EGNOS

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Aviation powered by EGNOS

World ATM Congress 2015

European
Global Navigation
Satellite Systems
Agency

ESSP

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Agenda

16:00 – 16:15	**EGNOS as an enabler of PBN**	G.G. Calini /GSA
16:15 – 16:30	**EGNOS SoL Service: Roadmap and Support to Implementation**	T. Racaud /ESSP
16:30 – 16:45	**European Regulatory Instruments Encouraging PBN Approach Implementation**	L. Smaja/Eurocontrol
16:45 – 17:45	**EGNOS Awards**	ESSP, GSA

EGNOS as an enabler of PBN

Presented by Mr. Gian Gherardo Calini

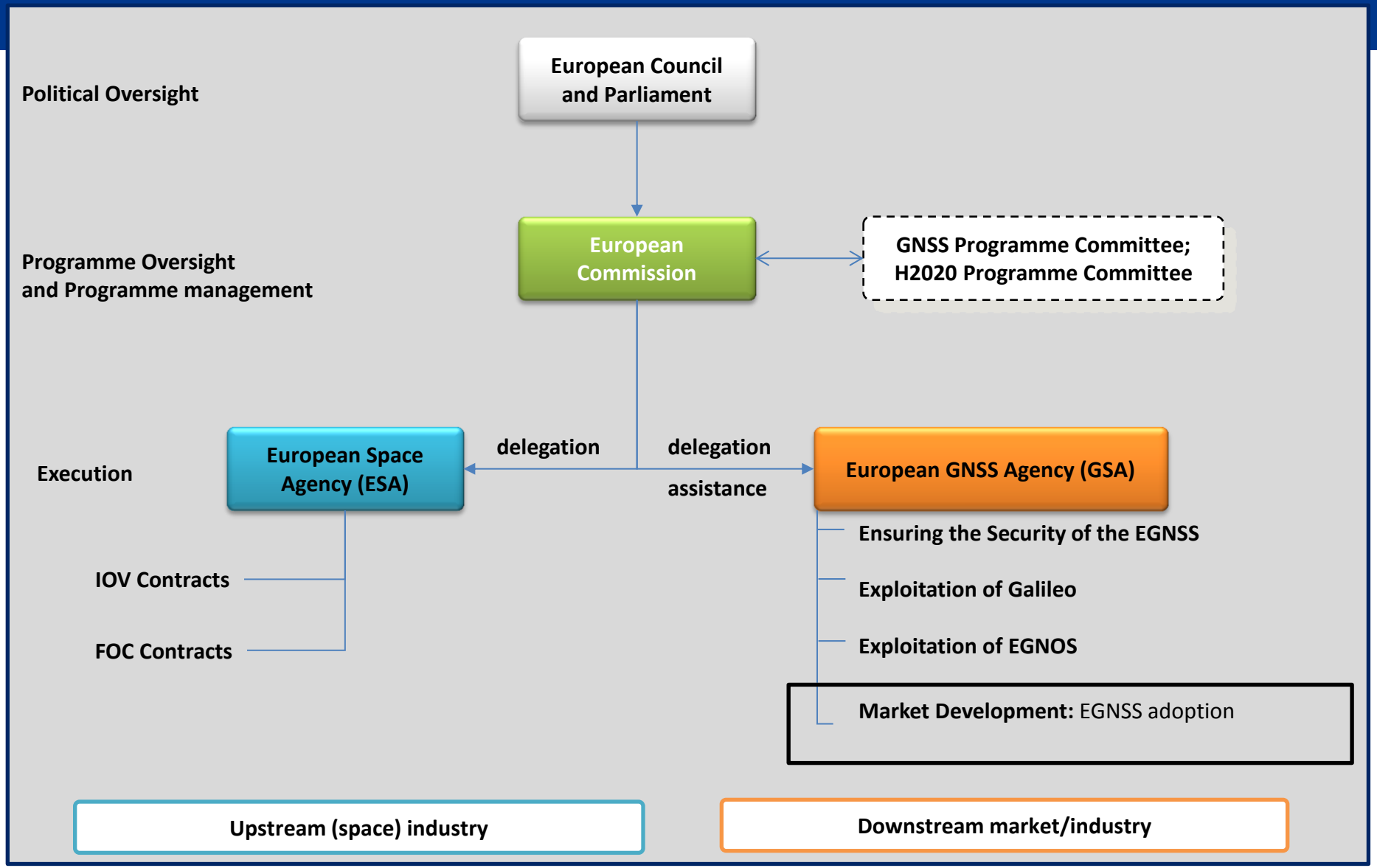
Head of Market Development Dept, European GNSS Agency

GSA Mission

Our mission is to achieve the highest EU return on European GNSS investment, in terms of benefits to users and industry competitiveness, by:

- ✓ Designing and enabling services fully matching user needs
- ✓ Managing service provision ensuring full user satisfaction in the most cost-efficient manner
- ✓ Engaging market stakeholders, developing applications and value-added services and user technology, towards E-GNSS full adoption

GSA role within EU GNSS programmes



GSA stays close to the aviation users and stakeholders to reap full EGNOS benefits

ESSP

EGNOS Service provider
Technical assistance to foster EGNOS adoption

EUROCONTROL

Cooperation agreement to implement European Union GNSS policies as they apply to the field of aviation.

EUROPEAN AVIATION SAFETY AGENCY

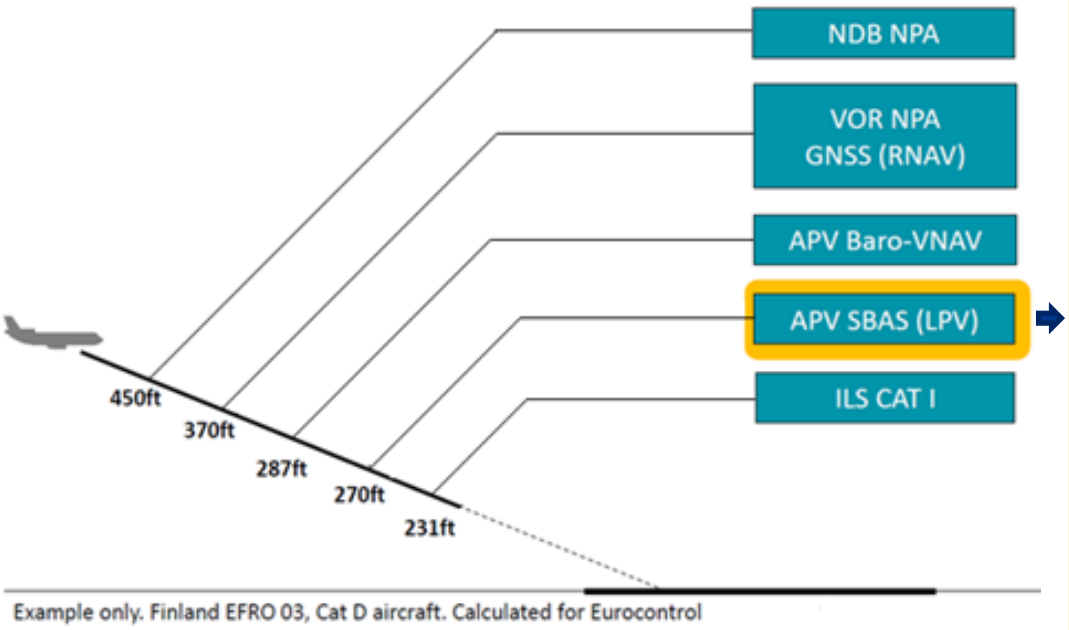
Safety, pilot training, airworthiness criteria

EBAA
era european regions airline association
PPL/IR EUROPE

Users: business, general aviation, associations
Industry: avionics/aircraft manufacturers
Stakeholders and decision makers

EGNOS enables approaches down to LPV minima

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



Example of Decision Height Minimum

- EGNOS enables approaches with **comparable performance to ILS CAT I**, without the need for ground infrastructure
- Decision heights can be reduced to:
  - NPA: 450ft
  - LPV: 250ft (200ft soon)
- Procedures can be implemented for all runways, both ends, at little or no extra cost

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Benefits for Aviation from EGNOS

- ✓ Reduction of CFIT by 74%[1]
- ✓ Increased accessibility to underserved non-ILS airports and in poor weather conditions
- ✓ Reduce delays and diversions by 48%[2], with impact on passenger services, operating costs and fuel use
- ✓ New destinations: access to less congested airports with lower fees
- ✓ Reduced fuel burn/costs and noise print
- ✓ Improve operational capability by providing backup for ILS approaches

✓ EGNOS is a low cost alternative to ILS
(EGNOS LPV one-off cost ≈ yearly ILS maintenance ≈ 32 K€)

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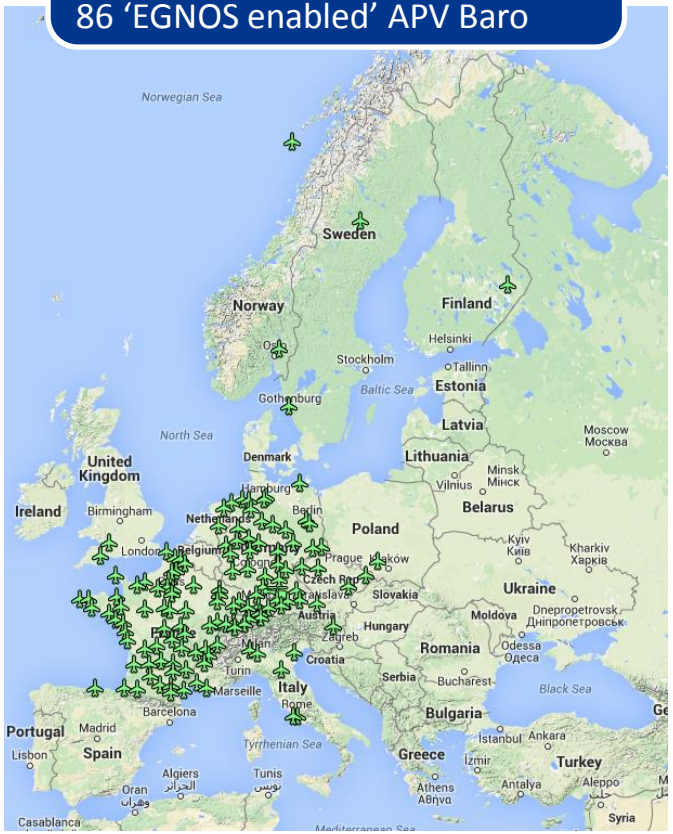
1 – Airlines/ANSP estimate
2 – EuroControl estimate

Adoption Results in Aviation
LPV Airport Implementation

As of February 2015

176 LPV approaches
86 'EGNOS enabled' APV Baro



Plans by 2018

> 440 LPV procedures

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

Operators upgrade to LPV funded by GSA

REGIONAL

Aurigny

2x BN2B Trislander

Air Nostrum

5x ATR 72-600

15x CRJ 1000

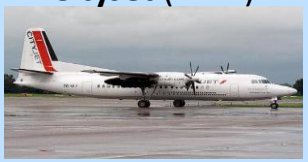
Skybus

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

NLR

Fairchild Metro II

Cessna Citation II

Air Charters Europe

King Air 300

King Air 1900D

Aviation South West

Piper P28A

Beechcraft 76

Royal Star-Aero

Piper PA-34 Seneca II

Dutch & MartinAir Flight Academies

4x Diamond DA42

Ljungbyheds Flygklubb

DA40-180

GSA AVAILABLE INSTRUMENTS TO FOSTER EGNOS BASED OPERATIONS IMPLEMENTATION

GSA portfolio of actions to foster EGNOS adoption in aviation

Technical support

- Ad hoc assistance to implementation
- Dedicated training
- Co-funding
- Development of STC for most common avionics to reduce certification costs, e.g AML for GNS 430W/530W

Regulation evolution to meet user needs

- LPV implementation to non instrumental runways
- Evolution of training/approval requirements
- Contribution to standard development

Research and development
(under EC delegation)

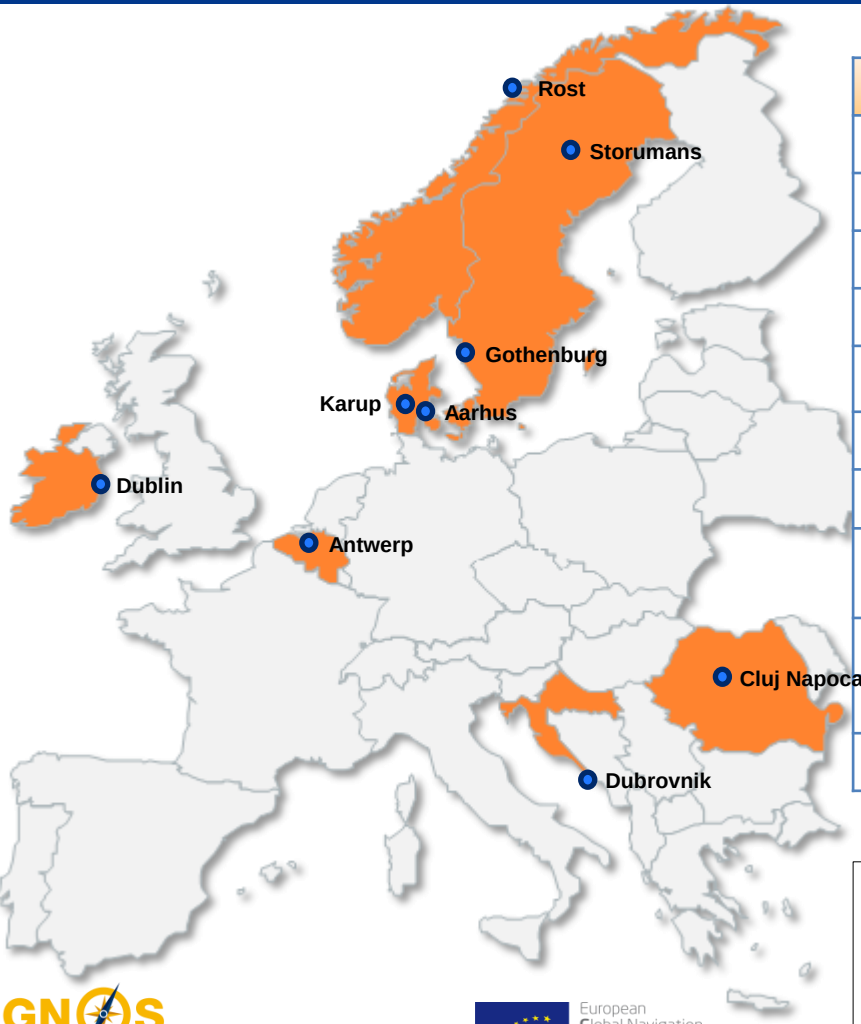
- Advanced operations trials
- Validation of new concepts
- Multiconstellation/multifreq receivers (coming soon)

User driven system evolution

- Market analysis
- User needs/satisfaction monitoring
- Requirements definition
- Cost Benefit analysis

EGNOS

Example of Ongoing support programme (I): Technical support to 1st EGNOS RNP APCH in 8 countries



Country	Airport	Status
Belgium	Antwerp	Design ongoing
Czech Republic	Vodochody	Publication May 2015
Croatia	Dubrovnik	Publication April 2015
Denmark	Aarhus	Publication April 2015
Denmark	Karup	Publication April 2015
Ireland	Dublin	Publication in April 2015
Norway	Røst	Operational
Romania	Cluj Napoca	Completed, under CAA approval
Sweden	Gothenburg City	Operational
Sweden	Storuman	Operational
Sweden	Trollhattan	Ongoing, publication Q3 2015

+ Pioneer project to deploy 2 LPV procedures to non-instrument runways at
'GA' airfields (Sherburn-in-Elmet and Perth) with PPL/IR Europe

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Example of Ongoing support programme (II): GSA-EBAA LPV Working Group

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

GSA + EBAA

EBAA-GSA LPV Working Group set up in August 2014

Two main activities:

1) LPV implementation to EBAA members priority aerodromes. Selection criteria:
   - Airport in the destination network of EBAA member
   - LPV potential to increase safety and accessibility for frequently visited aerodromes

2) Facilitate equipage and operational approval to perform LPV approaches :
   - Analysis of members fleet and availability of retrofit solutions
   - Guidelines to obtain operational approval


H2020-GALILEO-2015-1
NEW OPPORTUNITIES

H2020-Galileo-2015 Call opened 04/11/2014

Deadline for submission: 8th April 2015

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https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-galileo-2015-1.html

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

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

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

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

EGNSS Apps development

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

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

25 m€ Available for funding

Deadline for submission of proposals for second call: April 8th 2015






2014 Aviation Call for Grants

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2014 Call for proposals to foster EGNOS adoption in aviation

Objectives

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

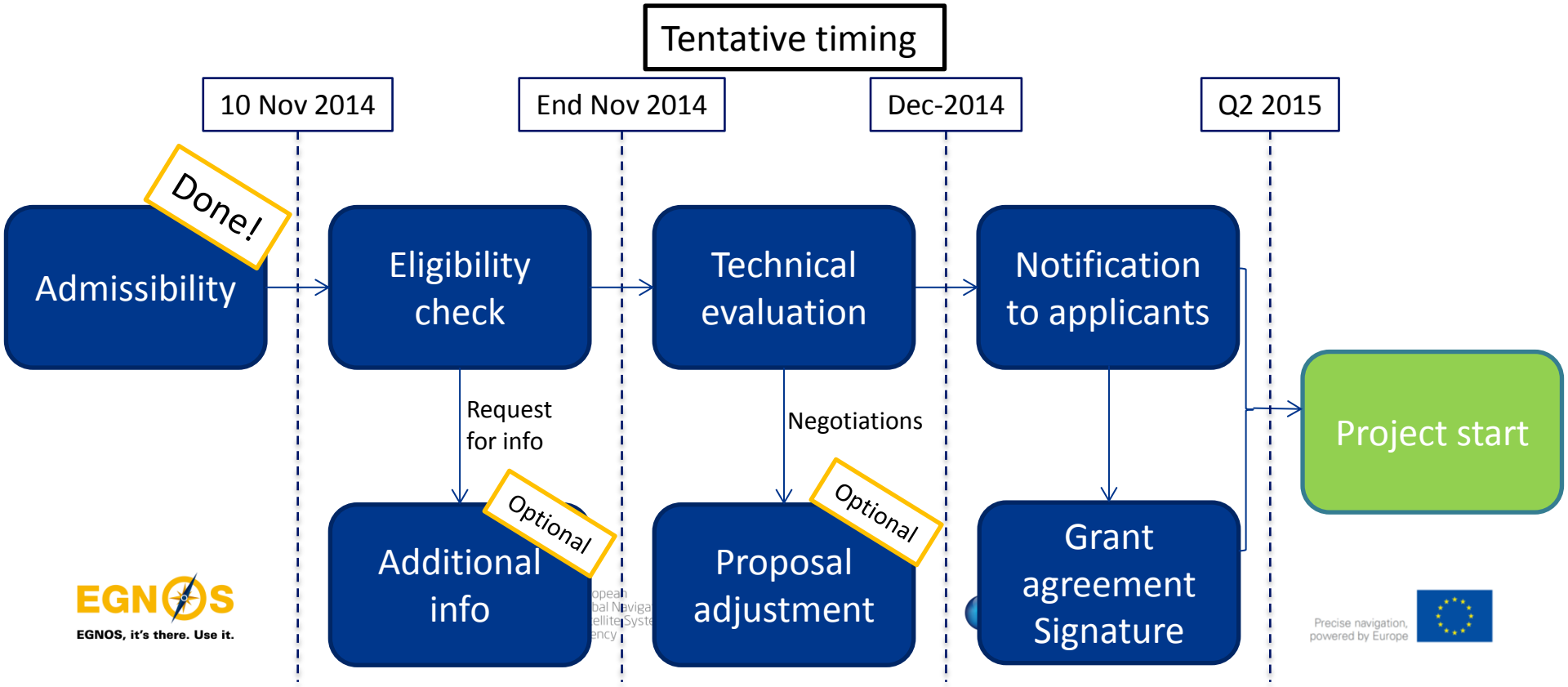
Deadline for submitting applications: 31 October 2014 – at 16:00 Prague time

Signature of Grant Agreement: December 2014

2014 Aviation call for proposals: projects selection

Summary

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



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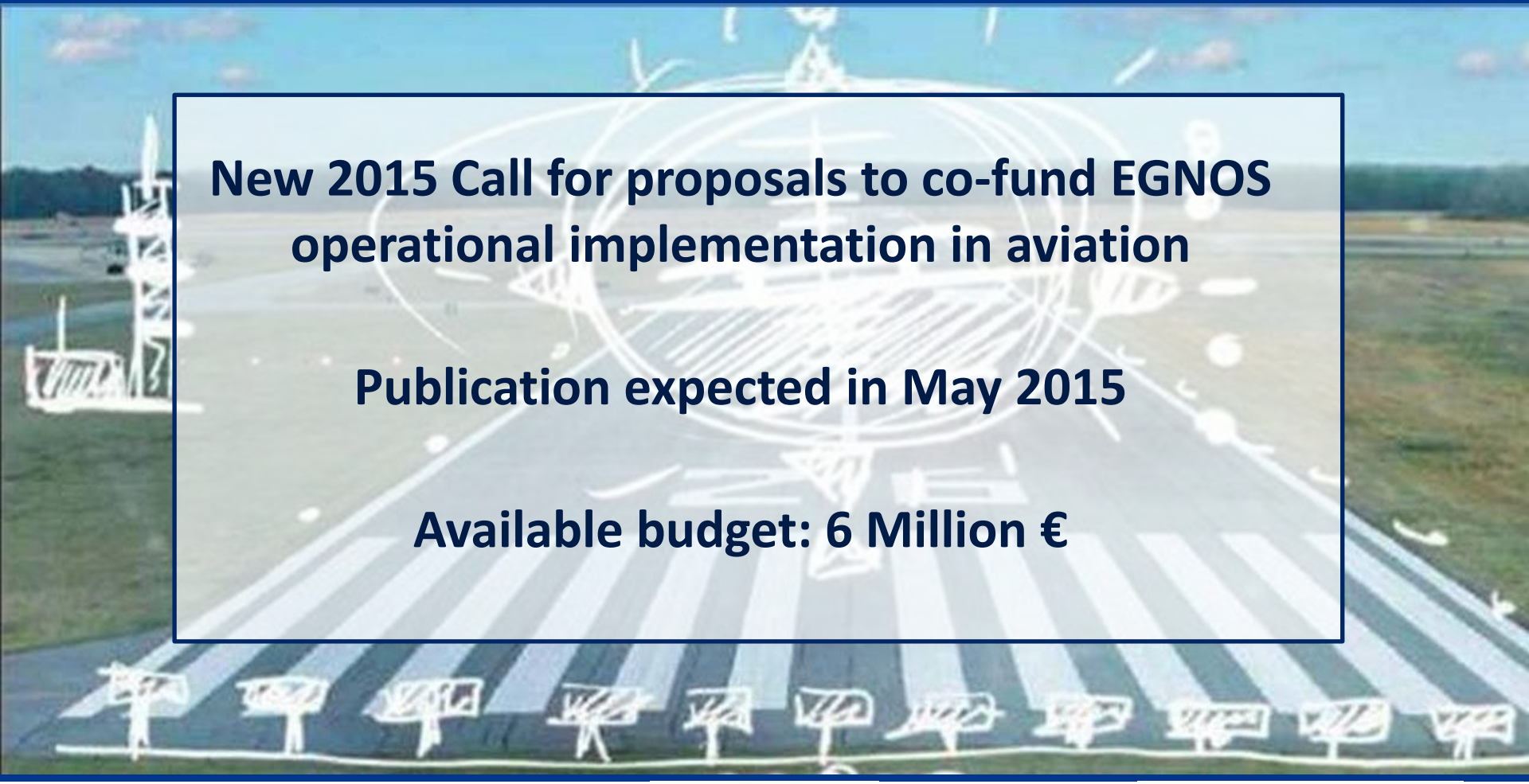

New 2015 Call for proposals to co-fund EGNOS operational implementation in aviation

Publication expected in May 2015

Available budget: 6 Million €

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Latest information at GSA website and social networks

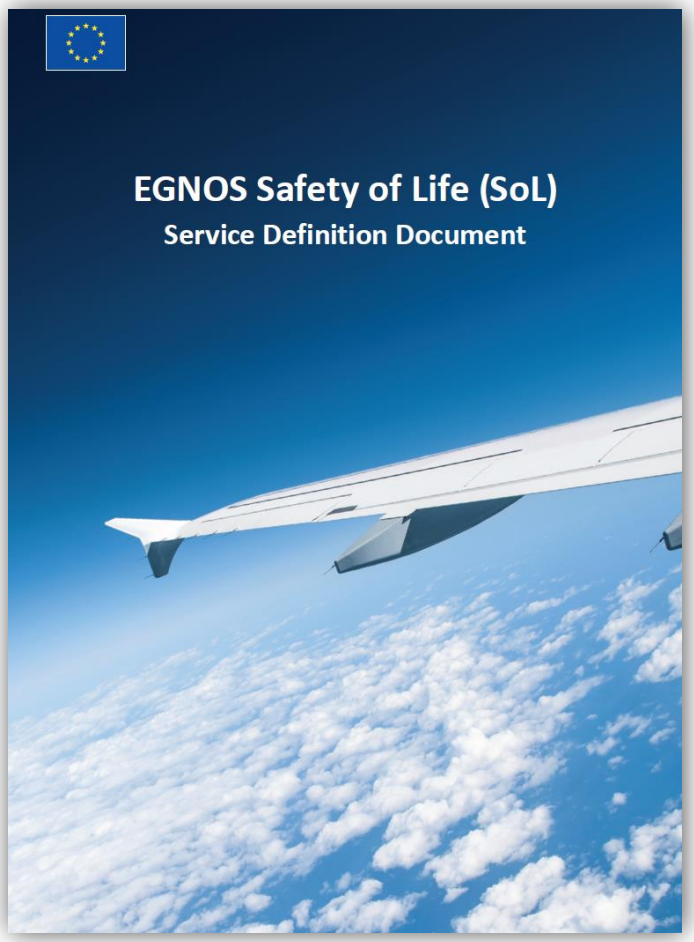
www.gsa.europa.eu
http://www.gsa.europa.eu/gsa/grants
https://www.facebook.com/EuropeanGnssAgency
https://twitter.com/EGNOSPortal

Thank you!

For further information contact:

Gian Gherardo Calini
Gian-Gherardo.CALINI@gsa.europa.eu

EGNOS SoL Service: Roadmap and Support to Implementation



Presented by Mr. Thierry Racaud,
European Satellite Services Provider

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Contents

- **European Satellite Services Provider**
- **SoL Service status**
- **Implementation status**
- **SoL Service Roadmap**
  - Current Service Levels
  - Next challenges
  - LPV-200
- **ESSP support to EGNOS Implementation**

European Satellite Services Provider

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

100 highly skilled professionals on 2 sites

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

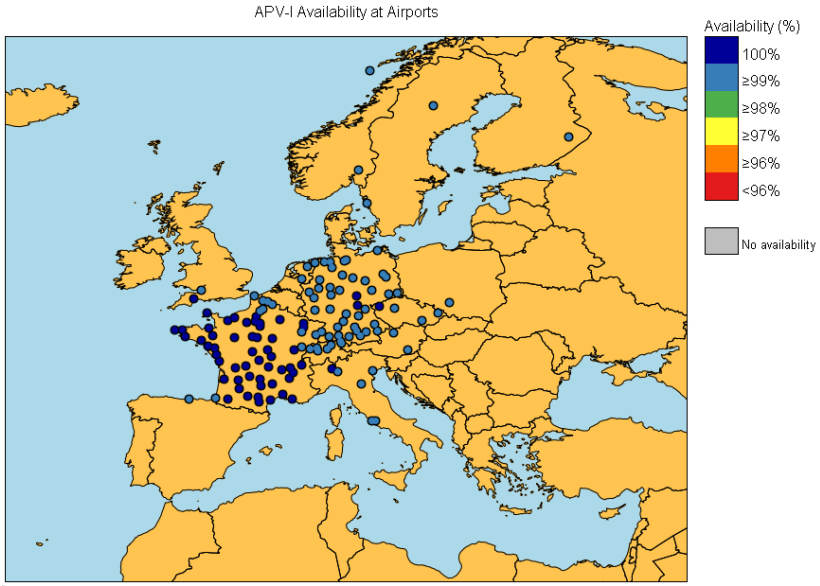
ESSP within the EGNOS ecosystem

EGNOS SoL Service: Status

Service described in the EGNOS SoL Service Definition Document

APV-I performance at airports with EGNOS-based procedures during January 2015

- Availability > 99%
- Worst case: APV-I availability
  99.40% at EFJO / Joensuu (Finland)



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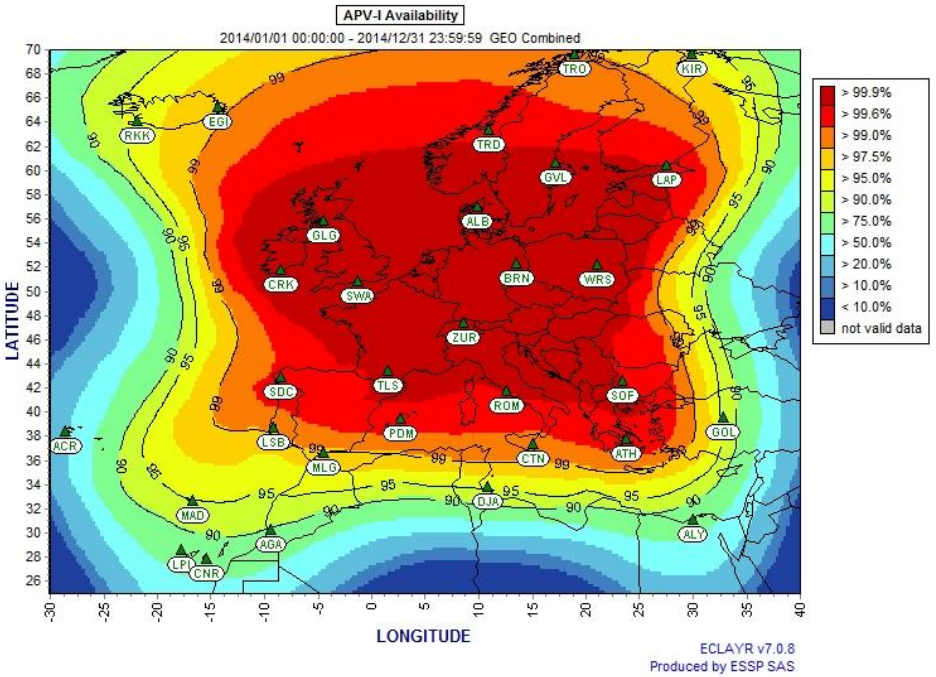
EGNOS SoL Service: Status

APV-I performance during 2014

- Very good coverage of the ECAC landmasses
  - all the LPV procedures available more than 99% of the time
- Some areas with lower availability due (mainly) to ionospheric activity, linked to solar cycle 24 (very active during 2014)



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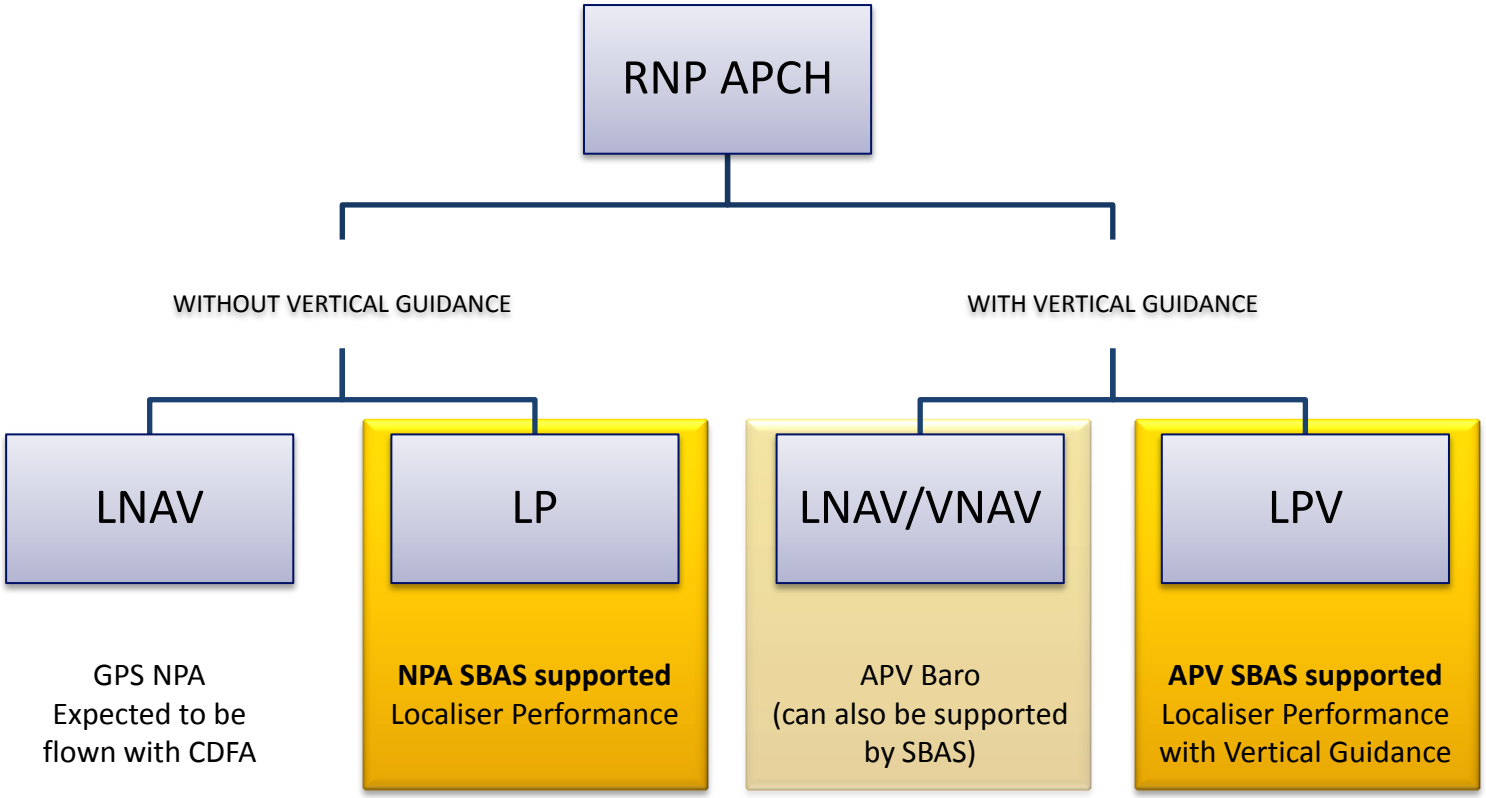
EGNOS SoL Service: Implementation

EGNOS-based operations



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EGNOS SoL Service: Implementation

28 EGNOS Working Agreements signed after the SoL Service Declaration

- **Latest:**
  - BULATSA (Bulgaria)
  - Jersey Airport (Jersey)
  - LVNL (Netherlands)
  - Land's End (UK)
- **(+4) Under signature or ready to be signed:**
  - Croatia Control Ltd (Croatia)
  - Letiště Vodochody (Czech Republic)
  - ACR (Sweden)
  - BAE Systems Marine Ltd (Walney Island, UK)
- **In progress:**
  - Royal Netherlands Air Force (for Civil Operations in Dutch Military airports)
  - Royal Danish Air Force (for Civil Operations in Danish Military airports)
  - Saint's Mary Airport (UK)

Target of 40 EWAs by end 2015

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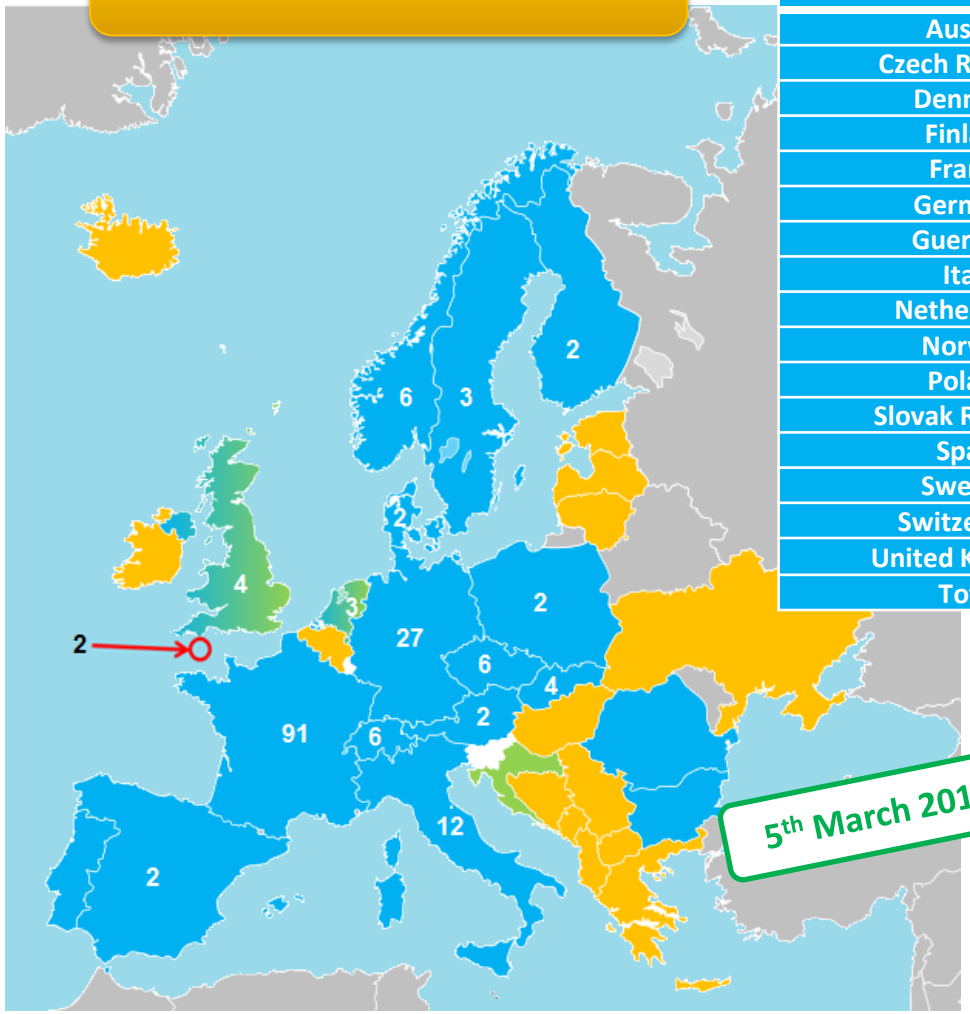
EGNOS SoL Service: Implementation

28 EWAs already signed!



COUNTRY	Airports	LPV Procedures	APV baro Procedures (EGNOS enabled)
Austria	2	2	0
Czech Republic	3	6	4
Denmark	1	2	0
Finland	1	2	0
France	63	91	1
Germany	17	29	71
Guernsey	1	2	0
Italy	6	12	0
Netherlands	2	3	0
Norway	2	6	0
Poland	1	2	0
Slovak Republic	2	4	0
Spain	1	2	0
Sweden	2	3	0
Switzerland	6	6	0
United Kingdom	2	4	0
Total	**113**	**176**	**76**

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

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EGNOS SoL Service: Current levels

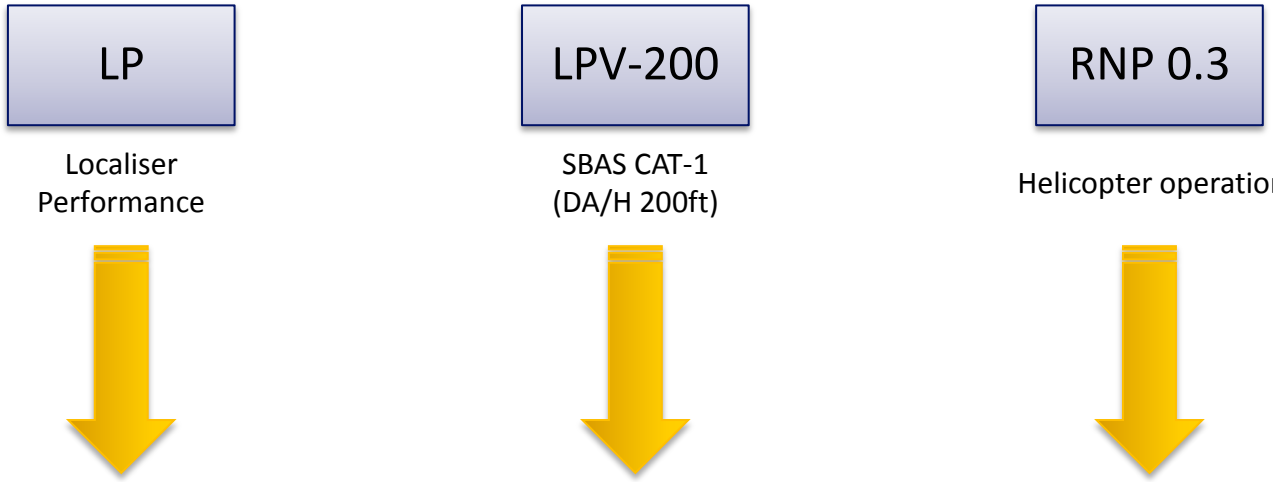
- Current EGNOS SoL service levels provided are:

NPA	APV-I
Non Precision Approach	Approach with Vertical Guidance
RNP APCH operations down to LNAV minima	RNP APCH operations down to LPV minima (250ft)

- Nowadays, **LPV is the highest precision PBN** Instrument Approach Procedure

- By the use of the existing EGNOS SoL Service, the pilot can take the aircraft down, without visual contact to the ground, to as low as 250 feet Decision Height (ILS look-alike approach)

EGNOS SoL Service: Next challenges



ESSP is currently working towards the provision of the EGNOS SoL Service fulfilling the PBN Navigation Specifications demanded by users

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LPV-200: an EGNOS **major milestone**

- New EGNOS system release V2.4.1M will enable LPV operations based on EGNOS SoL service down to a decision height of 200 ft minima (ILS CAT I look-alike)
- According to ICAO, these operations are considered within Instrument Approach Procedures (IAP) as Precision Approaches based on SBAS (PA - SBAS CAT-I)
- This new service level will be called **LPV-200** and its declaration towards users is foreseen in Q4 2015

LPV-200 will bring extra operational benefits (i.e reducing delays, diversions and cancellations) and increase accessibility to European runways with respect to APV while maintaining today's high safety levels

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EGNOS SoL Service: Roadmap 2015 -2017

By the end of 2015, there will be:

- LPV-200 Service level declaration in Q4 2015: new SoL SDD publication
- A general improvement in the coverage area (mainly borders) due to an increase of the robustness against ionospheric disturbances

New version of EGNOS SoL Service Implementation Roadmap foreseen by Q2 2015

Beyond 2015, it is foreseen:

- Coverage improvement toward full EU-28 coverage
- Extension of coverage up to 72°N latitude
- Improvement of GPS SV monitoring capabilities

EGNOS SoL Service: ESSP support to implementation

Awareness

Technical support

- LPV implementation status
- Comprehensive guidance material
  - ANSPs and airports
  - Operators
- Support for EWA signature
- Support services catalogue
  - Manufacturers, Part 21s, Part 145s
  - Procedure designers
  - Flight Validation companies
  - Complementary services

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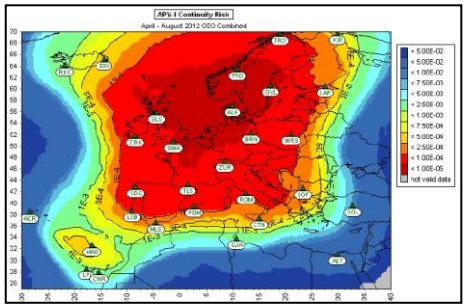
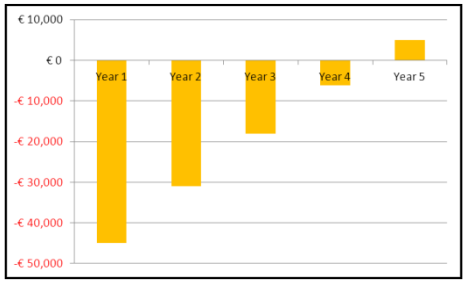
EGNOS SoL Service: ESSP support to implementation

Awareness





Check-out our online EBCAST tool

Technical support

- Performance Assessments
  - EGNOS SoL service performances
  - EGNOS NOTAMs proposals
- Cost Benefits Analyses
  - For airports/ANSPs
  - For operators
- Dedicated Workshops
- Support for mapping EGNOS in PBN implementation plans
- Technical advice on implementation projects (lessons learnt, PoCs)

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EGNOS SoL Service: user interfaces

- For more information on EGNOS…
  - EGNOS User Support Website

    http://egnos-user-support.essp-sas.eu
  - EGNOS Helpdesk

    egnos-helpdesk@essp-sas.eu

    +34 911 236 555 (24/7)
  - EGNOS performances
    - Real-time service performances and SIS status

      http://egnos-user-support.essp-sas.eu/egnos_ops/public_upcm
    - Monthly Performance Reports

      http://www.essp-sas.eu/monthly_performance_reports
    - Yearly Service Provision Reports

      http://www.essp-sas.eu/printed_documents

THANKS FOR YOUR ATTENTION

Thierry RACAUD

Chief Executive Officer

ESSP SAS

www.essp-sas.eu

We certify you´re there.

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EUROCONTROL

European Regulatory Instruments Encouraging PBN Approach Implementation

Presented by Ms. Lendina Smaja, Eurocontrol

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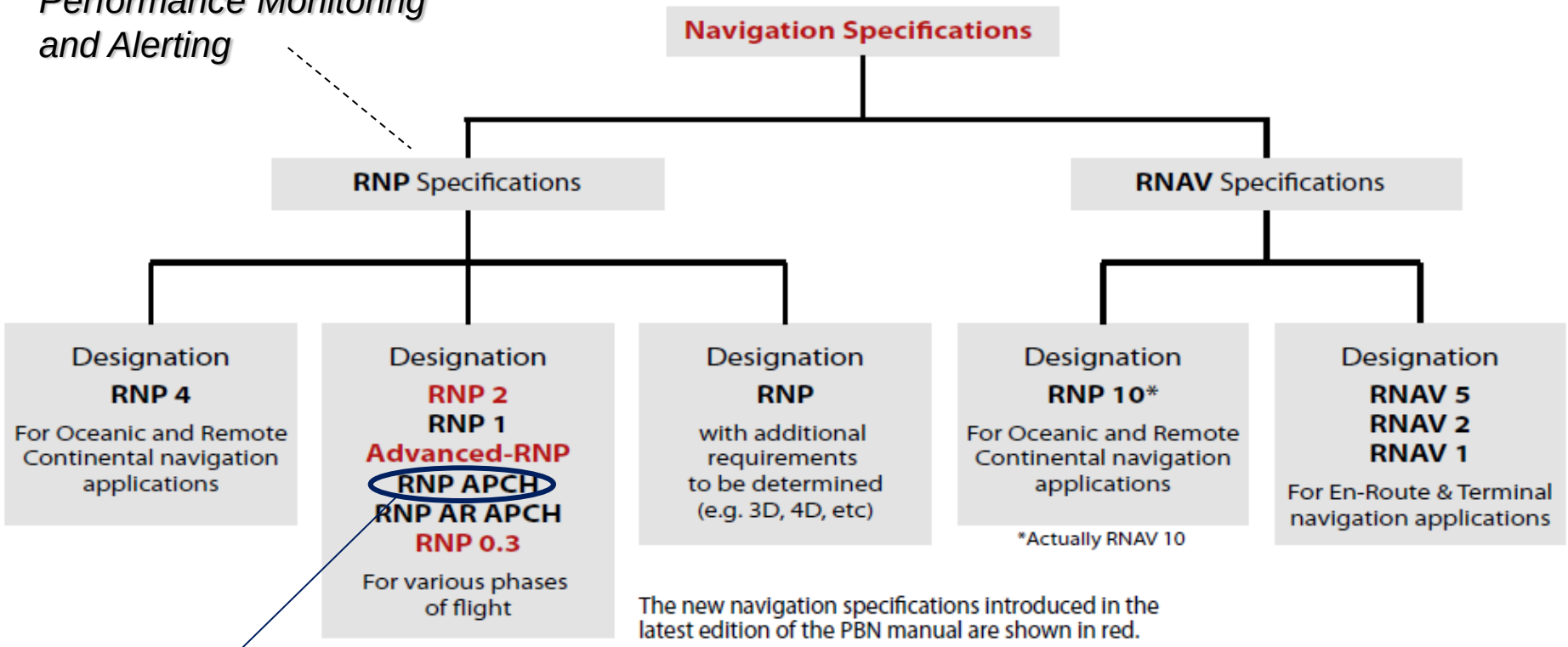
European regulatory instruments encouraging PBN approach implementation

World ATM Congress (WAC)
10th March 2015 (Madrid)
EUROCONTROL

Table of contents

ICAO PBN Navigation Specifications

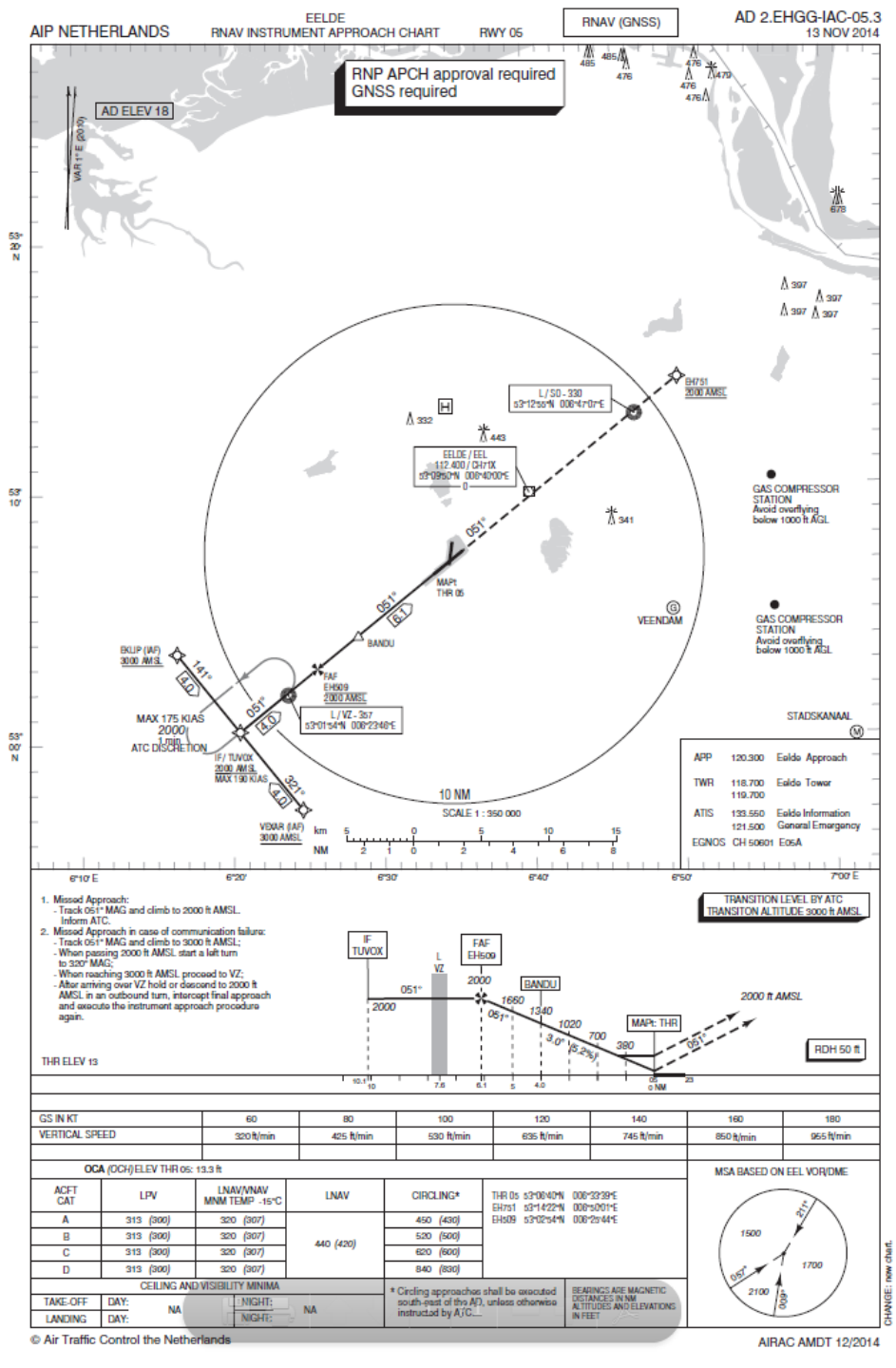
With On-Board Performance Monitoring and Alerting

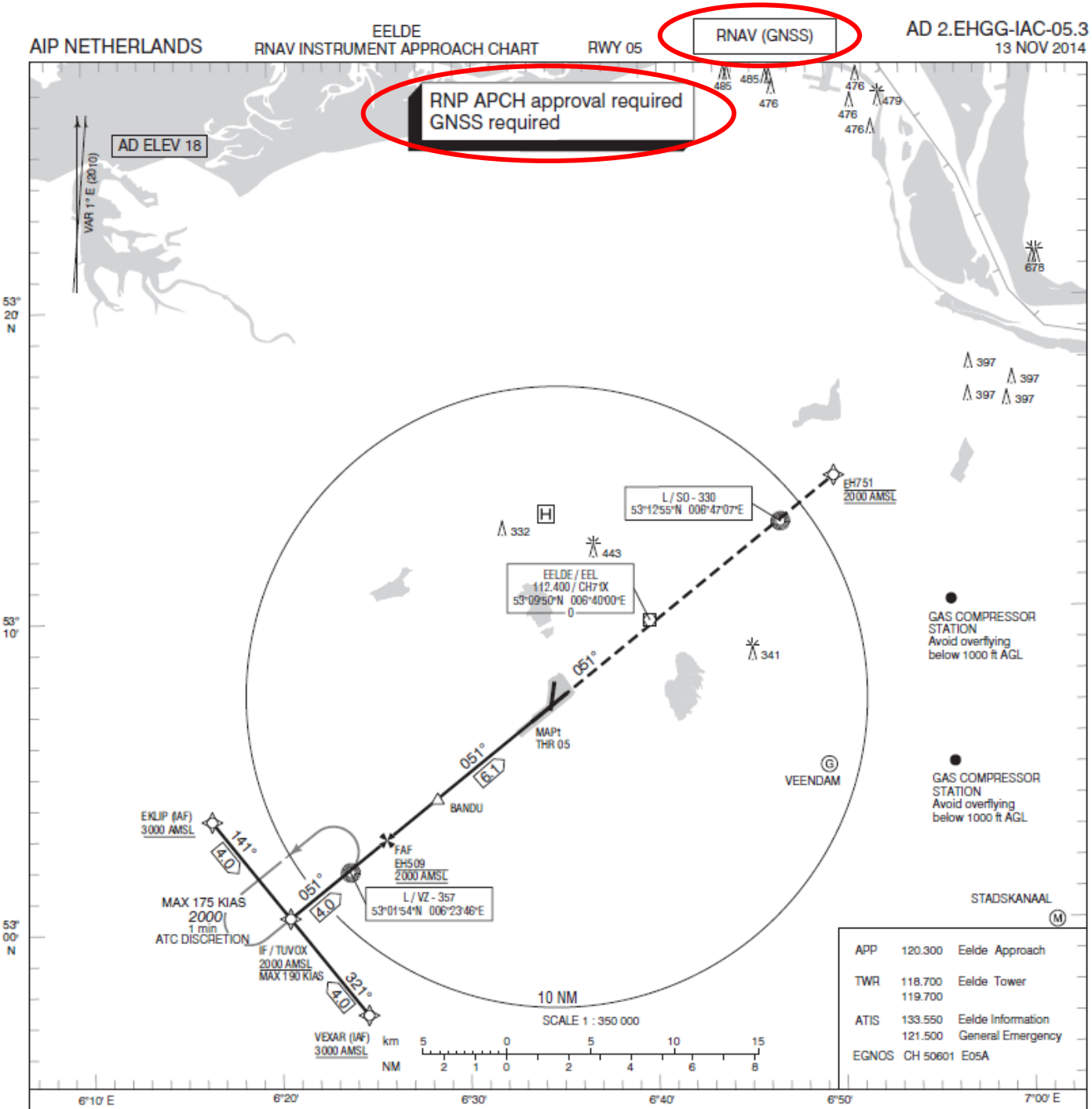


EGNOS is required by the RNP APCH navigation specification.

RNP APCH
Chart Example

- Eelde (The Netherlands):
  - LNAV minima
  - LNAV/VNAV minima
  - LPV minima



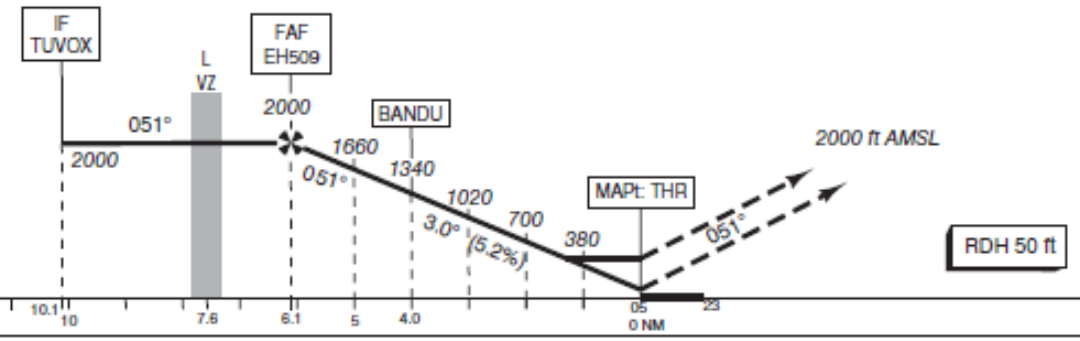

AIP NETHERLANDS
EELDE
RNAV INSTRUMENT APPROACH CHART
RWY 05
RNAV (GNSS)
AD 2.EHGG-IAC-05.3
13 NOV 2014
RNP APCH approval required
GNSS required
AD ELEV 18
VAR 1° E (2010)
L / SO - 330
53°12'55"N 006°47'07"E
EH751
2000 AMSL
EELDE / EEL
112.400 / CH71X
53°09'50"N 006°40'00"E
051°
MAPt
THR 05
BANDU
6.1
FAF
EH509
2000 AMSL
L / VZ - 357
53°01'54"N 006°23'46"E
EKLIP (IAF)
3000 AMSL
141°
4.0
051°
4.0
MAX 175 KIAS
2000
1 min
ATC DISCRETION
IF / TUVOX
2000 AMSL
MAX 190 KIAS
321°
4.0
VEXAR (IAF)
3000 AMSL
10 NM
SCALE 1 : 350 000
km
NM
GAS COMPRESSOR
STATION
Avoid overflying
below 1000 ft AGL
VEENDAM
STADSKANAAL
APP 120.300 Eelde Approach
TWR 118.700 Eelde Tower
119.700
ATIS 133.550 Eelde Information
121.500 General Emergency
EGNOS CH 50601 E05A
53° 20' N
53° 10'
53° 00' N
6°10' E
6°20'
6°30'
6°40'
6°50'
7°00' E

EUROCONTROL

1. Missed Approach:
   - Track 051° MAG and climb to 2000 ft AMSL. Inform ATC.
2. Missed Approach in case of communication failure:
   - Track 051° MAG and climb to 3000 ft AMSL;
   - When passing 2000 ft AMSL start a left turn to 320° MAG;
   - When reaching 3000 ft AMSL proceed to VZ;
   - After arriving over VZ hold or descend to 2000 ft AMSL in an outbound turn, intercept final approach and execute the instrument approach procedure again.

THR ELEV 13

TRANSITION LEVEL BY ATC
TRANSITON ALTITUDE 3000 ft AMSL



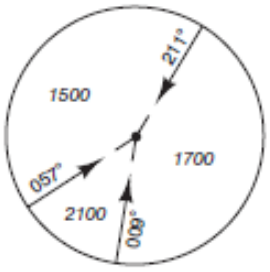
GS IN KT	60	80	100	120	140	160	180
VERTICAL SPEED	320 ft/min	425 ft/min	530 ft/min	635 ft/min	745 ft/min	850 ft/min	955 ft/min

OCA *(OCH)* ELEV THR 05: 13.3 ft

ACFT CAT	LPV	LNAV/VNAV MNM TEMP -15°C	LNAV	CIRCLING*
A	313 *(300)*	320 *(307)*	440 *(420)*	450 *(430)*
B	313 *(300)*	320 *(307)*		520 *(500)*
C	313 *(300)*	320 *(307)*		620 *(600)*
D	313 *(300)*	320 *(307)*		840 *(830)*

THR 05 53°06'40"N 006°33'39"E
EH751 53°14'22"N 006°50'01"E
EH509 53°02'54"N 006°25'44"E

MSA BASED ON EEL VOR/DME



CEILING AND VISIBILITY MINIMA			
TAKE-OFF	DAY: NA	NIGHT: NA	
LANDING	DAY:	NIGHT:	

* Circling approaches shall be executed south-east of the AD, unless otherwise instructed by ATC.

BEARINGS ARE MAGNETIC
DISTANCES IN NM
ALTITUDES AND ELEVATIONS IN FEET

CHANGE: new chart.

AIRAC AMDT 12/2014

- ***LPV capable aircraft*** *will fly LPV approach or LNAV in case of degraded EGNOS performances*
- *On charts without LPV, LNAV/VNAV can be flown by LPV capable aircraft only if this is approved by the local authority*

ICAO Resolutions and conclusions

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

> *" … 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 and 70% by 2014."*

- **37th ICAO Assembly (Oct 2010)** 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. "*

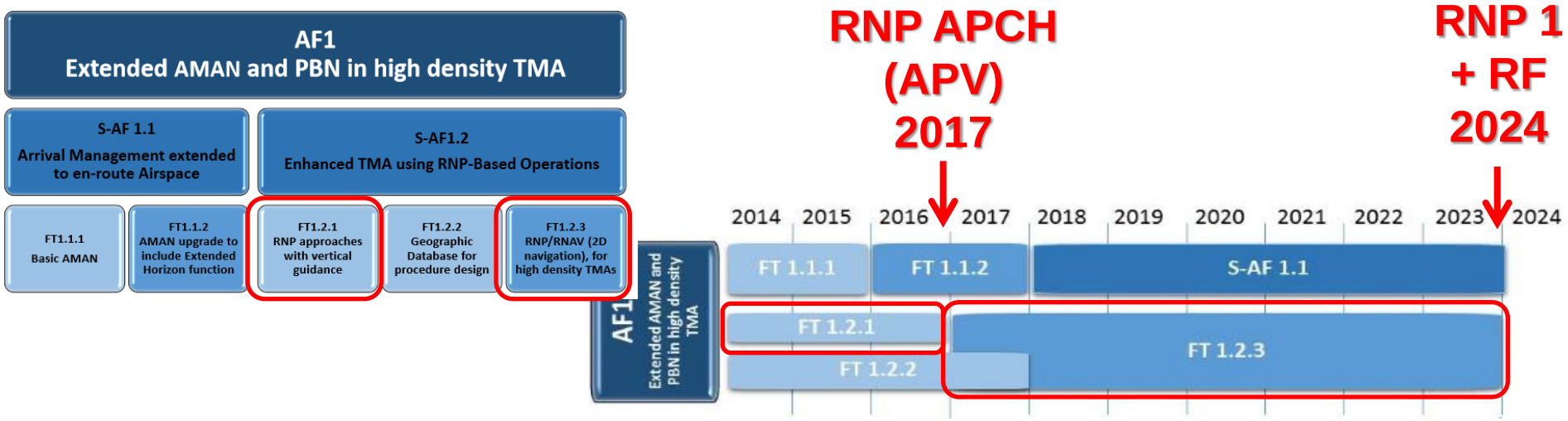
- **EANPG 55 (Nov 2013)** agreed priorities for deployment, where the availability of an approach with vertical guidance (APV, ILS, MLS or GBAS) is the highest priority.
- **HLSC 15 (Feb 2015)** also concluded that implementation of the Resolution should proceed "… with emphasis on areas where maximum safety benefits can be gained".

Existing regulation in Europe (1/2)

- **27 June 2014**: adoption of the **"PCP IR"**
  - The Commission Implementing Regulation (EU) No 716/2014 mandates the implementation of 6 first essential ATM Functionalities (AF) of the Master Plan – the Pilot Common Projects.
  - AF#1 (Extended AMAN and PBN in high density TMA) mandates RNP 1 + RF and RNP APCH (APV)
- **5 December 2014**: appointment of the SESAR Deployment Alliance as the **SESAR Deployment Manager**
  - SESAR Deployment Alliance: A6 Alliance of ANSPs, A4 airlines and SESAR-related Deployment Airport Operators Group (SDAG)
  - A preliminary version of the Deployment Manager **Deployment Programme** is available.

Existing regulation in Europe (2/2)

- Target dates (from the DM preliminary Deployment Programme)



- 10 out of the 24 targeted Airports already have APV procedures:

London Heathrow	*Amsterdam Schipol*	*Stockholm Arlanda*
Paris CDG	*Munich FJ Strauss*	*Berlin Brandenburg*
London Gatwick	*Rome Fiumicino*	*Manchester*
Paris Orly	*Barcelona El Prat*	*Palma de Mallorca*
London Stansted	*Dusseldorf Int.*	*Copenhagen Kastrup*
Milan Malpensa	*Zurich Kloten*	*Vienna Schwechat*
Frankfurt Int.	*Brussels National*	*Dublin*
Madrid Barajas	*Oslo Gardermoen*	*Nice Cote d'Azur*

Additional regulation for Europe in preparation (1/2)

- Mandate on EUROCONTROL to draft a rule until in March 2014 and then transferred to EASA
- **EASA** now oversees PBN implementation
- **Total System** Approach

  EASA RMT.0639 *'Performance-Based Navigation (PBN) implementation in the European Air Traffic Management Network (EATMN)'*

- **Publication dates:**
  - NPA 2015-01 : 19/01/2015 (available at *http://hub.easa.europa.eu/crt/docs*)
  - Consultation: until 20/04/2015
  - Opinion: 2015/Q2
  - Decision: 2015/Q4

Additional regulation for Europe in preparation (2/2)

The proposed rule (NPA 2015-01) :

* On the ground side:

- **APV required** on instrument runways ends without approach with vertical guidance before **January 2024**
  - ie. Runway ends with Precision Approach are excluded from the mandate
- From end 2018, deployment of PBN SID, STARs and ATS routes, when achieving airspace performance targets requires it:
  - In En-route, « RNP 1 + FRT » to be used if PBN is implemented
  - In TMA, « RNP 1 + RF » to be used if PBN is implemented
- **Requirement to maintain non-PBN applications** when introducing PBN (to accommodate non-PBN capable aircraft)

* On the airborne side:

- **No mandate** but non PBN-equipped aircraft might be authorized “with constraints” (e.g. limited access time, suboptimal trajectories, etc…)

Summary of the situation

- **No mandate on the aircraft**, however operators shall be equipped as required for intended operations
- **Mandates on ANSP/airports**, to implement the following PBN applications :

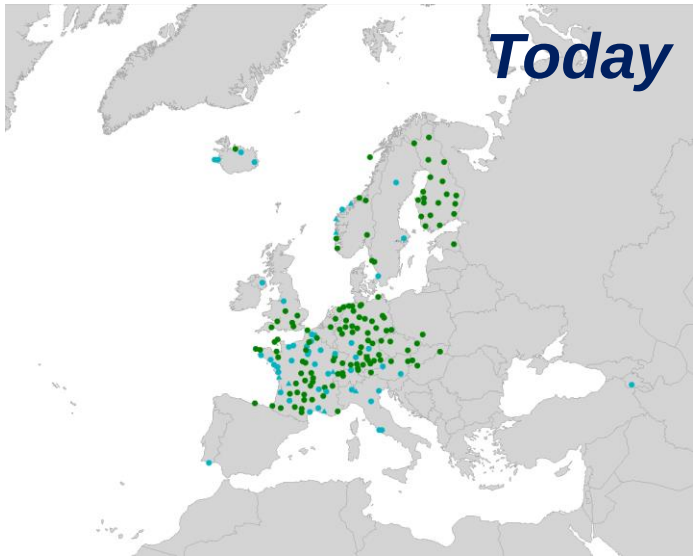
Nav Spec	PCP IR	EASA NPA
RNP APCH (APV)	At 24 Major airports (by 2016)	Mandated everywhere there isn't Precision Landing (ILS, MLS, GBAS) (by 2024)
RNP 1 + FR	At 24 Major TMA (by 2024)	No mandate for deployment, *The NPA proposes to mandate the use this Nav Spec(*) only if PBN is to be used in the TMA*
RNP 1 + FRF	No mandate for deployment	No mandate for deployment, *The NPA proposes to mandate the use this Nav Spec(*) only if PBN is to be used in the en-route*

EUROCONTROL's support to deployment
- The RAISG stakeholders' group

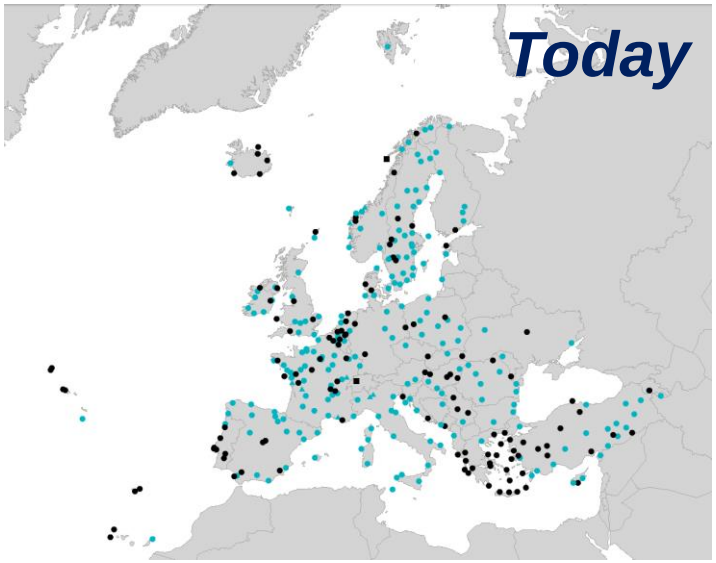
- **Main objectives**
  - Better understand PBN and RNP APCH (all types)
  - Find a way through ICAO provisions
  - Support **harmonized** implementation
  - Provide a forum for **exchange** of lessons learned
  - Collect **best practices**
  - Develop **guidance for implementation** (ICAO EUR doc 025)
  - **Monitor** the deployment of RNP APCH in Europe (PBN Approach Map Tool)

Implementation status and plans (1/2)

Airports with APV

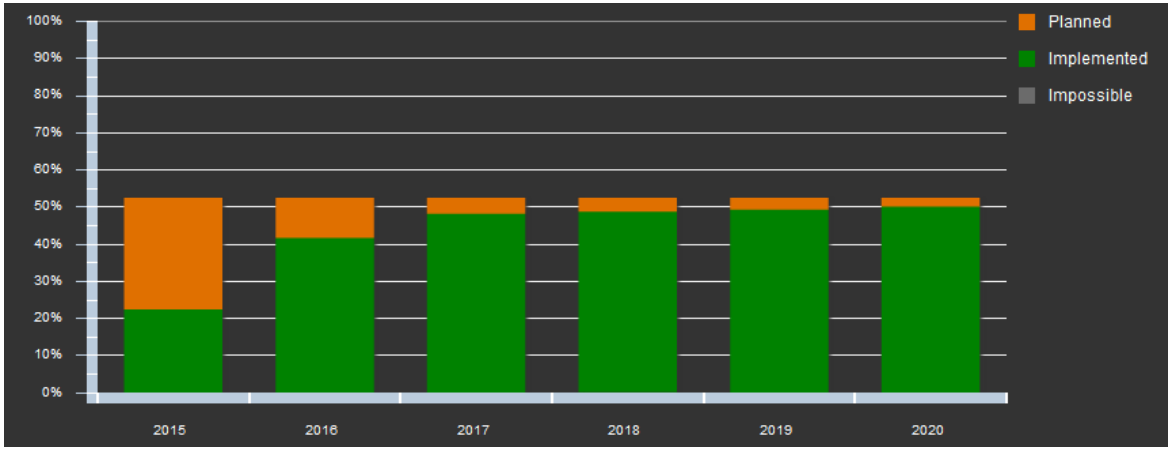


Airports without 3D approaches



Implementation status and plans (2/2)

APV status of implementation



Today:

22% of rwy ends

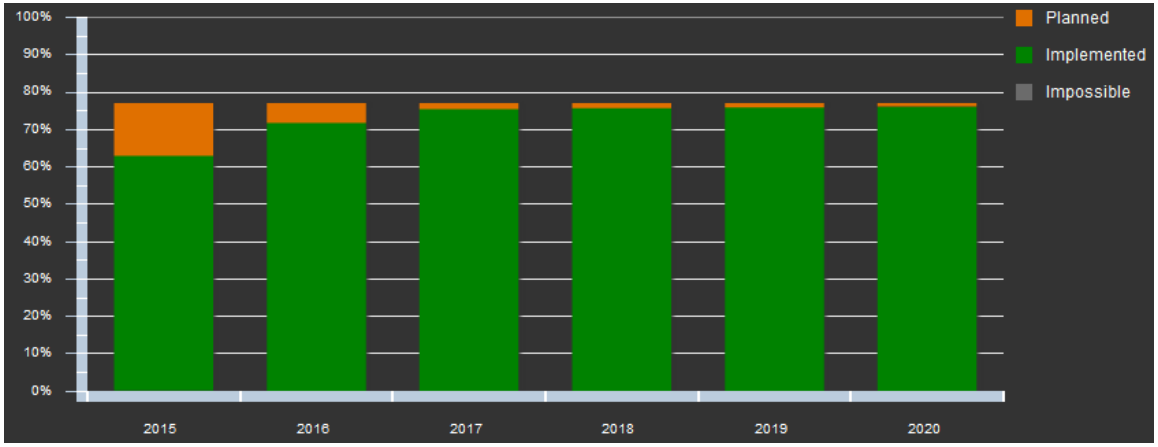
- 11% SBAS
- 17% Baro-VNAV

2020:

51% of rwy ends

- 35% SBAS
- 37% Baro-VNAV

3D status of implementation



Today:

63% of rwy ends

2020:

77% of rwy ends

Thank you for your attention !

EGNOS
Is there, use it!

EGNOS Awards

Year 2015

ESSP

European Global Navigation Satellite Systems Agency

EGNOS Awards

In recognition of EWA signature

BULATSA

BULGARIAN AIR TRAFFIC SERVICES AUTHORITY

award collected by **Mr Georgi Peev**

Bulatsa Director General

EGNOS

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European Global Navigation Satellite Systems Agency

ESSP

Precise navigation, powered by Europe

EGNOS Awards

Burgas airport (LBBG)

Credits: BULATSA


Credits: Burgas airport

EGNOS Awards

In recognition of 1st LPV publication

award collected by **Carin Holtzrin Kjellander**

Director International Affairs

RNP/APV procedures to Gothenburg City Airport

Carin Holtzrin-Kjellander
LFV

International and Swedish National Requirements

ICAO Assembly Resolution 37-11

1. *Urges all States to implement RNAV and RNP air traffic services (ATS) routes and approach procedures in accordance with the ICAO PBN concept laid down in the Performance-based Navigation (PBN) Manual (Doc 9613);*

2. *Resolves that:*

a) *States complete a PBN implementation plan as a matter of urgency to achieve:*

1) *implementation of **RNAV and RNP operations (where required) for en route and terminal areas** according to established timelines and intermediate milestones; and*

2) *implementation of **approach procedures with vertical guidance (APV)** (Baro-VNAV and/or augmented GNSS), including LNAV only minima 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 per cent by 2010, 70 per cent by 2014; and*

3) *implementation of **straight-in LNAV only procedures, as an exception to 2) above**, for instrument runways at aerodromes where there is no local altimeter setting available and where there are no aircraft suitably equipped for APV operations with a maximum certificated take-off mass of 5 700 kg or more;*

→

TSFS 2015:1 – Swedish CAA /Transportstyrelsens regulatory document.

---

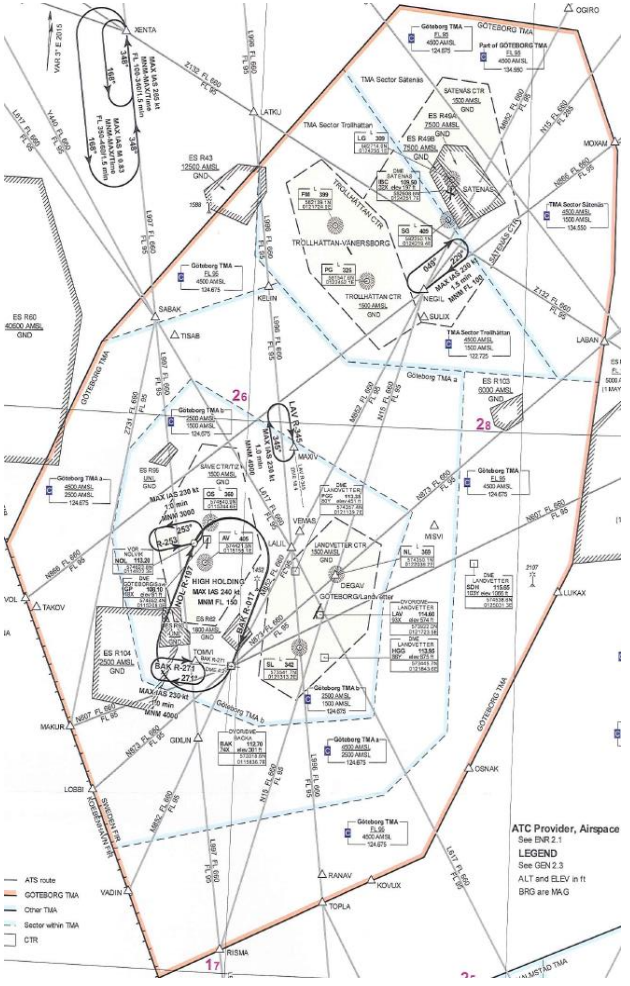
11 b § APV procedures should be implemented to all instrument RWY ends.
The APV-procedur to be based on barometric pressure (Baro-VNAV) and/or satellite navigation (GNSS) with support from SBAS.

…

APV approaches to be implemented by 1 dec 2016.

Choice of Airport for first APV implementation – ESGP (Gothenburg City Airport)

- Airport had already contacted LFV about design of RNAV (GNSS) procedures …
- Possibility of funding from GSA for the first SBAS procedure
- Swedish CAA advised GSA about ESGP as a suitable airport
  - 3 operators with SBAS equipment installed (no approval)
  - Geografical position, EGNOS availability and continuity
  - Alternate for ESGG with SBAS/ Baro-VNAV equipped operators
  - ”Despite” eventual complications with surrounding airports within the same TMA
- Situation before …
  - RNAV SID/STAR RWY 01/19
  - ILS/LOC RWY 19
  - NDB/DME RWY 01/19

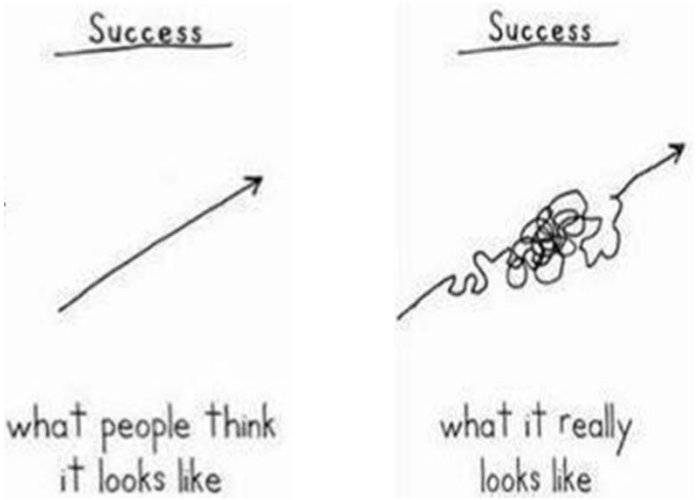


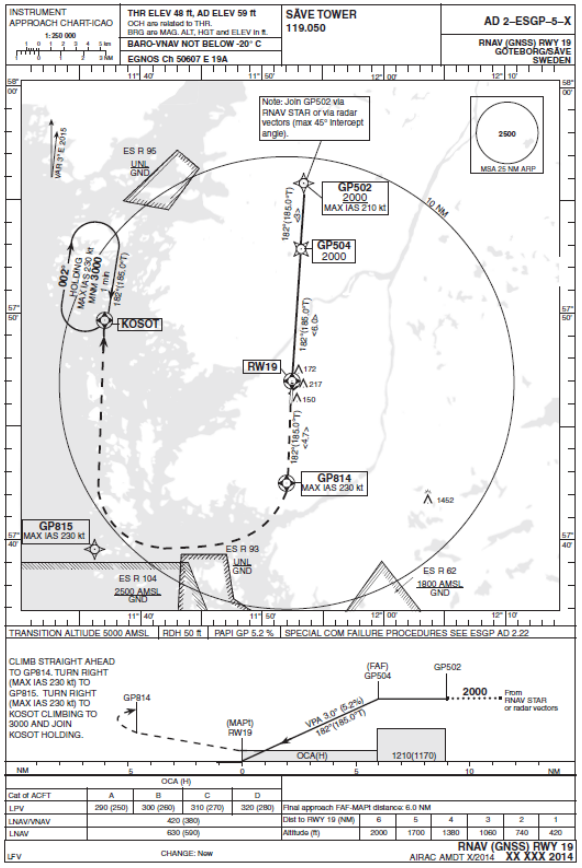
Lessons learned - 1

- **EWA (EGNOS working agreement)** – We are still not sure that the document is clearly adaptable for all states depending on roles and responsibilities between ANSPs, Airport operators and Regulator…
- **ATS standard operating procedures** – Relevant (ICAO) documents with effect on practical applications for ATCO are not updated accordingly taking into account changes related to RNAV procedures and operators capabilities, ex phraseology, naming of procedures, vectoring issues.
- **RNAV** – the challenge to keep RNAV through complete procedure and adjust to present environment ex. holding, missed approach procedure, connection from STAR.
- **Environmental constraints** – the T-bar concept will at some airports add new routes to present route system and that could lead to the need of negotiations for a new environmental approval.

Lessons learned - 2

It’s never really quite as simple as they say …

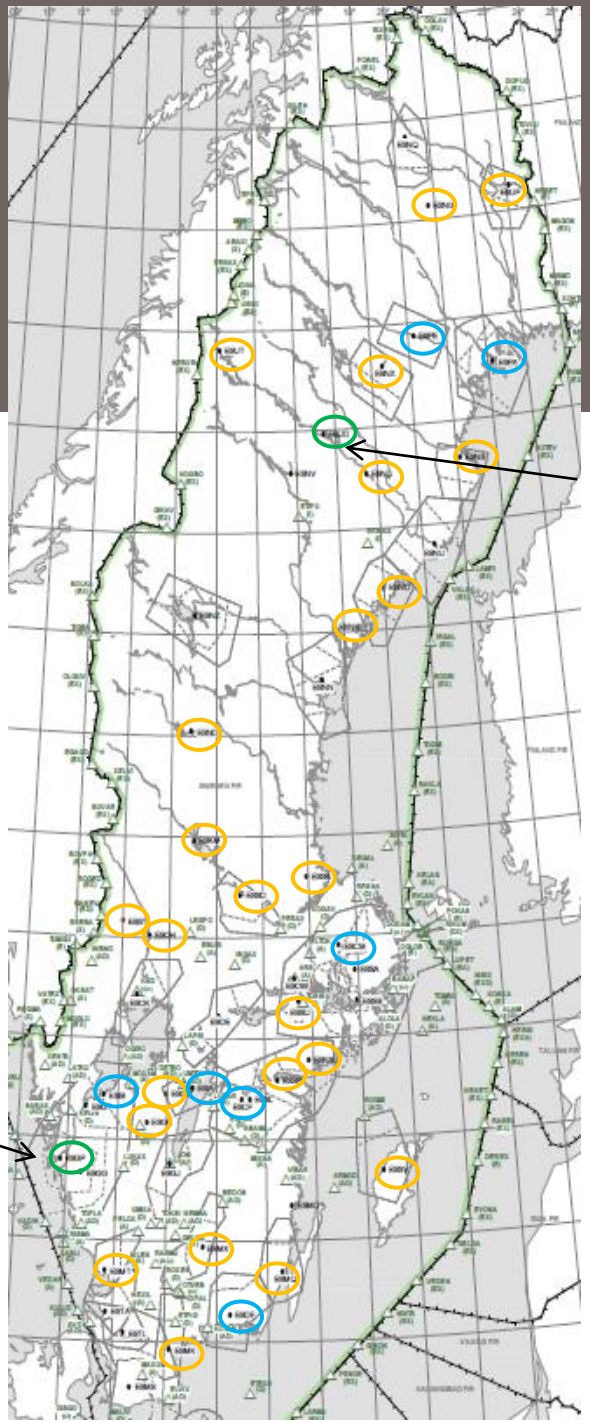




With a new concept comes new tasks , and old tasks in a new context.
”Normal” acitivities such as design, coding, validation, safety assesment, publication, training etc need some extra consideration.

Production planning
RNP/APV apch LFV

2 airports operational
24 airports ongoing
7 airports (mil) planning



ESUD - Storuman
WEF 11 DEC 2014

ESGP - Gothenburg City Airport
WEF 18 SEP 2014

THANKS FOR YOUR ATTENTION!

EGNOS Awards

In recognition of EWA signature

Luchtverkeersleiding Nederland
Air Traffic Control the Netherlands

award collected by **Mr Bart Banning**

Flight Procedures Expert at LVNL

EGNOS
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European Global Navigation Satellite Systems Agency

ESSP

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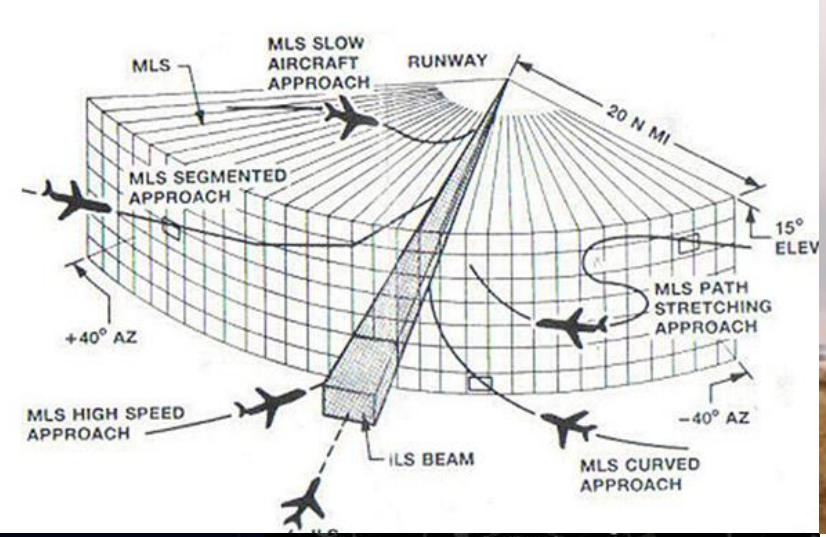
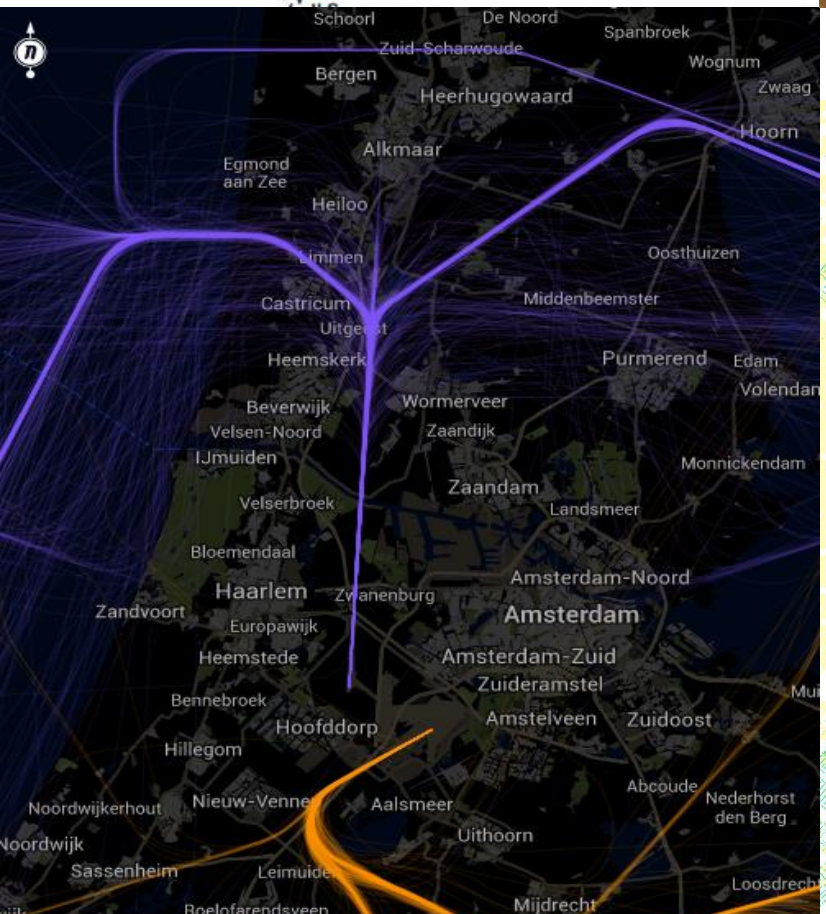
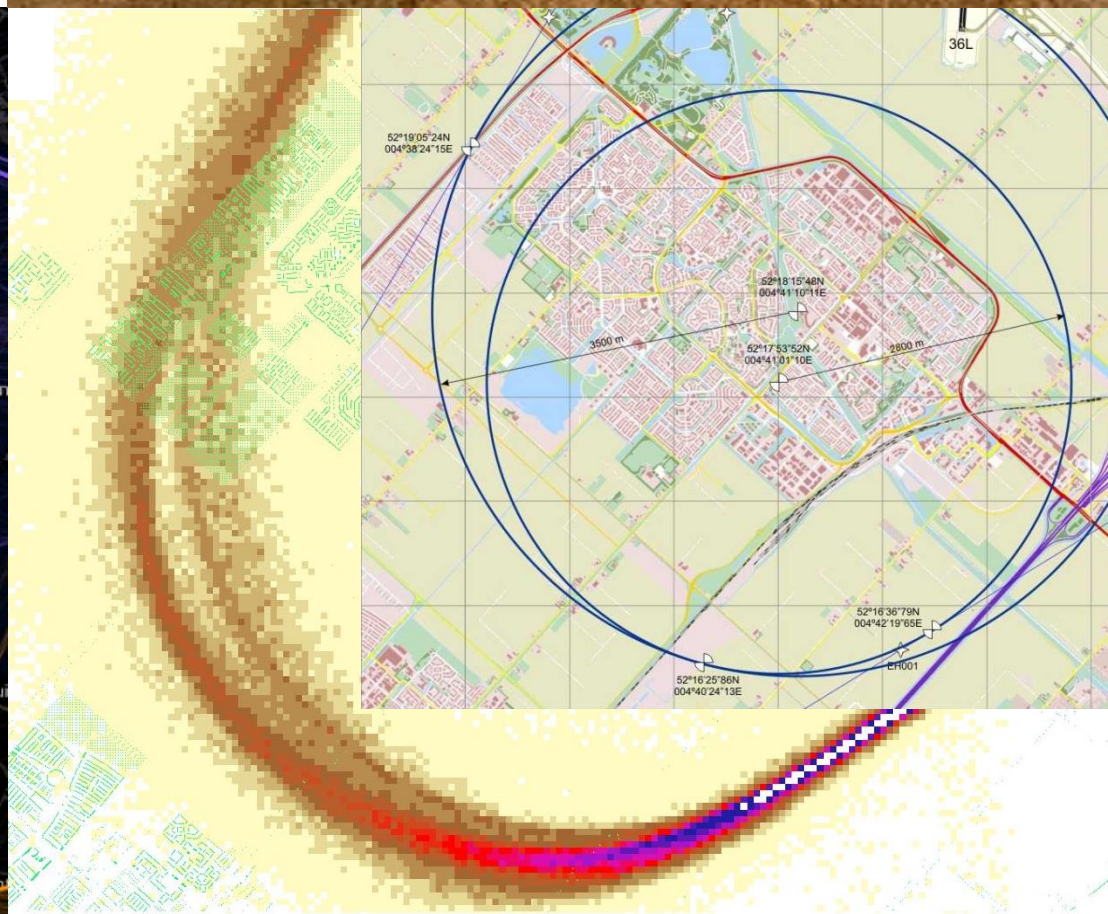
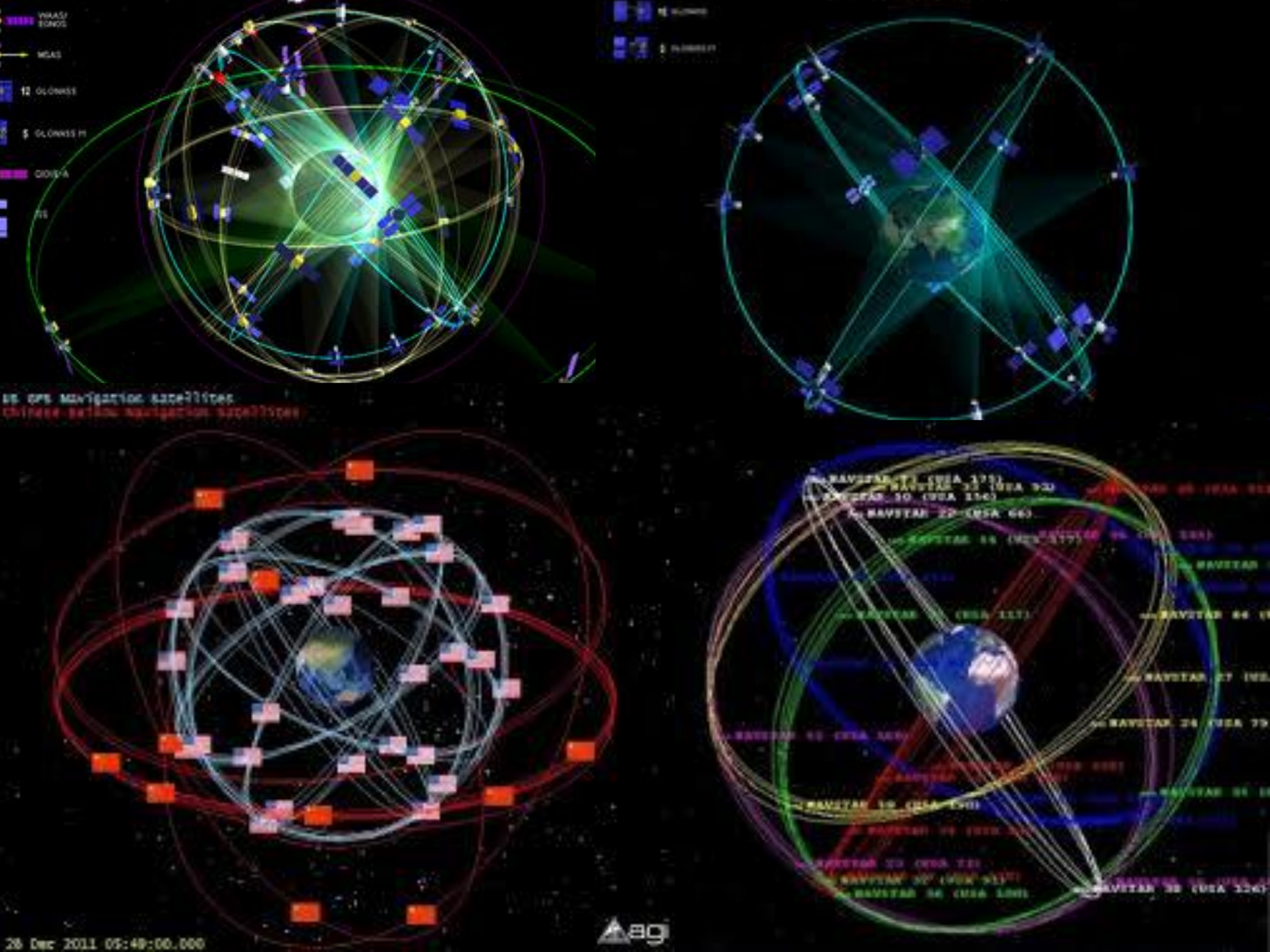
CSCL GLOBE


Amsterdam
Vijfhuizen
Polderbaan
A9
A5
Zwanenburgbaan
A4
Schiphol
Buitenveldertbaan
Oostbaan
Haarlemmermeer
Kaagbaan
Aalsmeerbaan


MLS
MLS SLOW AIRCRAFT APPROACH
RUNWAY
20 N MI
MLS SEGMENTED APPROACH
15° ELEV
MLS PATH STRETCHING APPROACH
+40° AZ
-40° AZ
MLS HIGH SPEED APPROACH
ILS BEAM
MLS CURVED APPROACH


Schoorl
De Noord
Spanbroek
Zuid-Scharwoude
Wognum
Bergen
Zwaag
Heerhugowaard
Hoorn
Alkmaar
Egmond aan Zee
Heiloo
Oosthuizen
Castricum
Middenbeemster
Heemskerk
Purmerend
Edam
Volendam
Beverwijk
Wormerveer
Velsen-Noord
Zaandijk
IJmuiden
Monnickendam
Zaandam
Velserbroek
Landsmeer
Bloemendaal
Haarlem
Amsterdam-Noord
Zwanenburg
Zandvoort
Amsterdam
Europawijk
Heemstede
Amsterdam-Zuid
Zuideramstel
Bennebroek
Amstelveen
Zuidoost
Hoofddorp
Hillegom
Abcoude
Nederhorst den Berg
Noordwijkerhout
Nieuw-Vennep
Aalsmeer
Uithoorn
Noordwijk
Sassenheim
Leimuiden
Loosdrecht
Mijdrecht


36L
52°19'05"24N
004°38'24"15E
52°18'15"48N
004°41'10"11E
3500 m
52°17'53"52N
004°41'01"10E
2800 m
52°16'36"79N
004°42'19"65E
52°16'25"86N
004°40'24"13E
EH001


12 GLONASS
28 Dec 2011 05:49:00.000


PH-ACE


PH-DFA


PH-MFA
Martinair


PH-LAB
PHARUS


8
17

EGNOS Awards

In recognition of EWA signature

JERSEY AIRPORT

award collected by **Mr Les Smallwood**

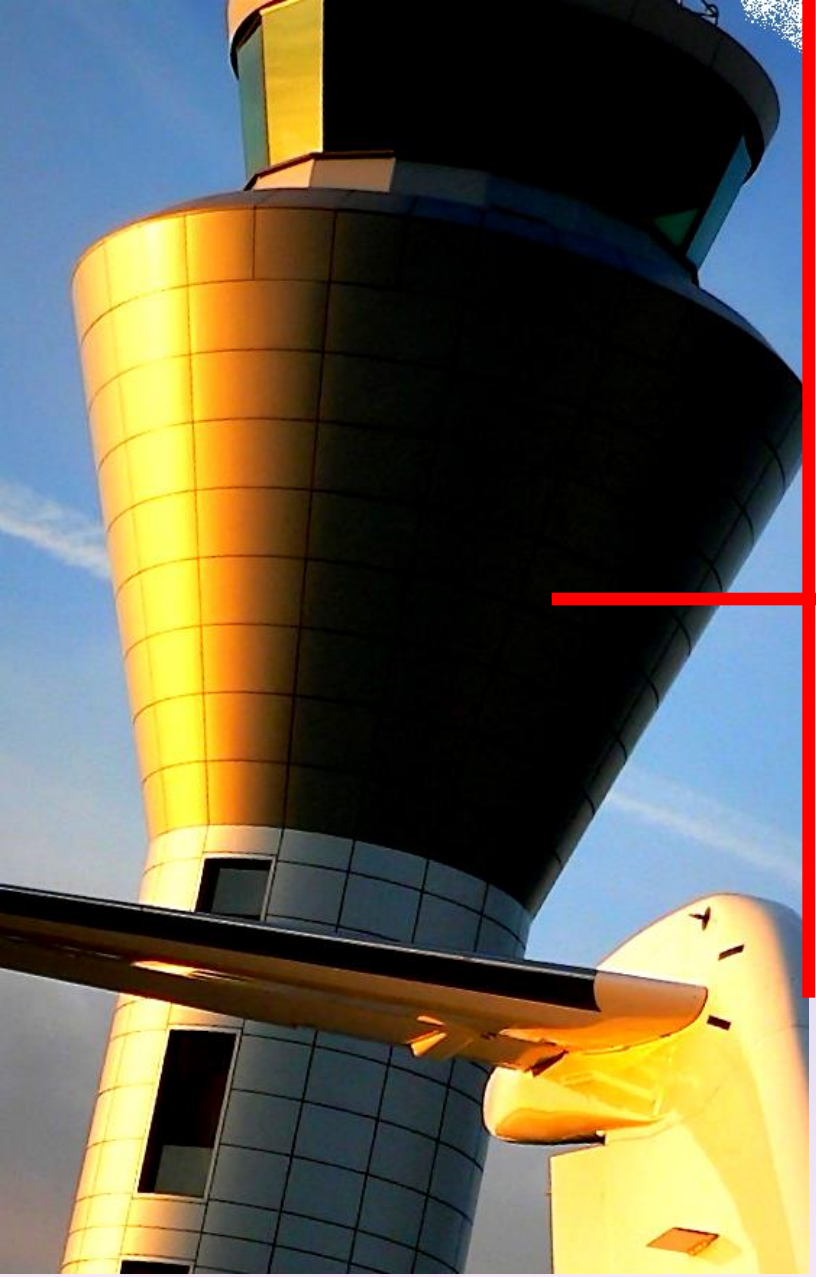
Senior Air Traffic Control Officer at Jersey Airport

EGNOS
EGNOS, it's there. Use it.

European Global Navigation Satellite Systems Agency

ESSP

Precise navigation, powered by Europe



JERSEY AIRPORT

Jersey Airport ATC

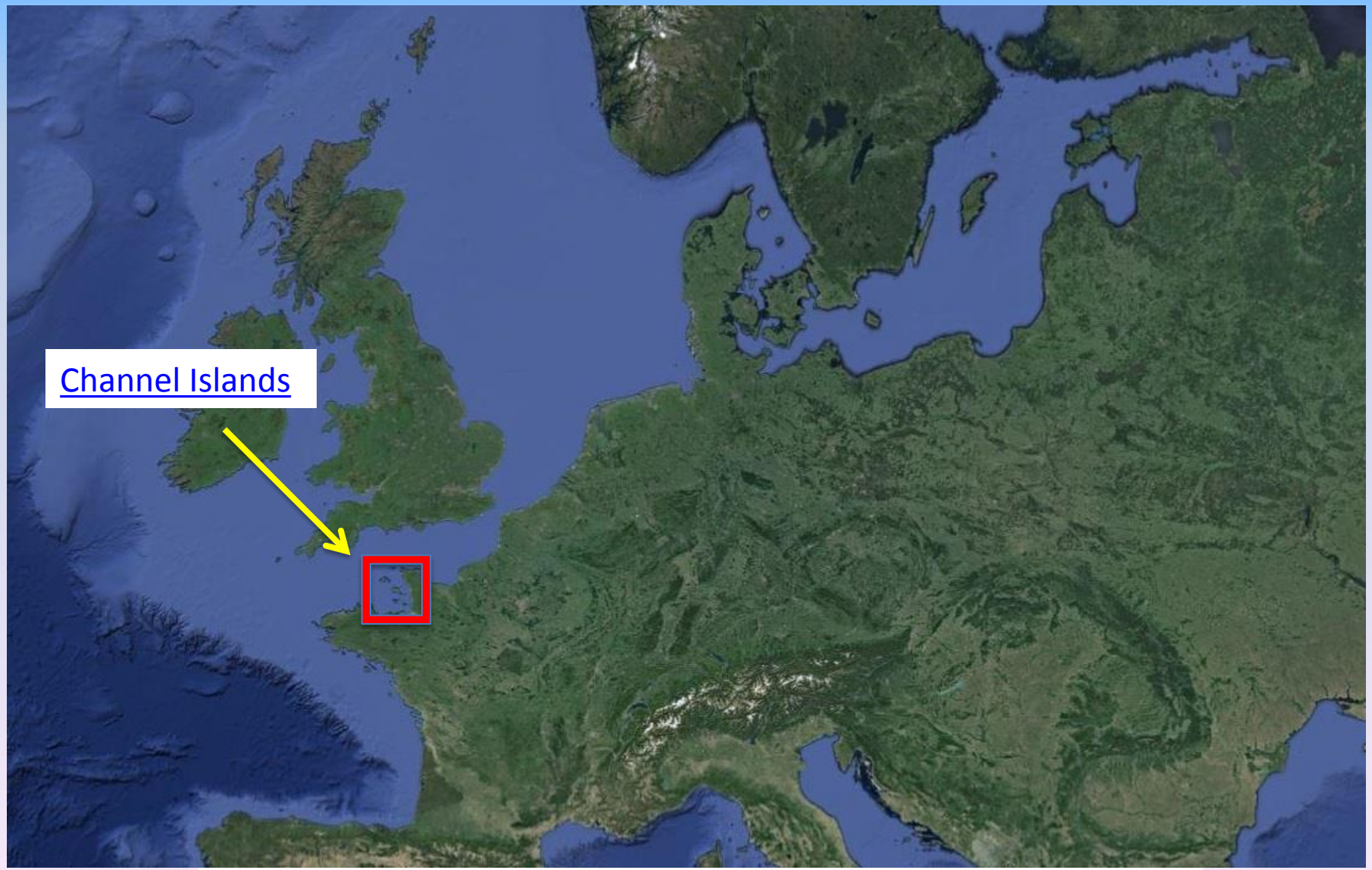
Les Smallwood

JERSEY AIRPORT PORT OF JERSEY JERSEY COASTGUARD JERSEY MARINAS

Overview

- Brief overview of Jersey and other Channel Islands
- Air Traffic Operation in Jersey
- Regulatory overview
- GNSS Approaches at Jersey Airport
- Ground based Navigation Aids
- EGNOS, ESSP & EWA
- Issues faced, so far & Implementation
- Questions

JERSEY AIRPORT PORT OF JERSEY JERSEY COASTGUARD JERSEY MARINAS

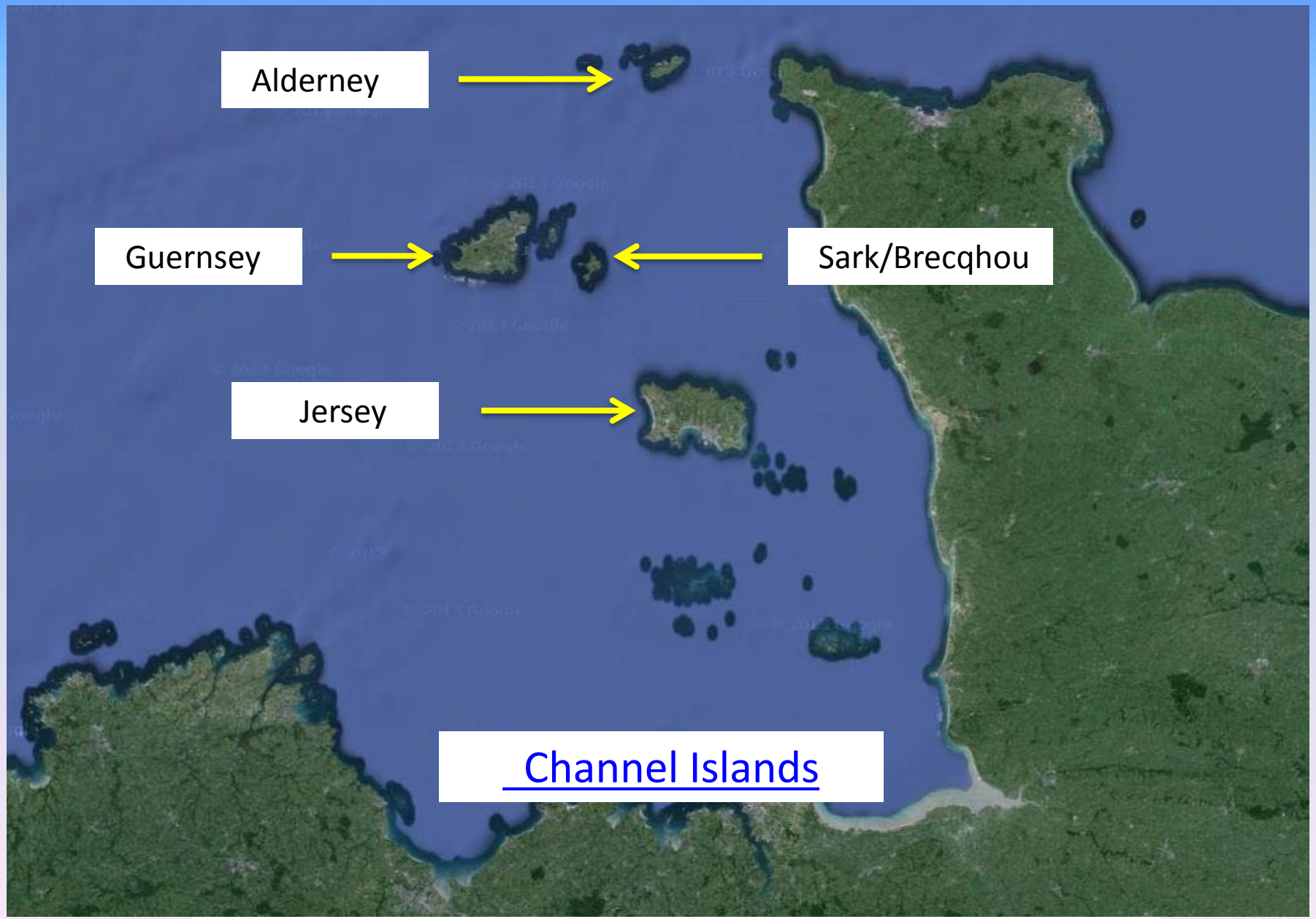


JERSEY AIRPORT

PORT OF JERSEY

JERSEY COASTGUARD

JERSEY MARINAS



JERSEY AIRPORT
PORT OF JERSEY
JERSEY COASTGUARD
JERSEY MARINAS

Jersey

- Population of 96,000 - 13km x 9km
- Government
  - States of Jersey
- Industry
  - Finance, Agriculture, Tourism
- Reliance on Airport & Sea Port (100%)

JERSEY AIRPORT
PORT OF JERSEY
JERSEY COASTGUARD
JERSEY MARINAS

JERSEY AIRPORT PORT OF JERSEY JERSEY COASTGUARD JERSEY MARINAS

Air Traffic Operation in Jersey

- ✈Channel Island Airspace
- ✈89% French FIR (FAB-EC)
  - ✈11% UK FIR

- ✈Movements – Total 52,763
- ✈ Scheduled 36,917
- ✈ Freight 2,550
- ✈ Light a/c 12,045
- ✈ Others 1,251

JERSEY AIRPORT PORT OF JERSEY JERSEY COASTGUARD JERSEY MARINAS

Regulatory overview

- DCA - Director of Civil Aviation
- National Supervisory Authority
  - France - DGAC - ANSP Certification
  - Regulatory Oversight - conducted by UK CAA
  - Jersey follows SES Regulation

JERSEY AIRPORT PORT OF JERSEY JERSEY COASTGUARD JERSEY MARINAS

GNSS Approaches

- Basic LNAV approaches - May 2013
- All ATCOs provided with training
  - SiS, Phraseology, RAIM, integration

- Ground Based Navigation Aids
  - ILS (Cat 1), VOR, NDB
- Strategy to reduce reliance on Ground Based Nav Aids (ILS & VOR issue)

JERSEY AIRPORT PORT OF JERSEY JERSEY COASTGUARD JERSEY MARINAS

GNSS Approaches

- Decision taken to add BaroVNav & LPV
  - Planning for the future

- EGNOS Working Agreement
  - Process commenced Sept 2013
  - Complex as Jersey non-EU State (ESSP help)
  - EWA completed late 2014

JERSEY AIRPORT PORT OF JERSEY JERSEY COASTGUARD JERSEY MARINAS

Issues faced

- Non EU State
- Inexperience of IFP Designers (new to GNSS)
- IFP Designers and IFP Regulators
  - Differing standards
  - Differing interpretation of PANS-Ops
- IFP Regulator – under resourced
  - Drafts submitted

JERSEY AIRPORT PORT OF JERSEY JERSEY COASTGUARD JERSEY MARINAS

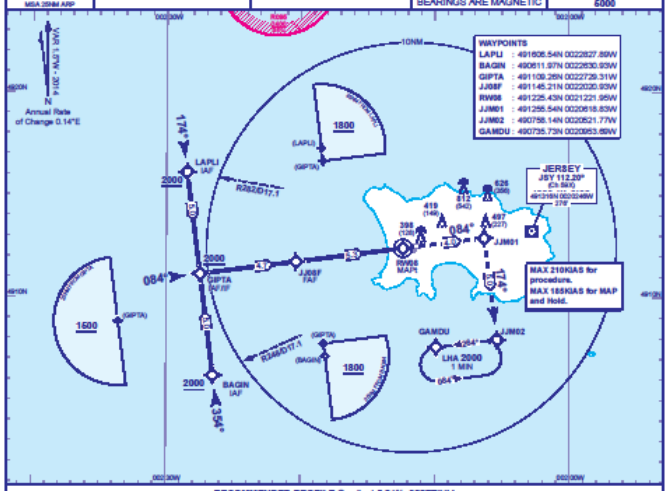
INSTRUMENT APPROACH CHART - ICAO

JERSEY
RNAV (GNSS)
RWY 08
(ACFT CAT A,B,C,D)

ATC	125.200, 120.450	JERSEY CONTROL	
APP	120.300, 118.550	JERSEY APPROACH	
TWR	119.450	JERSEY TOWER	
	121.900	JERSEY GROUND	
ATIS	134.675	JERSEY INFORMATION	

AD ELEVATION 277
THR ELEVATION 279
OBSTACLE ELEVATION
112 AMSL (165' ABOVE THR)
BEARINGS ARE MAGNETIC
TRANSITION ALTITUDE 6000

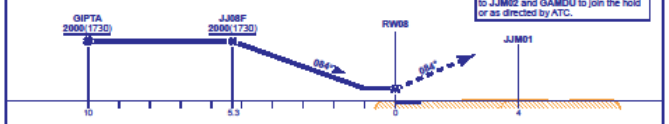
MSA 25NM ARP



RECOMMENDED PROFILE Gradient 5.24%, 320FT/NM

NM to RW08	5	4	3	2	1
ALT(HGT)	1810(1640)	1580(1320)	1280(1010)	960(690)	640(370)

MAPt RW08 (THR RWY 08)
Continuous climb to 3000, initially climb straight ahead to **JJM01**, then turn right to **JJM02** and **GAMDU** to join the hold or as directed by ATC.



Aircraft Category		A	B	C	D
OCA (OCH)	LNAV	820(350)	820(350)	820(350)	820(350)
VM(C)OCA (OCH AAL)	Total Area	730(453)	730(453)	1210(933)	1210(933)
	South of RWY 08/26	700(423)	700(423)	870(593)	870(593)

Rate of descent	G/S KT	160	140	120	100	80
	FT/MIN	850	740	640	530	430

NOTE Aircraft will normally be required to hold not lower than 3000.

CHANGE (11/14): RUNWAY DESIGNATORS CHANGED.

AERO INFO DATE 25 JUL 14

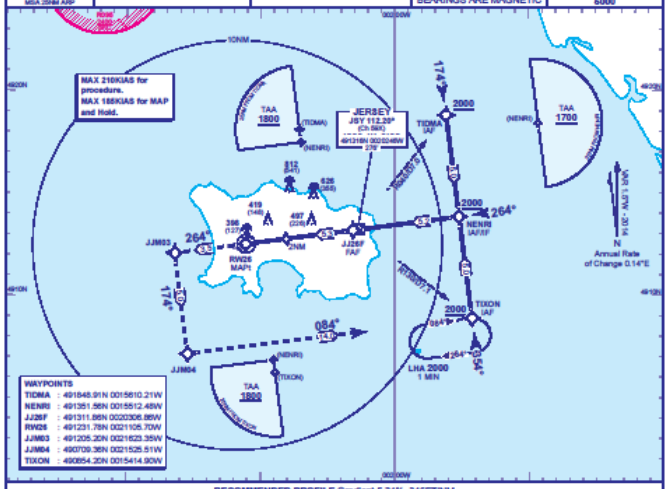
INSTRUMENT APPROACH CHART - ICAO

JERSEY
RNAV (GNSS)
RWY 26
(ACFT CAT A,B,C,D)

ATC	125.200, 120.450	JERSEY CONTROL	
APP	120.300, 118.550	JERSEY APPROACH	
TWR	119.450	JERSEY TOWER	
	121.900	JERSEY GROUND	
ATIS	134.675	JERSEY INFORMATION	

AD ELEVATION	277
THR ELEVATION	271
OBSTACLE ELEVATION	112 AMSL (-159) (ABOVE THR)
BEARINGS ARE MAGNETIC	
TRANSITION ALTITUDE	6000

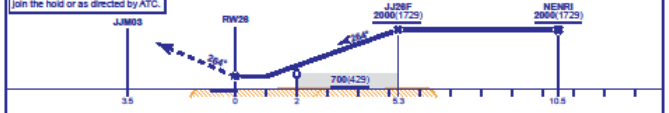
MSA 25NM ARP



RECOMMENDED PROFILE Gradient 5.24%, 316FT/NM

NM to RW26	5	4	3	2 (SDF)
ALT(HGT)	1910(1639)	1600(1329)	1280(1009)	980(689)

MAPt RW26 (THR RWY 26)
Continuous climb to 3000. Initially climb straight ahead to **JJM03** then turn left to **JJM04** and **TIXON** to join the hold or as directed by ATC.



Aircraft Category		A	B	C	D
OCA (OCH)	LNAV	860(379)	860(379)	860(379)	860(379)
VM(C)OCA (OCH AAL)	Total Area	730(453)	730(453)	1210(933)	1210(933)
	South of RWY 08/26	700(423)	700(423)	870(593)	870(593)

Rate of descent	G/S KT	160	140	120	100	80
	FT/MIN	850	740	640	530	430

NOTE Aircraft will normally be required to hold not lower than **3000**.

CHANGE (11/14): RUNWAY DESIGNATORS CHANGED.

AERO INFO DATE 25 JUL 14

✈ Questions?

JERSEY AIRPORT

PORT OF JERSEY

JERSEY COASTGUARD

JERSEY MARINAS

EGNOS Awards

Aviation Capacity Resources AB

EWA Signature ceremony by

Mr Morgan Sundell

Chief Technical Officer at Aviation Capacity Resources AB

and

Mr Thierry Racaud

Chief Executive Officer at ESSP SAS

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award collected by **Mr Rastislav Primus**

Head of ATM Planning and Procedures Department

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RNP APCH implementation in the Slovak Republic

Aviation powered by EGNOS workshop
World ATM Congress 2015
Madrid, 10.3. 2015

Ing. Rastislav PRIMUS
Head of ATM Planning and Procedures Department
LPS SR, š.p.

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Expressing our thanks

Representing LPS SR, I would like to show a gratitude and appreciation to

- **GSA**
- **INECO**
- **ESSP SAS**
- **EUROCONTROL**

for supporting implementation of RNP APCH (EGNOS based approaches included) in the Slovak Republic under ACCEPTA project.

Implementation enablers, milestones

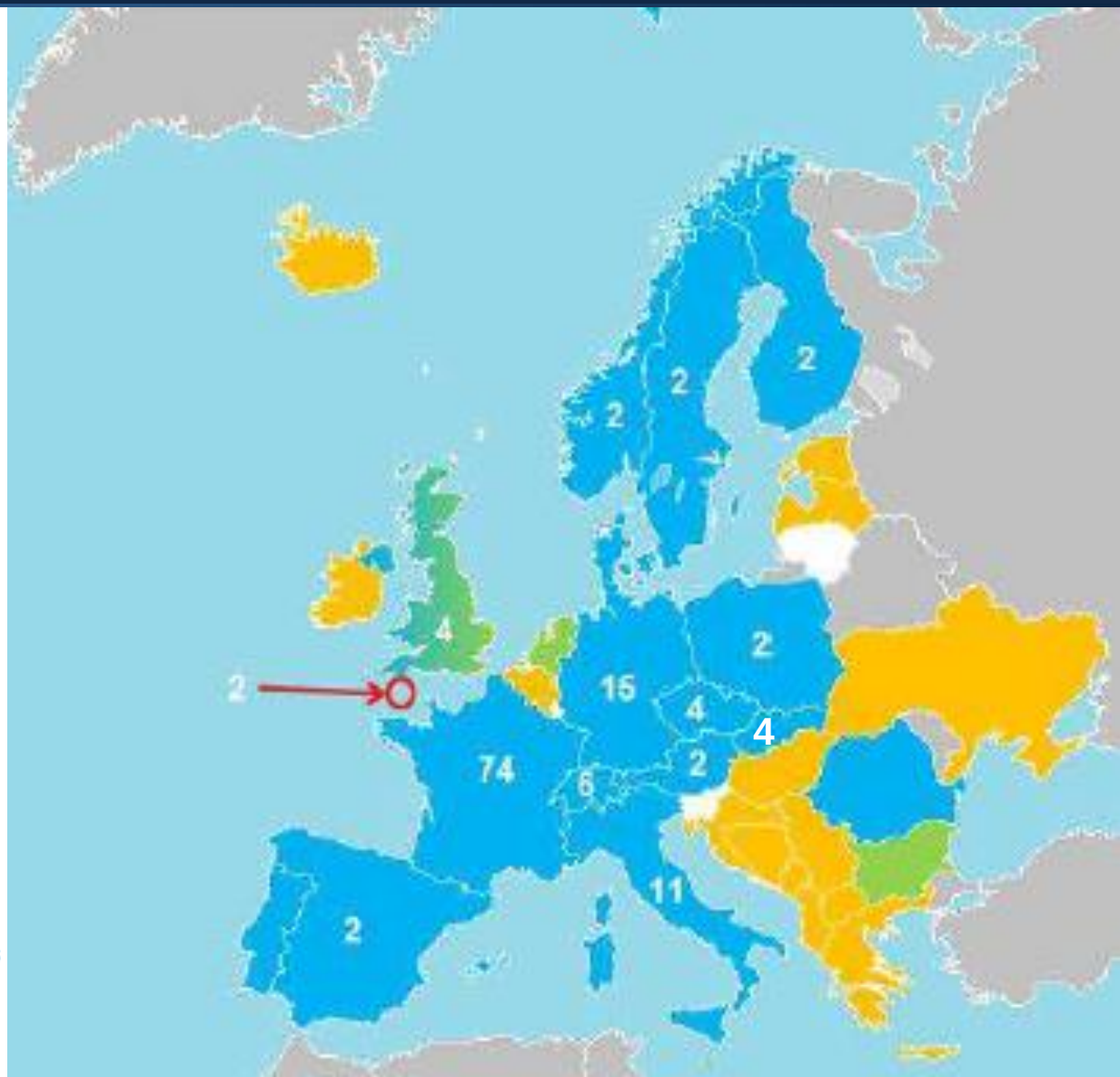
- 2007/2010 ICAO assembly resolutions

- 2011 MAR EGNOS SoL service declaration
- 2011 JUN ESSP workshop in Toulouse
- 2012 MAR Joining ACCEPTA project
- 2013 „just work“ (PD, CONOPS, SA ...)
- 2014 SEP EWA completion
- 2015 FEB RNP APCH publication

Getting blue

It took us almost
3 years

to get
the Slovak Republic
blue



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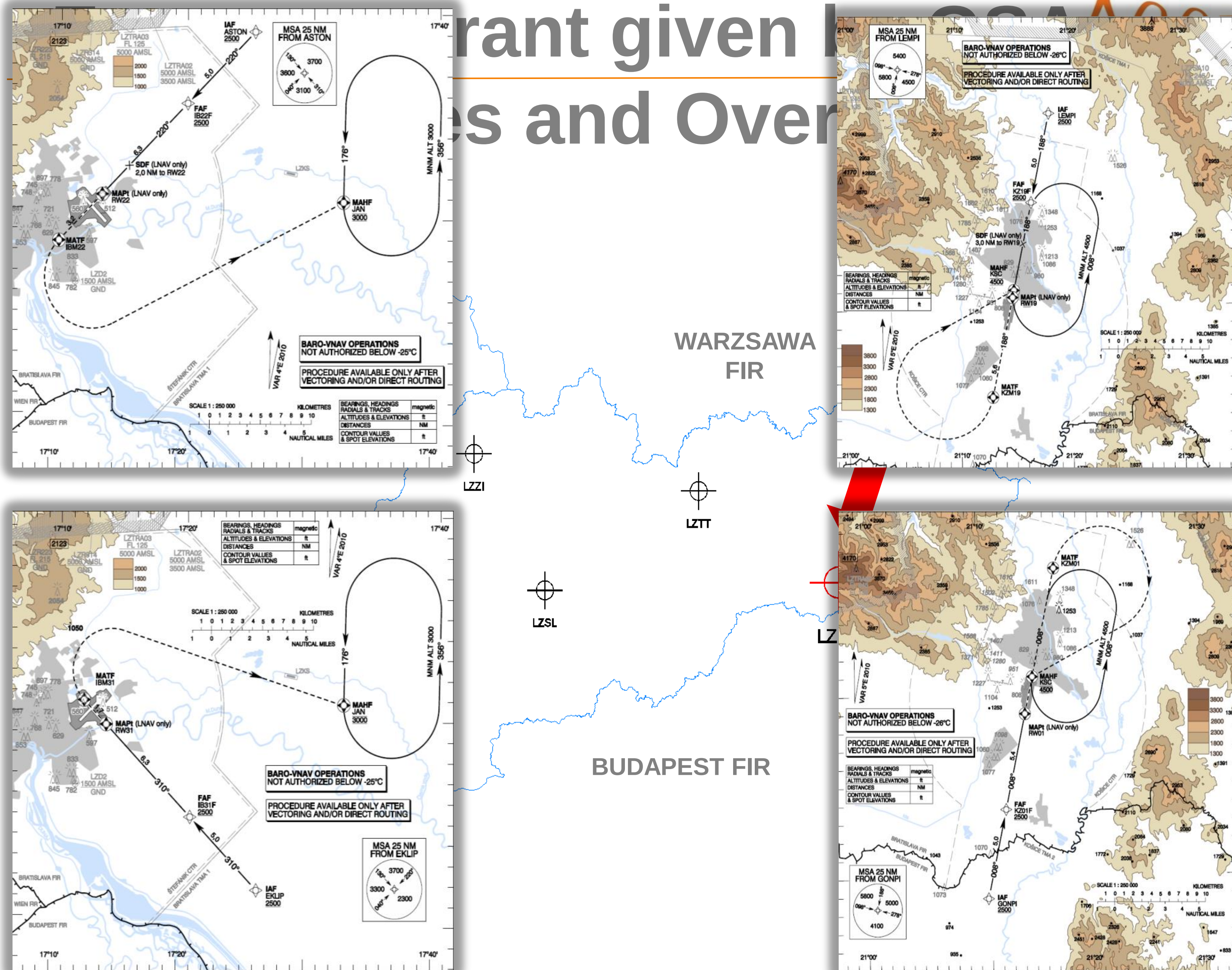


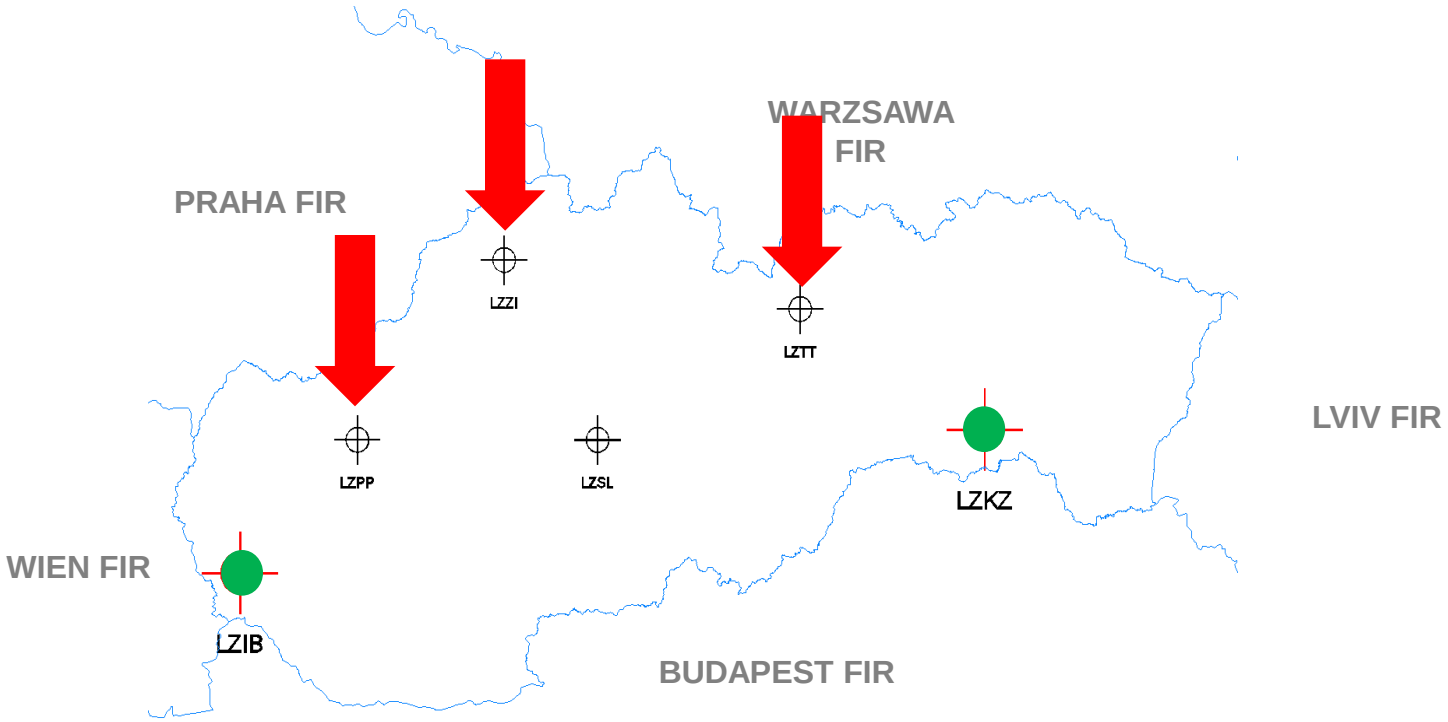
New Project (under name of „IMPROWE“)

GSA 2014 Call For Proposals for the Acceleration of EGNOS adoption in the field of civil aviation

LPS SR together with Austro Control and DLR

submitted common application for the next European grant given by GSA.

Project IMPROWE Objective



RNP APCH IP - conclusion

	AIRPORT_NAME	RUNWAY END	Main procedure	RNP APCH Implem. plan	Within project
LZIB	BRATISLAVA/M. R. STEFANIK	22	ILS	2014	ACCEPTA
		31	ILS		
LZKZ	KOSICE	01	ILS		
		19	VOR/DME		
LZPP	PIESTANY	01	ILS	2016	IMPROWE (LPS SR, Austro Control, DLR)
LZZI	ZILINA	06	ILS		
LZTT	POPRAD-TATRY	27	ILS		
		09	NIL		

ICAO resolution

Instrument RWY ends

30%	2010
70%	2014
100%	2016

LPS SR evolution

Instrument RWY ends

0%	2010
57%	2014
100%	2016

LPS SR

Thank you for attention

Looking forward for the next cooperation

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Luchtverkeersleiding Nederland
Air Traffic Control the Netherlands

award collected by **Mr Bart Banning**

Flight Procedures Expert at LVNL

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In recognition of 1st LPV publication

NAV Portugal, E.P.E.

award collected by **Américo Melo**

Air Traffic Controller at NAV Portugal

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EGNOS Awards

Lisbon airport (LPPT)

EGNOS

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THANK YOU!