European Space Week 2018

EGNOS Safety of Life (SoL): Enabling a more efficient Navigation Infrastructure and Airspace in Germany

Andre Biestmann, Marseille, 5th December 2018

member of FABEC

DFS Deutsche Flugsicherung

Agenda

- National Airspace Structure in GER (NAS@DEU)
- Facts and Figures for RNP-Approaches
- Overview Navigation Infrastructure DFS
- Brief History of GNSS & EGNOS at DFS
- Evolution of RNP-Approaches
- PBN@DEU
- Strategic Outlook
- Decommissioning NAV-Infrastructure with PBN
- Conclusion!

National Airspace Structure in GER (NAS@DEU)

Enroute	today
Flight Information Region	3
Upper Flight Information Region	2
ATS Routes	approx. 800
Direct Routings (DCTs)	approx. 800
Terminal-Procedures	approx. 2600

- Germany has 58 civil IFR-Airports and 2 IFR-Heliports in operation.
- Those airports have 128 Thresholds (THR) for IFR procedures. At 127 THRs vertical guided approaches are possible.
- 7 Airports are operating only with GNSS-Procedures.

Facts and Figures for RNP-Approaches

Use of EGNOS

OCA (OCH)	A	B	C	D
LNAV	400 (380)	400 (380)	400 (380)	400 (380)
LNAV / VNAV	400 (380)	400 (380)	400 (380)	400 (380)
LPV	159 (145)	169 (155)	179 (165)	189 (175)

LNAV/VNAV operations may be flown using SBAS certified equipment; If supported by avionics, no temperature limitation exist; No FAS-Datablock necessary – less integrity compared to LPV

LPV operations down to 250 ft DA (APV I) or down to 200 ft DA (CAT I) possible; FAS Datablock necessary; Higher integrity compared to LNAV/VNAV operations based on SBAS vertical guidance

Overview Navigation Infrastructure DFS

En route/SID/STAR/Approach navigation

155 DFS-facilities with

- 38 DVOR / 20 VOR
- 35 NDB
- 53 DME
- 9 TACAN

Special approach systems for landing under all weather conditions

- 16 DFS airports
  - 13 ILS CAT I
  - 36 ILS CAT II/III

Usage of Constellations and Augementation Systems

- 1 NAVSTAR GPS Constellation
- 1 EGNOS with NAVSTAR GPS
- 2 GBAS CAT I Augmentation Systems

Brief History of GNSS & EGNOS at DFS

Year	Step
1993	Planning process for 2D RNP approaches started.
1995	First 2D RNP approaches available.
2008	Planning process for 3D APV Baro-VNAV started.
2009	First 3D APV Baro-VNAV approaches available.
2010	Planning process for 3D APV SBAS started.
2012	First 3D APV SBAS approach available.
2015	Planning process for 3D SBAS CAT I started.
2017	First 3D SBAS CAT I approach at Bremen available (Remark: Bremen was also the first Airport with GBAS CAT I)
2017	Project Management for PBN Implementing Rule started
2018	PBN IR released by EC and DFS released PBN Program

Evolution of RNP-Approaches

Actual: 93% of the Thresholds have a vertical guided Approach.

Target: The last 9 Thresholds (7%) will follow until 10.09.2020!

This is the 1st Priority (following the ICAO Res 37-11!)

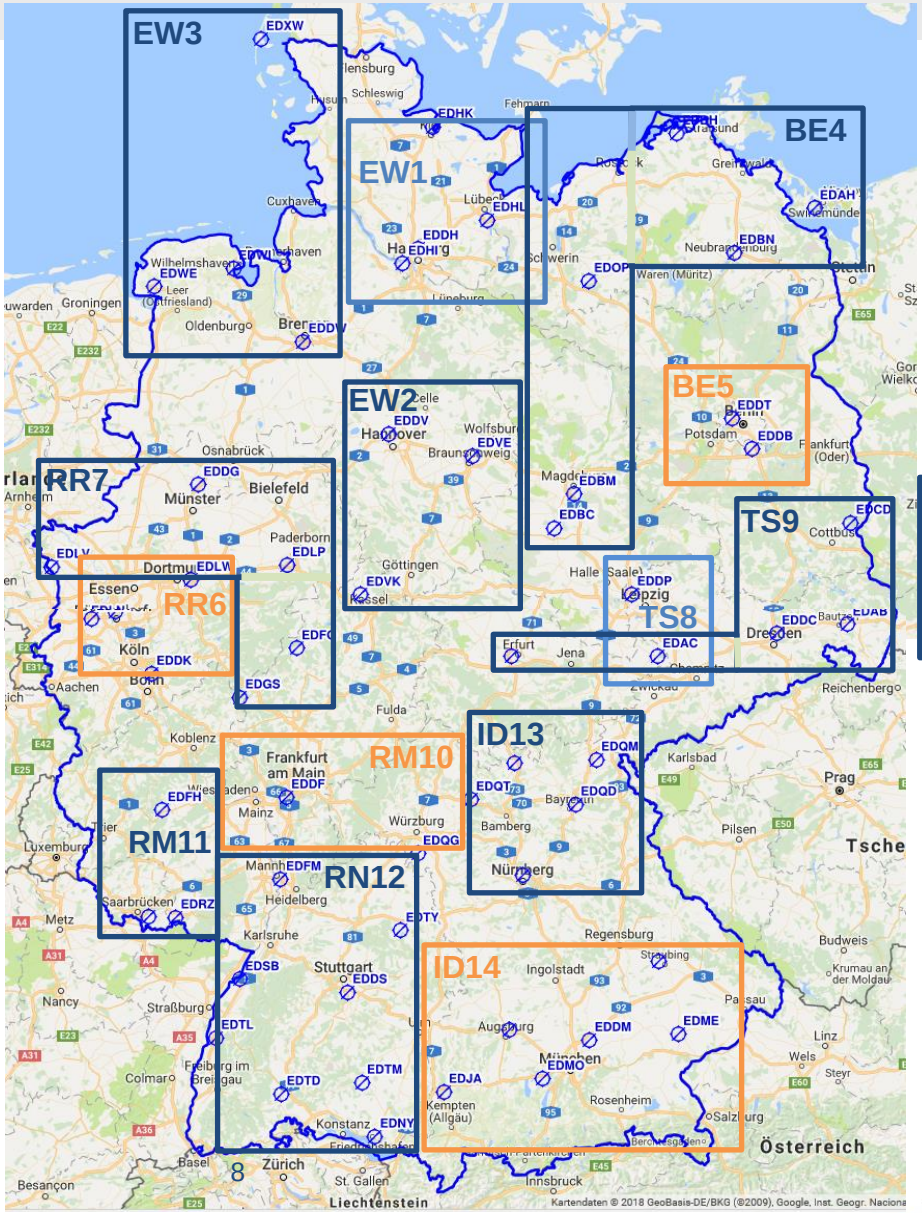
PBN@DEU – setup – geographical structure

EC Rule 716/2014:

- 4 PCP Hub Airports (FRA, MUC, DUS, BER)

EC Rule 2018/1048:

- 56 IFR-airports have been geographically structured in 14 PBN clusters with 1 up to 7 airports;
- The selection was done on known requirements analysed during “activity 0”; clusters are open to changes, if needed;
- 2 heliports are bundled in an extra-cluster.



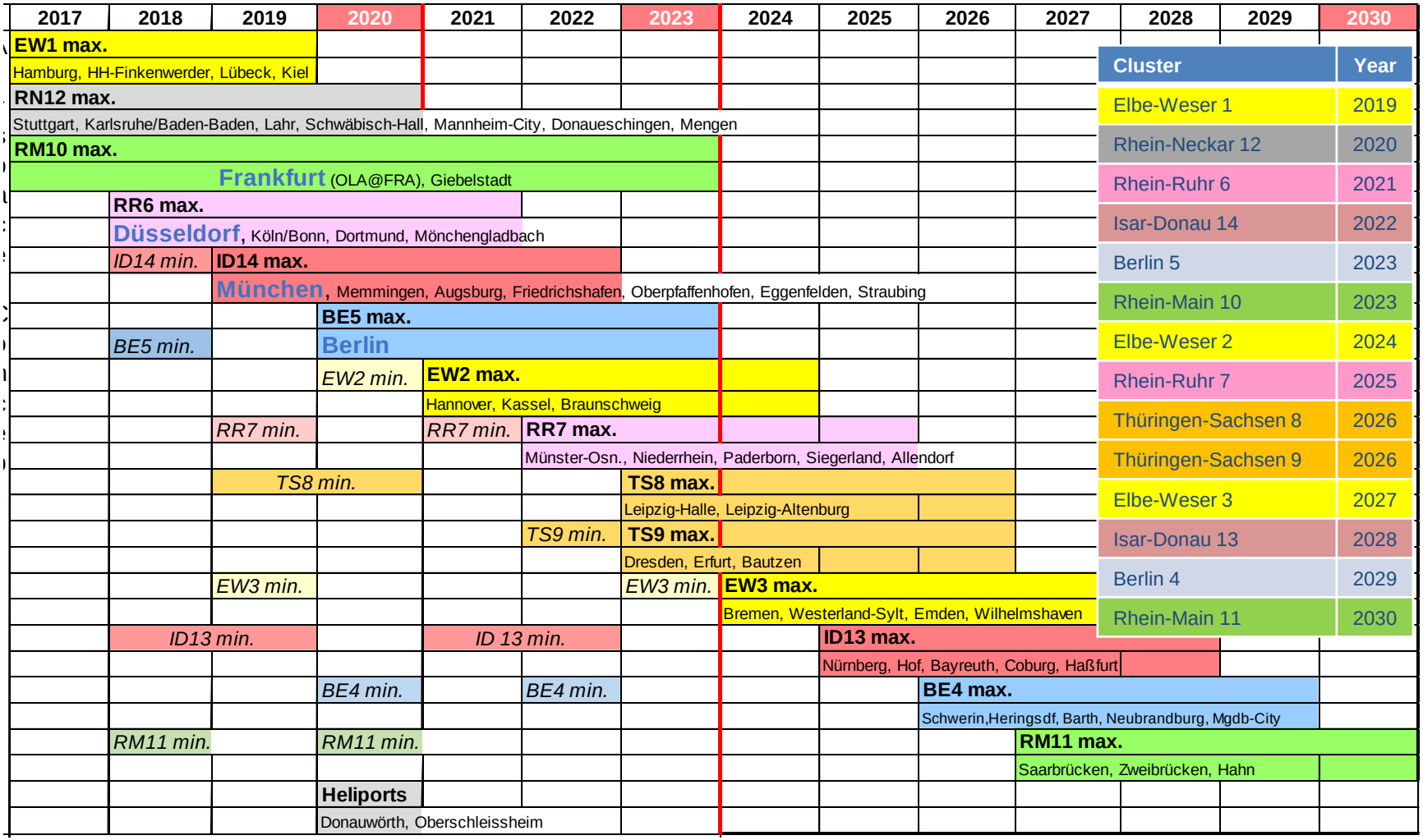
Cluster-segment PCP

Cluster-segment PBN

05th December 2018
Andre Biestmann, Airspace & ANS Support

DFS Deutsche Flugsicherung

PBN@DEU – setup – time schedule



Cluster	Year
Elbe-Weser 1	2019
Rhein-Neckar 12	2020
Rhein-Ruhr 6	2021
Isar-Donau 14	2022
Berlin 5	2023
Rhein-Main 10	2023
Elbe-Weser 2	2024
Rhein-Ruhr 7	2025
Thüringen-Sachsen 8	2026
Thüringen-Sachsen 9	2026
Elbe-Weser 3	2027
Isar-Donau 13	2028
Berlin 4	2029
Rhein-Main 11	2030

PBN@DEU – RNP APCH – time schedule

RWY THR	Type of Approach	Target # THR	today	PBN IR NPA 03.12.2020	PBN IR PA 25.01.2024	Strategic 6.6.2030
NPA	LNAV 2D	45 → 6	39	45	-	-
PA	LNAV 2D	81 → 11	67 → 3	78	81	-
NPA	LNAV/VNAV 3D	44 → 10	34	44	-	-
PA	LNAV/VNAV 3D	81 → 13	66 → 2	79	81	-
NPA	LPV APV-I 3D	44 → 22	22	44	-	-
PA	LPV APV-I 3D	77 → 29	24 → 24	53	77	-

PBN@DEU – Consultation and Transition Plan

Consultation:
started already

Consultation-Interest Groups
Airspace User (civ., mil.)
Airports
ATM/ANS (e. g. TWR, ACC, UAC
Network Manager
…

Transition Plan: draft structure and approval process agreed on with MoT


DFS Deutsche Flugsicherung¶

Performance·Based·Navigation¶

Implementation·in·Germany¶

Transition·Plan¶

Planning·/·Consultation·/·Release¶

Datum·24.07.2018¤

Version·0.3¶

Strategic Outlook

With the Environment of 100% EGNOS SBAS CAT I at Precision Runway Thresholds the Decommissioning of ILS can start!

Strategic Outlook

RWY THR	Type of Approach	Target # THR	today	PBN IR NPA 03.12.2020	PBN IR PA 25.01.2024	Strategic 6.6.2030
NPA	LNAV 2D	45	39 → 6	45	-	-
PA	LNAV 2D	81	67 → 11	78 → 3	81	-
NPA	LNAV/VNAV 3D	44	34 → 10	44	-	-
PA	LNAV/VNAV 3D	81	66 → 13	79 → 2	81	-
NPA	LPV APV-I 3D	44	22 → 22	44	-	-
PA	LPV APV-I 3D	77	24 → 29	53 → 24	77	-

Strategic Add On SBAS CAT I

NPA	SBAS CAT I 3D	open	0 → 8	8	open	open
PA	SBAS CAT I 3D	71	13 → 58			71

Decommissioning NAV-Infrastructure with PBN

En route/SID/STAR/Approach navigation

155 DFS-facilities with

- 38 DVOR / 20 VOR **-> 8 VORs are under review**
- 35 NDB **-> 35 NDBs should be decommissioned**
- 53 DME **-> number of DMEs will raises slightly (DME-DME is back-up for GNSS)**
- 9 TACAN **-> 9 TACANs will be constantly available (using DME)**

Special approach systems for landing under all weather conditions*

- 11 ILS CAT I **-> review of need of ILS CAT I upon 2030 (SBAS CAT I)**
- 36 ILS CAT II/III **-> review of need of ILS CAT III upon 2030 (GBAS CAT III)**

** Berlin-Tegel excluded*

Usage of Constellations and Augmentation Systems

- 1 NAVSTAR GPS-Constellation **-> Usage of Galileo as second constellation**
- 1 EGNOS with NAVSTAR GPS **-> Usage of EGNOS with Galileo**
- 2 GBAS CAT I Augmentation Systems **-> Usage of GBAS Galileo CAT I/II/III**

Decommissioning NAV-Infrastructure with PBN

- 11 ILS CAT I, which could be replaced by SBAS Cat. I after 2030:

1. Dresden ILS 04
2. Düsseldorf ILS 05L
3. Erfurt ILS 10
4. Hamburg ILS 05
5. Hamburg ILS 15
6. Hannover ILS 09R
7. Hannover ILS 27L
8. Köln/Bonn ILS 24
9. Münster/Osnabrück ILS 07
10. Nürnberg ILS 10
11. Saarbrücken ILS 27

Overall Conclusion: With EGNOS the Aviation System is much more flexible and safe! Thanks to EC, ESA, GSA, EASA, ESSP, ….!

EGNOS

DFS Deutsche Flugsicherung