PBN concept implementation in the Slovak Republic

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Waypoints are determined by terrestrial navigation infrastructure or by **GNSS** (Global Navigation Satellite Systems) e.g. GPS
ICAO - PBN concept - 2008

The reasons:
• more clarity on area navigation, definitions and terminology
• standardization of navigation applications, based on limited number of navigation specifications and navigation infrastructure

Performance Based Navigation
Area Navigation
Required navigation performance

PBN
RNAV
RNP

RNAV 10
RNAV 5
RNAV 1
RNP 5
RNP 1

VOR – DME
DME – DME
GNSS

PBN is one of several elements enabling the Airspace Concept.
En- Route phase

Implementation in SR  1998
Navigation Specification  RNAV 5
Navigation Infrastructure  VOR DME (DME DME) GNSS
RNAV route, a charting example

Z648 (RNAV 5)
- VEDER
  - 47°50'47"N 017°58'50"E
  - JAN 134° 26,6 NM
  - 129 m

- ADAMA (FIR BDRY)
  - 47°59'16"N 017°20'29"E
  - JAN 211° 14,1 NM
  - 129 m

FL 245
- 8 000 ft AMSL
- Class C

Bratislava ACC
- Štefánik APP
- Pre priestor zodpovednosti a frekvenci riadiaceho stanovišta pozri ENR 2.1
- SOUTHEASTBOUND

Pokračovanie, pozri AIP Austria.
For continuation, see Austria AIP.
Approach Phase

Implementation in SR: 2018 completed (LZSL excluded)
Navigation Specification: RNP Approach
Navigation Infrastructure: GNSS
Types of RNP approaches

- **NPA (NDB)**
- **NPA (LOC)**
- **RNP APCH to LNAV minima (GPS NPA)**
- **NPA (VOR/DME)**
- **RNP APCH to LNAV/VNAV minima (APV Baro)**
- **RNP APCH to LPV (APV SBAS / SBAS CAT I)**
- **ILS and GBAS (CATI)**
- **ILS, GBAS & MLS (CATII/III)**

Actual minima depends on obstacles around the intended approach path (including approach and missed approach segments of flight).

Source: Eurocontrol
APV SBAS / SBAS CAT I so called „LPV“

Source: Eurocontrol

<table>
<thead>
<tr>
<th>Description</th>
<th>System</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach conducted to a Decision Altitude / Height</td>
<td>GPS + SBAS</td>
<td>HAL: 40m</td>
</tr>
<tr>
<td>Lateral and vertical guidance based SBAS</td>
<td></td>
<td>VAL: 50m/35m</td>
</tr>
</tbody>
</table>
The components of EGNOS (EU SBAS)

- **Space segment**
  - Geostationary satellite: 36,000 km

- **User Segment**
  - GPS System: 20,200 km

- **Ground Segment**
  - Uplink Sites
  - Master Control Centre
  - Monitoring Stations
LPV Implementation in Europe

Source: Eurocontrol
7. 9. 2018
RNP APCH implementation in SR

- PRAHA FIR: 2015, 2017, 2018
- WIEN FIR: 2015
- LVIV FIR: 2018
- WARZSAWA FIR: 2018
- BUDAPEST FIR: 2017
RNP Approach, a charting example

**Chart Details**

- **FAF**
  - ZI06F
  - 7.9 NM to RW06

- **SDF** (LNAV only)
  - 4.0 NM to RW06

- **MAPt** (LNAV only)
  - RW06

- **MATF**
  - ZIM06

**Note:** Not authorized SOUTHEAST of the EXT D RCL.

**Table: OCA (OCH)**

<table>
<thead>
<tr>
<th>OCA (OCH)</th>
<th>ASC</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNAV</td>
<td>2.5% ft</td>
<td>2040 (1020)</td>
<td></td>
</tr>
<tr>
<td>LNAV/VNAV</td>
<td>2.5% ft</td>
<td>1896 (880)</td>
<td>1910 (894)</td>
</tr>
<tr>
<td>LPV</td>
<td>2.5% ft</td>
<td>1751 (735)</td>
<td>1765 (749)</td>
</tr>
<tr>
<td></td>
<td>5.0% ft</td>
<td>1188 (172)</td>
<td>1196 (180)</td>
</tr>
</tbody>
</table>

**Circling (** see Note **)**

- ft 2510 (1490) | 2560 (1540)

**Missed Approach**

- Climb to ZIM06, turn LEFT to SAGAN climbing to 4500 AMSL and hold. Max IAS 130 kt until established on track to SAGAN.
LPV as % of total number of IRE

Presented at EGNOS workshop, Athens, 4.10.2017
Project ACCEPTA (2012-2014)
ACCelerating EGNOS AdoPTion in Aviation

Supporting RNP approach implementation across Europe
Project IMPROWE (2015-2017)
(IMP)lementing RNP APCH Operations With Egnos)

Supporting RNP Approach implementation in Slovakia and Austria
Project SPICE (2016-2020)
(Synchronised PBN Implementation Cohesion Europe)

Supporting
- RNP approach
- RNAV SIDs / STARs implementation in cohesion Europe

Co-financed by the European Union
Connecting Europe Facility
Departure & Arrival Phase

Implementation in SR: on-going (planned before end of 2020)

Navigation Specification: RNAV 1 / RNP 1 (LZZI)

Navigation Infrastructure: GNSS, DME-DME
RNAV SID/STAR implementation plan

- WARZSAWA FIR
  - 2018-19
- PRAHA FIR
  - 2018-19
  - 2020
- WIEN FIR
  - 2019-20
- BUDAPEST FIR
- LVIV FIR
  - 2019-20
RNAV SID/STAR, charting examples
THANK YOU
FOR YOUR ATTENTION