



Global and Regional developments related to PBN



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Presentation Outline

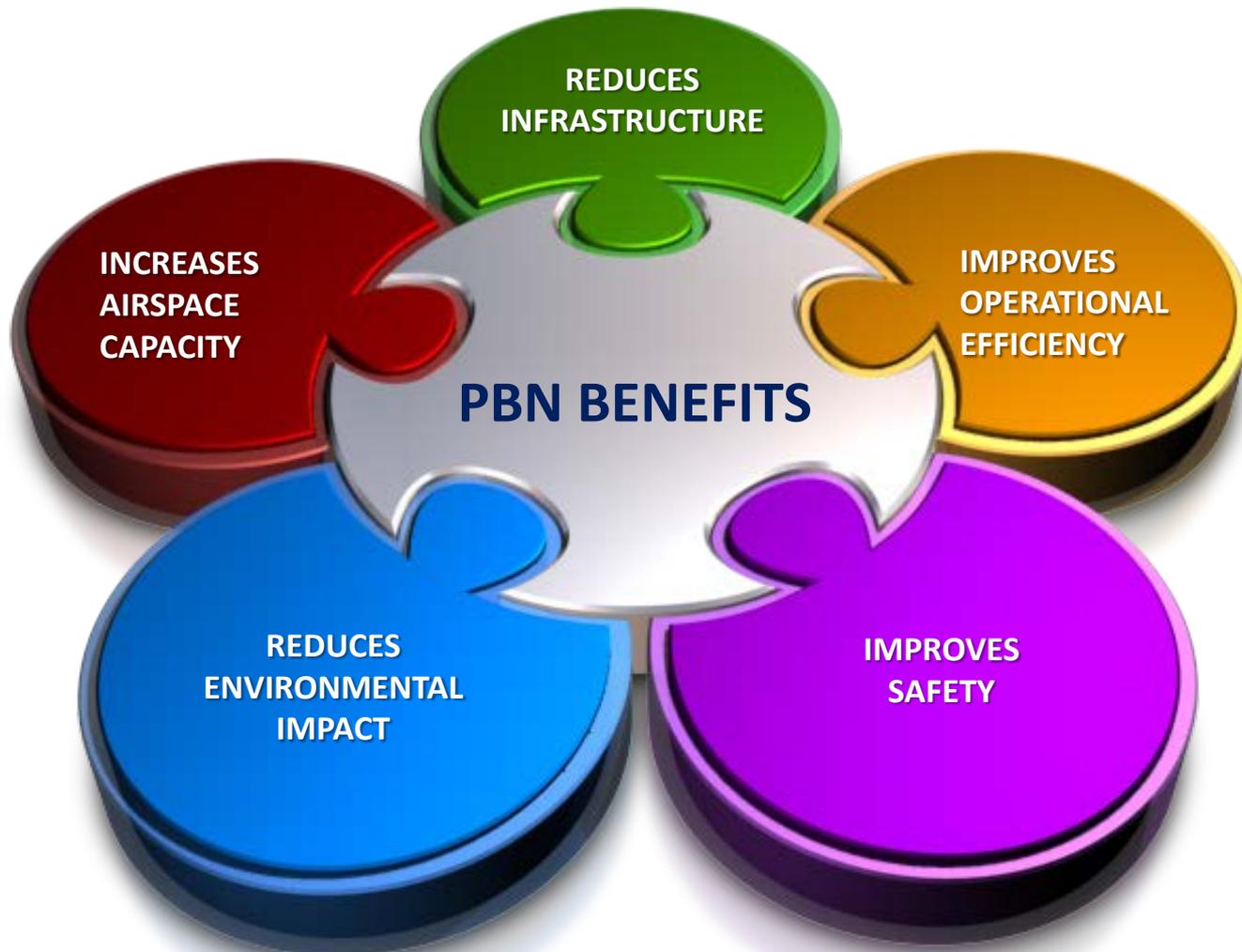
- **Why PBN**
- **Mandates and Targets**
- **Global Status of PBN implementation**
- **ICAO support to States**
- **PBN documentation framework**
- **Summary**
- **Action by the meeting**



Air Navigation Priority?



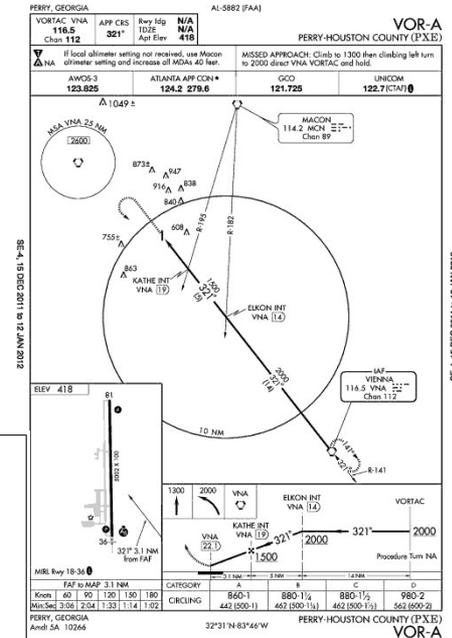
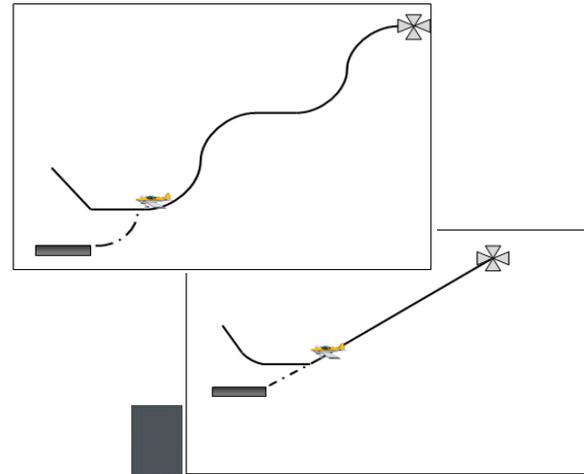
Why PBN?



Why PBN?

- **Safety**

- Approach procedures to runways that do not currently have an approach
- Straight-in approach procedures (vice circling)
- Approach procedures with vertical guidance (APV)
- Back up procedures to existing conventional precision approaches



JULY 7, 2013:
ASIANA AIRLINES FLIGHT 214
CRASH LANDING IN SAN FRANCISCO
 A TIMELINE OF EVENTS

The devastating Asiana Airlines crash landing that killed two and injured nearly 200, happened in the final seconds of a 10 and a half hour flight from Seoul, South Korea, to San Francisco on July 6, 2013. The aircraft was carrying 291 passengers and 16 crew members. Here's a timeline of events:

Click on the dates below to find out more

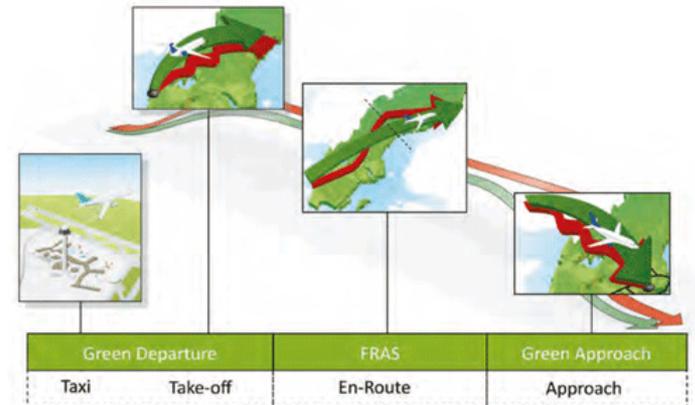
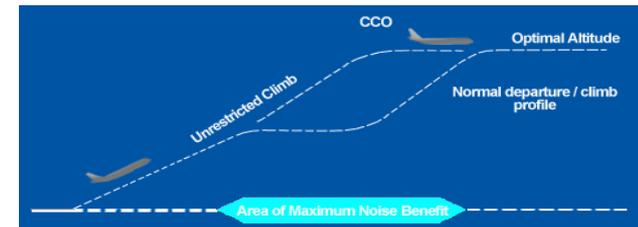
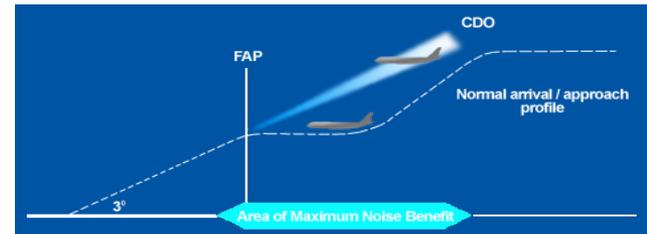
11:27 a.m. PT Plane Crashes 11:35 a.m. PT 1 p.m. PT 4:18 p.m. PT 7:47 p.m. PT Video 1 Video 2

Share Tweet 14 View BY TIMELINE BY LIST

Why PBN?

- Efficiency

- Increased airport accessibility
- Reduced infrastructure operating costs
- Reduced fuel burn and CO₂ emissions
- Avoidance of noise sensitive areas
- Continuous Descent and Climb operations
- Increased airspace capacity
- Improved and more flexible use of terminal airspace (arrivals and departures)
- User preferred routing





Major input to the PBN Program



Key PBN Related Outcomes

- States urged to comply with A37-11 targets
- States urged to continue to support ICAO PBN initiatives with resources
- ICAO to develop additional PBN provisions aligned with the Aviation System Block Upgrades (ASBUs), GANP and GASP
- ICAO to clarify regulatory oversight requirements for PBN implementation (HLSC 2015)
- ICAO to provide implementation support
 - PBN training and education
 - Implementation projects and tools
 - Flight Procedures Programme (FPP)



A37-11 PBN Global Targets

- States complete a PBN Implementation Plan to achieve:
 - Approach procedures with vertical guidance (APV (Baro-VNAV) including LNAV-only minima for all instrument runway ends by 2016:
 - 30% by 2010, 70% by 2014
 - Straight-in LNAV only procedures as an exception to the above where there is:
 - no local altimeter setting; and
 - no aircraft equipped for APV with max certified mass of 5700kg or more

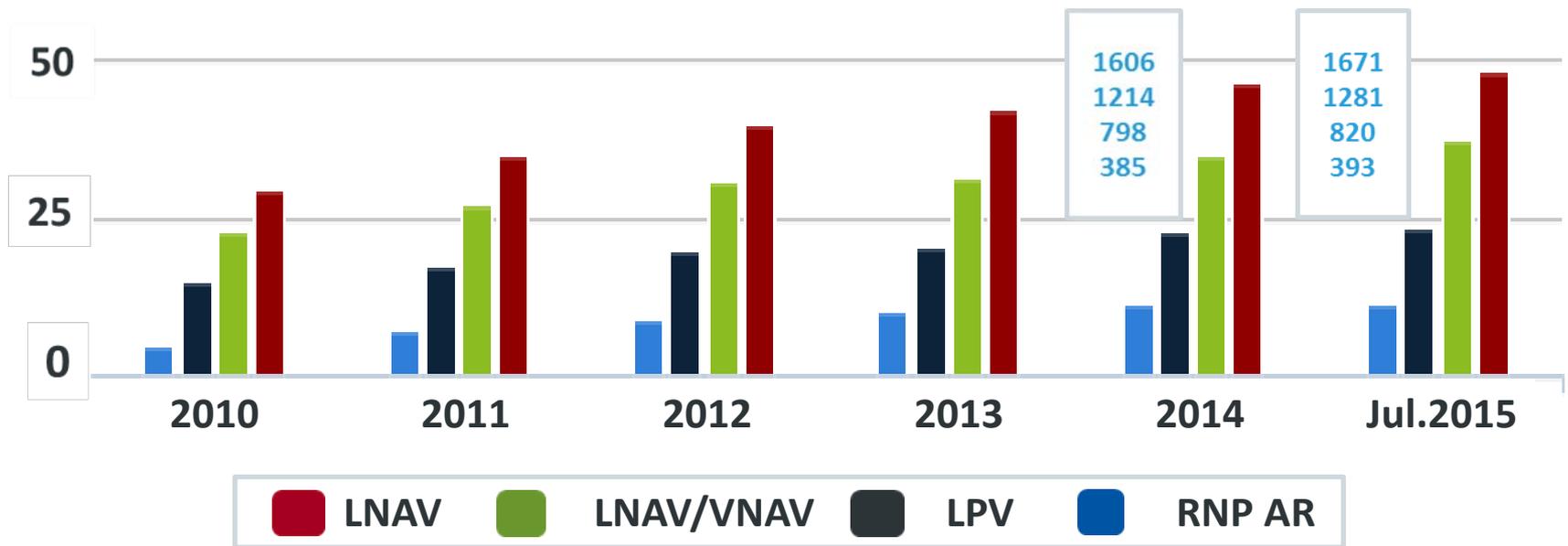


So where are we today?



PBN IMPLEMENTATION TRENDS

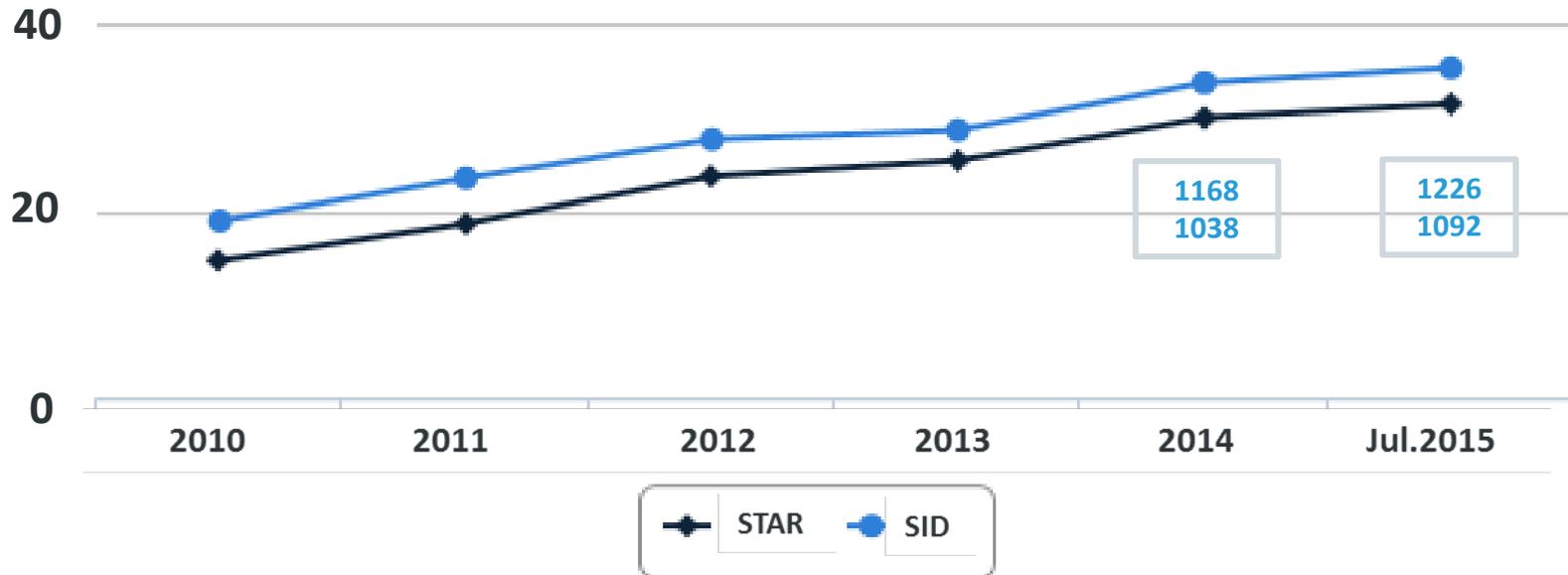
% of PBN Approaches by type for the world
(rate refers to the total number of instrument runways)



- This data is based on the International Aerodromes as listed in the Regional Air Navigation Plans
- World States include the total number of ICAO Member States

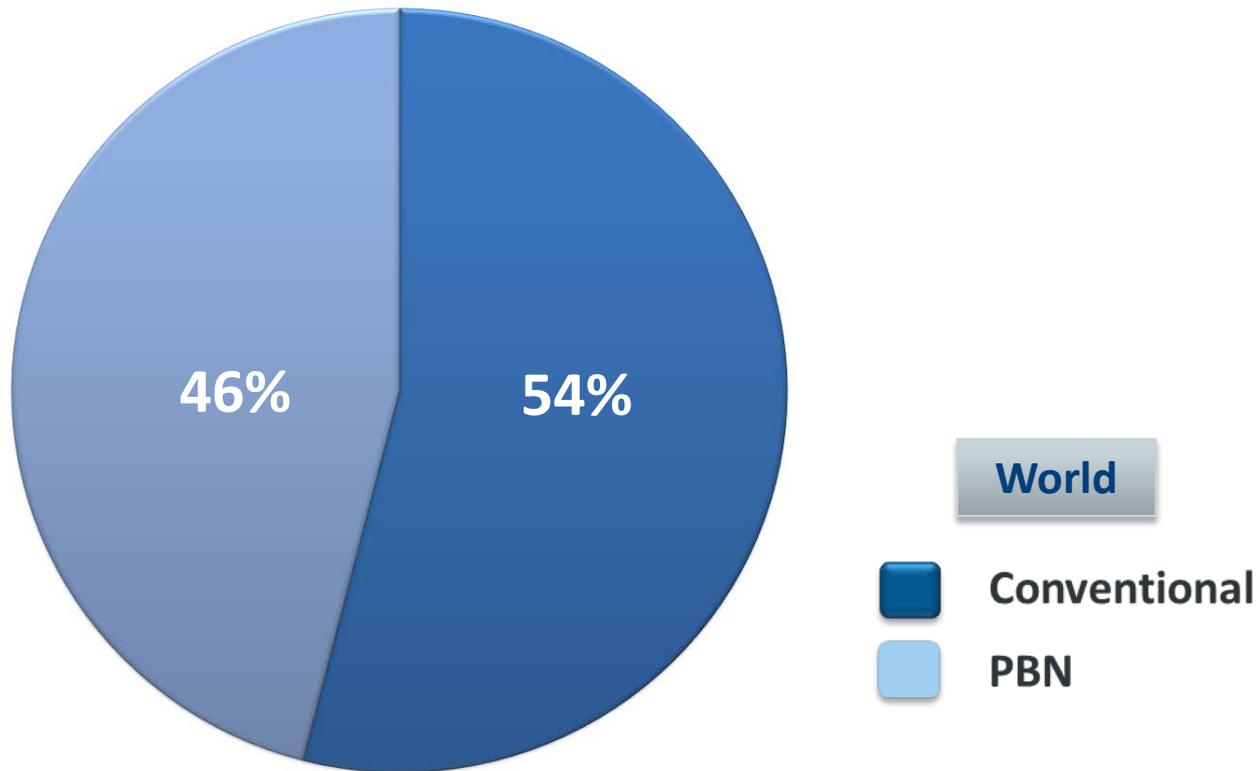
PBN IMPLEMENTATION TRENDS

% of PBN SID/STAR for the world
(rate refers to the total number of instrument runways)

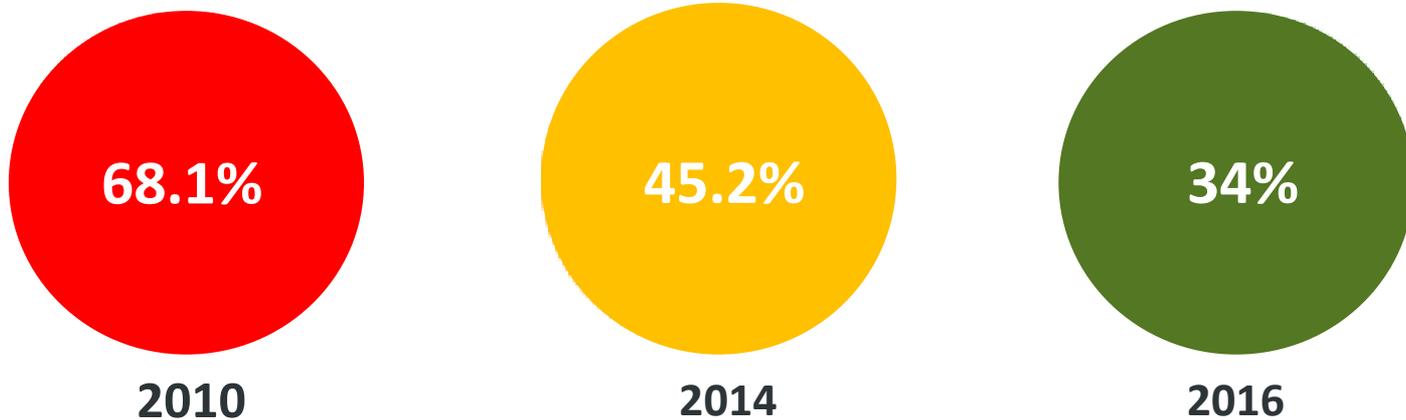


- *This data is based on the International Aerodromes as listed in the Regional Air Navigation Plans*
- *World States include the total number of ICAO Member States*

PBN Versus Conventional Routes



Percentage of States meeting the A37-11 Resolution Targets



Implementation Concerns

- Runway excursions
- CFIT
- Unstable approaches
- Lack of procedures with vertical guidance (APV)
- Lack of State PBN Implementation Plans
- Non-compliance with meeting A37-11 targets
- Air Operators not PBN equipped
- Delays in granting PBN Ops Approvals



What has ICAO done to help States with implementation? . . .





PBN Programme Office

- Officially established 1st October 2014
- Responsible for the global coordination of the PBN Programme
 - Act as ICAO's PBN focal point
 - Develop the PBN Standards and other required guidance material
 - Coordinate with ICAO Regions to ensure consistent and expeditious implementation
 - Develop PBN Products and Services
 - Monitor the global implementation of PBN

Flight Procedures Programme (FPP)

- Beijing, China
 - Co-located with Regional Sub-Office
- Dakar, Senegal
 - FPP Office established 2014 (covers all African States)
- MID Region(coming soon)



ICAO/IATA PBN GO Teams

- Expert Teams Visits to address specific implementation issues
 - Phase I (PBN Requirements Assessment) completed
 - Phase II (Airspace Design and Operations Approvals) completed
- Future ICAO Visits will be specific to address Region and/or State requirements for PBN Implementation
 - On request basis
- Focus/Services provided will be:
 - PBN Assessments / Gap Analysis
 - PBN Plan Development
 - Training
 - Implementation Assistance

Completed Global Visits Phase (I and II)	
Thailand (2)	UAE (2)
Mexico	Kenya
Germany	India
Ecuador	Russia
South Africa	USA (CAR/SAM)

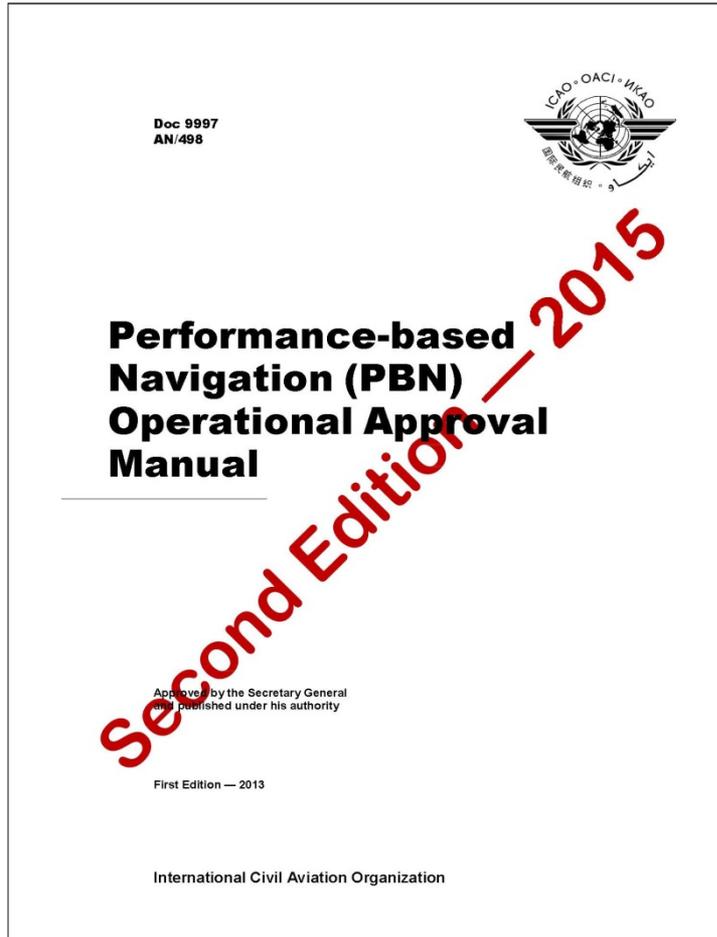
PBN Documentation Framework



- PANS Ops Volume I
- PANS Ops Volume II
- PBN Manual (Doc 9613) 4th Edition
- RNP AR Procedure Design Manual (Doc 9905)
- PBN Ops Approval Manual (Doc 9997)
- Manual on PBN Use in Airspace Design (Doc 9992)
- CDO Manual (Doc 9931)
- CCO Manual (Doc 9993)
- GNSS Manual (Doc 9849)
- Procedure QA Manual (Vol 1 to Vol 6) (Doc 9906)



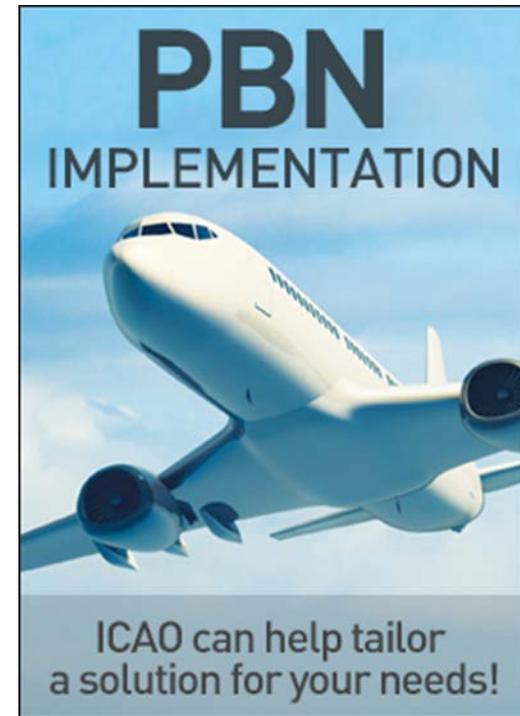
PBN Ops approval manual (now available)



- New navspecs
 - RNP 2
 - Advanced RNP
 - RNP 0.3
 - RF requirements
- Streamlined
- Third edition (2016)
 - Complex PBN
 - AFM requirements

PBN Tailored Products and Services

- PBN iKit
- PBN Start
- PBN Training
- PBN Publications/Bundles
- PBN Symposia/Workshops
- PBN Implementation Assistance
- PBN Business Planning
- PBN Financial Aid



Provided through ICAO HQ, Regional Offices, FPPs, ICAO Authorized Training Centers, On-line ICAO Store



PBN Training

- Computer Based Training Courses (CBTs)

PBN Overview
PBN Ops Approval
PBN Airspace Design

PBN for Pilots

PBN for ATCOs

- PBN Classroom Courses

PBN Ops Approval
PBN Airspace Design
(available from ICAO HQ)

PD Courses
(available from ICAO HQ
and FPP Offices)

Raising PBN Awareness

Interested in PBN Chart Depiction?
Get a copy of our recently issued Cir 336

Introducing the redesigned and updated PBN Website

ICAO Asia-Pacific Performance-Based Navigation Symposium
8-10 June in Bangkok, Thailand

"Expanding P
challenges in

Assembly Resolution A37-11 calls for 100% of
runways to have a PBN approach by 2016

Performance-based Navigation
The Primary Air Navigation Priority

HLSC emphasises the importance
of effective regulatory oversight

#icaoPBN



Implementing Air Navigation's #1 Priority
Performance-based Navigation (PBN)

Having difficulty implementing PBN and achieving the many safety and efficiency benefits?

ICAO can help tailor a solution for your needs. Contact us at:

www.icao.int/PBN



PBN Recognition – IFP Organizations

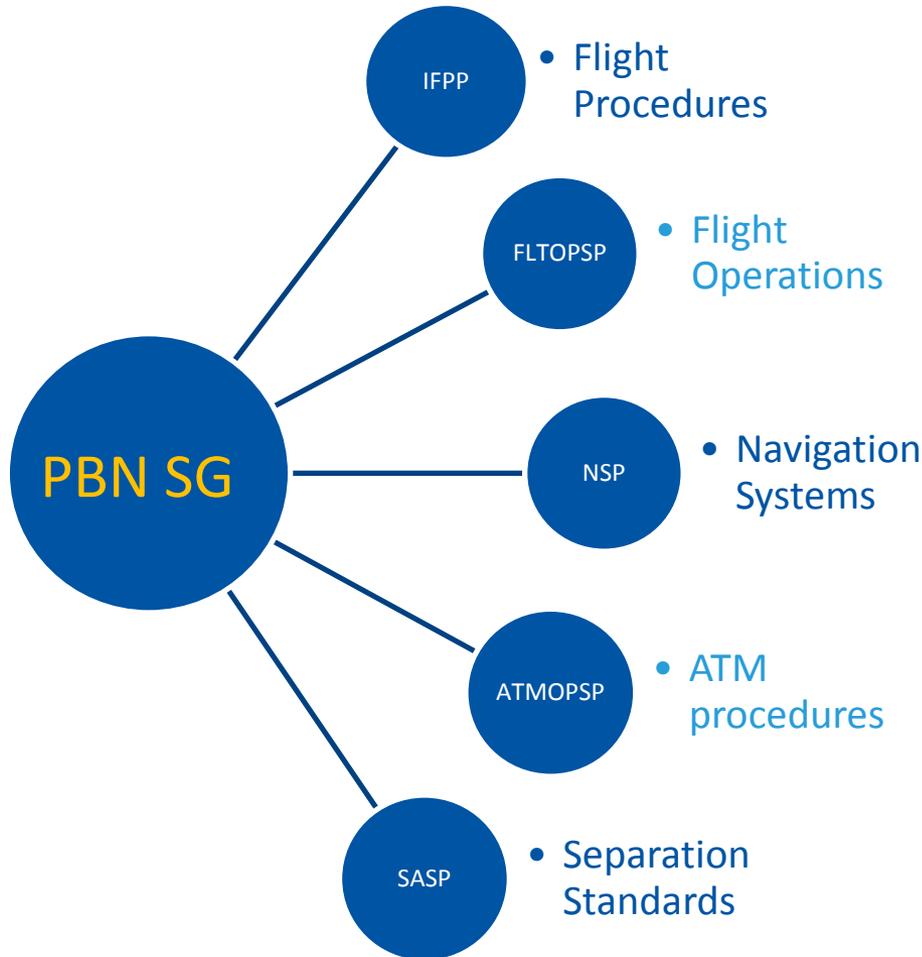
- Endorsement/Recognition of Compliance of Instrument Procedure Design organizations
- To assist States with PBN Implementation
- Organizations recognized by ICAO (9):
 - Airways New Zealand
 - ASAP s.r.o. (Slovakia)
 - Beijing Transafe Technology and Trade Company, Limited (China)
 - CAAC Central-Southern Airport Design & Research Institute (China)
 - China Academy of Civil Aviation Science and Technology (CAST)
 - GE Aviation (USA)
 - Hughes Aerospace (USA)
 - Ingegneria Dei Sistemi S.p.A (Italy)
 - Shanghai Eastern China Civil Aviation Procedure Design and Research Institute (SECAF)



New PBN SARPs and guidance



PBNSG Inter-panel Coordination



GBAS CAT II/III, charting/database
Harmonization, Regulatory oversight,
Visual PBN procedures, PBN to XLS

Making PBN the norm in operations,
Visual guided Approaches using Area
Navigation

GBAS CAT II/III, Galileo/Beidou
terrestrial navaid strategy

CDO/CCO Phraseology

RNP1, RNP2, ARNP RNP APCH, RNP AR
APCH separation standards
Parallel sep standards for GBAS/RNP
Reduced divergence departures

PBNSG Main Tasks

- Current PBNSG Work Program:
 - Develop strategic plan for PBN concept (2016)
 - Update the Ops Approval Manual (Doc 9997) (2016)
 - Inclusion of Complex PBN
 - Develop reversion strategy for GNSS outage (2017)
 - Develop initial guidance for mixed mode operations (2017)
 - Develop operational guidance on PBN procedures (2017)
 - Investigate use of Multi-Constellation/Multi Frequency for GNSS (2017)
 - Flight plan codes for all nav specs and options (2018)
 - Implementation of RF legs and FRT's (2020)
 - Develop RNP AR Departure procedures (2020)





Other Highlights

- Making PBN the norm in operations rather than the exception
 - Simplify the approval process (2016)
 - Specific Approval only for ‘Complex PBN operation’ (2016)
 - Update training provisions to include PBN (2018)
 - **(PANS TRAINING and Annex 6)**
- Stabilized RNP approaches to parallel runways (2018)
- PBN approach clearance phraseology (2018)
- Visual procedures using PBN (2018)
- RNP AR Departures (Revision of RNP AR Design Manual) (2018)
- Helicopter PBN Operations (2018)

Summary

- PBN Implementation is **Air Navigation's #1 Priority**
- **Global support** for PBN Implementation by all stakeholders
- **Safety/efficiency/capacity** issues can be addressed/
mitigated through PBN
- PBN main **enabler** for many ASBU modules and ROIs
- Rate of implementation **slow** in some regions
- Products and Services are **now available** to assist States
- Coordination is **essential** to effective implementation

Action by the meeting

The meeting is invited to:

a. encourage States to:

- i. take into consideration the global and regional developments related to PBN when developing their national PBN plans; and
- ii. benefit for the available ICAO products and Services

b. consider the latest PBN developments in the amendment of the MID region PBN Implementation Plan.



North American Central American and Caribbean (NACC) Office Mexico City	South American (SAM) Office Lima	ICAO Headquarters Montreal	Western and Central African (WACAF) Office Dakar	European and North Atlantic (EUR/NAT) Office Paris	Middle East (MID) Office Cairo	Eastern and Southern African (ESAF) Office Nairobi	Asia and Pacific (APAC) Office Bangkok
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Thank You