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Preparation for ASBU B1 (PBN)

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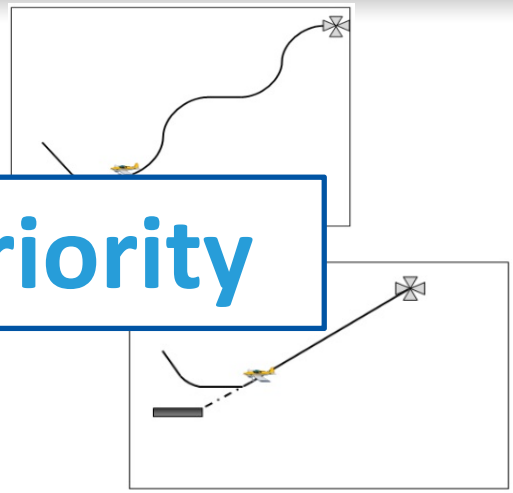
Outline

- Why PBN
- Why B0– APTA, B0-CCO, B0-CDO in MID
- B0-APTA status in MID
- MID Region PBN implementation Plan
- GANP ASBU 2019 - ASBU Block 1 – APTA, CCO, CDO (2019)
- Challenges
- Recommendations
- Conclusion

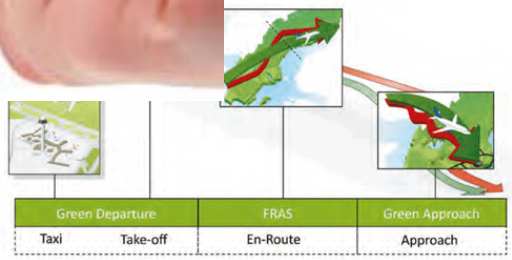
Why PBN

- **Safety**
  - Approach procedures to runways that do not currently have an approach
  - St
  - Ap
  - Ba pr

PBN is Air Navigation Priority



- **Efficiency**
  - Increased airport accessib
  - Reduced infrastructure op
  - Reduced fuel burn and C(
  - Avoidance of noise sensitive areas
  - Improved and more flexible use of available airspace
  - User preferred routing

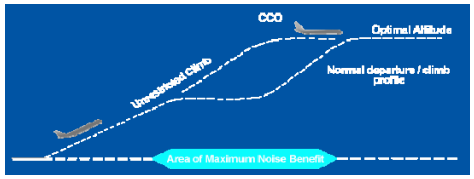


Why B0-APTA B0-CC0 and B0-CDO

B0-APTA, BO-CDO and B0-CCO have been considered as priority 1 for implementation in the MID Region as per the MID Air Navigation Strategy (2013-2018).

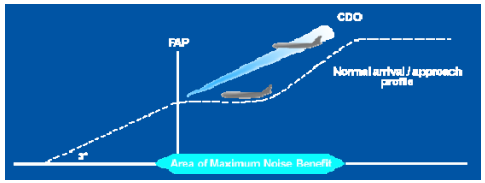
WHY:

1- CFIT (Unstable Approach) was considered as emerging risk



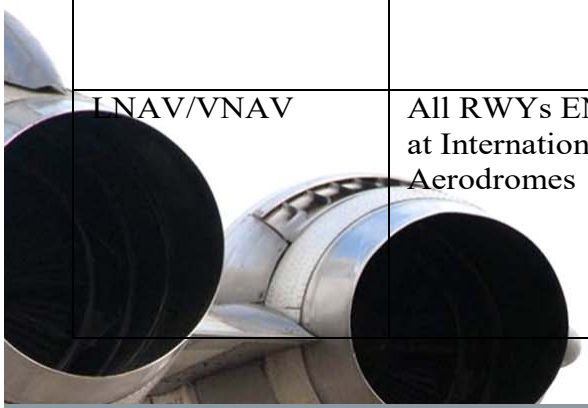
2- 70% of runway ends at international airports were not equipped with approach with vertical guidance.

3- Airport accessibility and reduce of CO2 emissions



B0-APTA in MID

B0 – APTA: Optimization of Approach Procedures including vertical guidance			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
States' PBN Implementation Plans	All States	Indicator: % of States that provided updated PBN implementation Plan Supporting metric: Number of States that provided updated PBN implementation Plan	100% by Dec. 2018
LNAV	All RWYs Ends at International Aerodromes	Indicator: % of runway ends at international aerodromes with RNAV(GNSS) Approach Procedures (LNAV) Supporting metric: Number of runway ends at international aerodromes with RNAV (GNSS) Approach Procedures (LNAV)	All runway ends at Int'l Aerodromes, either as the primary approach or as a back-up for precision approaches by Dec. 2016
LNAV/VNAV	All RWYs ENDs at International Aerodromes	Indicator: % of runways ends at international aerodromes provided with Baro-VNAV approach procedures (LNAV/VNAV) Supporting metric: Number of runways ends at international aerodromes provided with Baro-VNAV approach procedures (LNAV/VNAV)	All runway ends at Int'l Aerodromes, either as the primary approach or as a back-up for precision approaches by Dec. 2017

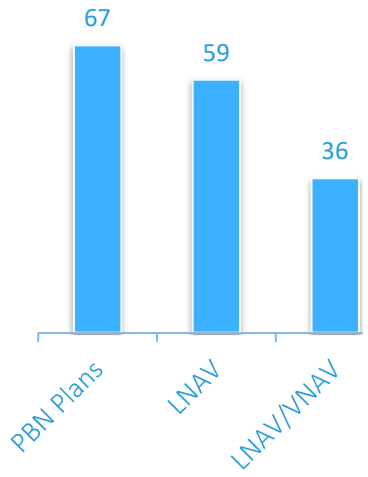


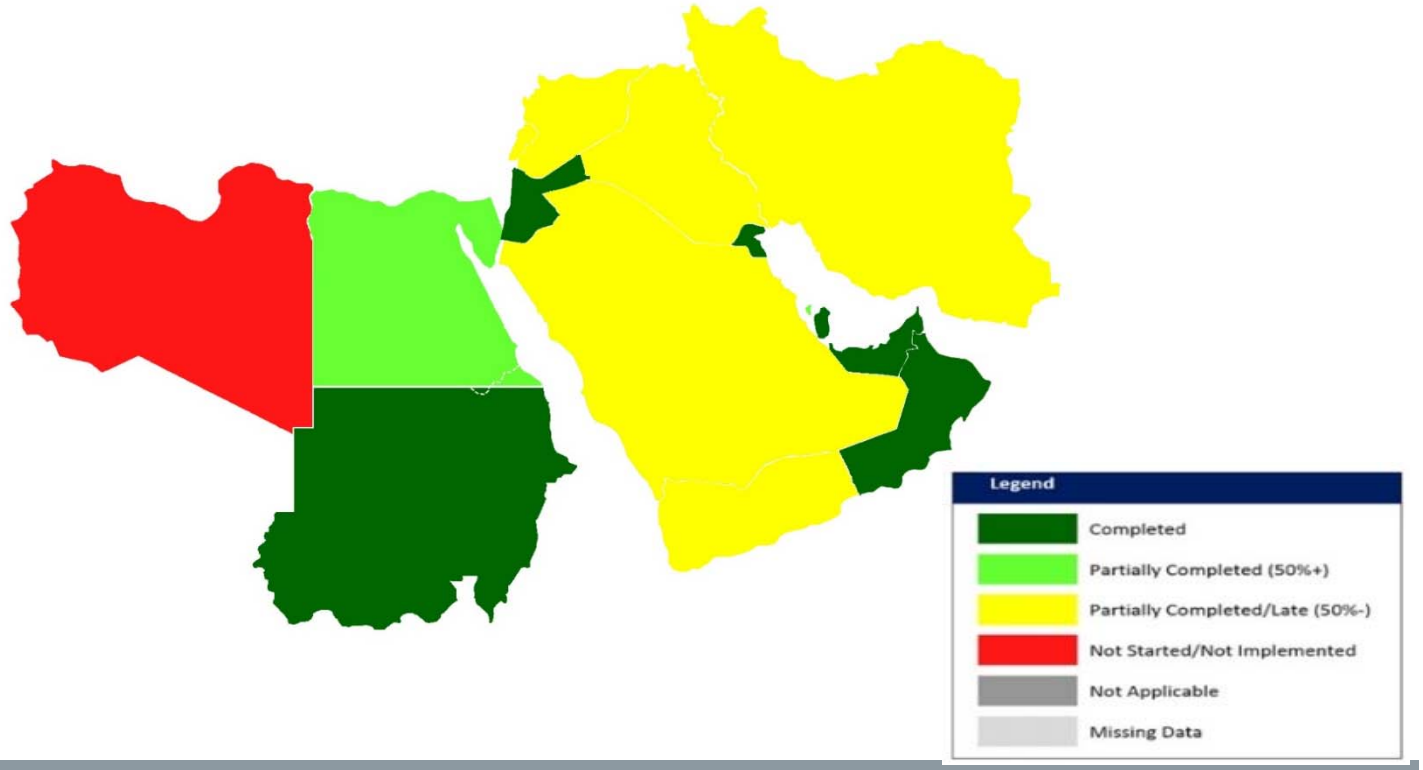
B0-CDO in MID

B0 – CDO: Improved Flexibility and Efficiency in Descent Profiles (CDO)			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
PBN STARs	OBBI, HESN, HESH, HEMA, HEGN, HELX, OIIE, OISS, OIKB, OIMM, OIFM, ORER, ORNI, OJAM, OJAI, OJAQ, OKBK, OLBA, OOMS, OOSA, OTHH, OEJN, OEMA, OEDF, OERK, HSNN, HSOB, HSSS, HSPN, OMAA, OMAD, OMDB, OMDW, OMSJ	Indicator: % of International Aerodromes/TMA with PBN STAR implemented as required. Supporting Metric: Number of International Aerodromes/TMAs with PBN STAR implemented as required.	100% by Dec. 2018 for the identified Aerodromes/TMAs
International aerodromes/TMAs with CDO	OBBI, HESH, HEMA, HEGN, OIIE, OIKB, OIFM, OJAI, OJAQ, OKBK, OLBA, OOMS, OTHH, OEJN, OEMA, OEDF, OERK, HSSS, HSPN, OMAA, OMDB, OMDW, OMSJ	Indicator: % of International Aerodromes/TMA with CDO implemented as required. Supporting Metric: Number of International Aerodromes/TMAs with CDO implemented as required.	100% by Dec. 2018 for the identified Aerodromes/TMAs

B0 – CCO: Improved Flexibility and Efficiency Departure Profiles - Continuous Climb Operations (CCO)			
Elements	**Applicability**	**Performance Indicators/Supporting Metrics**	**Targets**
PBN SIDs	OBBI, HESN, HESH, HEMA, HEGN, HELX, OIIE, OISS, OIKB, OIMM, OIFM, ORER, ORNI, OJAM, OJAI, OJAQ, OKBK, OLBA, OOMS, OOSA, OTHH, OEJN, OEMA, OEDF, OERK, HSNN, HSOB, HSSS, HSPN, OMAA, OMAD, OMDB, OMDW, OMSJ	Indicator: % of International Aerodromes/TMA with PBN SID implemented as required. Supporting Metric: Number of International Aerodromes/ TMAs with PBN SID implemented as required.	100% by Dec. 2018 for the identified Aerodromes/TMAs
International aerodromes/TMAs with CCO	OBBI, HESN, HESH, HEMA, HEGN, HELX, OIIE, OIKB, OIFM, ORER, ORNI, OJAM, OJAI, OJAQ, OKBK, OLBA, OOMS, OOSA, OTHH, OEJN, OEMA, OEDF, OERK, HSNN, HSOB, HSSS, HSPN, OMAA, OMDB, OMDW, OMSJ	Indicator: % of International Aerodromes/TMA with CCO implemented as required. Supporting Metric: Number of International Aerodromes/TMAs with CCO implemented as required.	100% by Dec. 2018 for the identified Aerodromes/TMAs

Status of PBN (APTA) Implementation in the MID Region





MID Region PBN Implementation Plan

Airspace	Short term Up to 2020		Medium term 2021-2025	
	Navigation Specification Preferred	Targets	Navigation Specification Acceptable	Targets
En-route – Oceanic	RNAV 10 RNP 4*	100 % by 2016 50% by 2020	RNP 4*	100% by 2025
En-route - Remote continental	RNAV 5	100% by 2016	RNP 4*	50% by 2023 100% by 2025
En-route – Continental	RNAV 5 RNAV 1	100 % by Dec 2017 W/A[1]		
En-route - Local / Domestic	RNAV 5 RNAV 1	100 % by Dec2017 W/A		
TMA – Arrival	RNAV 1 (surveillance) or RNP 1 (non-surveillance)	50% by Dec 2016 100% by Dec 2020		
TMA – Departure	RNAV 1 (surveillance) or RNP 1 (non-surveillance)	50% by Dec 2016 100% by Dec 2020		

MID Region PBN Implementation Plan

Airspace	Short term Up to 2020		Medium term 2021-2025	
	Navigation Specification Preferred	Targets	Navigation Specification Acceptable	Targets
Approach	LNAV: for all RWY Ends at International Aerodromes LNAV/VNAV: for all RWY Ends at International Aerodromes	80 % by 2014. 100% by 2020 70% by 2016 100% by 2020	GLS (GBAS) For the defined RWY Ends Based on operational needs and CBA	TBD
CCO and CDO	W/A	50% by 2020	W/A	100 % by 2025

- W/A: where applicable/defined Airspace, in accordance with State PBN implementation Plans, the MID Region Air Navigation Strategy and the MID ANP.
- * would be considered for implementation at the identified Airspace/TMAs
- When no month is specified (e.g. by 2017) means by the end of the year (December 2017).

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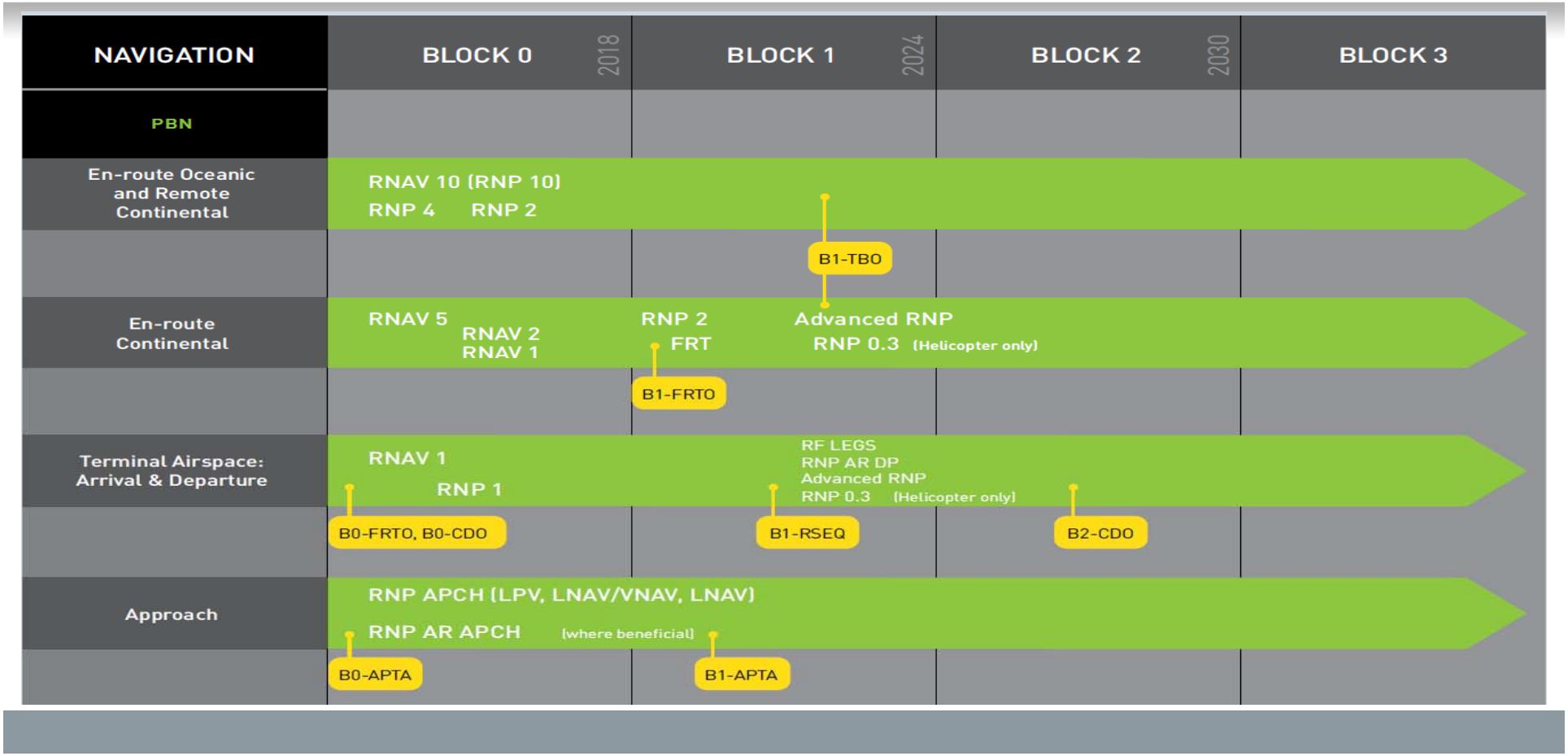
GANP PBN Roadmap



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ASBU Block 1 – APTA and CDO (2016)

B1-APTA	Optimized airport accessibility	
	To progress further with the universal implementation of performance-based navigation (PBN) and ground-based augmentation system (GBAS) landing system (GLS) approaches. PBN and GLS (CAT II/III) procedures to enhance the reliability and predictability of approaches to runways increasing safety, accessibility and efficiency.	
	Applicability	
	This Module is applicable to all runway ends.	
	Benefits	
	Efficiency	Cost savings related to the benefits of lower approach minima: fewer diversions, overflights, cancellations and delays. Cost savings related to higher airport capacity by taking advantage of the flexibility to offset approaches and define displaced thresholds.
	Environment	Environmental benefits through reduced fuel burn.
	Safety	Stabilized approach paths.
	Cost	
	Aircraft operators and ANSPs can quantify the benefits of lower minima by modelling airport accessibility with existing and new minima. Operators can then assess benefits against avionics and other costs. The GLS CAT II/III business case needs to consider the cost of retaining ILS or MLS to allow continued operations during an interference event. The potential for increased runway capacity benefits with GLS is complicated at airports where a significant proportion of aircraft are not equipped with GLS avionics.	

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ASBU Block 1 – APTA and CDO (2016)

B1-CDO	Improved flexibility and efficiency in descent profiles (CDOs) using VNAV
	To enhance vertical flight path precision during descent, arrival, and to enable aircraft to fly an arrival procedure not reliant on ground-based equipment for vertical guidance. The main benefit is higher utilization of airports, improved fuel efficiency, increased safety through improved flight predictability and reduced radio transmission, and better utilization of airspace.
	Applicability
	Descent, arrival, flight in terminal area.
	Benefits
	Capacity: VNAV allows for added accuracy in a continuous descent operation (CDO). This capability allows for the potential to expand the applications of standard terminal arrival and departure procedures for improved capacity and throughput, and improve the implementation of precision approaches.
	Efficiency: Enabling an aircraft to maintain a vertical path during descent allows for development of vertical corridors for arriving and departing traffic thus increasing the efficiency of the airspace. Additionally, VNAV promotes the efficient use of airspace through the ability for aircraft to fly a more precisely constrained descent profile allowing the potential for further reduced separation and increased capacity.
	Environment: VNAV allows for reduced aircraft level-offs, resulting in lower emissions.
	Predictability: VNAV allows for enhanced predictability of flight paths which leads to better planning of flights and flows.
	Safety: Precise altitude tracking along a vertical descent path leads to improvements in overall system safety.
	Cost
	VNAV allows for reduced aircraft level-offs, resulting in fuel and time savings.

ASBU Block 0 – APTA (2019)

APTA-B0/1	PBN Approaches (with basic capabilities)
APTA-B0/2	PBN SID and STAR procedures (with basic capabilities)
APTA-B0/3	Cat I Precision Approach Procedures
APTA-B0/4	PBN transitions to/from xLS (with basic capabilities)
APTA-B0/5	PBN Operations for helicopters (with basic capabilities)
APTA-B0/6	CCO and CDO (Basic)
APTA-B0/7	Performance based Aerodrome Operating Minima

ASBU Block 1 – APTA (2019)

APTA-B1/1	PBN Approaches (with advanced capabilities)
APTA-B1/2	PBN SID and STAR procedures (with advanced capabilities)
APTA-B1/3	GBAS CAT II/III precision approach procedures
APTA-B1/4	PBN to and from xLS transitions – with advanced capabilities
APTA-B1/5	SID and STAR transitions
APTA-B1/6	Simultaneous operations to parallel runways
APTA-B1/7	PBN Operations for helicopters (with advanced capabilities)
APTA-B1/8	VPT RNAV Operations
APTA-B1/9	Performance-based aerodrome operating minima (Ground Infrastructure)
APTA-B1/10	Performance-based aerodrome operating minima (Airborne equipment)
APTA-B1/11	CCO and CDO (Advanced)

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GANP 2019 KPIs

KPA	Efficiency			Capacity		Predictability	
Focus Area(s)	**Additional flight time & distance**	**Vertical flight efficiency**	**Additional fuel burn**	**Capacity, throughput & utilization**	**Capacity shortfall & associated delay**	**Punctuality**	**Variability**
Core KPIs	**KPI02** Taxi-out additional time **KPI13** Taxi-in additional time			**KPI09** Airport peak arrival capacity **KPI10** Airport peak arrival throughput		**KPI01** Departure punctuality **KPI14** Arrival punctuality	**KPI15** Flight time variability
Additional KPIs	**KPI04** Filed flight plan en-route extension **KPI05** Actual en-route extension **KPI08** Additional time in terminal airspace	**KPI17** Level-off during climb **KPI18** Level capping during cruise **KPI19** Level-off during descent	**KPI16** Additional fuel burn	**KPI06** En-route airspace capacity **KPI11** Airport arrival capacity utilization	**KPI07** En-route ATFM delay **KPI12** Airport/Terminal ATFM delay	**KPI03** ATFM slot adherence	

Challenges

The following challenges have been identified as the main impediments to the advancement of PBN implementation in the MID Region:

- shortage of PANS-OPS, Airspace Planners and OPS-approval experts
- insufficient procedure design work in some States to attain or maintain competency
- lack of airspace and procedure design training: initial, OJT, and/or recurrent;
- lack of capabilities to implement Quality Assurance
- lack of regulatory expertise to oversee the process leading to procedure publication;
- low Level of Civil/Military Cooperation
- unstable political and security situation in some States
- implementation of eTOD Area 2;
- fleet equipage
- Operational Improvements Assessment;
- catering for non-compliance (mixed equipage environment)
- fully integrated system (IFP, AIM, eTOD);
- airspace changes to accommodate current and projected traffic increase and further improve safety, capacity and efficiency
- GNSS Signal Vulnerability
- maintain Target Level of Safety (TLS)
- stakeholders (ATCOs, Pilots, etc.) training and readiness.

Recommendations

States were encouraged to:

- ✓ ensure the recruitment/training of qualified experts in the fi… …O, airspace planning, and operations approval
- ✓ work cooperatively
- ✓ request ICAO support for t…
- ✓ organize at n…
- ✓ …

The MID FPP would provide the optimum solution and foster the implementation of PBN

- ✓ …e Regulator in the planning and …
- ✓ … best practices with each other
- ✓ …e benefit accrued from the implementation of PBN.

Conclusions

- Will B1-APTA be priority 1 for (2019-2024)?
- If yes, what would be its elements considering the regional PBN planning?
- Measure performance? Which KPIs?

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THANK YOU