.g procedure design Cost Benefit analysis to establish implementation priorities			
Operators	Avionics available and certified	Analysis of SBAS capabilities of EU fleet Priorities for STC*/SB* development Sponsorship of AML development to reduce costs			
	Aircraft equipped and certified	Technical support: how to implement upgrade, how to get operational approval Cost Benefit analysis			
	Flight crew capability	EGNOS introduction in IFR training syllabus (EASA NPA 2013-25)			

Example of GSA funding to launch LPV roll out: ACCEPTA FP7 project

- Country with LPV Published
- Country with LPV Designed



- Publication year:
- 2011
 - 2012
 - 2013-2014

Total of 80 RWYs
Incl. 5 heliports

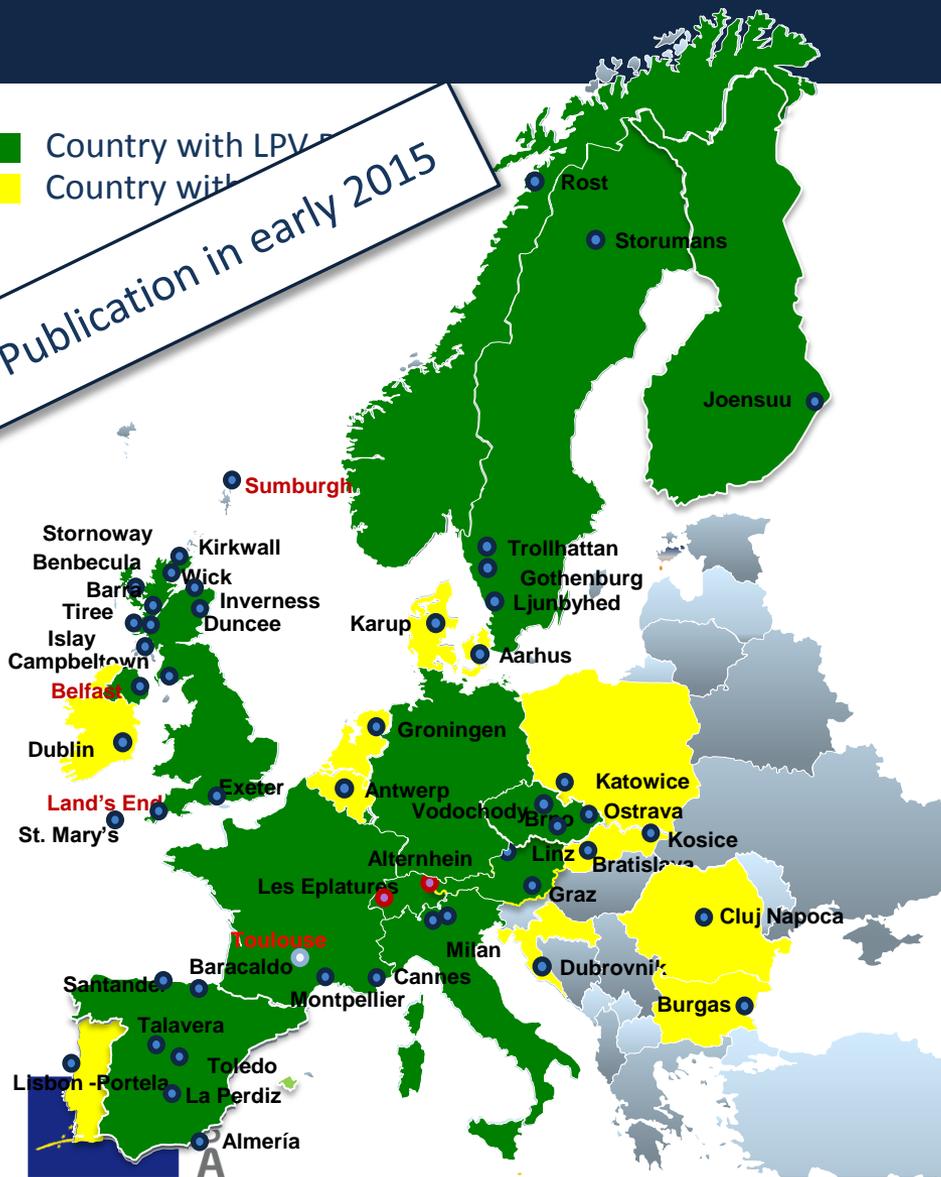
- Existing procedures:
 - ILS (Belfast Int.)
 - APV Baro (Brno)
 - LNAV (Exeter)
 - VOR/DME/LOC
 - VFR (Barra)
- Existing services:
 - Full ATC (Lisbon)
 - AFIS (Islay, Tiree)
 - NO ATC (La Perdiz)

GSA technical support to 1st LPV implementation: 10 additional countries get EGNOS onboard

Country with LPV

Country with

Publication in early 2015



Country	Airport	Status
Norway	Røst	In AIP, under validation
Sweden	Gothenburg City	Operational
Sweden	Ljungbyhed	Design started
Sweden	Storumans	Flight validation on-going
Sweden	Trollhattan	Design ongoing
Romania	Cluj Napoca	Design completed
Ireland	Dublin	Design completed
Belgium	Antwerp	Design on-going
Denmark	Aarhus	Design completed
Denmark	Karup	Design completed
Croatia	Dubrovnik	Design on-going
Czech Republic	Vodochody	Design started
Poland	Katowice	Operational on 13 Nov
Bulgaria	Burgas	Publication Q1 2015

Snow ball effect already happening!:

- **Norway** regulation to implement APV to all instrumental runways by 2016. 7 LPVs by Nov 2014+40 LPVs planned
- **Denmark:** regional airports association demand more LPV.
- **Sweden:** 8 operators request GSA support

GSA strategy to foster EGNOS adoption in aviation

Procedures	EGNOS in PBN Plans	Analysis of where EGNOS can bring most benefits Regulatory enablers. E.g. LPV to non instrumental runways? Training to ANSP/CAA	Continuous user needs monitoring	Funding schemes	R&D for new concept validation
	Operational implementation	Technical assistance, e.g procedure design Cost Benefit analysis to establish implementation priorities			
Operators	Avionics available and certified	Analysis of SBAS capabilities of EU fleet Priorities for STC*/SB* development Sponsorship of AML development to reduce costs			
	Aircraft equipped and certified	Technical support: how to implement upgrade, how to get operational approval Cost Benefit analysis			
	Flight crew capability	EGNOS introduction in IFR training syllabus (EASA NPA 2013-25)			

Enabling a positive business case: 19 Operators upgrading the fleet to LPV

REGIONAL

Aurigny



6x BN2B Trislander

Air Nostrum



5x ATR 72-600



15x CRJ 1000

Skybus



Twin-Otter

Chalair



2 x Beechcraft1900

CityJet (VLM)



8x Fokker 50

Loganair



2x Twin Otter

Hebridean Air



2x BN2B Islander

Wideroe



DHC 8-100

BUSINESS

Inaer



Bell 412

NetJets



Hawker 750

Specsavers



2x Beech 350

REGA



Eurocopter EC135

GENERAL/TRAINING

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
Lund University School
of Aviation

Dutch & MartinAir Flight Academies



4x Diamond DA42

Ljungbyheds Flygklubb



Cirrus SR20

DA40-180

Coming soon

Coming soon

Coming soon

EGNOS is the preferred option for Business Operators...



The fleet is already equipped and ready to fly LPV:

- Most OEMs for business aviation and high end helicopters provide baseline configuration with SBAS/EGNOS equipage for their new models
- Just operational approval is needed

Users request it:

- Larger business operator in Europe (NetJet) is an EGNOS pioneer user
- Advanced procedures successfully tested, e.g. RF legs

It makes 'business sense':

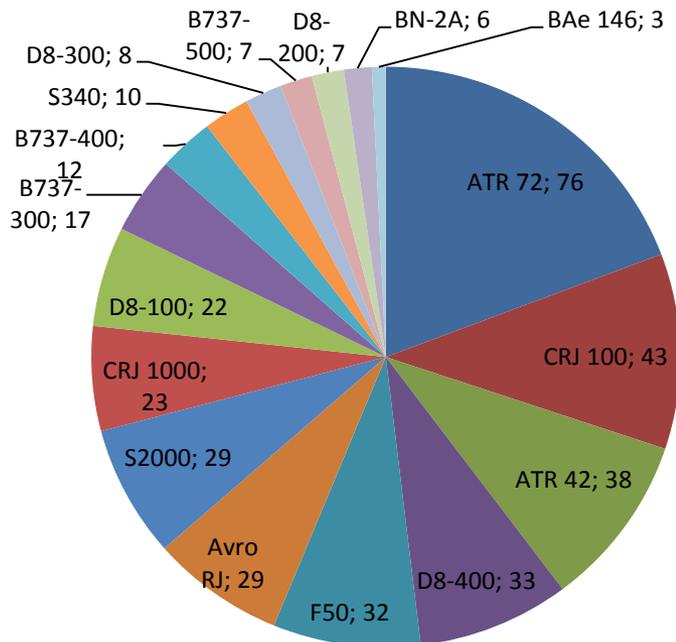
- On time arrival to less equipped airfields
- Improvement in service regularity
- Optimization of untapped regional airport capacity

Memorandum of Understanding (MoU) to promote the wide use of EGNOS – precision-based navigation (PBN) – at regional airports in Europe

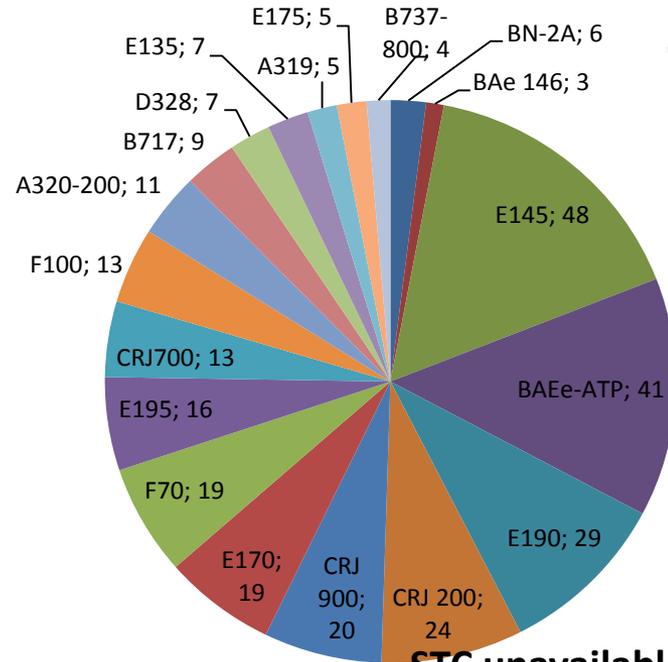


...EU Regional Airlines are ready for EGNOS...

SBAS Retrofitting capabilities of European General Airlines fleet



Retrofittable: 395 a/c



STC unavailable: 308 a/c

LPV only retrofit can be expensive
 Positive business case for combined mandated upgrades:
Datalink + ADS-B out + LPV updates



...General Aviation needs cost effective avionics...

GNS430W



- Garmin GNS 430W/530: GNSS/SBAS avionics most commonly used by IFR GA in EU
- LPV Aircraft retrofit with GNS 430W/530W is considered a Major Modification by EASA

➔ 😞
Average **10,000 €**

GNS530W




Solution:
All Model List for CS 23 (light GA aircraft)

➔ 😊
300€



*“This initiative is of high interest of PPLIR Europe members!
We are ready to support this to increase safety”*

Paul Sherry, Chairman & Director



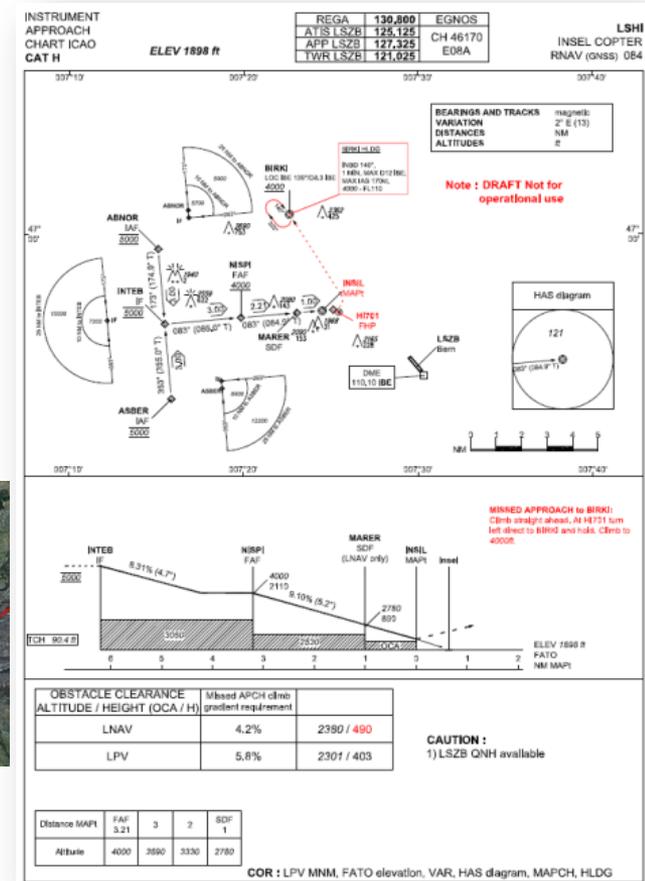
“EASA is ready to take this application further for the benefit of GA users”

Paul Hatton, EASA

...and EGNOS is a reality in HEMS operations

PinS LPV procedure to Insel Hospital First PinS LPV approved in Europe! June 2014

- The new procedure entails to REGA operation:
 - Improved access to Insel Hospital in adverse weather conditions
 - Lower approach minimums
 - More accurate positioning of the navigation solution
 - Vertically guided approaches



PinS LPV criteria in ICAO PAN-OPS in Nov 2014





Opportunities to take EGNOS onboard now!



Open 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 futures 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



Open 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 futures 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



23 Days left!



The call is structured in 7 areas of activities:

RNP APCH procedures to LPV minima based on EGNOS

PinS Procedures to LPV minima based on EGNOS

Aircraft or rotorcraft forward fit

Aircraft or rotorcraft retro fit

Development of Service Bulletin

Development of Supplemental Type Certificate

Other EGNOS based operations and development of Enablers

Latest information at GSA website and social networks: check for clarifications!

European Global Navigation Satellite Systems Agency

Home Links Contact

Search

GSA GALILEO EGNOS R & D SECURITY THE MARKET COMMUNICATION

About GSA
Organisation
Governance
Procurement
Grants
Job Opportunities
News

The Register An integral part of
More Information
Partners

GNSS Service Centre Moving Towards Full...
The European GNSS Service Centre (GSC) is preparing to be the essential interface between global users and Galileo's Full Operational...

Gothenburg City Airport pioneers LPV approach in...
Gothenburg City airport is leading the way in Sweden for satellite-based landing procedures enabled by Europe's EGNOS system – improving...

GNSS Service Centre Continues to Grow
The GNSS Service Centre (GSC), based within Madrid's National Institute of Aerospace Technology (INTA), is an integral part of the European...

<http://www.gsa.europa.eu/call-proposals-acceleration-egnos-adoption-field-civil-aviation-0>

<https://www.facebook.com/EuropeanGnssAgency>

<https://twitter.com/EGNOSPortal>



Conclusions

Opportunities and challenges ahead

LPV roll out in Europe speeds up

- ✓ x2 countries with LPV procedures published in one year
- ✓ 21 countries plan to publish LPV in 2014-2015
- ✓ Increased user demand
- ✓ More available avionics solutions
- ✓ Pioneer regulation and implementations for LPV to non instrumental runways
- ✓ DataLink and Surveillance requirements improve the SBAS business case
- ✓ Rotorcraft market opens up



Challenges and opportunities ahead

- LPV demand vs design/approval capacity?
- High demand at high latitudes
- LPV retrofit solutions exists for aprox. 20% of EU aviation fleet
- EGNOS Integrity added value for other applications? Surveillance, Vertical Separation
- LPV-200 capability, enabling CAT I approach procedures (down to 200ft)





Thank you!

For further information contact:

Carmen Aguilera

Carmen.aguilera@gsa.europa.eu

AGENDA (12:00 – 14:30)

12:00-13:30

EGNOS Safety-of-Life Service for Aviation

- ☞ Europe's LPV implementation status and plans for 2015
Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)
- ☞ EGNOS Adoption in Aviation: strategies and main achievements
Carmen Aguilera – Market Development Officer (GSA)
- ☞ Overview of the approach to PBN Implementation in Europe
Lorenzo Bella – Satellite Navigation Expert (EUROCONTROL)
- ☞ EASA role in EGNOS-based aircraft operations
Ivan Ferencz – ATM/ANS Organisation Approval Team Leader (EASA)
- ☞ CAP1122 LPV for visual airfields
Paul Fraser-Bennison – Policy Specialist -Aerodromes- (UK CAA)

13:30-14:30

Lunch

Overview of PBN Implementation in Europe

EGNOS Service Provision Workshop
7-8 October 2014 (Lisbon)
EUROCONTROL

Table of contents

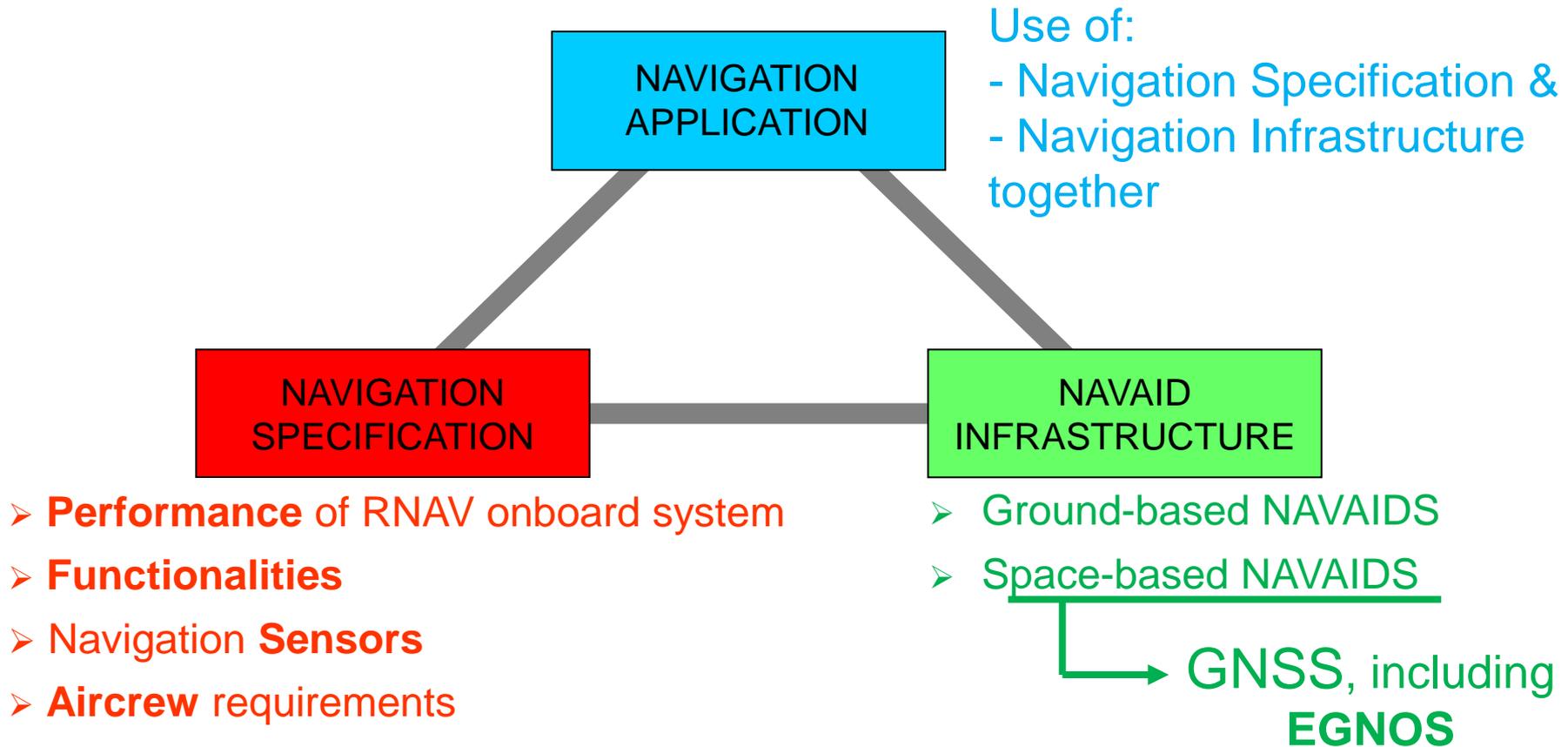
- **Part 1: ICAO and European frameworks for EGNOS-based operations implementation**
 - ... within PBN context (RNP APCH)
 - ... ICAO Assembly Resolutions and priorities
 - ... The European regulatory context (PBN IR and PCP IR)
- **Part 2: RNP APCH examples and facts**
 - ... Example charts and concept of operation
 - ... APV SBAS procedures and LPV 200
 - ... EUROCONTROL support to deployment
- **Part 3: RNP APCH deployment status (Map Tool)**
 - ... current status and plans
 - ... APV, LNAV/VNAV, LPV details
 - ... Improved monitoring tools coming soon

- Part 1 -

**ICAO and European frameworks for
EGNOS-based operations
implementation**

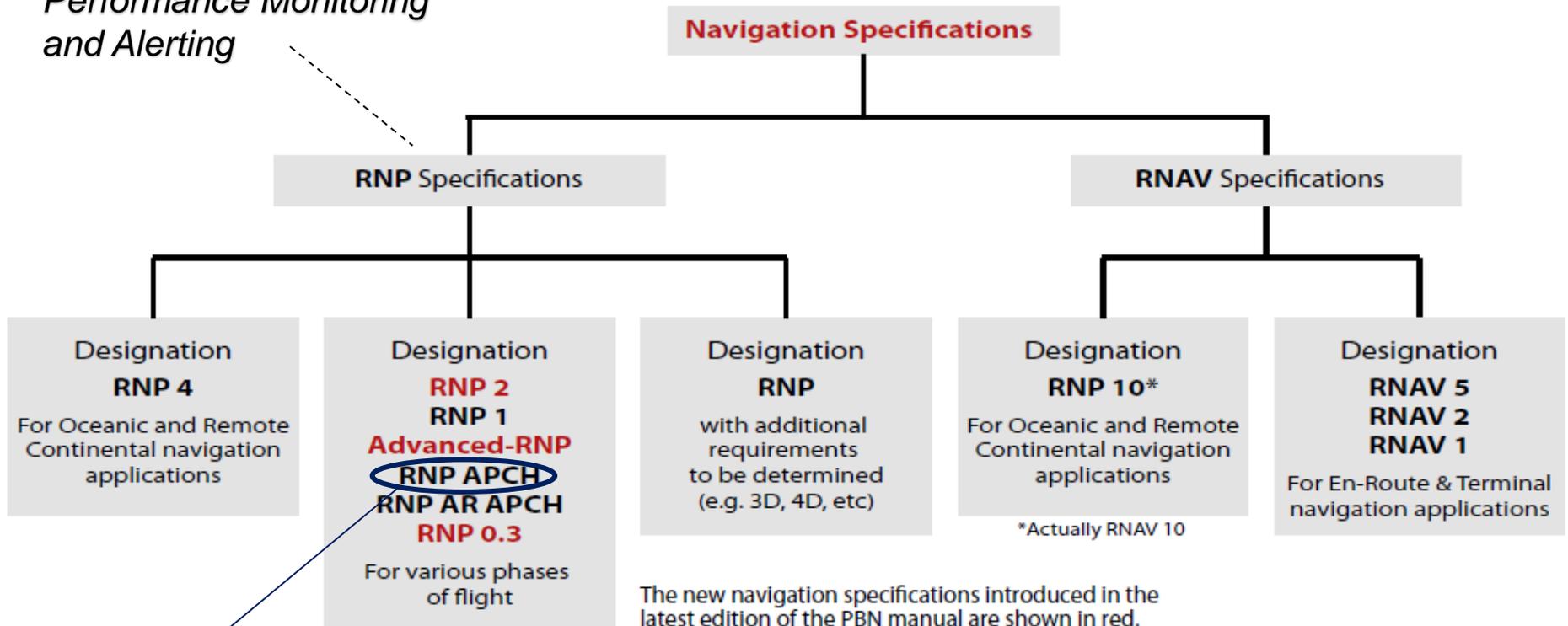
The PBN Concept

(according to ICAO PBN Manual - doc 9613)



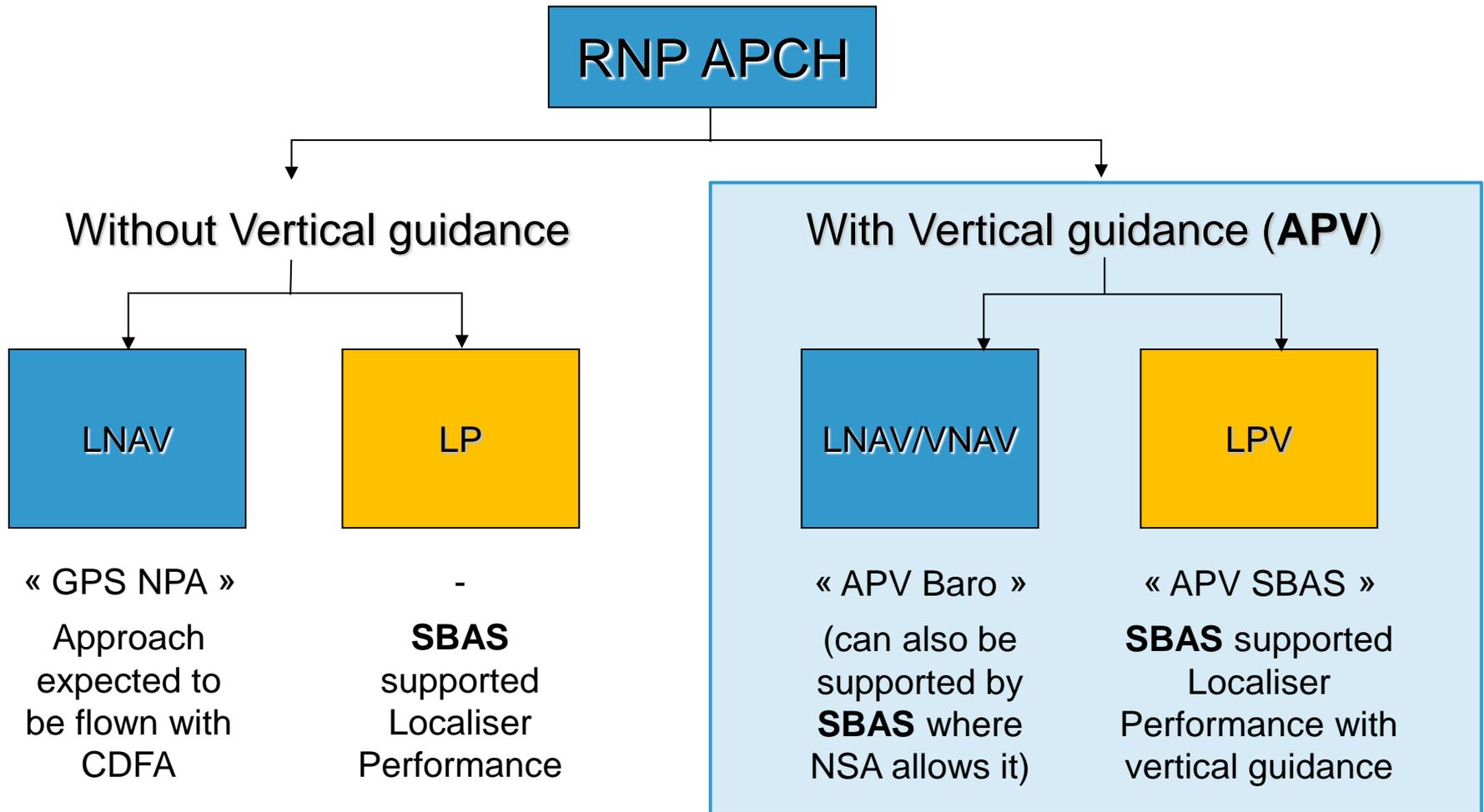
Navigation Specifications (today)

*With On-Board
Performance Monitoring
and Alerting*



EGNOS can support all PBN applications. However, The only PBN application that requires EGNOS is in the RNP APCH navigation specification.

4 types of RNP APCH



Note: LP will be published only where LPV cannot be

ICAO Recommendations (1/2)

- **ICAO (36th Assembly Oct 2007) resolved**

“ States and planning and implementation regional groups (PIRGs) should complete a PBN implementation plan by 2009 to achieve:

- *Implementation of RNAV and RNP operations for **en route and terminal areas** according to established timelines and intermediate milestones; and*
- *Implementation of approach procedures with vertical guidance (**APV**) (**Baro-VNAV and/or augmented GNSS**) for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows:*
 - *30% by 2010*
 - *70% by 2014. ”*

ICAO Recommendations (2/2)

- **37th ICAO Assembly (Oct 10):**

Concerning APproach with Vertical guidance (APV), the resolution added:

*“ ... implementation of straight-in **LNAV only procedures, as an exception**, for instrument runways at aerodromes where there is no local altimeter setting available and where there are no aircraft suitably equipped for APV operations. ”*

Agreed stepped approach to deployment (EANPG 55th conclusion – Nov 2013)

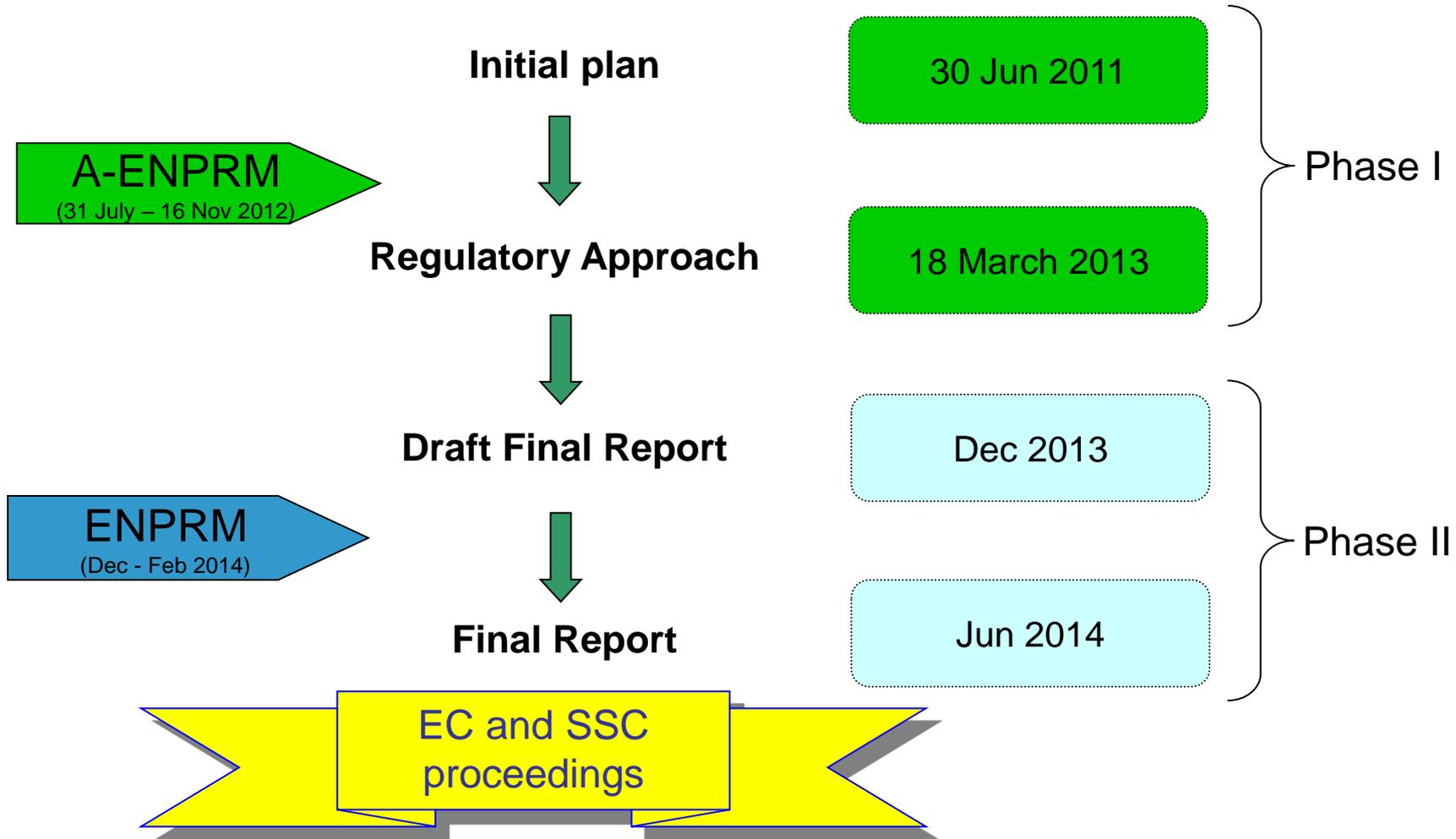
- a. *Implement approach procedure with vertical guidance (APV Baro-VNAV) or localizer performance with vertical guidance (LPV) procedures:*
 - i) *at instrument runways served **only by** procedures based on non-directional beacons (**NDB**) and*
 - ii) *as replacements to all **non-precision approach** procedures*

Note: Whenever LPV is available, a Baro-VNAV should be provided too, as practicable
- b. *Implement APV as **back-up to precision approaches** procedures.*

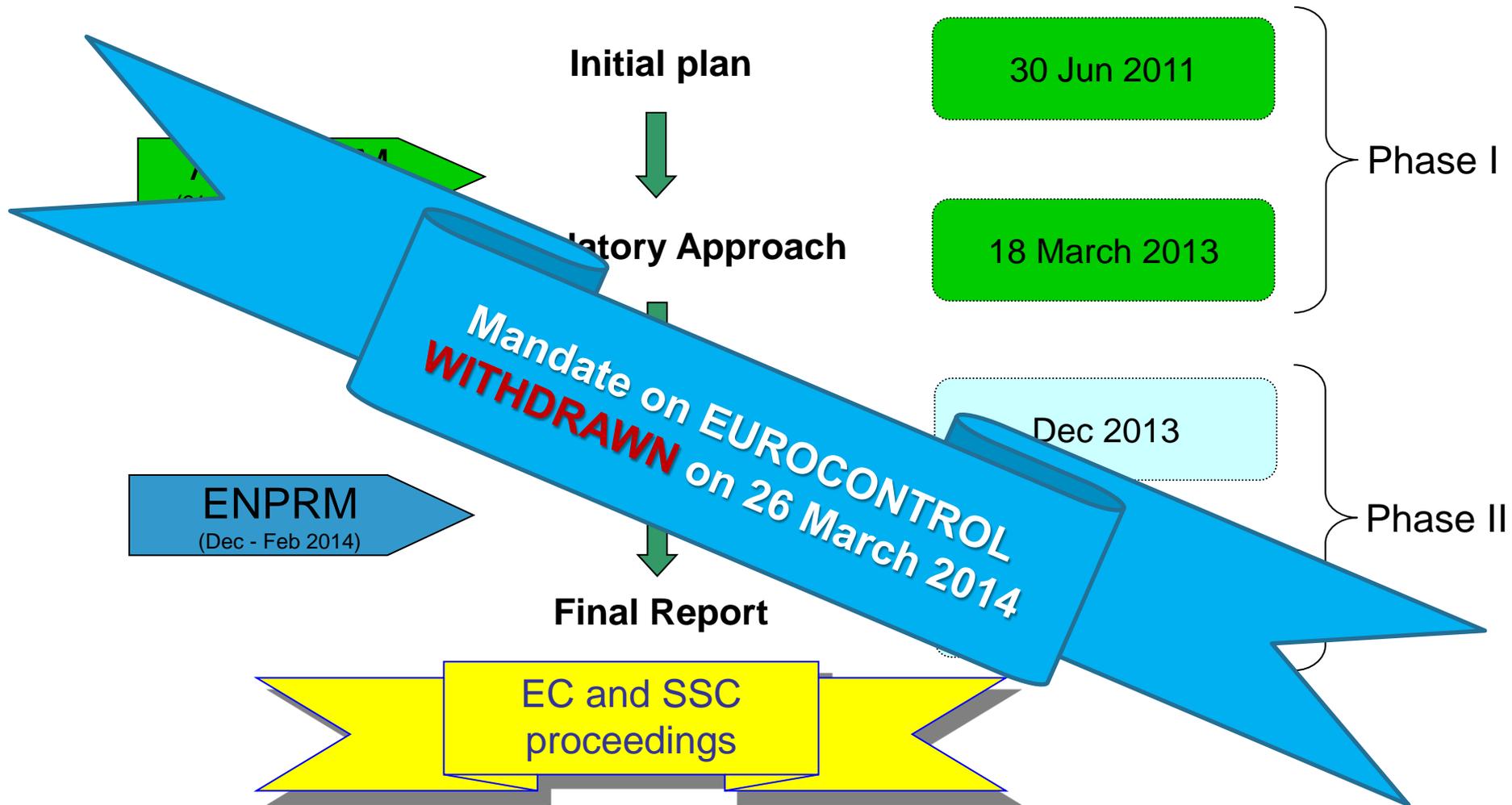
Implementation decisions shall be taken in close consultation with the airspace users and taking their needs/priorities into account.

Note: *The availability of an approach with vertical guidance (3D) is **the** priority*

Original European IR Development Process



Original European IR Development Process

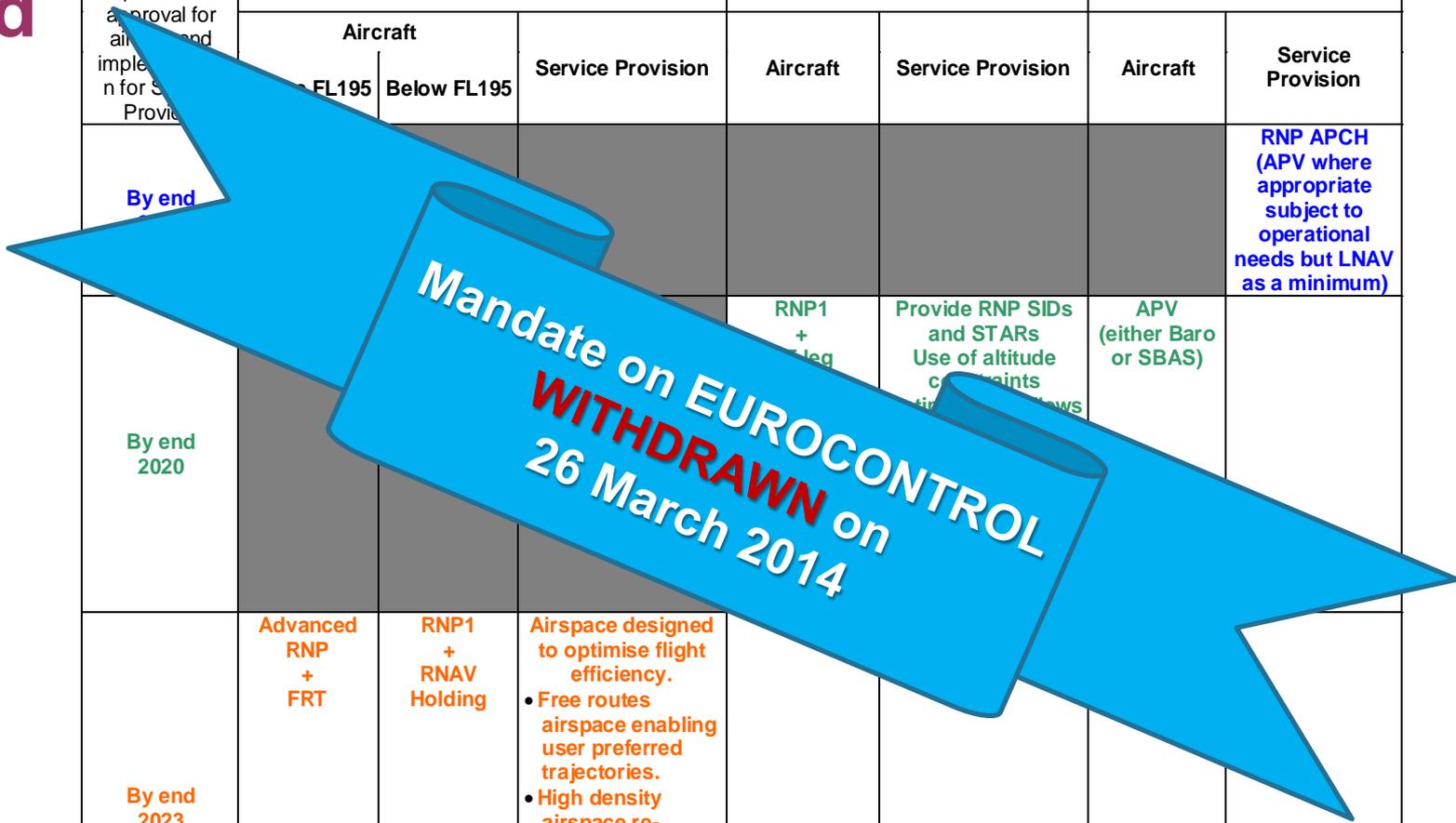


Proposed Options for draft PBN IR

Date of applicability of certification and operational approval for aircraft and implementation for Service Provider	PHASE OF FLIGHT						
	En-Route			Terminal		Final Approach	
	Aircraft		Service Provision	Aircraft	Service Provision	Aircraft	Service Provision
Above FL195	Below FL195						
By end 2018							RNP APCH (APV where appropriate subject to operational needs but LNAV as a minimum)
By end 2020				RNP1 + RF leg + RNAV Holding + Ability to meet altitude constraints	Provide RNP SIDs and STARs Use of altitude constraints Optimise TMA flows to provide: <ul style="list-style-type: none"> • Capacity • Efficiency • Access • CCO/CDAs based on positive CBA 	APV (either Baro or SBAS)	
By end 2023	Advanced RNP + FRT	RNP1 + RNAV Holding	Airspace designed to optimise flight efficiency. <ul style="list-style-type: none"> • Free routes airspace enabling user preferred trajectories. • High density airspace re-designed for closer space routes and route conformance monitoring tools implemented to manage traffic 				

Proposed Options for draft PBN IR

Date of applicability of certification and operational approval for implementation for Service Provision	PHASE OF FLIGHT						
	En-Route			Terminal		Final Approach	
	Aircraft		Service Provision	Aircraft	Service Provision	Aircraft	Service Provision
Above FL195	Below FL195						
By end							RNP APCH (APV where appropriate subject to operational needs but LNAV as a minimum)
By end 2020				RNP1 + Leg	Provide RNP SIDs and STARs Use of altitude constraints Minimum altitudes	APV (either Baro or SBAS)	
By end 2023	Advanced RNP + FRT	RNP1 + RNAV Holding	<p>Airspace designed to optimise flight efficiency.</p> <ul style="list-style-type: none"> Free routes airspace enabling user preferred trajectories. High density airspace re-designed for closer space routes and route conformance monitoring tools implemented to manage traffic 				



Current status of European IR Development

- **EASA** now overseeing PBN implementation
- **Total System** Approach
 - ‘Performance-Based Navigation (PBN) implementation in the European Air Traffic Management Network (EATMN)’*
- **Planned publication dates:**
 - NPA: 2014/Q4
 - Consultation: 3 month
 - Opinion: 2015/Q1
 - Decision: 2015/Q4

Existing regulation in Europe

- **Pilot Common Projects (PCP) IR** - Commission Implementing Regulation (EU) No 716/2014, dated 27 June 2014
- Includes **APV** (LNAV/VNAV and LPV)
- Scope: **24 Major Airports** in EU and EFTA Member States
11 already have published APV procedures

London Heathrow
Paris CDG
London Gatwick
Paris Orly
London Stansted
Milan Malpensa
Frankfurt Int.
Madrid Barajas

Amsterdam Schipol
Munich FJ Strauss
Rome Fiumicino
Barcelona El Prat
Dusseldorf Int.
Zurich Kloten
Brussels National
Oslo Gardermoen

Stockholm Arlanda
Berlin Brandenburg
Manchester
Palma de Mallorca
Copenhagen Kastrup
Vienna Schwechat
Dublin
Nice Cote d'Azur

- Target Date: **1 January 2024**

- Part 2 -

RNP APCH examples and facts



EUROCONTROL

RNP APCH Chart Example 1

- Brest (France):
 - LNAV minima
 - LNAV/VNAV minima
 - LPV minima

AIP
FRANCE

APPROCHE AUX INSTRUMENTS

Instrument approach
CAT A B C D
ALT AD : 325, **THR : 289 (10 hPa)**

AD2 LFRB IAC 09
03 MAY 12

BREST BRETAGNE

RNAV (GNSS) RWY 07R

ATIS BRETAGNE : 129 350

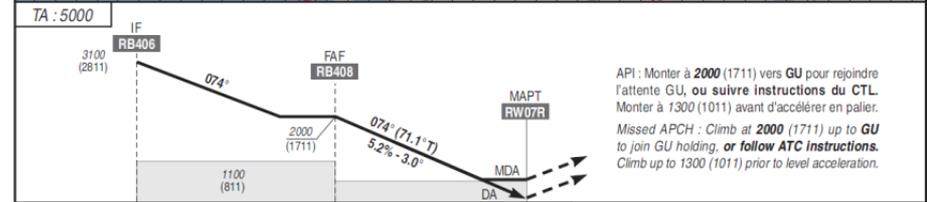
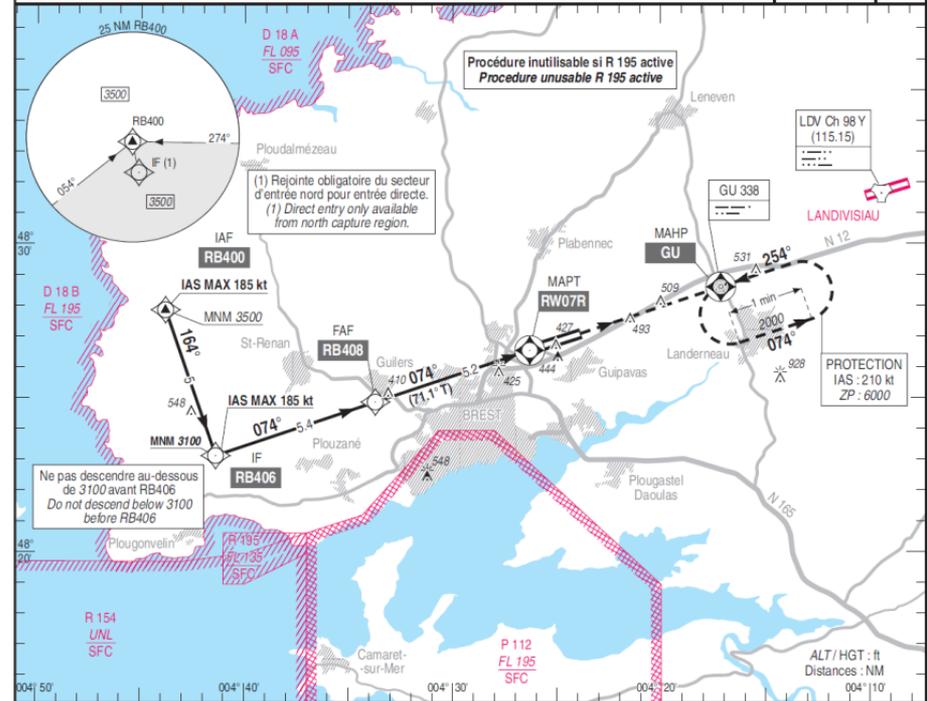
APP : IROISE Approche/Approach 135.825 (L)

LANDI Approche/Approach 122.4 (L) pendant HOR activité de LANDI APP / During LANDI APP HOR of activity.

TWR : BRETAGNE Tour/Tower 120.1

EGNOS
Ch 51177
E07A
RDH : 50

VAR
3° W
(10)



→ THR (NM) 10.6 5.2 0 REF HGT : ALT THR

MNM AD : distances verticales en pieds, RVR et VIS en mètres. / Vertical distances in feet, RVR and VIS in meters.

CAT	LPV		OCH LPV		LNAV/VNAV OCH : 364		LNAV OCH : 367		MVL / Circling ⁽¹⁾		DIST RW07R					
	DA (H)	RVR	DA (H)	RVR	DA (H)	RVR	MDA (H)	RVR	MDA (H)	VIS	ALT (HGT)	5	4	3	2	1
A					1500		1500	780 (490)	1500			1930	1615	1295	975	700
B	590 (300)	1400	300		1500		1500	810 (520)	1600			(1641)	(1326)	(1006)	(686)	(410)
C					1700		1700	910 (620)	2400							
D					1700		1700	990 (700)	3600							

T MINIMUM Baro VNAV : -15°C

Observations / Remarks : (1) MVL interdites au sud de la piste / Circling prohibited South of RWY.
Panne de guidage GNSS lors de l'approche / Loss of guidance during approach : voir / see ENR 1.5

	FAF - THR	5.22 NM	70 kt	85 kt	100 kt	115 kt	130 kt	160 kt	185 kt
VSP (ft/min)		370	450	530	610	690	850	980	



EUROCONTROL

AIP
FRANCE

AD2 LFRB IAC 09
03 MAY 12

APPROCHE AUX INSTRUMENTS

Instrument approach

CAT A B C D

ALT AD : 325, THR : 289 (10 hPa)

BREST BRETAGNE

RNAV (GNSS) RWY 07R

ATIS BRETAGNE : 129.350

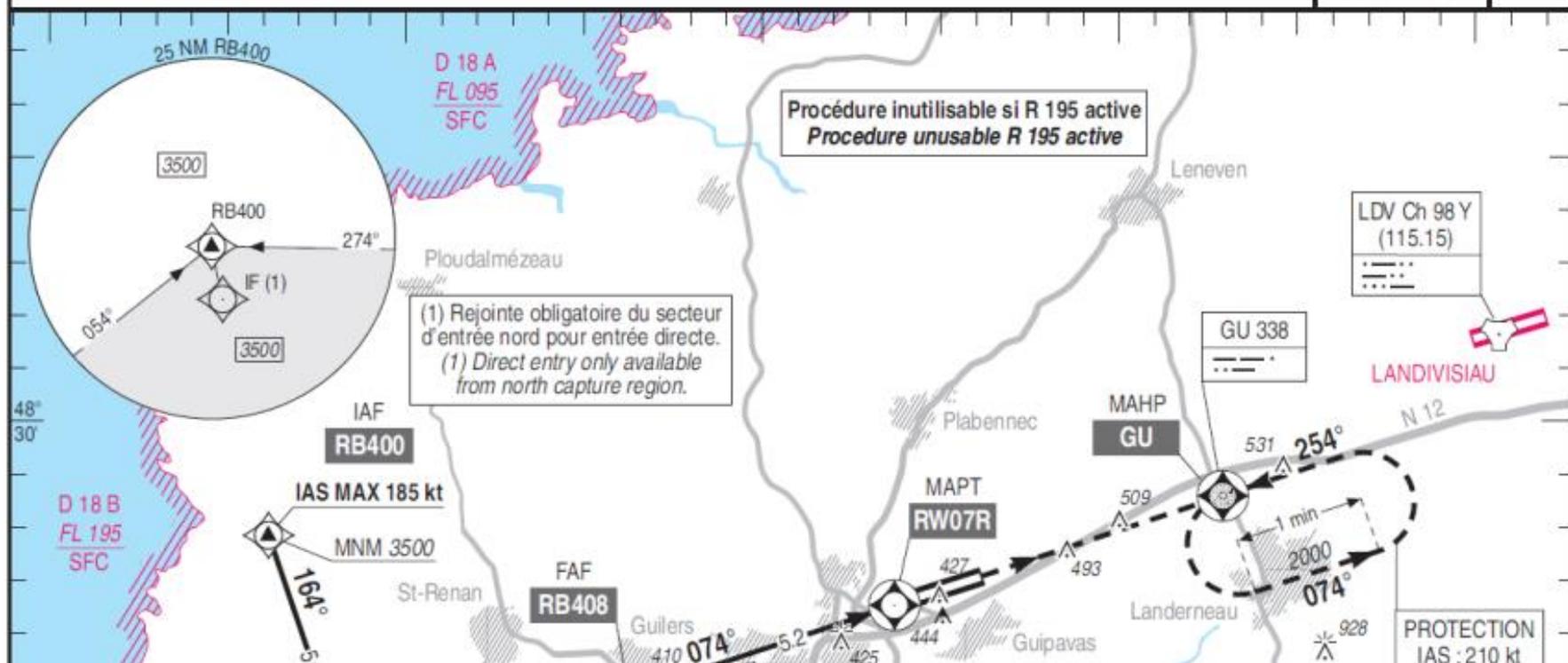
APP : IROISE Approche/Approach 135.825 (L)

LANDI Approche/Approach 122.4 (L) pendant HOR activité de LANDI APP / During LANDI APP HOR of activity.

TWR : BRETAGNE Tour/Tower 120.1

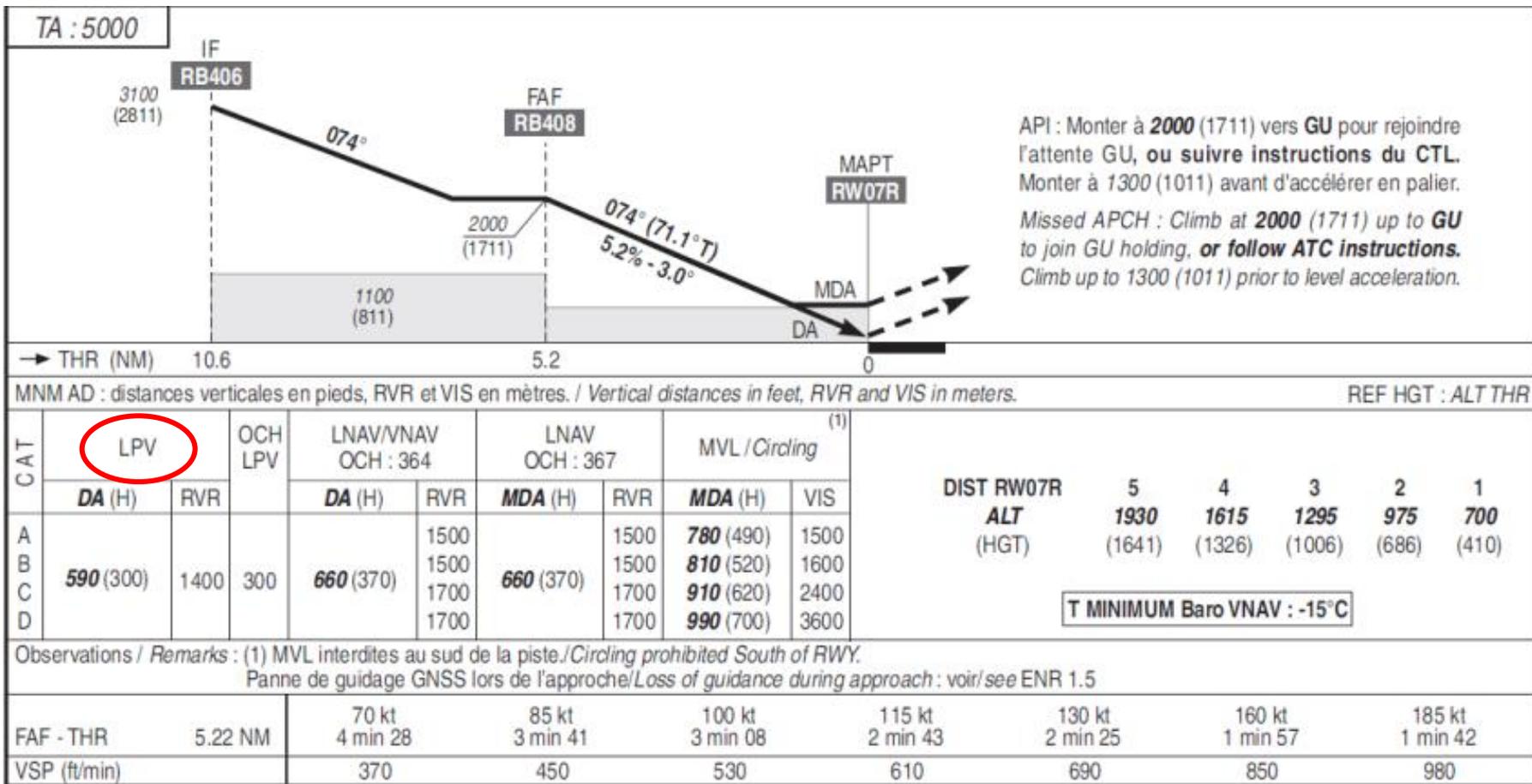
EGNOS
Ch 51177
E07A
RDH : 50

VAR
3° W
(10)





EUROCONTROL



API	IDENT	VSS
X	X	X

AMDT 05/12 CHG : R 195, GU, obstacles, texte API, MNM.

© SIA

Note: LPV capable aircraft will fly LPV approach or LNAV in case of degraded EGNOS performances



EUROCONTROL

RNP APCH Chart Example 2

LUFTFAHRTHANDBUCH DEUTSCHLAND
AIP GERMANY

AD 2 EDDH 4-6-3
Effective: 6 FEB 2014

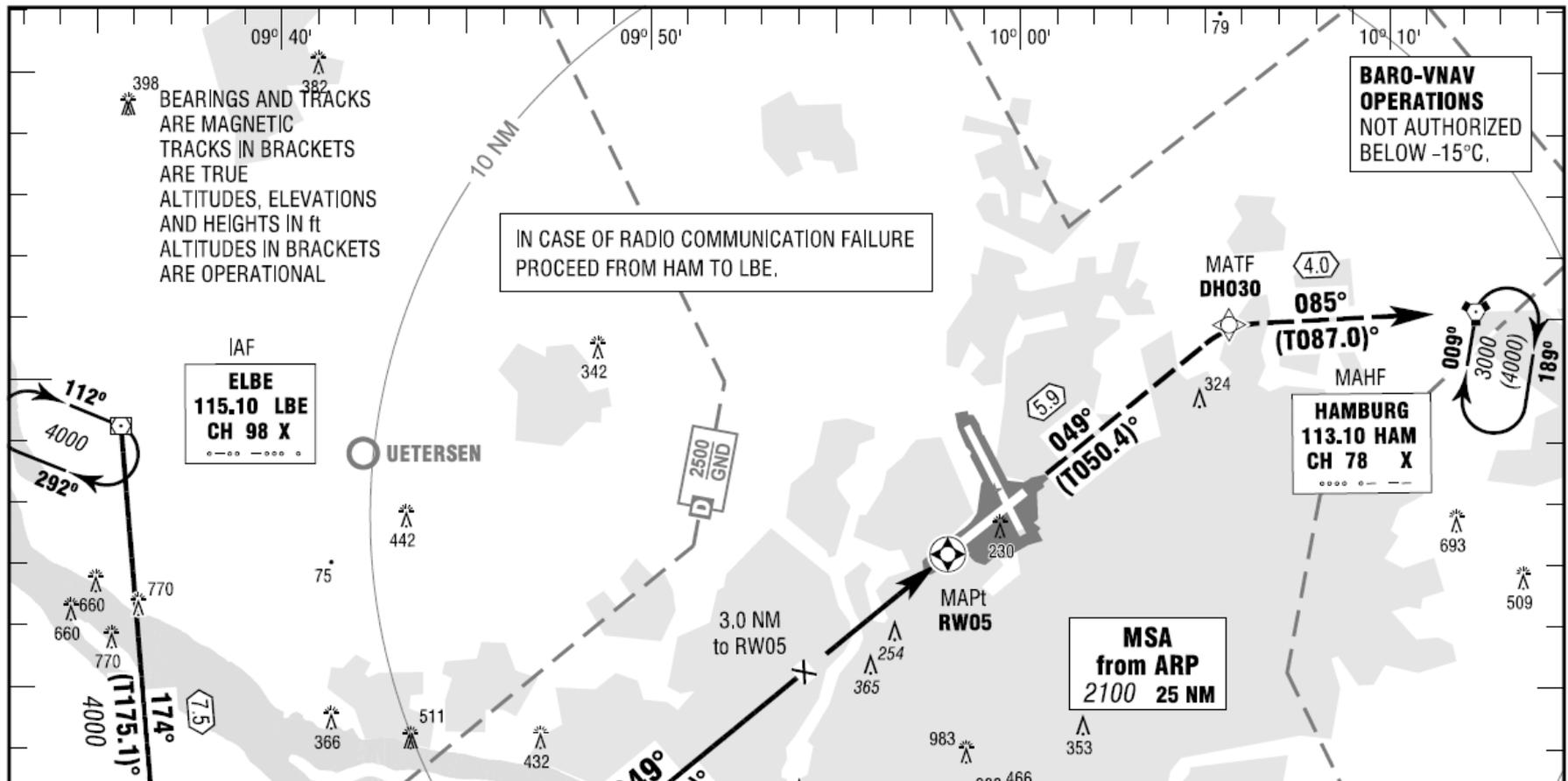
**INSTRUMENT
APPROACH
CHART - ICAO**

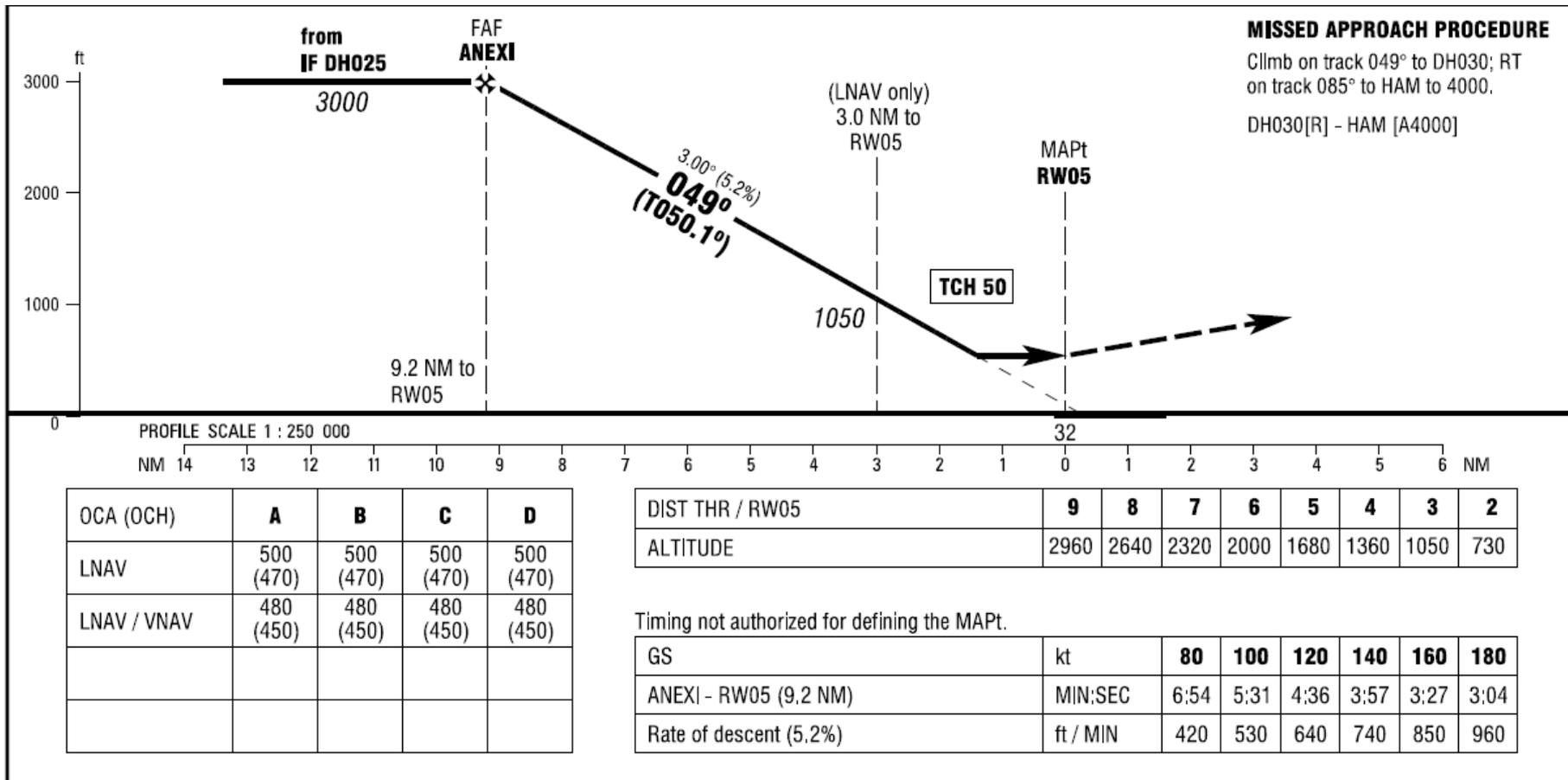
VAR 2° E

ELEV 53
OCH RELATED TO
THR 05 ELEV 32

ATIS	123.125	TOWER	126.850
BREMEN RADAR	134.250	GROUND	121.800
DIRECTOR	118.200	APRON	121.700

**HAMBURG
RNAV (GPS)
RWY 05**





Note: LPV capable aircraft will fly LNAV/VNAV approach **ONLY IF** the ANSP/CAA allow the use of EGNOS for vertical guidance

Allowing the use of EGNOS on APV Baro (example of German AIP ENR 1.5)

ENR 1.5-12
12 JAN 2012

LUFTFAHRTHANDBUCH DEUTSCHLAND
AIP GERMANY

4. Nutzung von EGNOS auf RNAV(GPS)-Anflugverfahren

Die Nutzung des europäischen Satellitenergänzungssystems (SBAS) "EGNOS" wird für den Betrieb auf den im Luftfahrthandbuch, AD-Teil, publizierten RNAV(GPS)-Anflugverfahren, sowohl für Nichtpräzisionsanflüge (NPA bis zum publizierten "LNAV"-Minimum) als auch für APV-Verfahren (APV-Baro-VNAV bis zum publizierten "LNAV/VNAV"-Minimum, APV-SBAS bis zum publizierten "LPV"-Minimum) freigegeben.

Voraussetzung zur Nutzung der Vertikalführung mit EGNOS auf APV-Baro-VNAV-Verfahren ist eine zugelassene SBAS-Avionik der Klasse 2, 3 oder 4.

Informationen zur Systemverfügbarkeit von EGNOS werden im Falle einer negativen Verfügbarkeit über NOTAM publiziert. Ansonsten ist davon auszugehen, dass das System EGNOS betriebsbereit ist.

Weitere operationelle Nutzungsvoraussetzungen sind über entsprechende EASA-Publikationen geregelt.

4. Use of EGNOS on RNAV(GPS) Approach Procedures

The use of the European satellite augmentation system (SBAS) "EGNOS" has been approved for operations on the RNAV(GPS) approach procedures published in the AD part of the AIP for non-precision approaches (NPA up to the published "LNAV" minimum) as well as for APV procedures (APV Baro-VNAV up to the published "LNAV/VNAV" minimum, APV-SBAS up to the published "LPV" minimum).

Class 2, 3 or 4 approved SBAS aircraft avionics are a requirement for the use of vertical guidance with EGNOS on APV Baro-VNAV procedures.

Information on the system availability of EGNOS will be published with NOTAM in the case of negative availability. Otherwise, it may be assumed that the EGNOS system is ready for operation.

Further operational requirements of use are specified in the relevant EASA publications.

See also the EASA SIB No. 2010-21R3 (dated June 2013)

Note: AIP Germany is in the process of being updated.

LPV 200

- The declaration of EGNOS « **LPV 200** » capability will allow lower minima for LPV approaches on **Precision Approach instrument runways**

The minimum minima will decrease from 250ft to 200ft

- The publication of lower minima will be possible **only from a new design** (different design criteria)
- LPV approaches published before the LPV 200 declaration **won't be invalidated.**

EGNOS performance required for an approach are coded in the navigation database (e.g. APV 1 or LPV 200)

- EGNOS-based APV will continue to be published on **RNAV(GNSS) approach charts** with an **LPV minima.**

EUROCONTROL's support to deployment

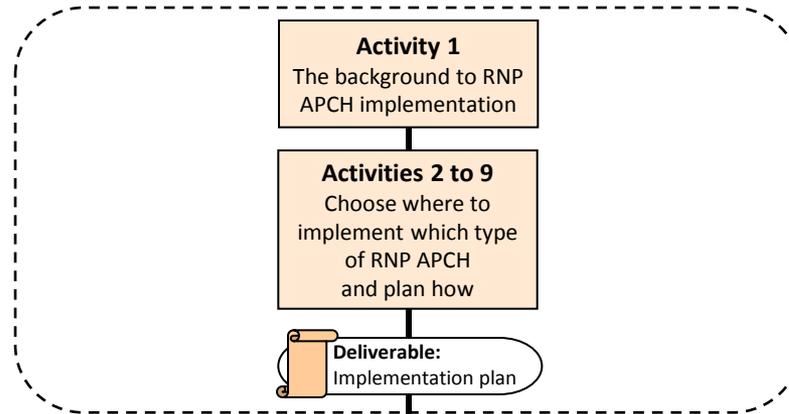
- The RAISG stakeholders' group

- **Supporting groups**
 - Joint ICAO PBN TF & EUROCONTROL RAISG until April 2014
 - Joint ICAO PBN TF & EUROCONTROL NSG from Sept. 2014
 - **RAISG** “for technical support” (12-13 November 2014)
- **Main objectives of RAiSG**
 - Better understand PBN and RNP APCH (*all types*)
 - Find a way through ICAO provisions
 - Support **harmonized** implementation
 - Provide a forum for **exchange** of lessons learned
 - Collect **best practices**
 - Develop **guidance for implementation** (ICAO EUR doc 025)
 - **Monitor** the deployment of RNP APCH in Europe (PBN Approach Map Tool)

Methodology for RNP APCH Implementation

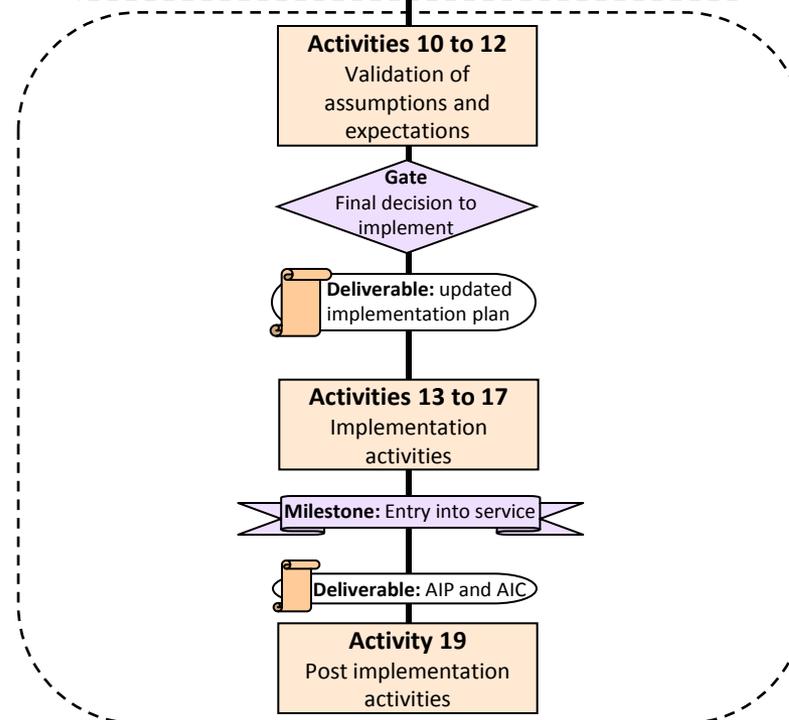
- ICAO EUR doc 025

Process 1



What to implement and Where ?

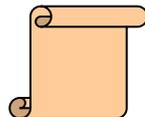
Process 2



How to implement ?

Process 1: What to implement and where

- **Activity 1:** The background to RNP APCH implementation
- **Activity 2:** Create the implementation project team
- **Activity 3:** Agree project objectives, scope and timescale
- **Activity 4:** Survey of candidate airports
- **Activity 5:** Airport Capabilities Assessment
- **Activity 6:** Survey of Traffic Characteristics and Aircraft Operators
- **Activity 7:** ATC and NOTAM services
- **Activity 8:** Benefits and costs for RNP APCH implementation
- **Activity 9:** Choose which kind of RNP APCH to implement



Deliverable: Implementation Plan

Process 2: How to implement

- **Activity 10:** Procedure design
- **Activity 11:** Validation of expected benefits
- **Activity 12:** Local Safety Case
-  – **Gate:** Final Decision to Implement 
 -  **Deliverable:** Updated Implementation Plan
- **Activity 13:** Procedure validation
- **Activity 14:** ATM/CNS Integration Issues
- **Activity 15:** AIS Requirements
- **Activity 16:** Training Requirements
- **Activity 17:** Final review before deployment
- **Activity 18:** Introduction into service
 -  **Deliverable:** AIC and AIP
- **Activity 19:** Post-implementation activities

- Part 3 -

RNP APCH deployment status

(as illustrated on the EUROCONTROL PBN Approach map tool

<http://prisme-newgis.hq.corp.eurocontrol.int/pbn/>)

Monitoring RNP APCH deployment status

- the PBN Approach Map tool

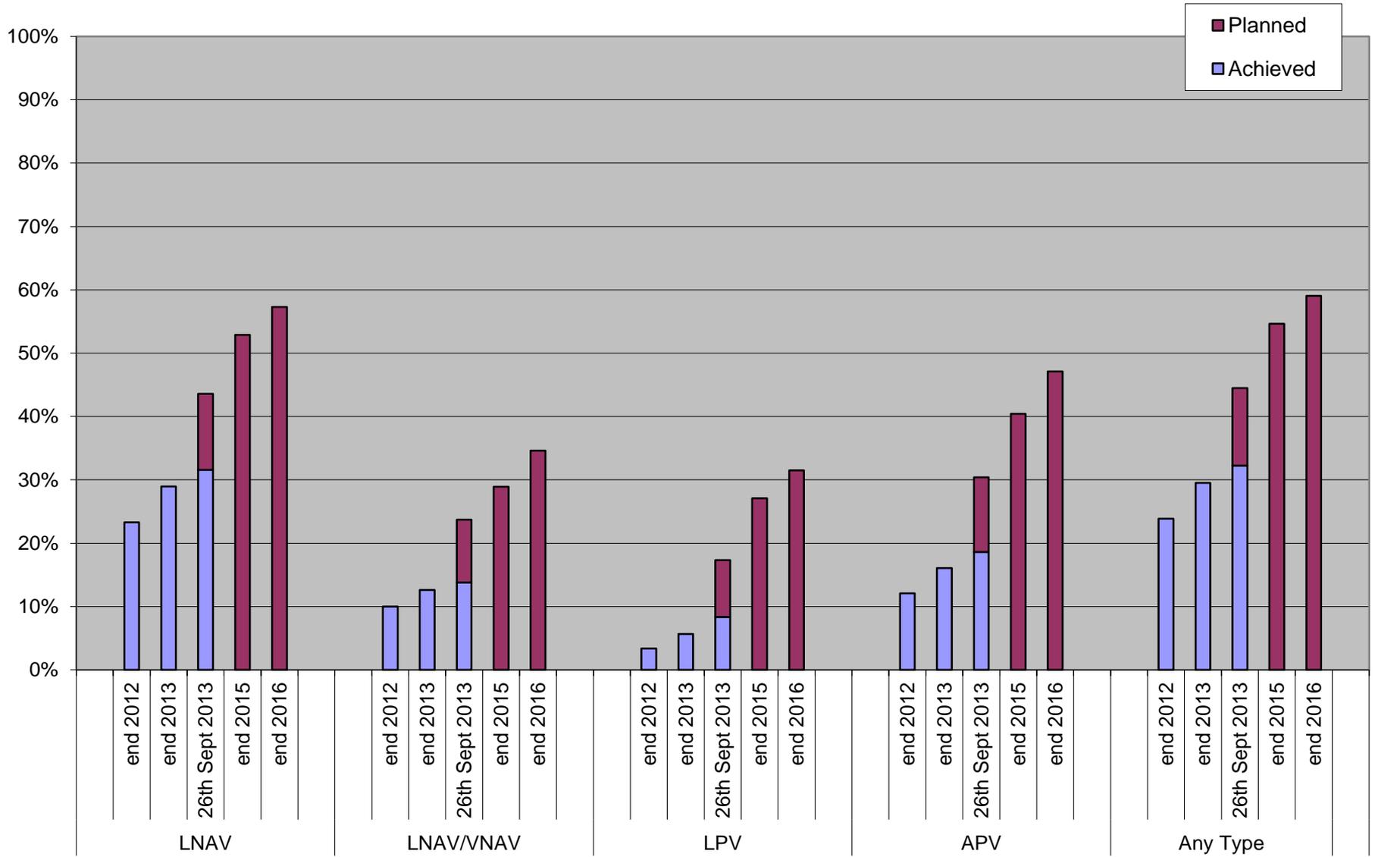
- Deployed in **June 2012**
- The map is regularly updated according to :
 - Stakeholders inputs (RAISG and PBN TF),
 - ICAO yearly surveys (updates to ICAO ANP documents – CNS 4b table)
 - Aeronautical Information publications (AIS websites and EAD content)
 - Interim Deployment Programme (IDP) inputs
 - LSSIP team inputs (NAV 10 objective),
 - Information shared by ESSP concerning EGNOS-based information.
 - data houses inputs whenever this is possible
 - Seeking to establish a closer link with national AIS providers
- List of national points of contact and list of runway ends maintained.
- Upgraded map tool planned for **November 2014**
(with **advanced monitoring tools**)

Implementation status and plans (1/2)

	Today (26th Sept. 2014)		End 2016		2020+	
PBN approach type (or aggregated type)	(nb of rw ends covered)	(% of total nb of rw ends)	(nb of rw ends covered)	(% of total nb of rw ends)	(nb of rw ends covered)	(% of total nb of rw ends)
LNAV	458	31%	831	57%	869	59%
LNAV/VNAV	200	13%	502	34%	540	37%
LP	0	0%	0	0%	0	0%
LPV	121	8%	457	31%	497	34%
(APV)	270	18%	683	47%	727	50%
AR	7	<1%	12	<1%	12	<1%
(Any Type)	468	32%	856	59%	892	61%

Total number of instrument runway ends: 1450

Implementation status and plans (2/2)



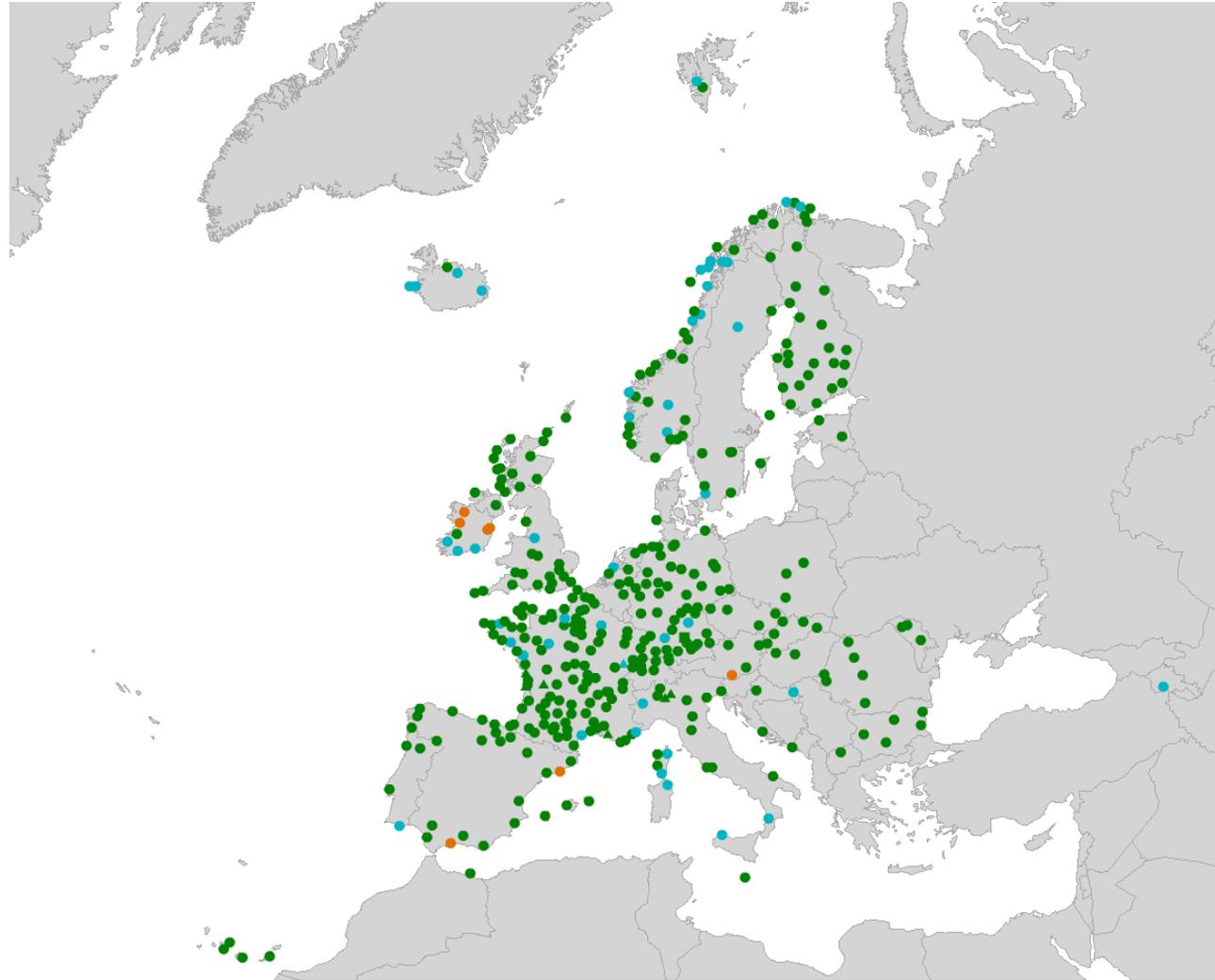
APV status (26th Sept. 2014)

270 runway ends covered
(18% of runway ends)



APV status (2020+)

727 runway ends covered
(50% of runway ends)



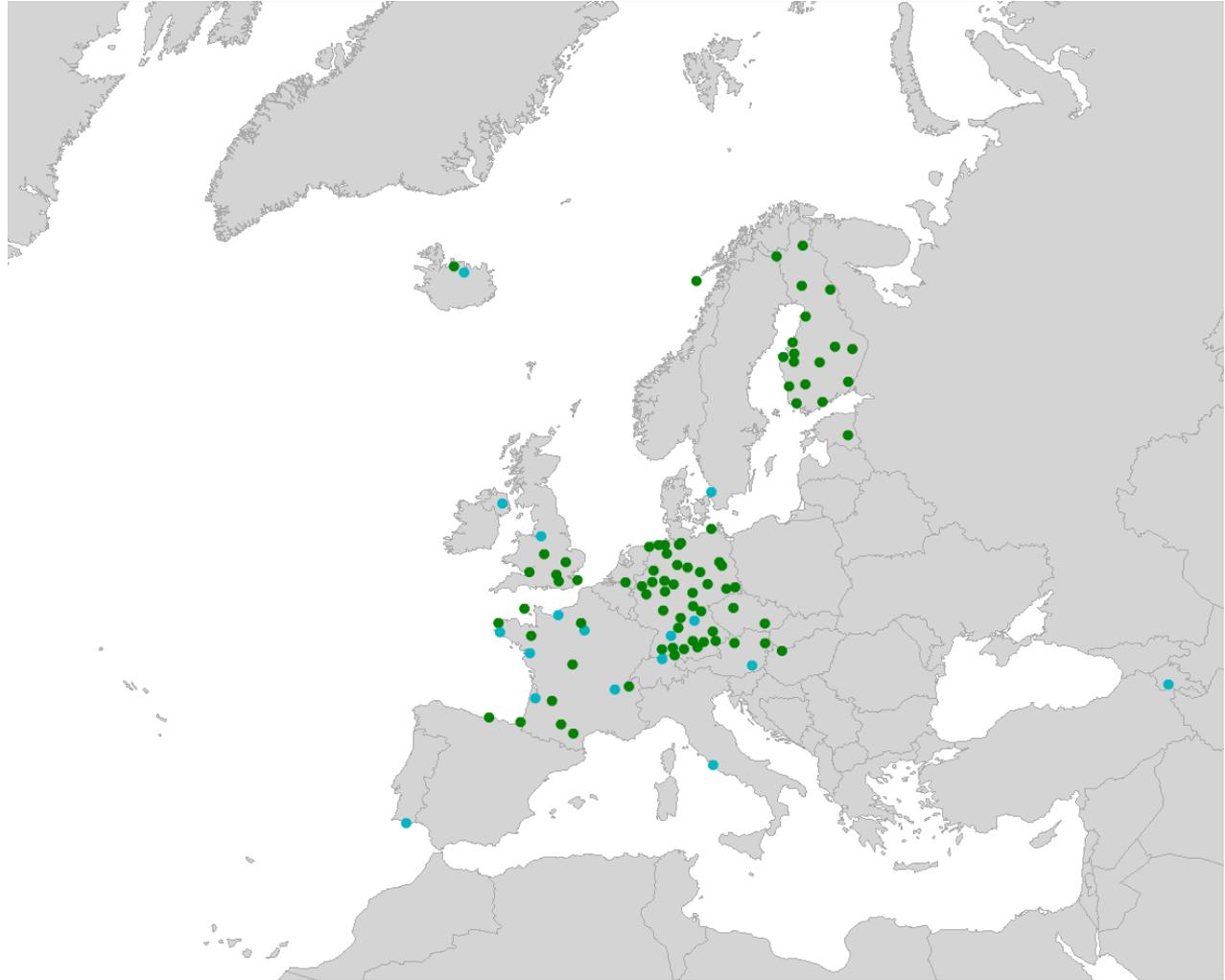
APV SBAS status (26th Sept. 2014)

121 runway ends covered
(**8%** of runway ends)



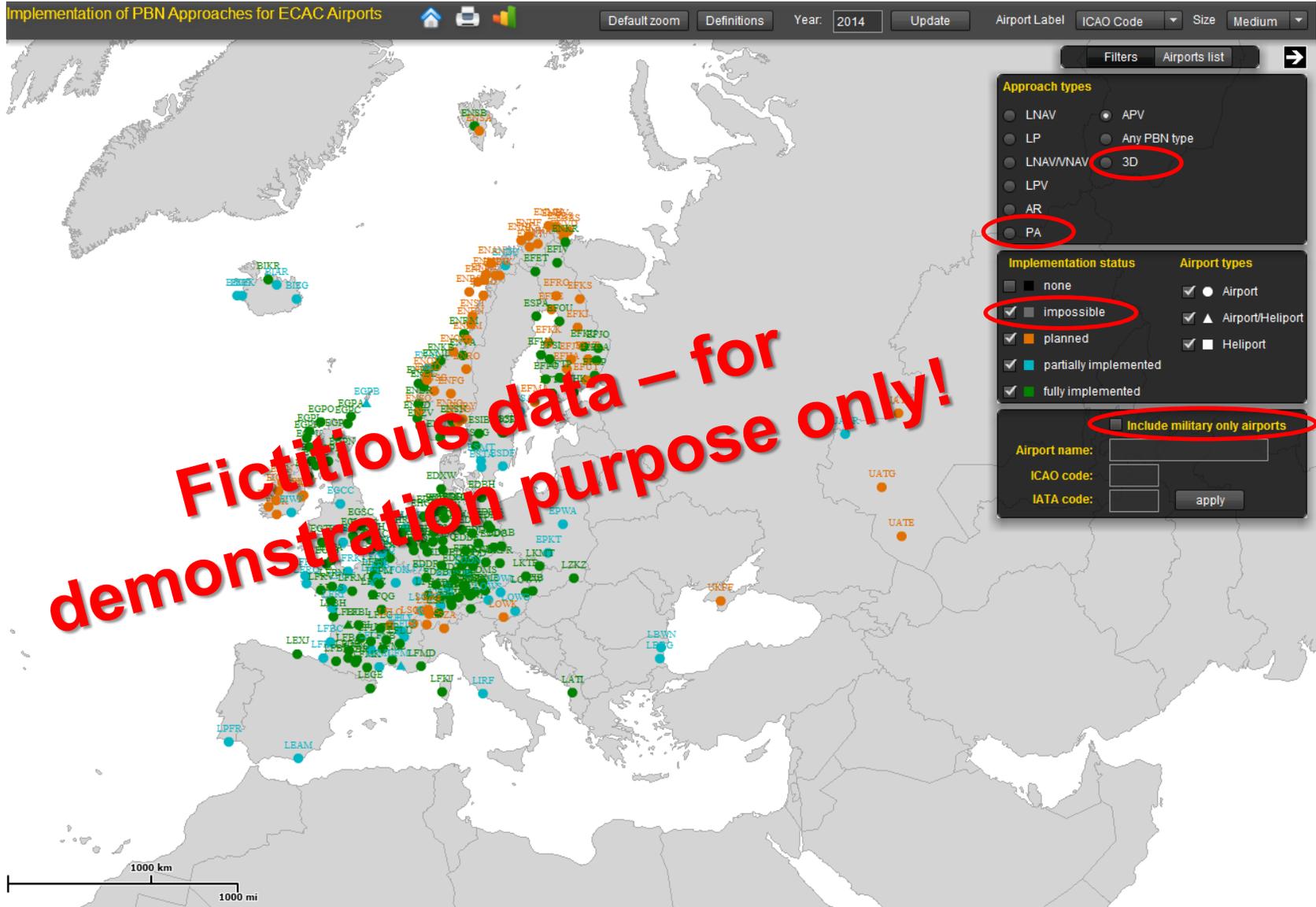
APV Baro status (26th Sept. 2014)

200 runway ends covered
(**13%** of runway ends)



Prototype of the Upgraded PBN Approach Map tool (1/3)

- New interface -



Prototype of the Upgraded PBN Approach Map tool (2/3)

- Details of the approaches at an airport -

Implementation of PBN Approaches for ECAC Airports

Default zoom Definitions Year: 2014 Update Airport Label ICAO Code Size Medium

Filters Airports list

Approach types

- LNAV
- LP
- LNAV/VNAV
- LPV
- APV
- Any PBN type
- 3D

Airports

Airport details Free text Runway Ends

ALMERIA (LEAM)

	LNAV	LP	LNAV/VNAV	LPV	AR	PA
26	Status <input type="text"/>	<input type="checkbox"/> Impl.				
07	Status Planned	<input type="text"/>	Planned	Planned	<input type="text"/>	<input type="checkbox"/> Impl.
Year	2013	<input type="text"/>	2013	2013	<input type="text"/>	
25	Status Planned	<input type="text"/>	Planned	Planned	<input type="text"/>	<input checked="" type="checkbox"/> Impl.
Year	2013	<input type="text"/>	2013	2013	<input type="text"/>	

on status

Airport types

- Airport
- Airport/Heliport
- Heliport

Include military only airports

apply

1000 km 1000 mi

Fictitious data – for demonstration purpose only!

Prototype of the Upgraded PBN Approach Map tool (3/3)

- More statistics -

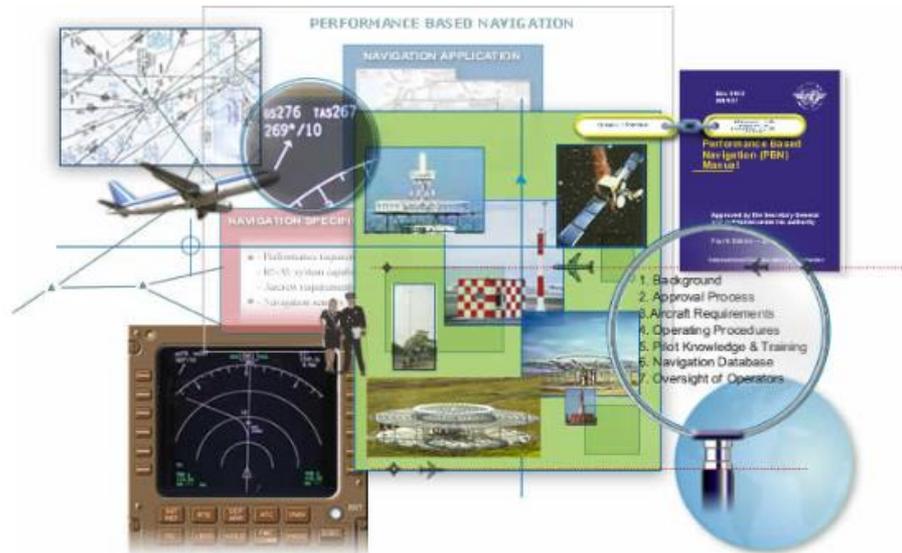


Fictitious data – for demonstration purpose only!

Thank you for your attention !

PBN Direct Access Web Based

PERFORMANCE BASED NAVIGATION (PBN) TRAINING MODULES



Modules

			
Using the WBT	Introduction to Area Navigation & Performance Based Navigation (PBN)	PBN Components	PBN Implementation

[click here to EXIT](#)

Click on your choice of module above to enter

AGENDA (12:00 – 14:30)

12:00-13:30

EGNOS Safety-of-Life Service for Aviation

- ☞ Europe's LPV implementation status and plans for 2015
Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)
- ☞ EGNOS Adoption in Aviation: strategies and main achievements
Carmen Aguilera – Market Development Officer (GSA)
- ☞ Overview of the approach to PBN Implementation in Europe
Lorenzo Bella – Satellite Navigation Expert (EUROCONTROL)
- ☞ EASA role in EGNOS-based aircraft operations
Ivan Ferencz – ATM/ANS Organisation Approval Team Leader (EASA)
- ☞ CAP1122 LPV for visual airfields
Paul Fraser-Bennison – Policy Specialist -Aerodromes- (UK CAA)

13:30-14:30

Lunch



EASA

European Aviation Safety Agency

EASA role in EGNOS-based aircraft operation

Ivan Ferencz

ATM/ANS Organisation Approval Team Leader

08/10/2014

Your safety is our mission.

An agency of the European Union 



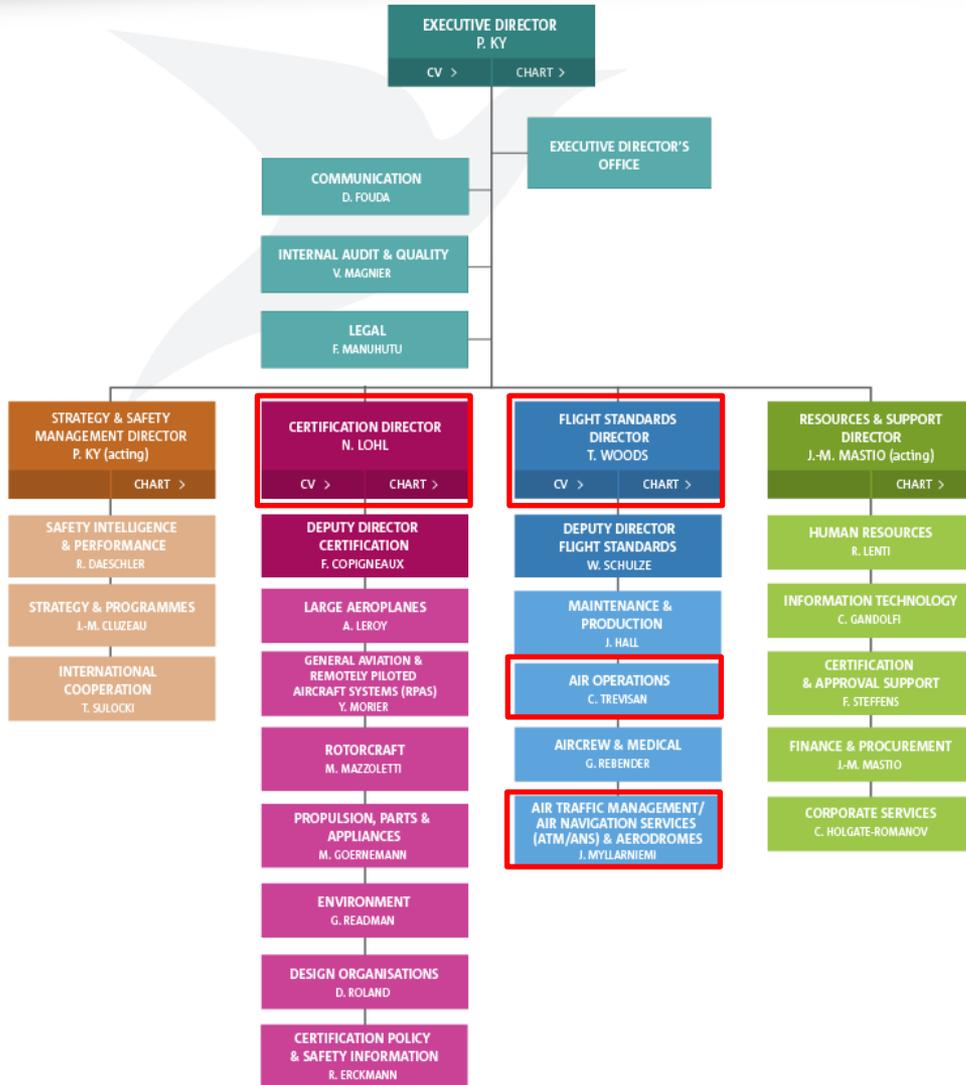
- EASA structure
- EASA Rules
- Regulation under development
- EGNOS/ESSP oversight
- Responsibility of EASA in the ESSP oversight
- Responsibility of national Competent Authorities



The European Aviation Safety Agency is the centrepiece of the European Union's aviation safety system comprised of the Agency, the European Commission and the National Aviation Authorities (NAAs).



EASA structure



Oversight



Certificates Approvals



Rules





Certification specification applicable to on-board navigation equipment supporting RNP approaches

➤ GPS+SBAS

➤ ETSO-C145c

- Airborne Navigation Sensors Using the Global Positioning System Augmented by the Satellite Based Augmentation System
- LNAV, APV

➤ ETSO-C146c

- Stand-Alone Airborne Navigation Equipment Using the Global Positioning System Augmented by the Satellite Based Augmentation System
- LNAV, APV

➤ GPS only

➤ ETSO-C129a (cancelled)

- Airborne Supplemental Navigation Equipment Using Global Positioning System (GPS)
- LNAV

➤ ETSO-C196a

- Airborne Supplemental Navigation Sensors for Global Positioning System Equipment Using Aircraft-Based Augmentation
- LNAV



- **AMC 20-27:** Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV BAROVNAV Operations + EASA Certification Memorandum on Clarifications to AMC 20-27 (CM-AS-002 Issue 02)
 - The Certification Memorandum enables SBAS/GNSS as a source of altitude on approaches to LNAV/VNAV minima
- **AMC 20-28:** Airworthiness Approval and Operational Criteria for RNAV GNSS approach operation to LPV minima using SBAS



EASA Rules on the way

- Initial issue of the CS-ACNS has been published in December 2013
 - Book 1 – Certification Specifications
 - Book 2 – AMC and GM
 - Navigation is not incorporated to the CS-ACNS yet
- Existing AMCs (20-26/20-27/20-28) will be cancelled
- Airworthiness requirements of these AMCs will be a part of CS-ACNS and related AMCs/GMs
- Operational requirements of AMCs will be integrated to the OPS rules.



EASA Rulemaking activities

- RMT.0256 - Revision of operational approval criteria for PBN' –
 - impacts Part FCL of the Aircrew regulation and Part SPA of the OPS IR
 - NPA 2013-25, consultation phase closed
- RMT.0445 - Technical requirements and operation procedures for airspace design including procedure design
 - creates a new Part as proposed in NPA 2013-08 of 10th May 2013 to contain the PBN requirements for airspace design (ASD) including procedure design
- RMT.0519 - Provision of requirements in support of global PBN operations
 - primarily populating the Navigation part of the CS ACNS with the airworthiness criteria corresponding to the different PBN specifications;
- RMT.0593 - Technical requirements and operational procedures for the provision of data (DAT) for airspace users for the purpose of air navigation
 - NPA 2014-20 released, Open for comments until 31/10/2014
- RMT.0639 - Performance-Based Navigation (PBN) implementation in the European Air Traffic Management Network (EATMN)
 - safe, efficient and harmonised implementation of specific PBN specifications and functionality in the EATMN.



Acceptance of Nav Database Suppliers

- Letters of Acceptance (LoA)
 - Baseline: EUROCAE ED76 / RTCA DO200A
- LoA Type 1 – Data Houses
 - Issued LoAs:
 - EASA.LOA.0001 (Type 1) - European Aeronautical Group UK Ltd
 - EASA.LOA.0002 (Type 1) - Jeppesen GmbH
 - EASA.LOA.0003 (Type 1) - Lufthansa Systems FlightNav Inc
- LoA Type 2 – Data Packers
 - Issued LoAs:
 - EASA.LOA.0004 (Type 2) - THALES Avionics SAS

- FAA and TCAA LoAs are considered as equivalents

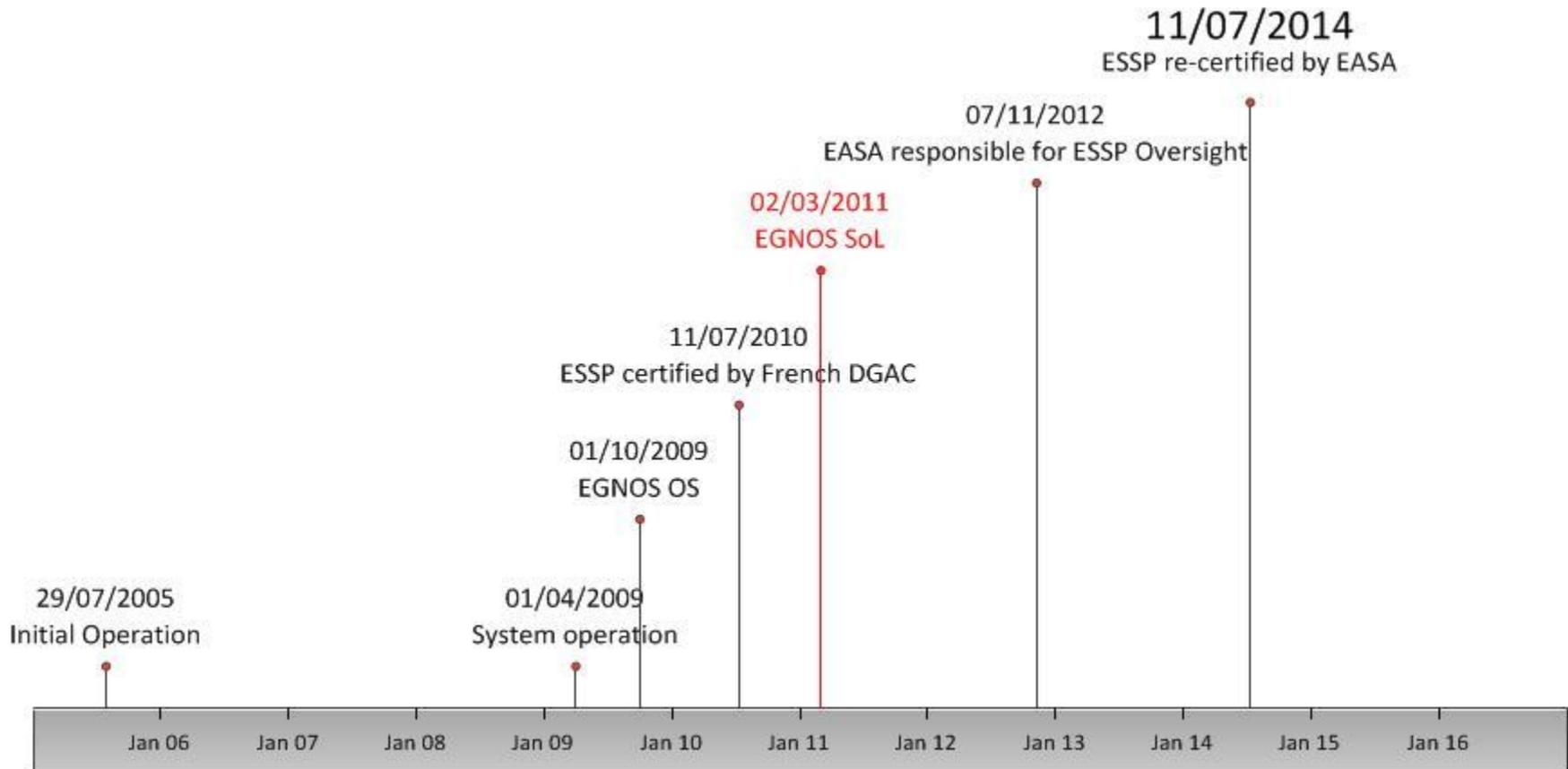


Safety information Bulletins are for information only; they do not contain mandatory instructions.

- SIB 2010-21R3 (06 September 2013) - Activation of the “European Geostationary Navigation Overlay Service” (EGNOS)
- SIB 2012-21 (19 December 2012) - European Geostationary Navigation Overlay Service Availability in North and North East of Europe
- SIB 2011-24R1 (11 June 2012) - European Geostationary Navigation Overlay Service (EGNOS) Availability
- SIB 2012-09 (23 May 2012) - Effects of Space Weather on Aviation
- SIB 2011-03 (24 March 2011) - Advisory Vertical Guidance

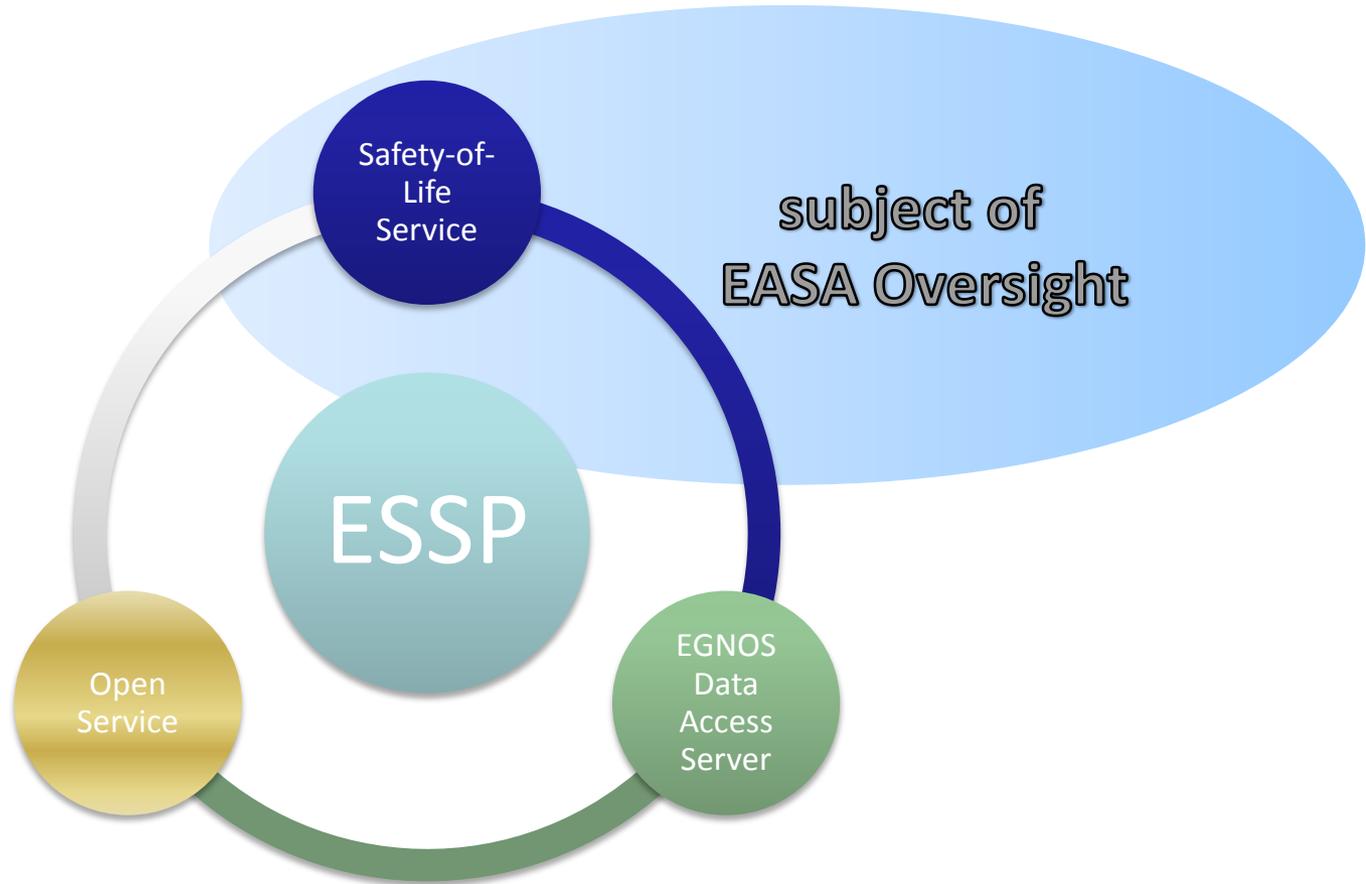


EGNOS Oversight - history





EGNOS Oversight - Scope





EGNOS Oversight - Activities

Monitoring of
safety
performance

Safety regulatory
audits

Verification of
compliance with
safety regulatory
requirements

Safety oversight of
changes to
functional systems



EGNOS Oversight - Activities

Monitoring of
safety performance

Safety regulatory
audits

- monitoring and assessment of the levels of safety achieved in order to determine whether they comply with the safety regulatory requirements applicable in the EU

- Occurrence reports received from ESSP, NSAs, End users
- EASA Internal Occurrence Reporting System (IORS)

<http://easa.europa.eu/iors/>

- results are used for determination of the safety oversight priorities in the context of risk-based oversight

Verification of
compliance with
safety regulatory
requirements

Safety oversight of
changes to
functional systems

Monitoring of
safety performance

Safety regulatory
audits

- on-going compliance of the organisations with applicable safety regulatory requirements

- implementation of safety objectives, safety requirements and other safety-related conditions identified in

- declarations of verification of systems,
- declaration of conformity or suitability for use of constituents
- risk assessment and mitigation procedures

Verification of
compliance with
safety regulatory
requirements

Safety oversight of
changes to
functional systems



EGNOS Oversight - Activities

Monitoring of safety performance

Safety regulatory audits

- Two years oversight cycle
- Three audit per year are scheduled
- Performed by EASA auditors with support of accredited Qualified Entities and NSAs
- Audit results are communicated to the ESSP only (Article 58.4 of the regulation (EC) 216/2008, Article 18 of the regulation (EC) 550/2004, Confidentiality)

Verification of compliance with safety regulatory requirements

Safety oversight of changes to functional systems

Monitoring of safety performance

Safety regulatory audits

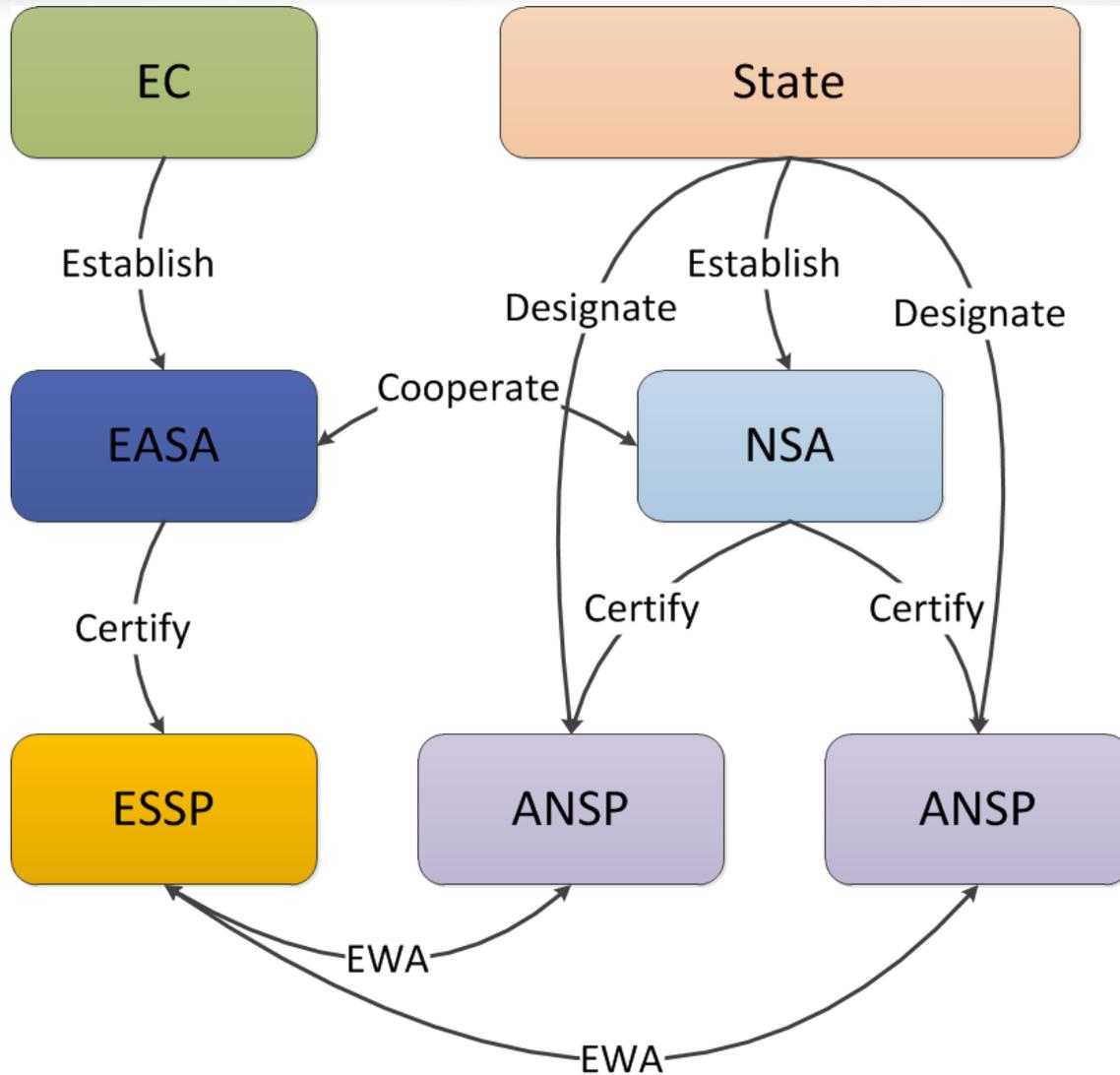
- Organisation of the activity depend on the number and magnitude of the changes.
- Purpose is to assess the acceptability of the safety demonstration associated to the introduction of the change.
- Mainly based on desktop review although some on-site audits are performed for software development aspects.

Verification of compliance with safety regulatory requirements

Safety oversight of changes to functional systems

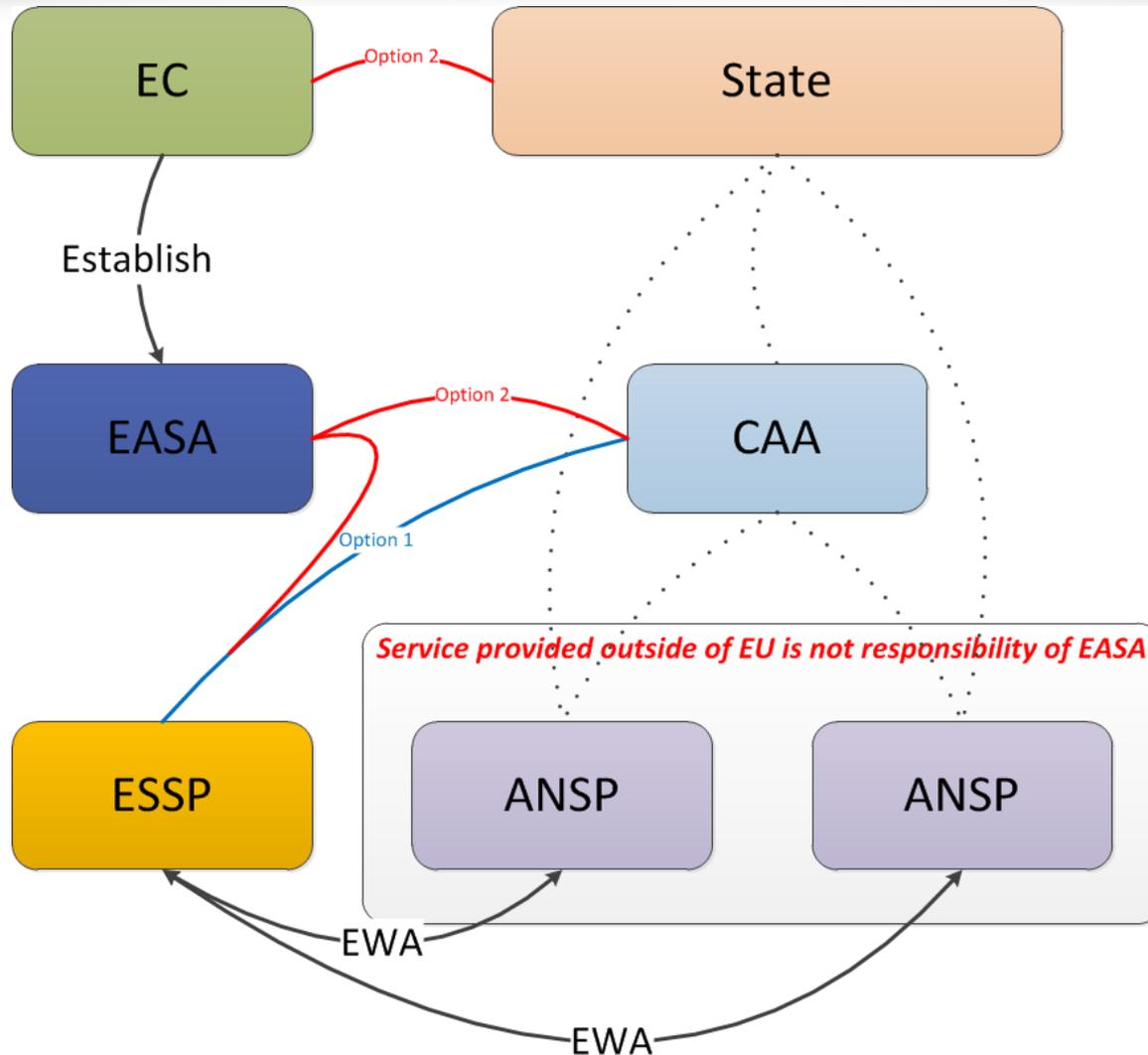


Oversight Responsibility - EU





Oversight Responsibility – non-EU





EGNOS Oversight - References

- ▶ Commission Implementing Regulation (EU) No 1034/2011: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:271:0015:0022:EN:PDF>
- ▶ Commission Implementing Regulation (EU) No 1035/2011: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:271:0023:0041:EN:PDF>
- ▶ Commission Regulation (EC) No 482/2008: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:141:0005:0010:EN:PDF>
- ▶ Commission Regulation (EC) No 748/2012: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:224:0001:0085:EN:PDF>
- ▶ EASA AMC 20-26: <http://www.easa.europa.eu/agency-measures/docs/agency-decisions/2009/2009-019-R/Annex%20II%20-%20AMC%2020-26.pdf>
- ▶ EASA AMC 20-27: <http://easa.europa.eu/agency-measures/docs/agency-decisions/2009/2009-019-R/Annex%20III%20-%20AMC%2020-27.pdf>
- ▶ EASA Certification Memorandum to AMC 20-27: <http://easa.europa.eu/certification/certification-memoranda.php>
- ▶ EASA AMC 20-28: <http://easa.europa.eu/agency-measures/docs/agency-decisions/2012/2012-014-R/Annex%20II%20-%20AMC%2020-28.pdf>
- ▶ CS-ACNS, Initial Issue: <http://easa.europa.eu/system/files/dfu/2013-031-R-Annex%20I%20to%20ED%20Decision%202013-031-R.pdf>



EASA

European Aviation Safety Agency

Thank you

Your safety is our mission.

An agency of the European Union 

AGENDA (12:00 – 14:30)

12:00-13:30

EGNOS Safety-of-Life Service for Aviation

- ☞ Europe's LPV implementation status and plans for 2015
Javier de Blas – Service & GNSS Projects Development Mngr (ESSP)
- ☞ EGNOS Adoption in Aviation: strategies and main achievements
Carmen Aguilera – Market Development Officer (GSA)
- ☞ Overview of the approach to PBN Implementation in Europe
Lorenzo Bella – Satellite Navigation Expert (EUROCONTROL)
- ☞ EASA role in EGNOS-based aircraft operations
Ivan Ferencz – ATM/ANS Organisation Approval Team Leader (EASA)
- ☞ CAP1122 LPV for visual airfields
Paul Fraser-Bennison – Policy Specialist -Aerodromes- (UK CAA)

13:30-14:30

Lunch



UK CAA CAP1122 – LPV for Visual Airfields

EGNOS Service Provision Workshop 2014

Paul Fraser-Bennison
07-08 October 2014

Presentation Overview



1. CAA policy regarding instrument approach procedures to aerodromes without an instrument runway and/or approach control (CAP 1122)
2. Current UK Status towards meeting ICAO Resolution A37-11
3. Summary

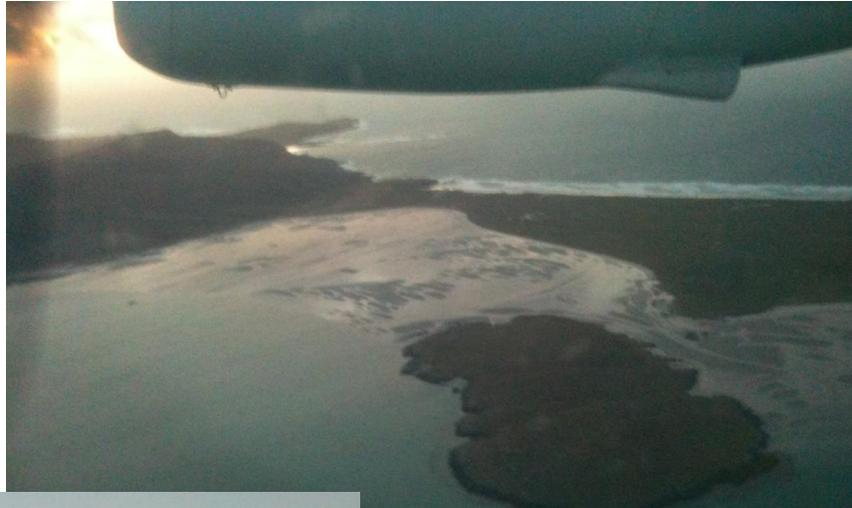
1

**CAA policy regarding
instrument approach
procedures to aerodromes
without an instrument runway
and/or approach control**

Drivers for change

- Regularise discrete Instrument Approach Procedures (DIAPs)
- Promulgate these in the UK AIP
- Take advantage of technology developments and the possibility of conducting 3D stabilised approaches improving both access and safety
- Support remote locations' reliance on air travel for Public Service Obligations (PSO)
- Open up opportunities for non-commercial operations e.g., General Aviation
- Acknowledging definition from revised ICAO Approach Classification where:
 - Non-instrument runway: A runway intended for the operation of aircraft using visual approach procedures or an instrument approach procedure to a point beyond which the approach may continue VMC

Some Unique UK Environments

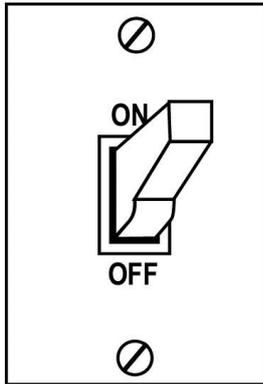


Challenge for the CAA

The challenge for this project was to -

- propose CAA policy for the process of approving IAPs to runways which do not meet instrument runway criteria and/or at aerodromes which do not provide an Approach Control service &
- facilitate the wider deployment of IAPs where safe to do so
- Important to set both the policy and provide the guidance as to how compliance might be demonstrated
- Cross-CAA project team formed to deliver CAP 1122

Standards-Based versus Risk-Based Applications



Standards-Based Application
You meet the Standards or you don't



Risk-Based Application
More Judgement required both
by applicant and Regulator

Scope – Public Transport Operations

Public Transport Operations						
	Approach	Aerodrome	Aerodrome	AFISO	No ATS	
	Control	Instrument	Visual		AGCS	SafetyCom
Licensed Aerodromes						
Instrument Runway	G	A1	A1	A1	R	N/A
Non- Instrument Runway	A1	A1	A1	A1	R	R
Unlicensed Aerodromes						
Non- Instrument Runway*	N/A	N/A	N/A	N/A	R	R

GREEN Permitted at present

AMBER 1 First stage of risk-based regulatory approach, applications considered on a case-by-case basis subject to safety analysis

RED Not normally prepared to consider applications at this stage. Some may be potential areas for future consideration, following experience gained from earlier stages

* Although it is conceivable that some unlicensed aerodromes may have runways which meet many of the required criteria, the absence of a licence and associated safeguarding activity, means that such runways can not be considered to be ‘instrument runways’. They are therefore depicted only as ‘non-instrument runways’ in the table.

Scope - Operations Other Than Public Transport

Operations other than Public Transport						
	Approach Control	Aerodrome Instrument	Aerodrome Visual	AFISO	No ATS	
					AGCS	SafetyCom
Licensed Aerodromes						
Instrument Runway	G	A1	A1	A1	A1	N/A
Non- Instrument Runway	A1	A1	A1	A1	A1	A1
Unlicensed Aerodromes						
Non- Instrument Runway*	N/A	N/A	N/A	N/A	A2	A2

GREEN Permitted at present

AMBER 1 First stage of risk-based regulatory approach, applications considered on a case-by-case basis subject to safety analysis

AMBER 2 Second stage of risk-based regulatory approach after first stage is complete, and, when further associated policy has been developed, applications considered on a case-by-case basis subject to safety analysis

RED Not normally prepared to consider applications at this stage. Some may be potential areas for future consideration, following experience gained from earlier stage

* Although it is conceivable that some unlicensed aerodromes may have runways which meet many of the required criteria, the absence of a licence and associated safeguarding activity, means that such runways can not be considered to be ‘instrument runways’. They are therefore depicted only as ‘non-instrument runways’ in the table.

**“When you’ve seen one aerodrome.....
.....you’ve seen one aerodrome”**



It is therefore not possible to assume what the outcome would be at a specific aerodrome location until the safety analysis has been conducted and the effectiveness of mitigations considered

Baseline Safety Arguments

<p>Goal 1</p> <p>The IAP at (aerodrome name) will be operated with an acceptable degree of safety.</p>							
<p>Strategy 1</p> <p>Argument that the standards-based approach which requires approach control (i.a.w. ANO Art 172) and a runway equipped to CAP168 'instrument runway' standards when used in combination with other risk-reduction measures, provides an acceptable degree of safety.</p>							
Goal 1.1	The risk of a CFIT accident is acceptably low. (CFIT)	Goal 1.2	The risk of a runway excursion accident is acceptably low. (REXC)	Goal 1.3	The risk of a runway collision accident is acceptably low. (RCOLL)	Goal 1.4	The risk of a mid-air collision accident is acceptably low. (MAC)
Goal 1.5	The risk of a loss of control accident is acceptably low. (LOC)	Goal 1.6	The risk of an accident during the introduction to service of a new IAP at this aerodrome is acceptably low. (INTRO)	Goal 1.7	The risk of an accident during the through-life operation of an IAP at this aerodrome is acceptably low. (THRULIFE)		

This table reflects the safety goals which are met by our standards-based method for approval of IAPs. These and the underpinning safety statements form a baseline which describes the current way for aerodromes using approach control and a runway meeting CAP 168 'instrument runway' standards

Candidate Alternative Safety Arguments

The IAP at (aerodrome name) will be operated with an acceptable degree of safety		
<p>Argument that the standards-based approach which requires Approach Control i.a.w. ANO Art 172 and a runway equipped to CAP 168 ‘instrument runway’ standards, when used in combination with other risk-reduction measures provides an acceptable degree of safety</p>	<p>Argument that the provision of approach control i.a.w. ANO Art 172 and/or a runway equipped to full CAP 168 ‘instrument runway’ standards would not be reasonably practicable in this case and that alternative solutions will be used in conjunction with other risk- reduction measures to provide an acceptable degree of safety.</p>	
<p>Baseline</p>	<p>Argument that the provision of Approach Control i.a.w. ANO Art 172 and/or a CAP 168 standard ‘instrument runway’ would not be reasonably practicable in this case.</p>	<p>Argument that alternative solutions will be used in combination with other risk-based measures to provide an acceptable degree of safety.</p>
	<p>Alternative Safety Arguments</p>	

Breakdown of Arguments

Alt 2.1 Argument that the provision of Approach Control i.a.w. ANO Art 172 would not be reasonably practicable in this case		
Alt 2.1.1 Low Intensity aerodrome and local airspace activity	Alt 2.1.2 Low and managed utilisation of IAP	Alt 2.1.3 Point In Space IAP (PINS)

Alt 2.2 Argument that the provision of an Instrument Runway equipped to full CAP168 standards would not be reasonably practicable in this case		
Alt 2.2.1 Low intensity and nature of aerodrome activity	Alt 2.2.2 Impracticable due to aerodrome physical features	Alt 2.2.3 Point In Space IAP (PINS)

Argument that alternative solutions will be used in combination with other risk-based measures to provide an acceptable degree of safety

IAP with Higher Minima

OCH – system minima	Not less than 500 ft. (subject to there being no more limiting obstacles)
RVR/Visibility	Not less than 1800 m
Runway/Survey Requirement	CAP 232 Aerodrome survey NPA - Classification 1 APV - Classification 2
Airspace/ATS Environment	Approach Control and/or ATC (at least ADI) provided or means established to ensure no concurrent use of IAP and visual circuit traffic

Absence of an Approach Control Service

1. The procedure is only to be used by a single operator and a robust PPR requirement is in place for booking the instrument approach procedure with clear slot times and sterile gap in between
2. The aerodrome is in an isolated area and has low levels of traffic both at the airfield and in the local environment

Other Considerations.....

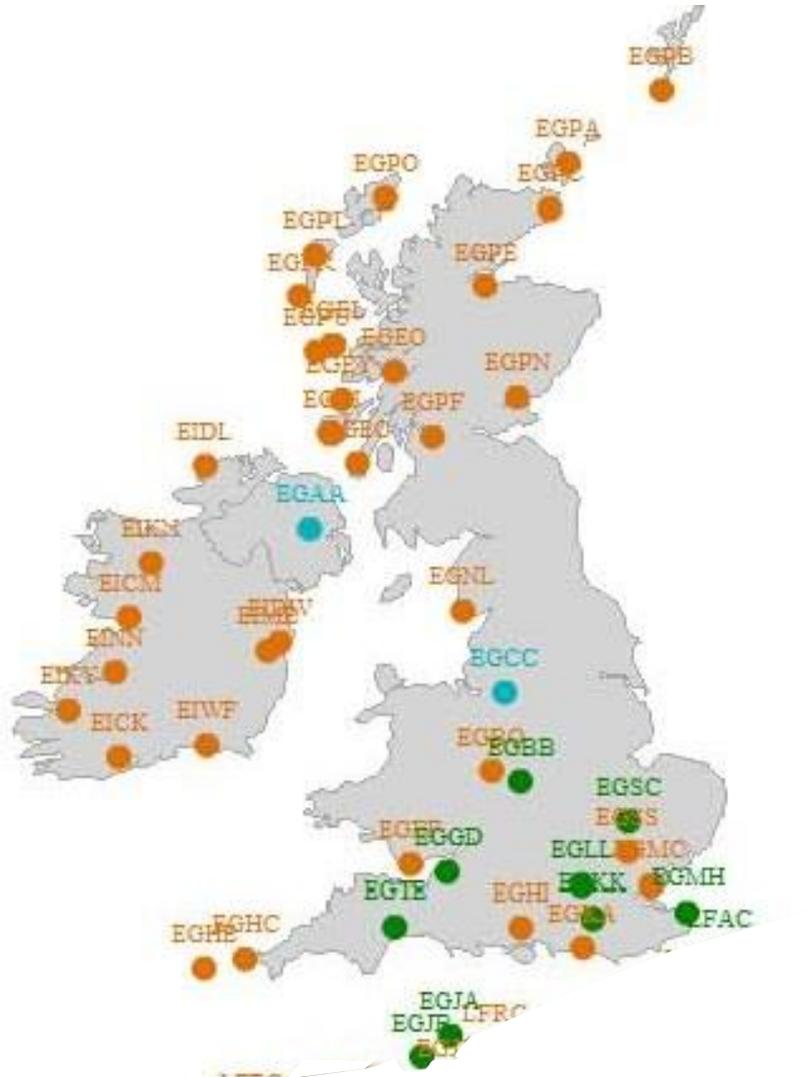
- Runway environment
- Survey requirements
- Airspace / ATS environment
- Application of generic ICAO PANS-OPS (Doc 8168) design criteria
 - CAP provides both the reference design criteria and methodologies for the calculation of OCA(H) for Category A and B aircraft to non-instrument runways, including case studies
 - Helicopter PINS approaches – to be developed further once experience gained
 - Post Implementation review
 - Ongoing monitoring and feedback – do the assumptions and safety arguments still hold true after 5 years?

2

Current UK progress towards meeting ICAO Resolution A37-11

APV Implementation Status

Acknowledgement: EUROCONTROL PBN Approach Map Tool



- Planned
- Partially implemented
- Fully implemented

LNAV, LNAV/VNAV and LPV Status

	Runway Ends LNAV	Runway Ends LNAV/VNAV	Runway Ends LPV
In Service	35	22	6
In Design	61	17	58

- With the scope of CAP 1122, the CAA does not anticipate a significant number of additional applications
- But it fills a regulatory gap and demonstrates what can be achieved with a Performance-based Regulatory approach

Some Lessons Learned

- New IAP projects take 2 years on average, but allow longer
 - Potential need for environmental consultation as part of a wider Airspace Change Proposal (ACP)
 - AIP promulgation cycles (AIRAC)
 - Regulatory review of IAP designs can take longer – especially if IAP designs are not right-first-time
 - Make LNAV a requirement and LNAV/VNAV recommended for all new LPV designs – it is cheaper in the long run and provides access for all
- Cost of flight validation data base is a problem
 - Approximate costs:
 - \$5000 per data base and \$1500 per runway end
 - Aerodromes encouraged to co-ordinate validation activities and share data base costs

CAA Initiatives

- Backing for funding opportunities



Civil Aviation Authority
INFORMATION NOTICE
Number: IN-2014/148



Issued: 09 September 2014

GSA Call for Grants to Promote EGNOS SBAS APV Instrument
Approach Procedures

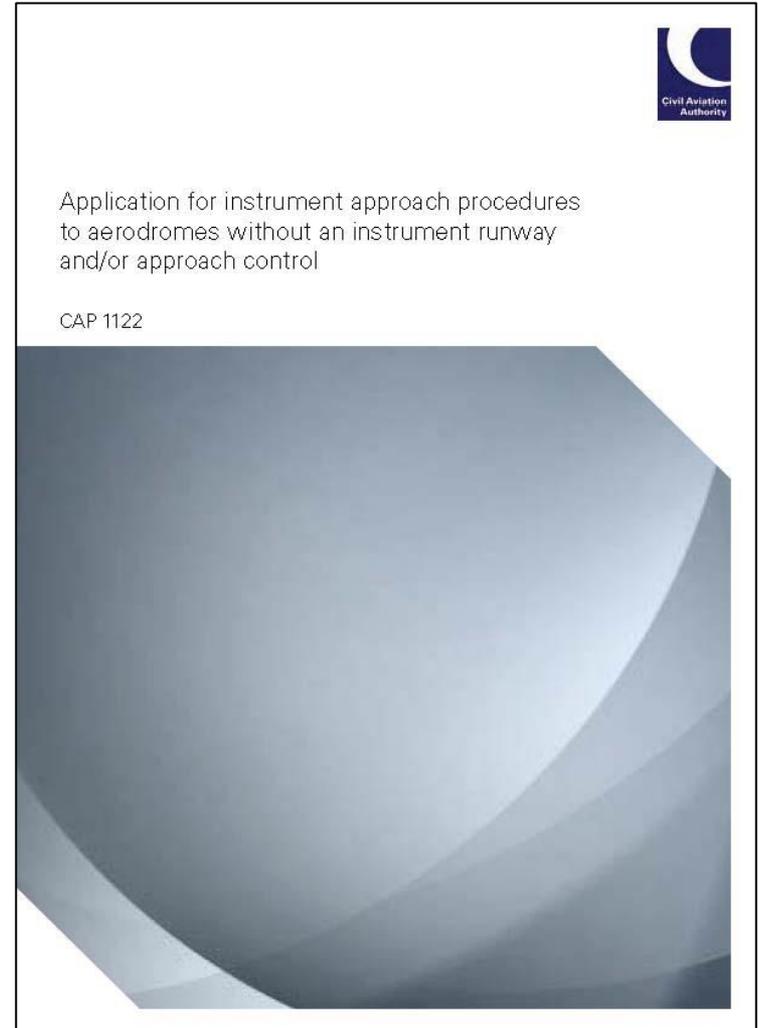
- ACCEPTA I & II, GSA and Horizon 2020
- Mechanisms in place to support industry
 - Centralised project co-ordination through government bodies such as the Transport Systems Catapult (TSC)
- Links to wider airspace re-design and modernisation
 - UK Future Airspace Strategy (FAS)
 - Industry Implementation Group managing UK FAS Deployment Plan
 - Navigation aid rationalisation
- Technical and operational support to industry

3

Summary

Summary

- CAP 1122 published May 2014
- Policy has been examined by a multi-disciplinary CAA group and consulted on with industry
- A more risk-based approach:
 - Applicant conducts a location-specific safety assessment in support of an application for an IAP based upon alternative safety mitigations
 - Early 'Preliminary Assessment' to reduce business risk
 - Single CAA point of contact for applicants
 - Post Implementation Review – Ongoing Monitoring & Feedback



Summary

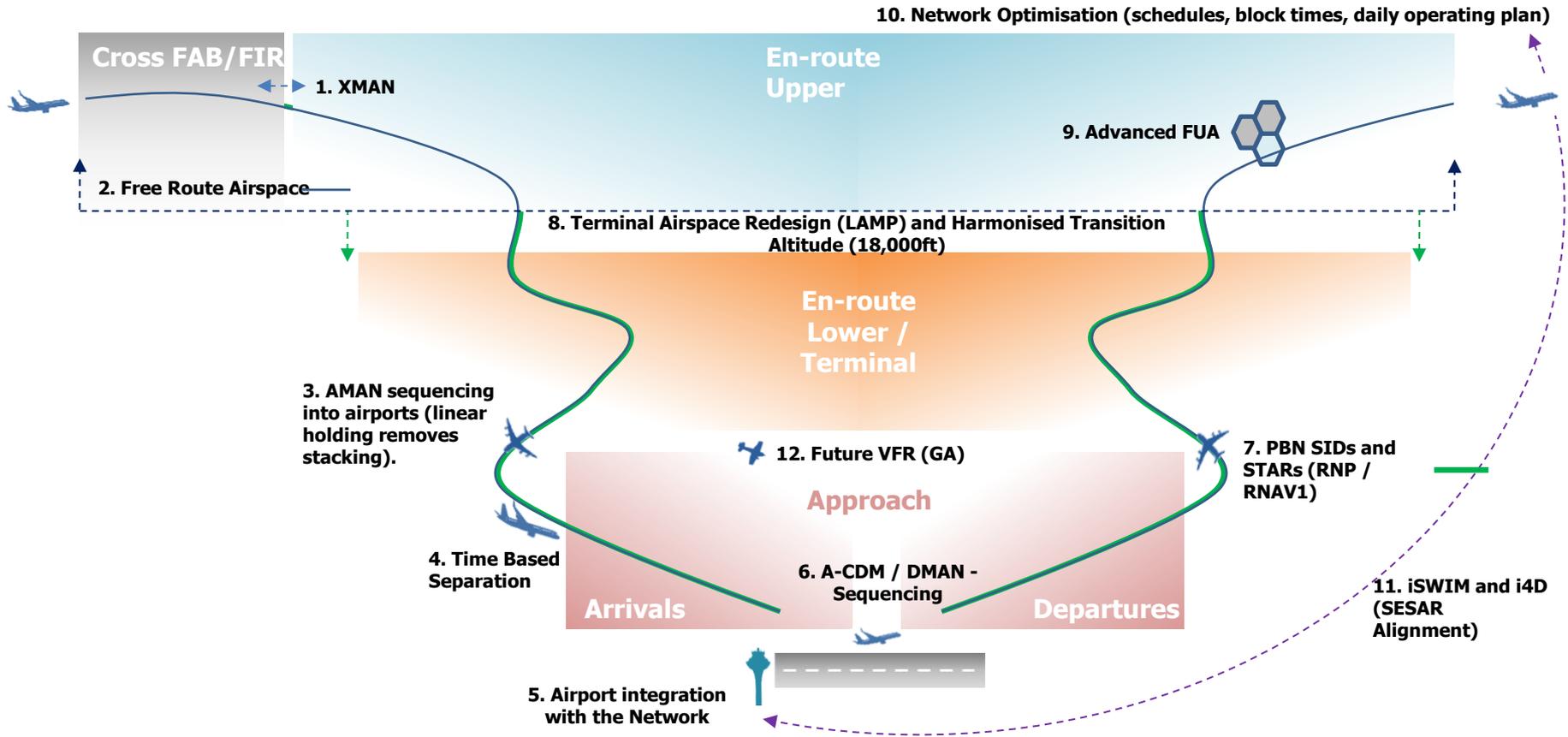
- Each case is location-specific so not possible to assume the outcome at a specific aerodrome location until safety analysis has been conducted
- An incremental approach to approval of such IAPs including PINS
- Guided by the matrices which reflect direction on alternative safety mitigation strategies that applicants would need to develop and present in the form of safety assurance documentation with supporting analysis
- The small number of discrete IAPs should be regularised, promulgated as IAPs with ownership taken by the associated aerodrome operator and use of the term 'discrete' discontinued
- Conducting a trial at a General Aviation aerodrome to investigate concept/issues in that sector

Questions?



Paul.Fraser-Bennison@caa.co.uk

FAS Deployment Plan Scope





lunch

EGNOS survey open!

<http://egnos-portal.gsa.europa.eu/egnos-users-satisfaction-survey>



7-8 October
Lisbon

The **EGNOS** Service Provision workshop



We certify you're there.

