



| ICAO

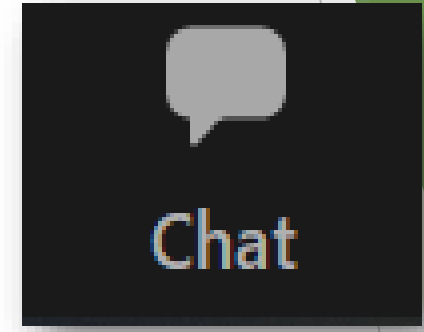
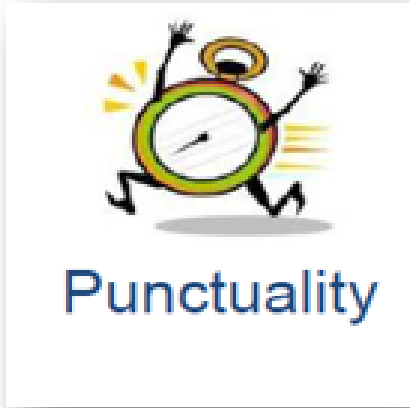
INTERNATIONAL CIVIL AVIATION ORGANIZATION

A UN SPECIALIZED AGENCY

PBN Route Laboratory
UNON 22 - 26 May 2023



Welcome & housekeeping



WORKSHOP AGENDA AND WORK PROGRAMME

Time	22 May	23 May	24 May	25 May	26 May
8:30 – 10:00	Welcome / Introductions 2019 PBN LAB Recap. PBN Review of ASBU.	PBN Activity 1 ANC Route Catalogue and implementation status.	PBN Activity 5 Determine 5LNC requirements from ICARD system. Agree on coordinated publication dates for AIP Supplements.	Plenary Session 4 Discussion on lessons learned. Concerns.	Plenary Session 8 Future Implementations. FRA impact on future PBN routings.
10:00 – 10:20	BREAK	BREAK	BREAK	BREAK	BREAK
10:20 – 12:00	Plenary Session 1 Environmental aspects. Implementation Issues facing States.	PBN Activity 2 Review from the Free Route Airspace PMT. PBN routes as precursor to FRA.	PBN Activity 5 Continued	Plenary Session 5 Operational Approval/Safety Regulatory Approval and Safety Assessment.	Plenary Session 9 Review Project Outlines and agreed dates for implementation.
12:00 – 13:00	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
13:00 – 14:40	Plenary Session 2 Review of PBN Concept. Changes to ICAO Doc 9613.	PBN Activity 3 Review of requested new stakeholder routings. Break-out groups - Coordinate alignment of route segments per region.	PBN Activity 6 Discuss ATS Letters of Agreements and changes/Procedure changes.	Plenary Session 6 Integration of PBN Routes with TMA SIDs/STARs entry and exit points and challenges.	Plenary Session 10 Outstanding issues. Summary. Workshop closing.
14:40 – 15:00	BREAK	BREAK	BREAK	BREAK	BREAK
15:00 – 16:45	Plenary Session 3 Review of PBN Navigation Specifications and Application.	PBN Activity 3 continued with Activity 4 Decide on operational requirements and applicable Navigation Specifications	PBN Activity 7 Review of Existing Routes from Existing Catalogue and determine applicability	Plenary Session 7 Agree on implementation Plan of Action and timelines.	Plenary Session 11 Workshop closing.

2019 Route Lab Recap/PBN Review - ASBU

- ▶ **Global Air Navigation Plan (Doc 9750)/ PBN Priorities**
- ▶ **Assembly A37-11 on PBN/CCO & CDO Implementation Timelines**
- ▶ **Airspace Organisation/Flexible Use Airspace**
- ▶ **Revised Abuja Safety Targets (PBN)**
- ▶ **APIRG/22 Conclusions on Free Route and PBN with CCO/CDO**
- ▶ **ATS Route Designators**

PBN: Our Highest implementation priority

In line with the continued focus on PBN as the highest priority for Air Navigation, ICAO's PBN Programme is working to further improve and develop the PBN concept, whilst also striving to assist States with successful implementation of PBN routes and procedures

Assembly Resolution A 37

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% by 2010, 70% by 2014, **100% by 2016**

Revised Abuja Safety Targets

- ▶ All States to implement PBN procedures for all instrument runways.
- ▶ 75% of Instrument Runways to have PBN procedures by end of 2020;
- ▶ 100% of Instrument Runways to have PBN Procedures by end of 2025

ASBU

- ▶ APIRG/22 Conclusion 22/08: Implementation of PBN with CCO and CDO
- ▶ That:
 - ▶ a) States that have not already done so, are urged to coordinate with the ICAO AFPP for the review and confirmation of status of their PBN - CCO/CDO procedures

Revised Abuja Safety Targets

ASBU

- ▶ Operational
- ▶ APTA - Improve arrival and departure operations
- ▶ **Baseline:** Terminal Area Arrival and Departure Procedures:
 - ▶ Where implemented, standard terminal arrival procedures (STARs) provide a defined lateral path for arriving aircraft to connect to the approach. Similarly, Standard Instrument Departure procedures (SIDS), where implemented, provide a lateral path for aircraft to depart the terminal area after take-off. These terminal procedures enable more efficient terminal airspace management.

▶ Block 0:

▶ Terminal Area Arrival and Departure Procedures:

- ▶ Enhanced STARS and SIDS with altitude constraints along the lateral path improve ATC management, and further support operational efficiency by providing vertical profiles that all aircraft can follow.

▶ Approach Procedures:

- ▶ Performance based aerodrome operating minima (PB AOM) allows for implementation of vertically guided approaches at a wider range of aerodromes, and facilitates a phased approach to improvement in approach capabilities.

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Element ID	Title
APTA-B0/1	PBN Approaches (with basic capabilities)
APTA-B0/2	PBN SID and STAR procedures (with basic capabilities)
APTA-B0/3	SBAS/GBAS CAT I precision approach procedures
APTA-B0/4	CDO (Basic)
APTA-B0/5	CCO (Basic)
APTA-B0/6	PBN Helicopter Point in Space (PinS) Operations
APTA-B0/7	Performance based aerodrome operating minima – Advanced aircraft
APTA-B0/8	Performance based aerodrome operating minima – Basic aircraft
APTA-B1/1	PBN Approaches (with advanced capabilities)
APTA-B1/2	PBN SID and STAR procedures (with advanced capabilities)
APTA-B1/4	CDO (Advanced)
APTA-B1/5	CCO (Advanced)

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- ▶ **FRTTO** - Improved operations through enhanced en-route trajectories
- ▶ **Baseline** - En-route trajectories are constrained by the fixed route network, permanently segregated areas, conventional navigation or limited use of area navigation (RNAV), rigid allocation of airspace between civil and military authorities, and rigid sector configurations. Conflict detection is a manual task, performed on the basis of paper/electronic flight strips.

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Element ID	Title
FRTO-B0/1	Direct routing (DCT)
FRTO-B0/2	Airspace planning and Flexible Use of Airspace (FUA)
FRTO-B0/3	Pre-validated and coordinated ATS routes to support flight and flow
FRTO-B0/4	Basic conflict detection and conformance monitoring
FRTO-B1/1	Free Route Airspace (FRA)
FRTO-B1/2	Reduced Navigation Performance (RNP) routes
FRTO-B1/3	Flexible Use of Airspace (FUA) with access to real time airspace data
FRTO-B1/4	Dynamic Slot Allocation
FRTO-B1/5	Enhanced Conflict Detection and Conformance Monitoring
FRTO-B1/6	Advanced Conflict Detection and Conformance Monitoring
FRTO-B1/7	Trajectory Options Set (TOS)

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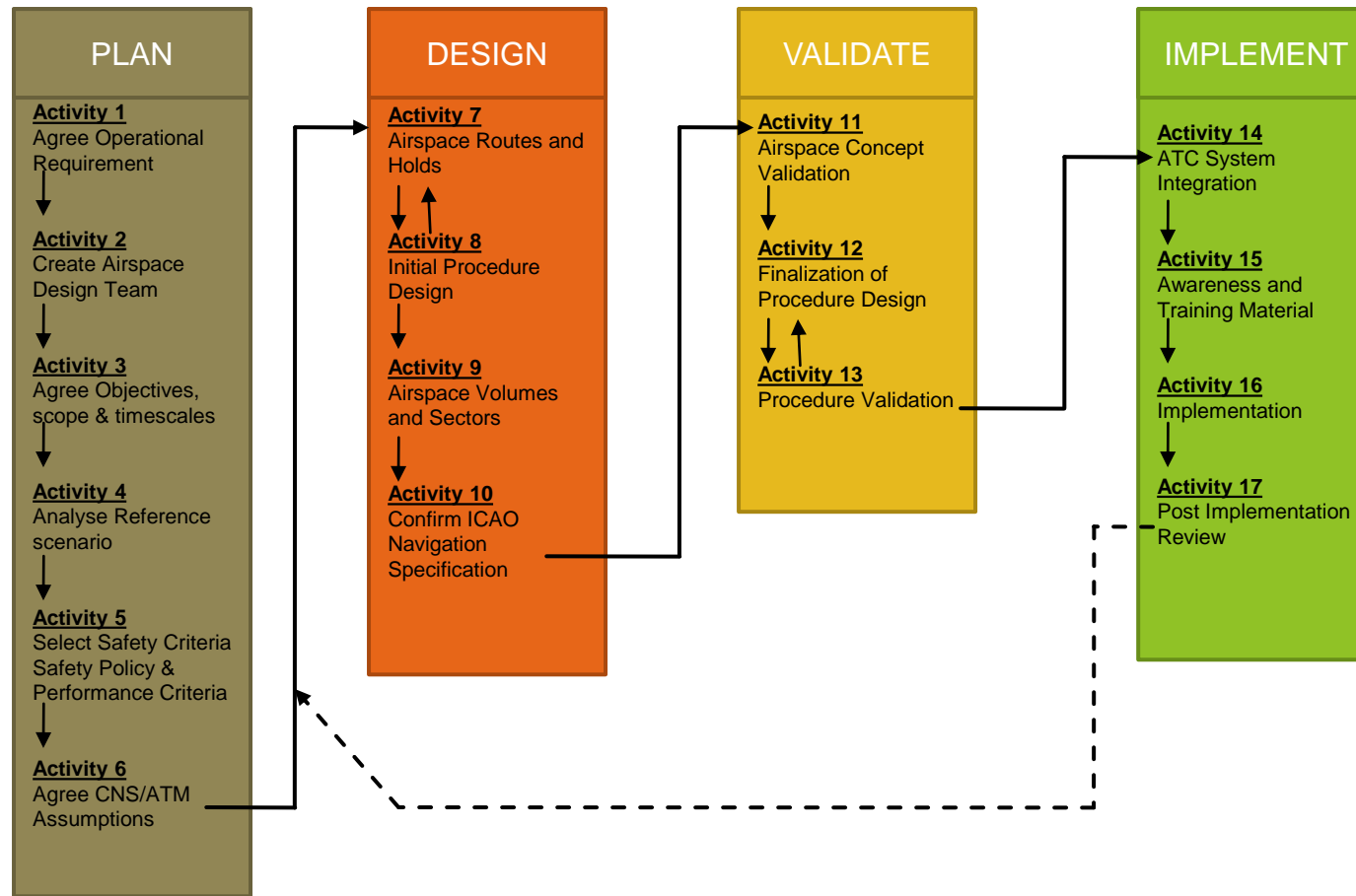
- ▶ FRTO – B0/1 – DCT ✓
- ▶ B1/1 – FRA ✓
- ▶ APTA – CCO/CDO – BASIC???
- ▶ IMBALANCE
- ▶ Gains en-route – Cancelled by TMA operations

END

ASBU

- Planning (Team (Core Team))
- System considerations (Data Sets)
- Design (Who?; SIM)
- Validation (Scope Creep, meet expectations)
- Implementation – No no no!!!!
- Training – Yes YES Yes!!! (Where, by who?)

Appendix A: Implementation Process Flow



PLANNING EXAMPLE

EXAMPLE PROJECT PLAN

	<u>ACTIVITY</u>	<u>Number of Days</u>
PLAN	1 Agree on Operational Requirements	10
	2 Create Airspace Design Team	5
	3 Agree on Objectives, Scope & Timeline	15
	4 Analyze Reference Scenario	15
	5 Select Safety Criteria, Safety Policy, & Performance Criteria	10
	6 Agree on CBS/ATM Assumptions	12
DESIGN	7 Design Airspace Routes and Holds	14
	8 Initial Procedure Design	20
	9 Design Airspace Volumes and Sectors	20
	10 Confirm ICAO Navigation Specification	5
VALIDATE	11 Airspace Concept Validation	20
	12 Finalize Procedure Design	22
	13 Procedure Validation	20
IMPLEMENT	14 ATC System Integration	30
	15 Awareness and Training Material	30
	16 Implementation	1
	17 Post Implementation Review	30
TOTAL DAYS REQUIRED		279

AFI PBN, CCO/CDO Implementation Challenges

- ▶ Awareness and lack of technical expertise
- ▶ Training of airspace and procedure designers
- ▶ Training, qualification, competence of pilots and air traffic controllers
- ▶ Maturity of concepts, systems, procedures in different regions
- ▶ Capacity for Regulatory Approvals
- ▶ Others (Political, Security of investments, Job Security, etc.)
- ▶ Return on Investments of airspace users (Most Capable, Best Served)



Thank You!