

The European Regulatory Framework & Cooperative Actions for Aviation

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EUROCONTROL

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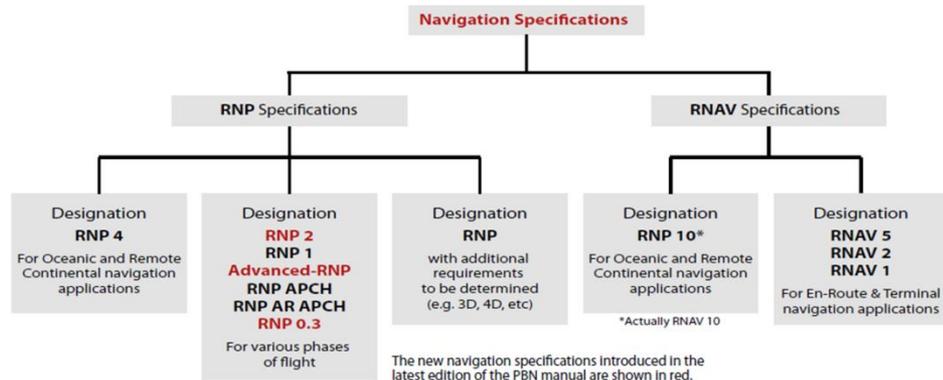
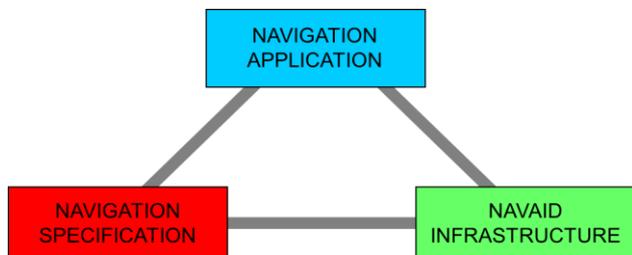
- **Part 1: The European regulatory framework**
 - The ICAO PBN context
 - The European context
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- Part 1 -

**The European regulatory framework for
EGNOS-based operations
implementation**

EGNOS in the ICAO PBN context (1/2)

- EGNOS SoL services are able to support all PBN operations defined by ICAO (RNAV and RNP), but less-performing systems can suffice
- ICAO PBN manual (ICAO doc 9613) identifies SBAS as the minimum system required for RNP APCH to LP and LPV
- Local considerations might require that SBAS is used for other operations such as RNP 0.3 procedures



- **ICAO 36th and 37th Assembly (Oct 2007 and 2010) resolutions:**
 - *“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.”*
 - *“Implementation of straight-in LNAV only procedures, as an exception” can be an option in specific cases.*
- **Priorities for deployment were agreed by EANPG in Nov 2013:**
 - The availability of an approach with vertical guidance (any 3D approach) at all runway ends is the priority
 - Safety improvement is the main goal

European mandates for PBN

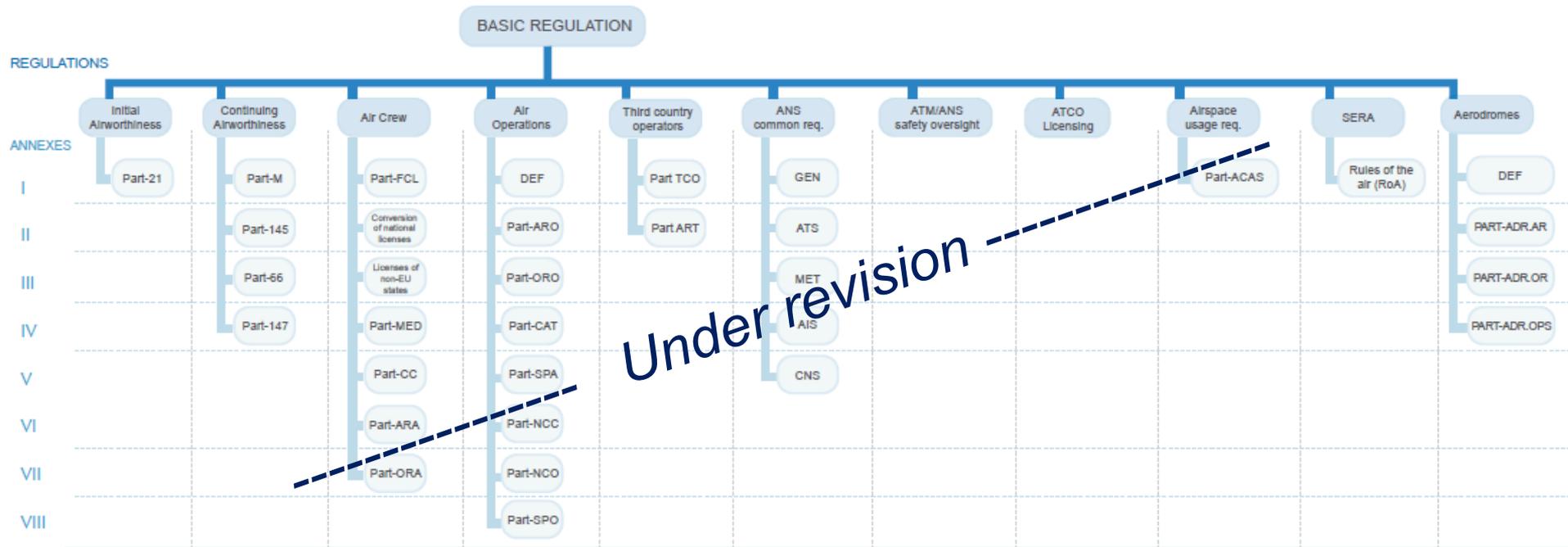
- **No mandate on the aircraft**, however operators shall be equipped as required for intended operations
- **Mandates on ANSP/airports** (in addition to local mandates), to implement the following PBN applications:

Phase of flight	Nav Spec	PCP IR	Future EC Regulation on PBN (based on EASA NPA ^{**})
Final App.	RNP APCH (APV)	25 Major airports (by 2018*)	Everywhere there isn't Precision Landing (ILS, MLS, GBAS) (by 2024)
TMA	RNP 1 + FR	25 Major TMA (by 2024)	<i>No mandate for deployment (subject to local decision wrt performance targets)</i>
En-route	RNP 1 + FRF	<i>No mandate for deployment</i>	<i>No mandate for deployment (subject to local decision wrt performance targets)</i>

(*) according DM Deployment Programme 2015 (30/09/2015), the recommended roadmap for AF#1 Family 1.2.1 « RNP Approaches with vertical guidance » is end 2018.

(**) Commenting period closed in April 2015.

The European regulatory framework for PBN

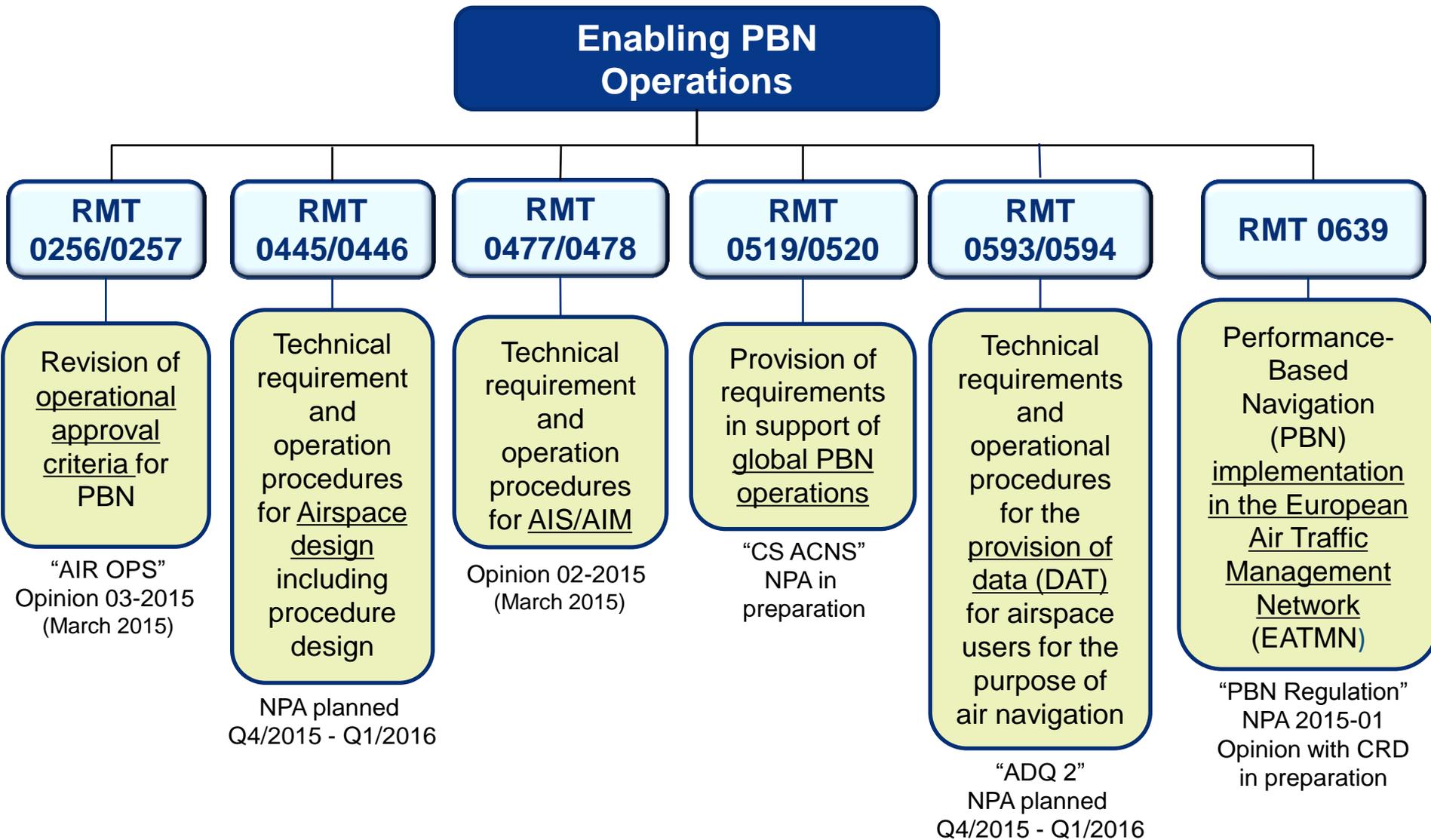


What's missing for PBN operations?



6 EASA Rule Making Tasks (see next slide)

Towards a complete set of PBN enablers...



Deployment status against PCP IR objective

- Pilot Common Projects (PCP) IR - Commission Implementing Regulation (EU) No 716/2014, dated 27 June 2014
- Includes APV (LNAV/VNAV and LPV)
- Scope: 25 Major Airports in EU and EFTA Member States

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

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

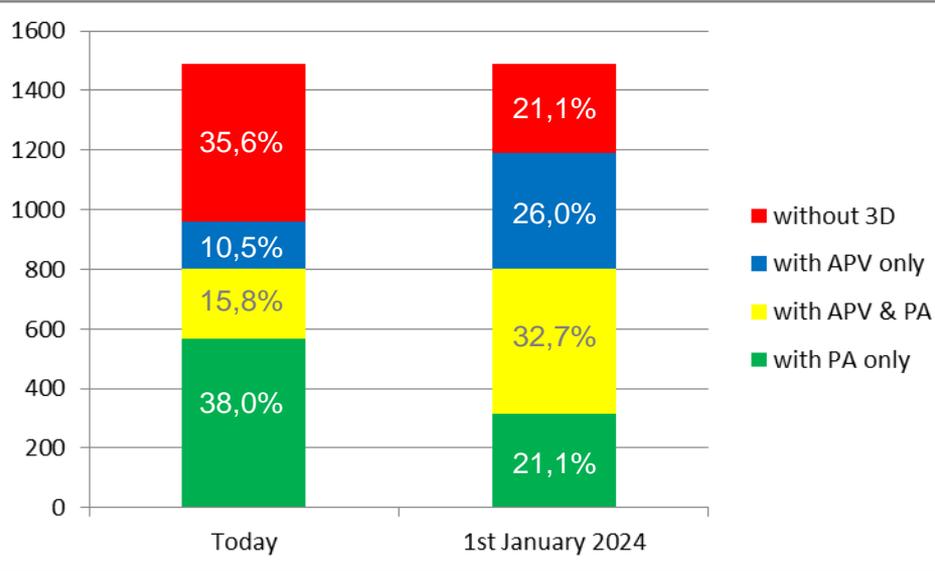
Stockholm Arlanda
Berlin Brandenburg ()*
Manchester
Palma de Mallorca
Copenhagen Kastrup
Vienna Schwechat
Dublin
Nice Cote d'Azur

(Airports in blue have at least one rwy end covered)

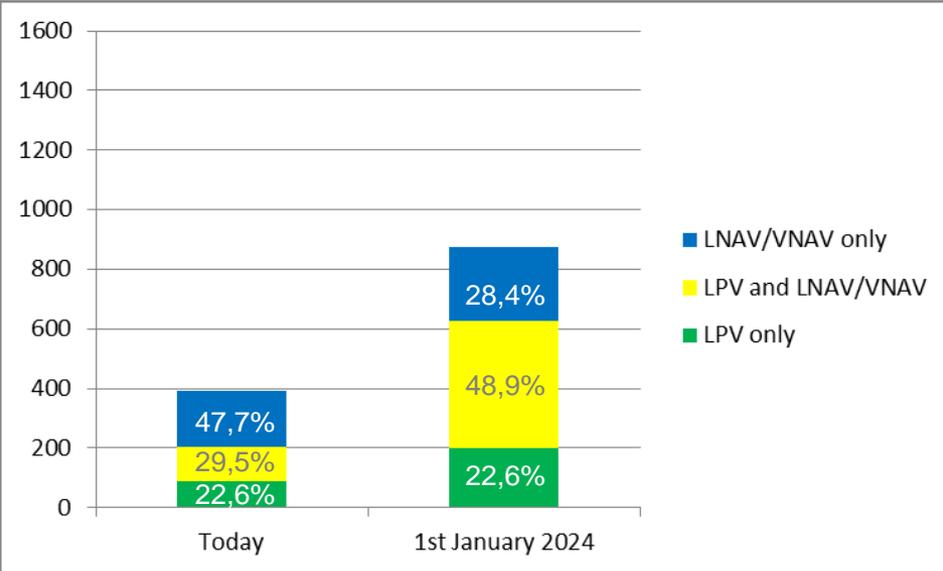
- Target Date: 1 January 2024

() (under construction)*

Deployment status against future PBN regulation (according the ECTL PBN Approach Map Tool) – 1/2

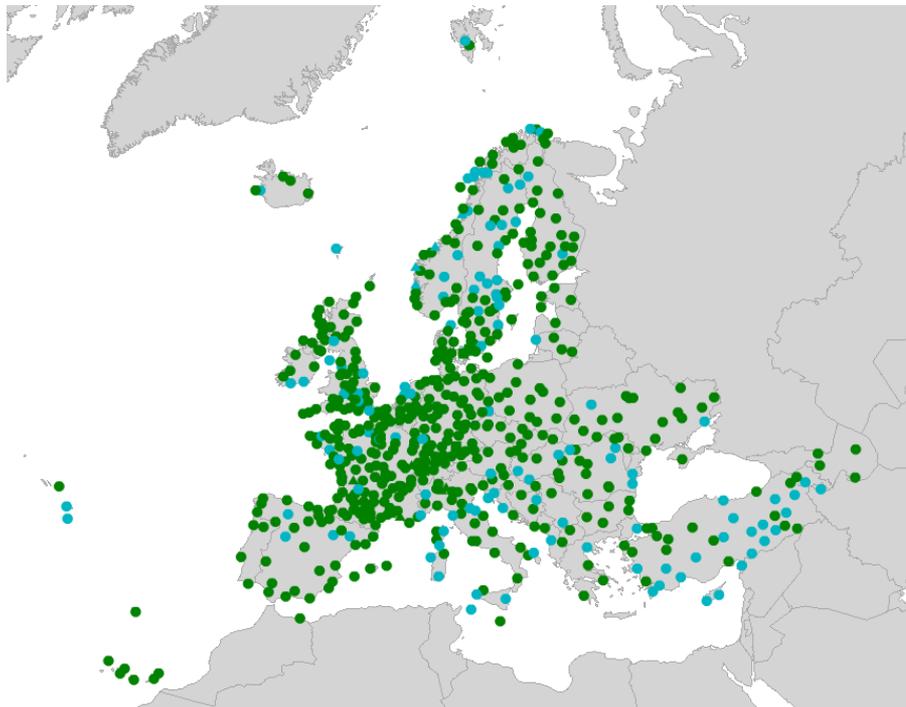


Evolution of IAP on ECAC rwy ends

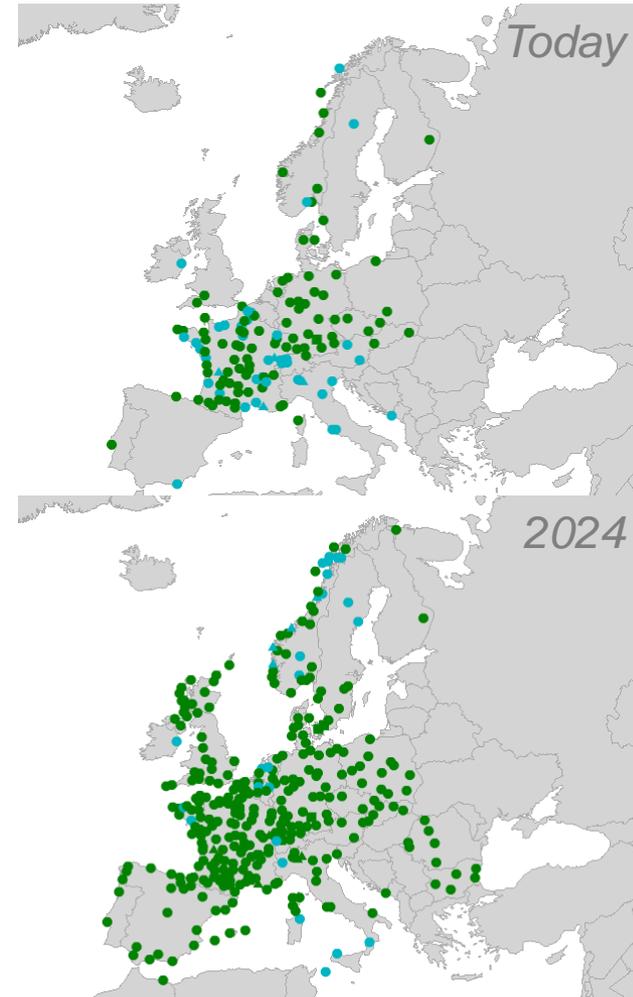


Evolution of APV deployment

Deployment status against future PBN regulation (according the ECTL PBN Approach Map Tool) – 2/2

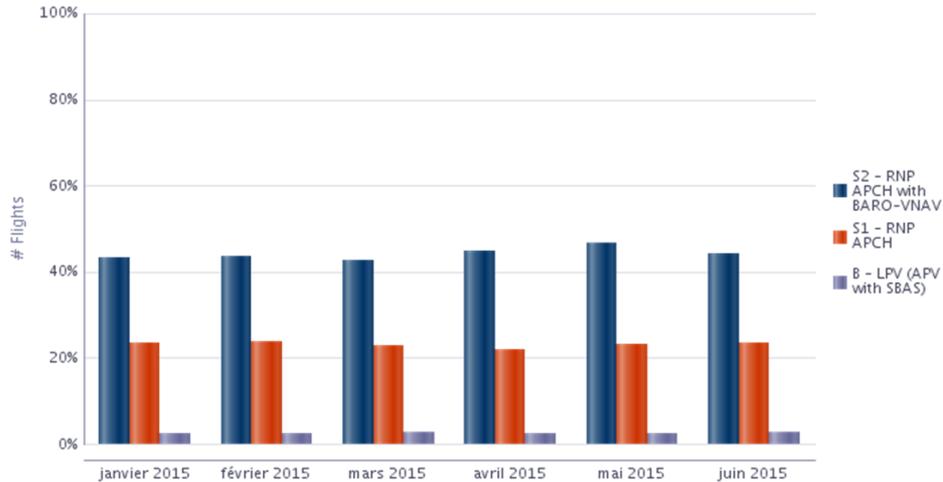


3D status
(53% IFR rwy ends covered)

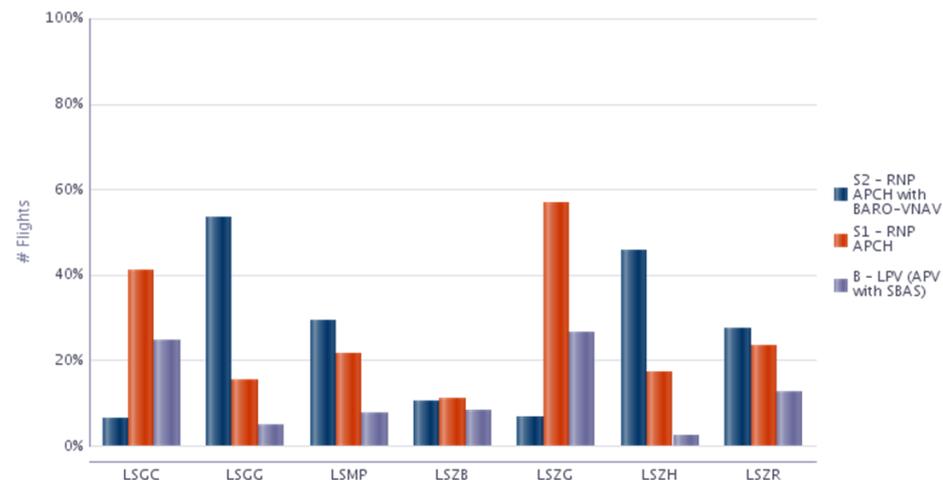


LPV evolution
(from 14% to 42% of rwy ends covered) 11/20

Flight and aircraft capability declared in FPL



Capable flights (Jan to June 2015)



Capable flights to LPV equipped airports in Switzerland (June 2015)

- PBN capability available in FPL since Nov 2012
- Analysis of FPL through the « CNS dashboard »
 - flight and aircraft characteristics
 - Analysis at different levels: Global, Airport, Operators, Aircraft make/model/series
- **Warnings:**
 - capabilities are « as declared » in FPL!
 - no indicator is available on when these functions are used (no statistics are available on the nb of PBN approaches conducted)

Some implementation issues raised at RAISG

- Publication can take up to 3 years
- Publication happened to be delayed:
 - until flight inspection aircraft were suitably equipped or
 - because of lack of safety oversight resource.
- Obstacles to publication:
 - High cost of flight validation and navigation databases
 - Approving the use of GPS remains an issue (improved awareness and intensive dialogue with NSA helped in some countries)
 - Lack of procedure design and procedure design safety oversight
- Publication at non-instrument runway: ICAO now makes it possible, but this raises challenges (e.g. minimum airport equipment remains a requirement, high quality obstacle data required, absence of local ATS service is a serious obstacle)

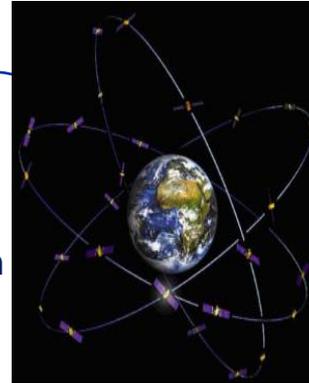
- Part 2 -

Global and cooperative actions for aviation

Satellites Areas for Aviation, including GNSS

GNSS

Global Positioning
Key enabler for PBN implementation
GBAS for precision approach
ADS-B positioning
Time synchronization and distribution



EARTH OBSERVATION AND WEATHER

Atmosphere knowledge
Hazards and weather forecast
Ash cloud prediction-monitoring
Contrails monitoring
Optimal flight planning

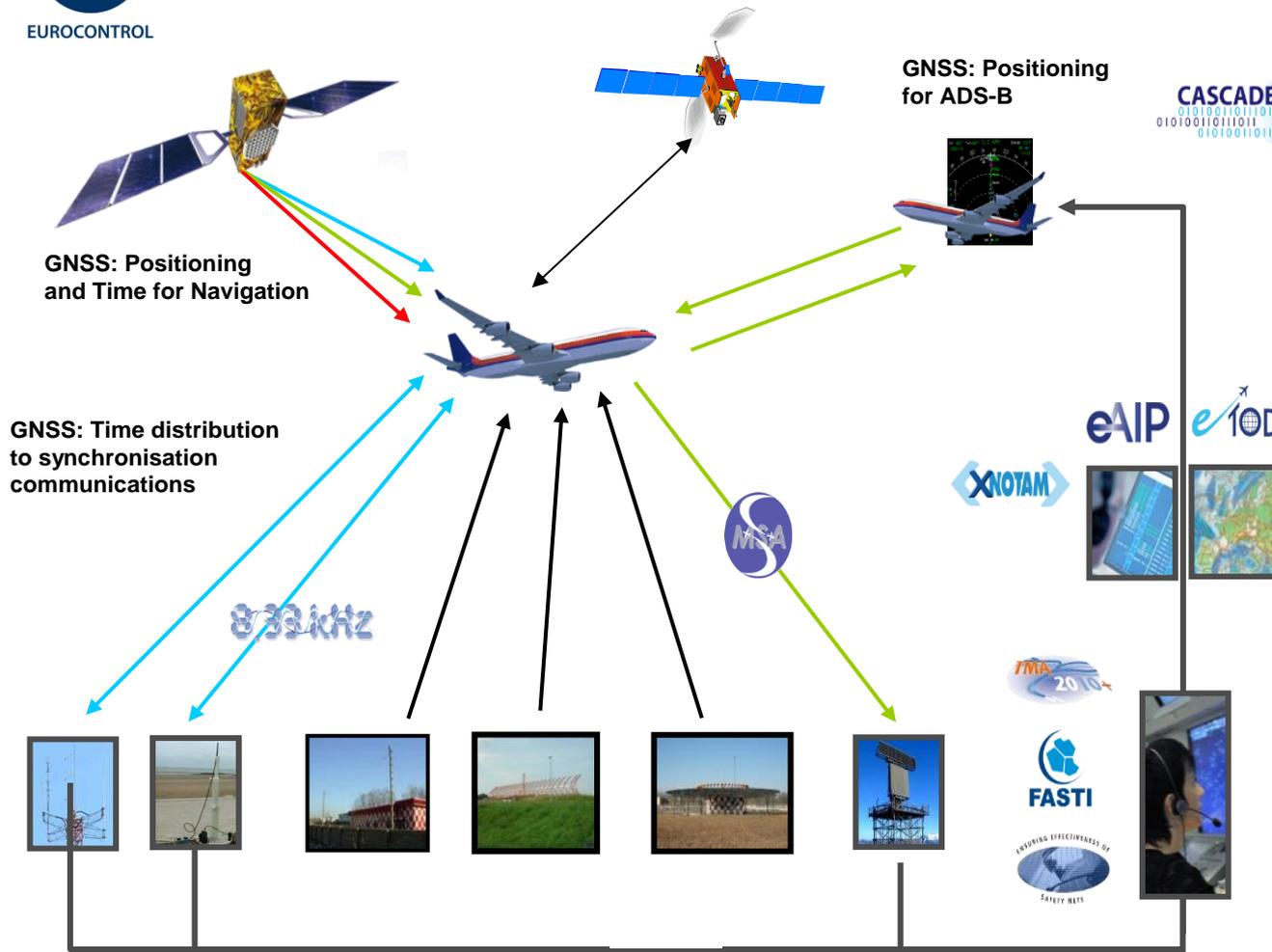


SATCOM

Part of current and future COM services
Datalinks as primary mode at global level
Demanding data, voice communication and SUR
(ADS-C, ADS-B services)
New ATM Satellite-based services for all flight domains



GNSS and CNS activities



Equipment	Indicator	% aircraft	% flights
GBAS landing system	A	2,63% (2,5%)	3,62% (3,7%)
LPV (APV with SBAS)	B	6,15% (4,4%)	2,06% (2,2%)
LORAN C	C	0,87% (0,6%)	0,12% (0,1%)
DME	D	96,97% (96,9%)	97,55% (97,3%)
GNSS	G	90,09% (89,0%)	87,31% (87,5%)
INS	I	74,32% (76,3%)	79,77% (78,9%)
PBN	R	95,99% (96,9%)	96,58% (96,5%)



Use of GNSS is expected to reach 100% before 2020

- GNSS required for Navigation and Surveillance
- Alternative Navigation systems (e.g. DME/DME, ILS, Inertial,..) to ensure safety and service continuity.

GSA / EUROCONTROL Cooperation

- **December 2006:** Agreement for cooperation signed with the Galileo Joint Undertaking (predecessor of European GNSS Agency- GSA)
- **June 2013:** EUROCONTROL / European Commission Task Force Report on GNSS
- **September 2014:** Exchange of letters between EUROCONTROL and the GSA for the set up of new working arrangements
- **20 April 2015:** Signature of a Framework Partnership Agreement between GSA and ECTL for 7 years.

GSA / EUROCONTROL Cooperation Areas

- Definition of mission level requirements for EGNOS and Galileo for Aviation needs
- Actions to support EGNOS and GALILEO–based applications in ECAC
- Spectrum, Regulatory and Standardisation aspects
- Support to European GNSS Developments
- Coordination of R&D for GNSS in Aviation
- Support to Aviation receivers developments
- Aviation specific GNSS performance monitoring
- Support to EGNOS extension beyond ECAC area

Some activities in the Regulatory context *'grey work'*

- Adaptation of SES to GNSS and Augmentations
- CONOPS for next generation GNSS and work on constellations approval status
- Support to EASA in CS-A-CNS airworthiness material for PBN applications
- Work on coherence for implementation between PBN and PCP regulations
- Spectrum defense for aviation ie. RFI and protection of the SBAS channel inside the L1 band

Thank you for your attention.

