WORKSHOP PBN

Implementation PBN in an En-route Environment

Presented by Indonesia

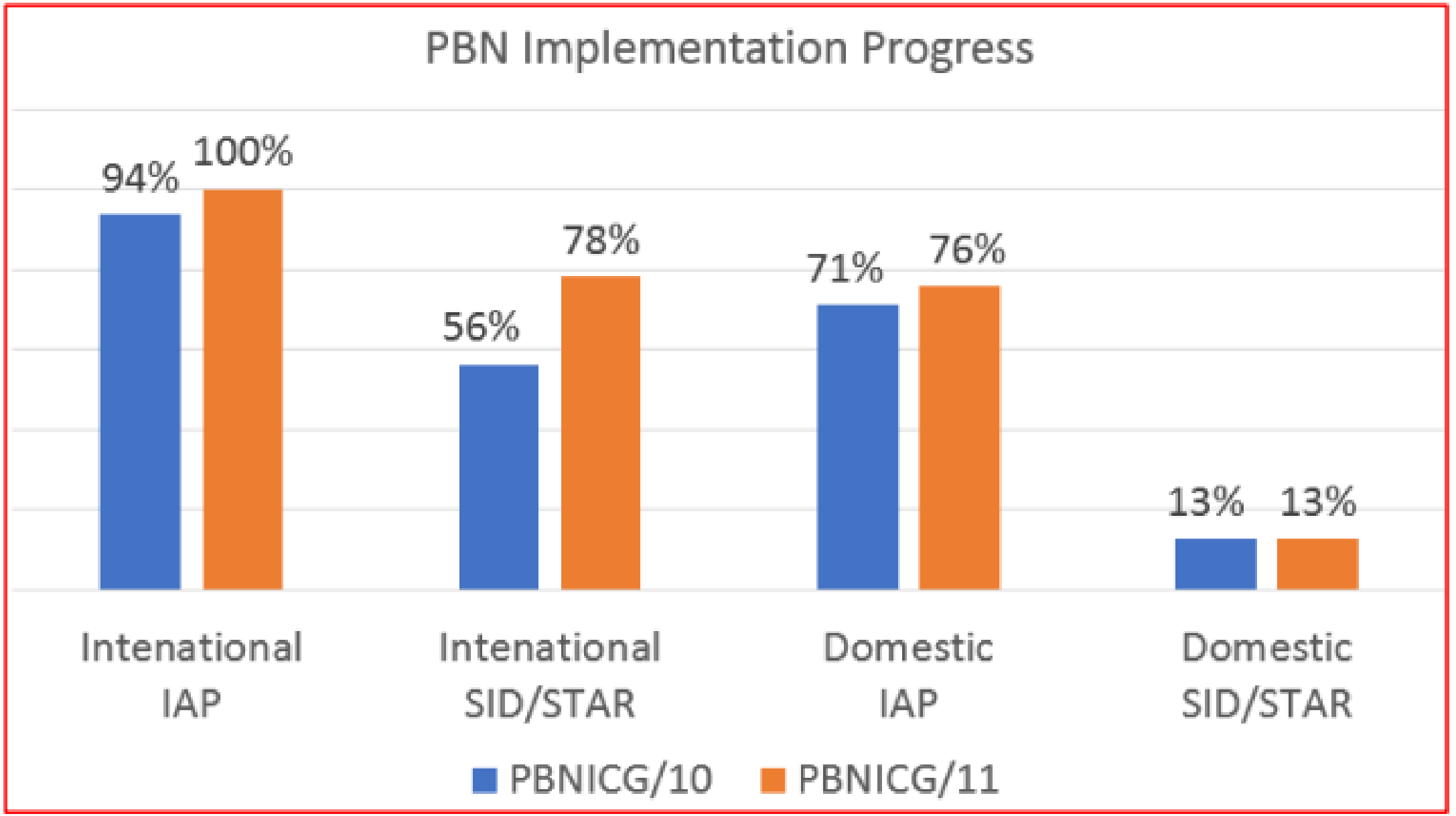
SAIOSEACG/3 Meeting, 16-19/04/2024

BENEFITS OF PBN

- Improving Safety
- Increasing Airspace Capacity
- Improving Operating Return

ICAO DOCUMENT OVERVIEW

- ICAO PBN Manual (Doc 9613)
- ICAO PBN Airspace Design Manual (Doc 9992)
  - ICAO CDO Manual (Doc 9931)
  - ICAO CCO Manual (Doc 9993)
- ICAO Doc 4444-PANS-ATM
- Doc 7030– Regional Supplementary Procedures
- Doc 8168– PANS-OPS
- Doc 9426– Air Traffic Services Planning Manual
- Doc 9906– Quality Assurance Manual for FPD


PBN Implementation Progress
94%
100%
56%
78%
71%
76%
13%
13%
Intenational IAP
Intenational SID/STAR
Domestic IAP
Domestic SID/STAR
PBNICG/10
PBNICG/11

WORKSHOP PBN

- Development of PBN airspace in Indonesia.
  - PBN Concept
  - Components of PBN
- The goals and expectations of PBN in airspace planning
- Approval of operations
- Operational experience and benefits
- Environmental

DEVELOPMENT OF PBN AIRSPACE

PBN Concept

Intended Airspace

- Describes intended operations within an airspace
- Develop strategic objectives in terms of safety, increased air traffic capacity, improved flight efficiency, mitigation and environmental impact

Airspace Concept

CNS\ATM/RWY/Traffic/MET

Airspace Designs:

Route,

Volume,

Sector

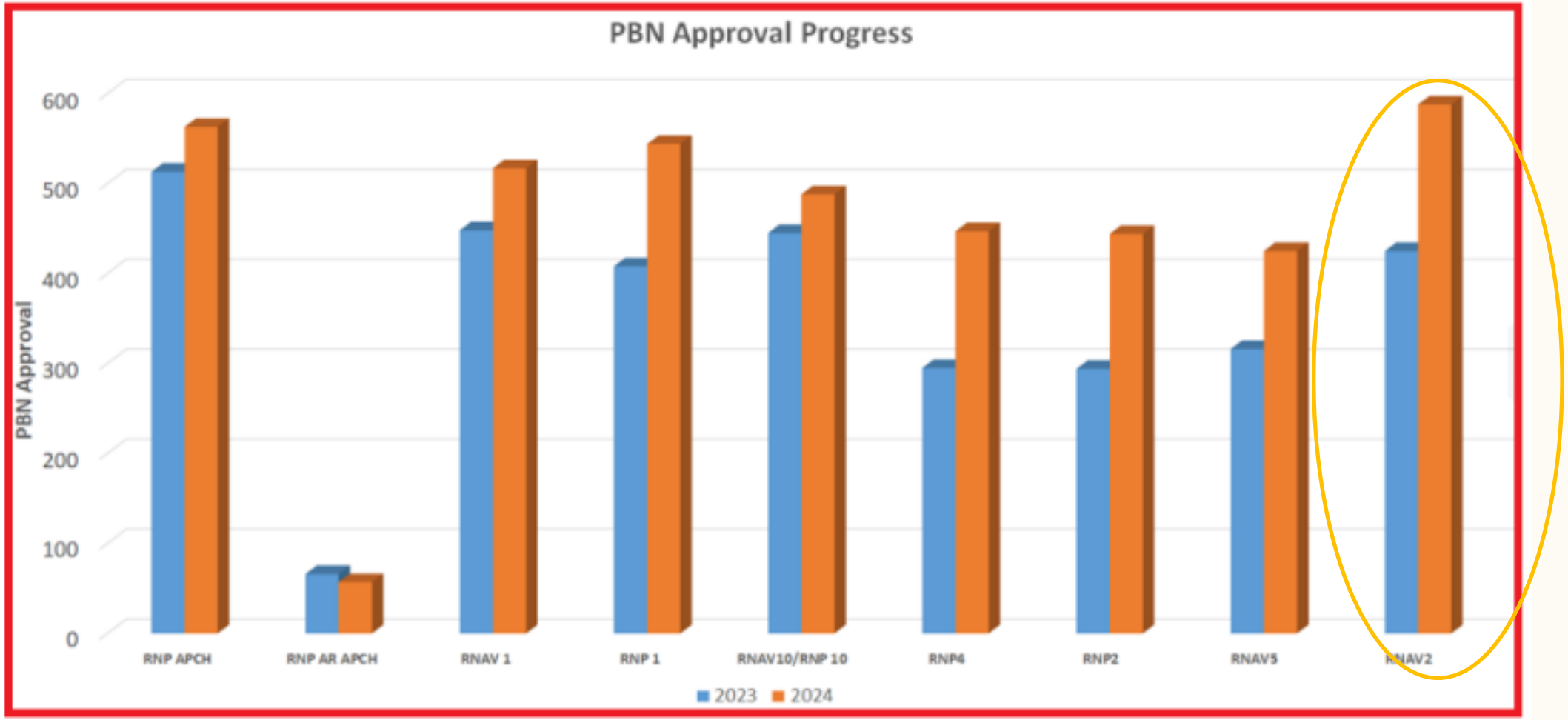
Inter facility
LOA
Sector interaction
Traffic assignment
CCO
CDO
FUA
Airspace Classification

A Fully Develop Airspace

- Describes in detail the organization and its operations
- Address all the strategic objectives identified for the project
- Address all CNS/ATM enablers
- Identifies all operational and technical assumptions

DEVELOPMENT OF PBN AIRSPACE

Fleet Population

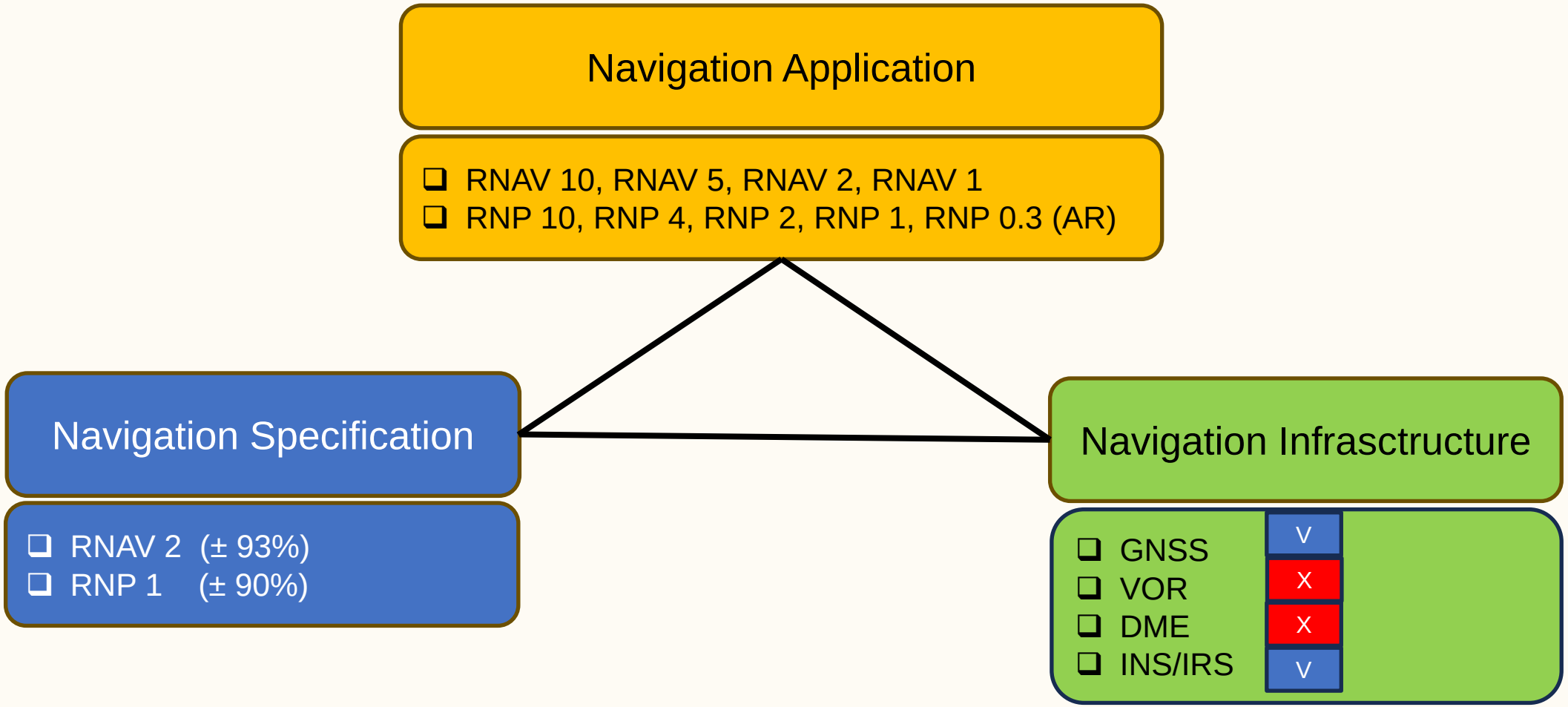


PBN IMPLEMENTATION PLAN

No.	PROGRAM	2022	2023	2024	2025	2026
1	**ATS ROUTE (NON-REGIONAL/ DOMESTIC)**	RNAV2 Int'l airport to Int'l airport	RNAV2 connecting Domestic airports	RNAV2 connecting Domestic airports	RNAV2 connecting Domestic airports	RNP2 connecting Remote airports
2	**ATS ROUTE (INTERNATIONAL)**	RNP2, RNP4, RNP10 Int'l Route High traffic (Oceanic)	RNP2, RNP4, RNP10 Int'l Route High traffic (Oceanic)	RNP2 or RNP4 Int'l Route High traffic (Oceanic)	RNP 2 or RNP4 Int'l Route Medium traffic (Oceanic)	RNP2 or RNP4 Int'l Route Medium traffic (Oceanic)
3	**SID/STAR / TERMINAL**	RNAV1 or RNP1 Domestic Airports High traffic	RNAV1 or RNP1 Domestic Airports Medium traffic	RNAV1 or RNP1 Domestic Airports Medium traffic	RNP 1 Domestic airports Low traffic	RNP1 Remote Airports Low traffic
4	**APPROACH**	Domestic airports High traffic RNP APCH LANAV/VNAV	Domestic airports Medium traffic RNP APCH LNAV/VNAV	Domestic airports Medium traffic RNP APCH LNAV/VNAV –	Remote airports High traffic RNP APCH LNAV/VNAV – RNP-AR	Remote airports High traffic RNP APCH LNAV/VNAV – RNP-AR

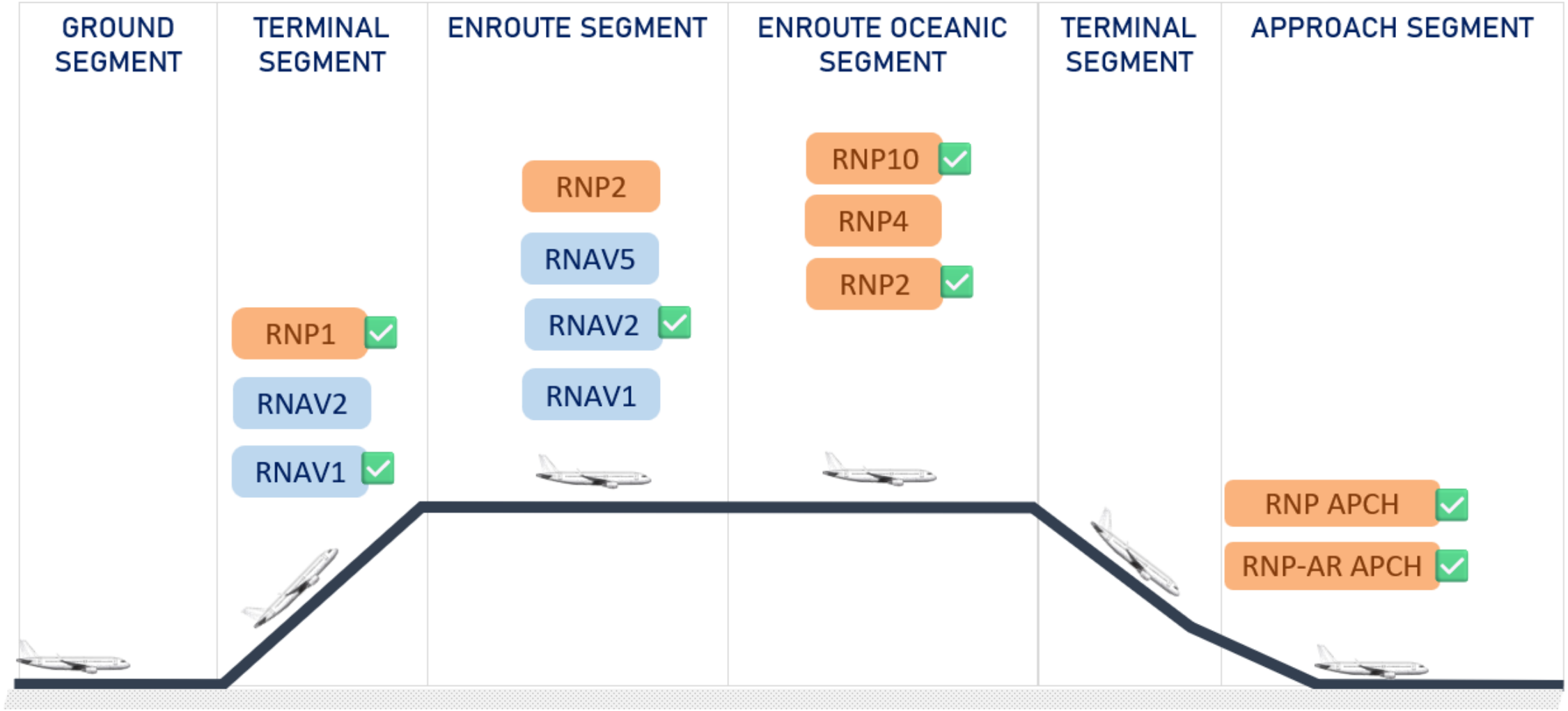
DEVELOPMENT OF PBN AIRSPACE

Component of PBN



Navigation accuracy is NM 95% of flight time

NAVIGATION APPLICATION



CRUISING/ENROUTE PHASE

Navigation Specification for an en route

PBN TYPE	ROUTE TYPE	ROUTE NAME	TOTAL
RNAV 10	Domestic	T1	1
RNP 10	Regional / International	L504, L511, L644, L762, L764, L774, L895, L896, L897, M300, M522, M635, M766, M768, M772, M774, M563, N628, N633, N646, N752, P570, P574, P648, dan P756	25
RNAV 2	Domestic	T2, T3, T4, T5, T6, T7, T8, T10, T15,T16, T17, T18, T19, T20, T21, T22, T23, T24, T25, T26, T28	21
RNP 2	Domestic	Z1, Z2, Z3, Z4, Z21, Z22, Z23, Z24, Z25, Z26, Z601, Z602, Z603, Z604, Z605, Z606, Z641, Z642, Z643, Z644, Z645, Z647, Z648, Z649. Z652, Z653, Z661, Z662, Z663, Z664, Z665, Z666, Z667, Z668, Z669, Z671, Z762, Z673, Z674, Z675, Z676, Z677, Z678, Z679, Z681, Z682, Z683, Z684, Z685, Z686, Z687, Z688 dan Z689	53

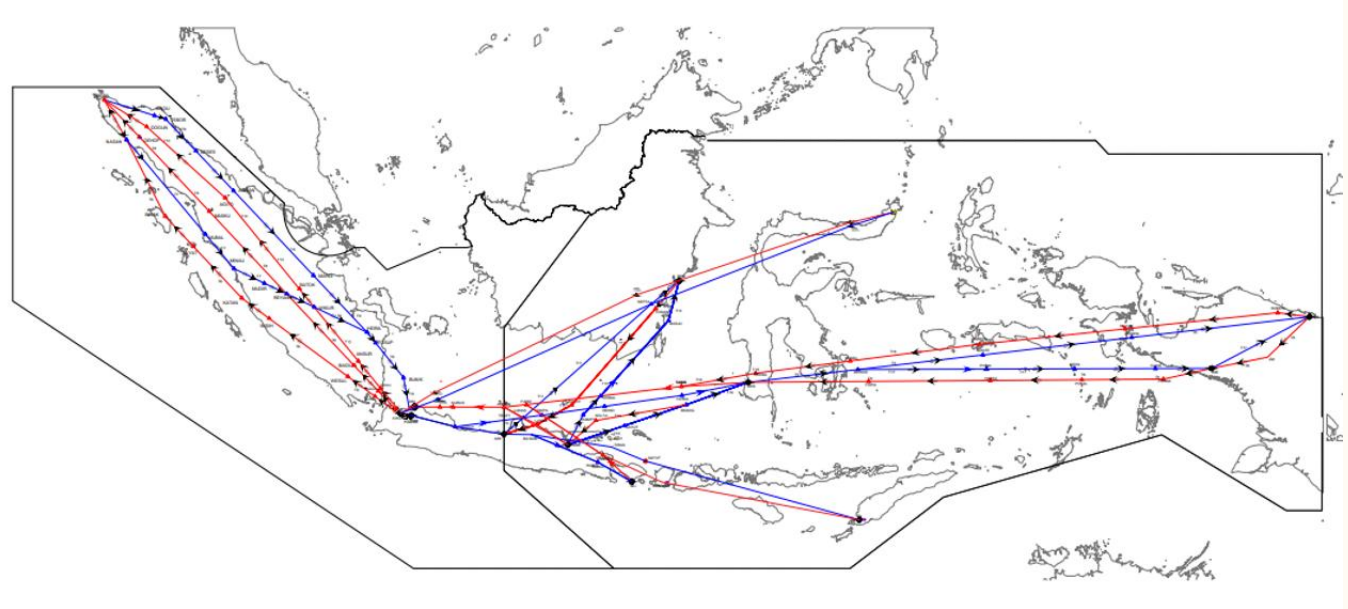
Consideration of RNAV 2 Routes Design

RNAV 2 is one-way route

Distant routes between Westbound and Eastbound

Connectivity between RNAV 2 routes and Conventional routes

Track Miles

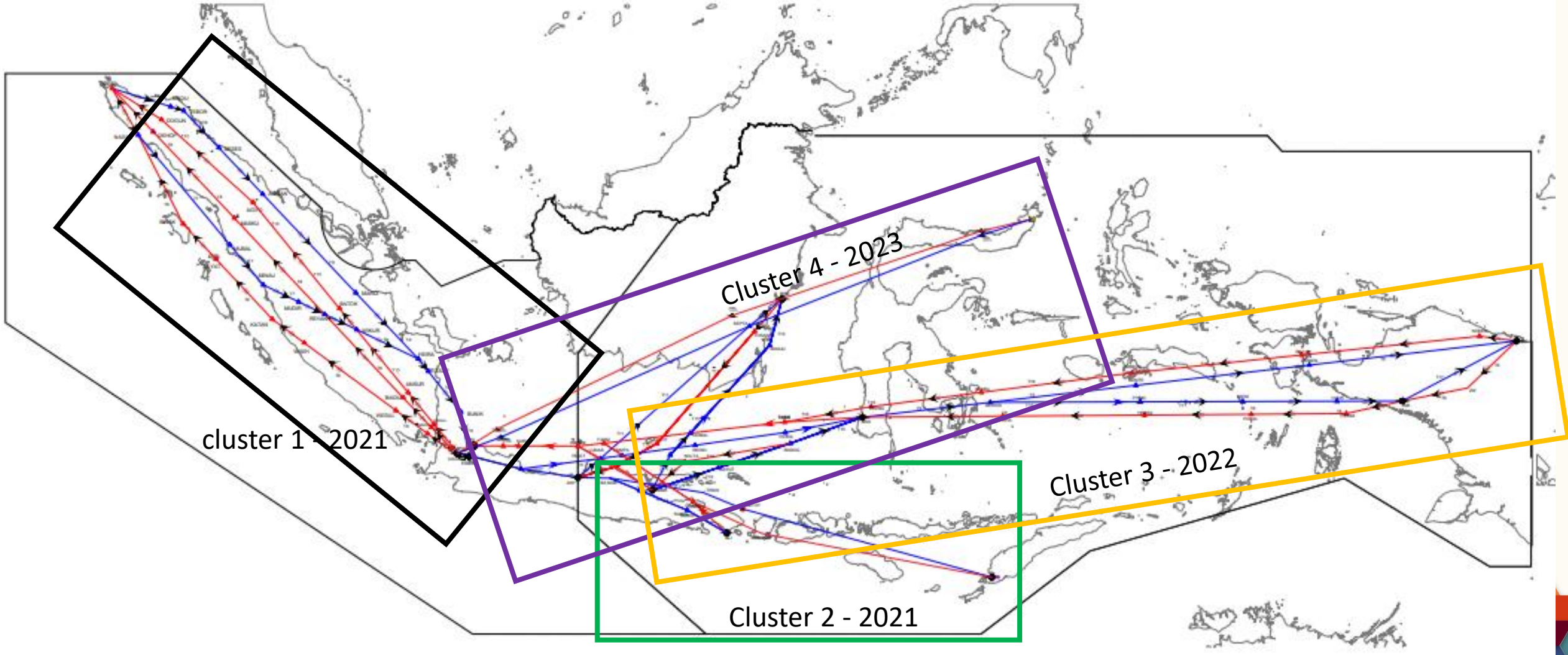


Simplicity of significant points

SID/STAR Connectivity

RNAV2 DOMESTIC ROUTES (2019 – 2023)

Satelit based route | *Increase airspace capacity* | *Shorter distance* | *Shorter time*



THE GOALS & EXPECTATION OF PBN

- ❑ Airspace User Experience
- ❑ AirNav Indonesia’s Capability
- ❑ Regulation

APPROVAL OF OPERATIONS

- ❑ Approval Process
- ❑ Methodology
- ❑ Training for FPD
- ❑ Air Traffic Control Officers (ATCOs)

APPROVAL OF OPERATIONS

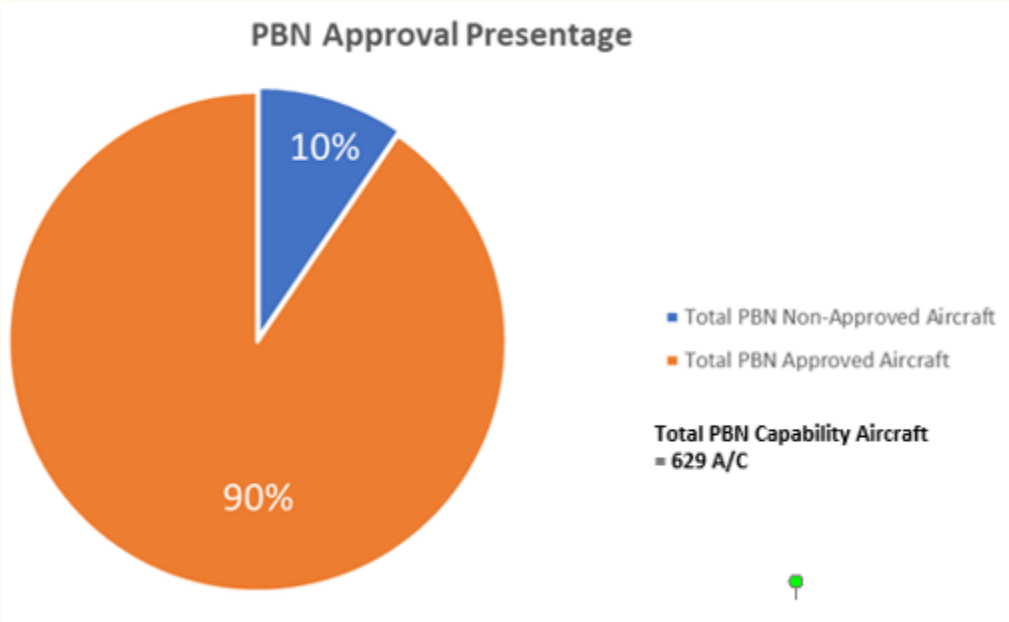
Approval Process

- ICAO Doc 9997 PBN Operational Approval Manual
- Improved the navigation specification
- Civil Aviation Safety Regulation part 91 AMDT. 5).
- Procedures to certify PBN Operational Approval are described in DGCA Staff Instruction 8900-4.1

Approval of Operations

Methodology

- ❑ Reviewing the requirements
- ❑ Submitting a formal application to the DGCA
- ❑ Document evaluation
- ❑ Performing feasibility
- ❑ Approval phase



Training of PFD

PAN-OPS Conventional :

- ❑ Training Program Elaboration
- ❑ Introduction
- ❑ Non-Precision Approach
- ❑ MSA
- ❑ Holding & Reversal Criteria
- ❑ Visual Maneuvering (Circling) Approach
- ❑ Departure Procedure
- ❑ Publication
- ❑ Examination
- ❑ On the Job Training

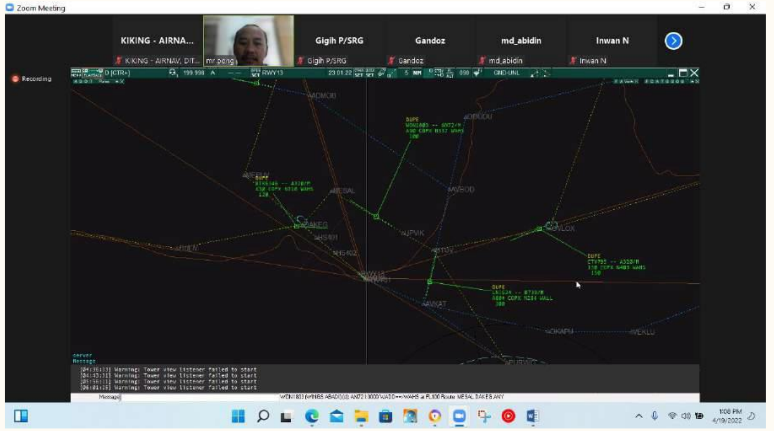
PAN-OPS PBN :

- ❑ Training Program Elaboration
- ❑ Basic Principles
- ❑ General Criteria
- ❑ Departure Procedures Construction
- ❑ Arrival & Approach Procedures Construction
- ❑ APV/Barometric Vertical Navigation (BARO-VNAV)
- ❑ Holding Procedures
- ❑ PBN En-Route Criteria
- ❑ Quality Assurance
- ❑ Report writing, charting, and publication
- ❑ OJT
- ❑ Examination

Training of ATC

Safety and smooth operation of aircraft

Indonesia is focusing on increasing the safety and smooth operation of aircraft throughout the country by PBN training flight procedures in some En route, TMAs, and airports for ATC.



Facilitate the Application of PBN

The objective of the course is to facilitate the application of PBN procedures through the improvement of understanding of the PBN concept and the PBN procedures by air traffic controllers. This will also improve the efficiency and capacity of airspace and the safety of operations, accelerating the implementation. Indonesia has conducted 17 PBN training ATC personnel in the year 2021 and 2 PBN training in the year 2022 (up until 15 March 2022).

Objective of the training

The objective of the course is to facilitate the application of PBN procedures through the improvement of understanding of the PBN concept and the PBN procedures by air traffic controllers. This will also improve the efficiency and capacity of airspace and the safety of operations, which will accelerate PBN implementation in Indonesia.

Training material for ATC'er

In terms of procedure development for ATC training materials consist of separations, routes and procedures, coordination, communications, contingencies, and emergencies. The training has been performed by the simulator and conducted online and offline consistent with the location of the ATC Unit. Since reported in PBNICG/9 in 2022, Indonesia has increased the implementation of PBN by 10% for international airports and 20% for domestic airports. The PBN training program in Indonesia is basic training, recurrent and advanced. The topics are en route PBN (RNAV 2), terminal (RNP 1), and approach (RNP APCH). Training local ATCs would improve confidence in the management of PBN traffic and provide a better perception of benefits in terms of workload and complexity reduction.

PBN Training content is as follows:

- Familiarization:principles, Concept of operations, AIP changes, Area of operations, SIM – exercise 1
- Contingencies: Mixed-mode traffic, lateral separation, aircraft deviations, and future change, SIM – exercise 2
- Competency assessments: exam, practical assessment, the review process

LESSON LEARNT OF PBN IMPLEMENTATION

- ❑ Stakeholder engagement
- ❑ Clear definition of operational requirements
- ❑ Robust training and procedures
- ❑ Continuous monitoring and evaluation
- ❑ To conduct effective PBN Training for ATC Personnel and pilot
- ❑ Dividing the phase based on the traffic flow and operational needs

CHALLENGES

Throughout the PBN Implementation, Indonesia has faced some challenges as follows:

- ❑ The strategy to increase the effectiveness of PBN
- ❑ The crossing between the SIDs and STARs
- ❑ The strategy to design a PBN that is capable of safety, capacity, efficiency, access, and environment on Jakarta Airspace
- ❑ The main challenge of PBN Operational Approval Implementation is aircraft eligibility, especially for the advanced Navigation Specification routes like RNP AR, RNP 2, and RNP 4 because some aircraft cannot conduct those Navigation specifications

Environmental Updates

Cumulative CO_2 Emissions Reduction by 2022

En route PBN RNAV 2 Cluster 1 sd Cluster 3	± 111.409 ton
PBN SID/STAR/IAP APP/TMA	± 237.470 ton
UPR	± 157 ton
	± 349.036 ton

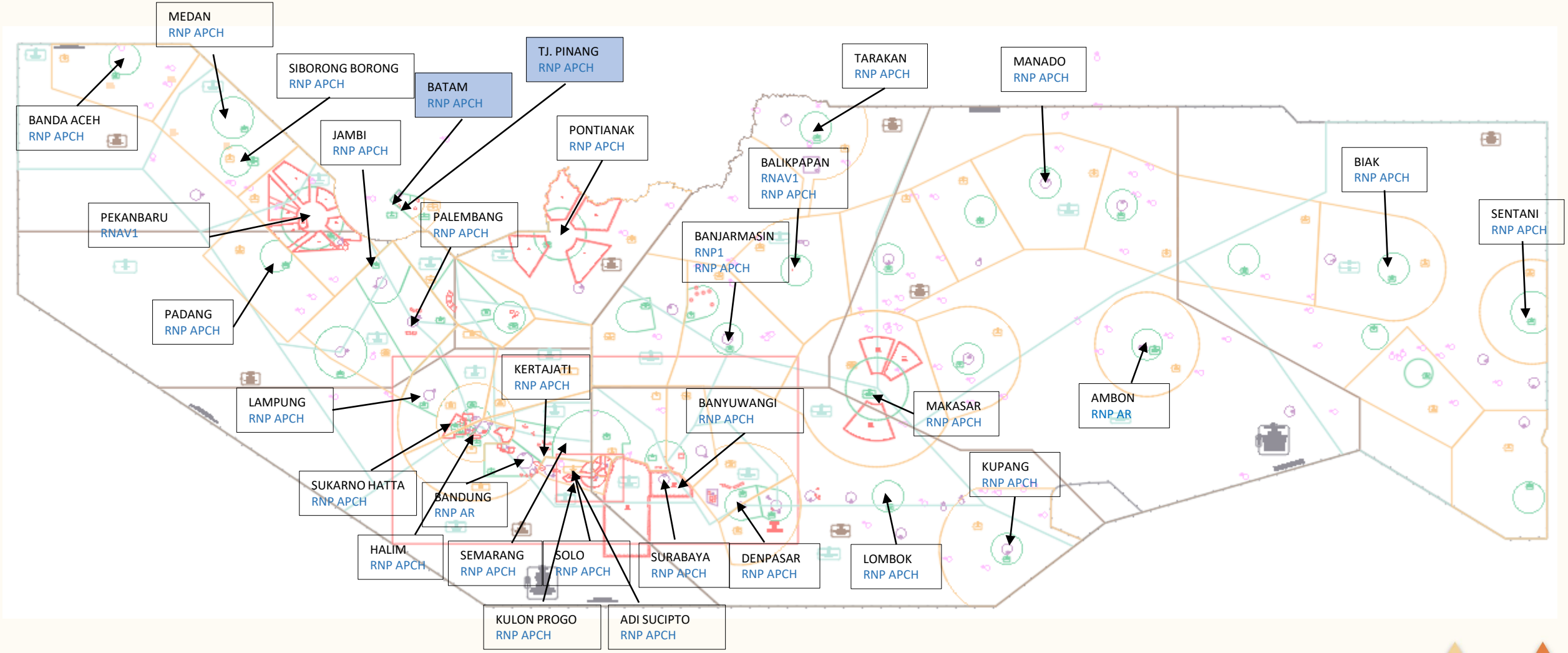
Cumulative CO_2 Emissions Reduction by 2023

En Route PBN RNAV 2 Cluster 1 sd Cluster 4	± 124.527 ton
PBN SID/STAR/IAP APP/TMA/APCH	± 283.079 ton
UPR	± 4.271 ton
A-SMGCS	± 31.2 ton
	± 411.909 ton

Terima Kasih
THANK YOU
ขอบคุณ
धन्यवाद
Salamat
Cảm ơn

International Airport with PBN IAP

(32/32 Airports)



Komite Akreditasi Nasional
LSSMAP-006-IDN

International Airport with PBN SID/STAR

(24/32 Airports)