



| ICAO CAPACITY & EFFICIENCY

# Preparation for ASBU B1 (PBN)

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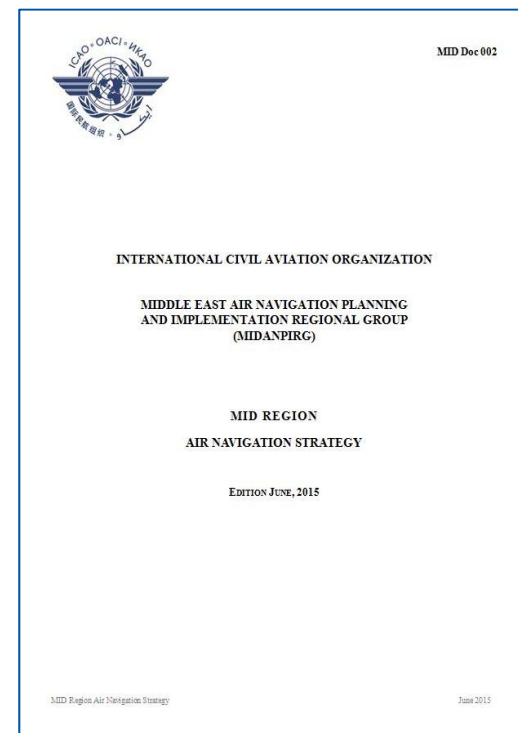


# Outline

- ❑ Background
- ❑ MID ASBU Block 0 – APTA, CCO and CDO
- ❑ GANP ASBU Coverage Area
- ❑ ASBU Block 1 – APTA and CDO (2016)
- ❑ GANP ASBU 2019
- ❑ ASBU Block 1 – APTA, CCO, CDO (2019)
- ❑ Action by the meeting



- **The Strategy was endorsed by MSG/4 meeting (Cairo, 24-26 November 2014), based on the outcome of the relevant MIDANPIRG subsidiary bodies and inputs received from stakeholders.**
- **The Strategy was further reviewed and updated by MIDANPIRG/15 meeting (Bahrain, 8-11 June 2015) and endorsed as ICAO MID Doc 002,**
- **The current version was updated by MIDANPIRG/16 (Kuwait, 13-16 February 2017)**
- **MID Doc 002 is available on the MID Office website.**





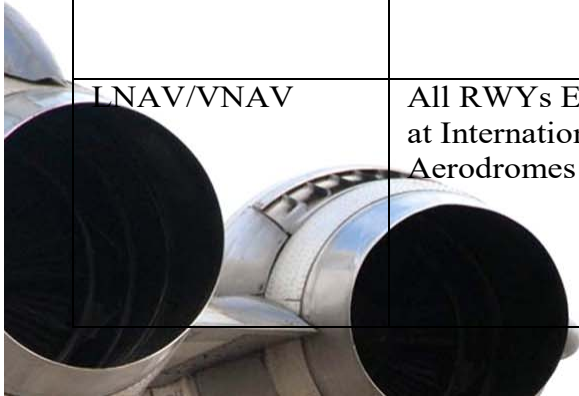
**The Strategy presents a 15 year rolling approach for the implementation of the ASBU Modules in the MID Region in accordance with GANP (2013-2028) as follows:**

- **Near-term (2013 - 2018): ASBU Block 0**
- **Mid-term (2019 - 2024): ASBU Block 1**
- **Long-term (2025 - 2030): ASBU Block 2**





<b>B0 – APTA: Optimization of Approach Procedures including vertical guidance</b>			
<b>Elements</b>	<b>Applicability</b>	<b>Performance Indicators/Supporting Metrics</b>	<b>Targets</b>
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





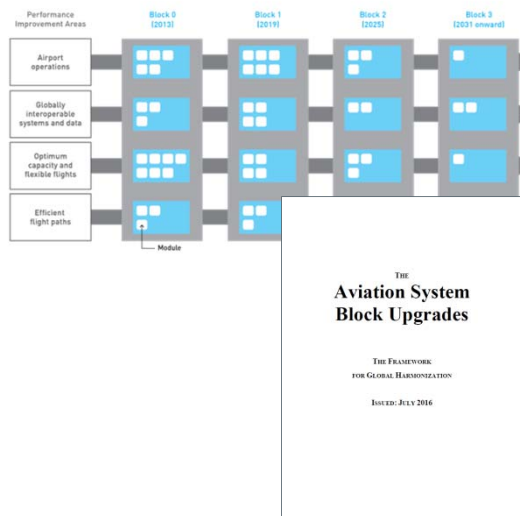
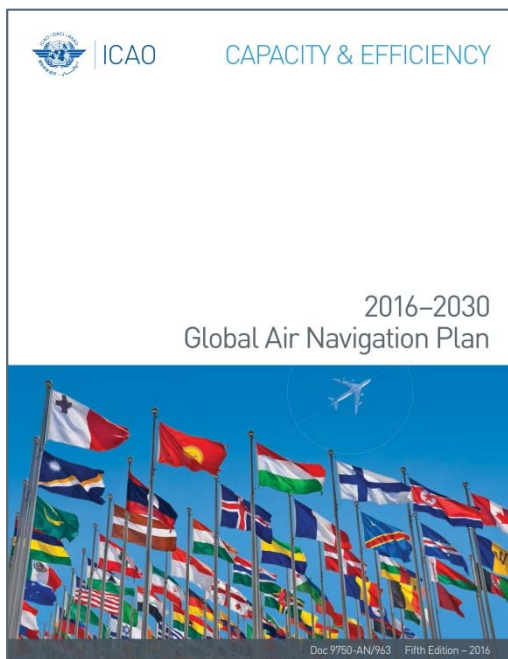
<b><i>B0 – CCO: Improved Flexibility and Efficiency Departure Profiles - Continuous Climb Operations (CCO)</i></b>			
<b>Elements</b>	<b>Applicability</b>	<b>Performance Indicators/Supporting Metrics</b>	<b>Targets</b>
PBN SIDs	OBBI, HESN, HESH, HEMA, HEGN, HELX, OIIE, OISS, OIKB, OIMM, OIFM, ORER, ORNI, 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



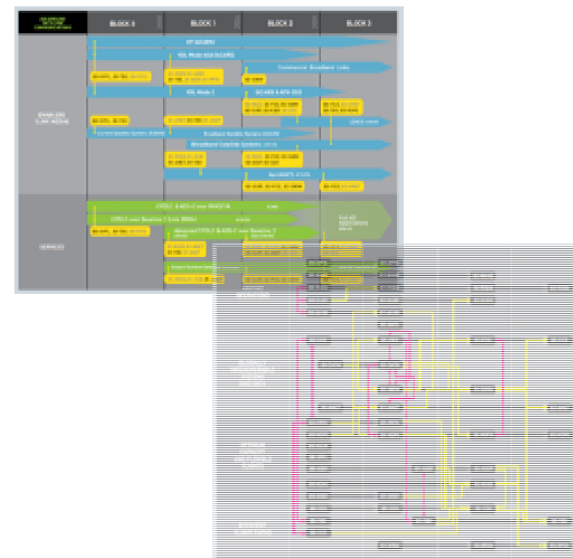
<b>B0 – CDO: Improved Flexibility and Efficiency in Descent Profiles (CDO)</b>			
<b>Elements</b>	<b>Applicability</b>	<b>Performance Indicators/Supporting Metrics</b>	<b>Targets</b>
PBN STARs	OBBI, HESN, HESH, HEMA, HEGN, HELX, OIIE, OISS, OIKB, OIMM, OIFM, ORER, ORNI, OJAM, OJAI, OJAQ, OKBK, OLBA, OOMS, OOSA, OTHH, OEJN, OEMA, OEDF, OERK, HSNM, 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



# Contents of the 2016-2030 GANP

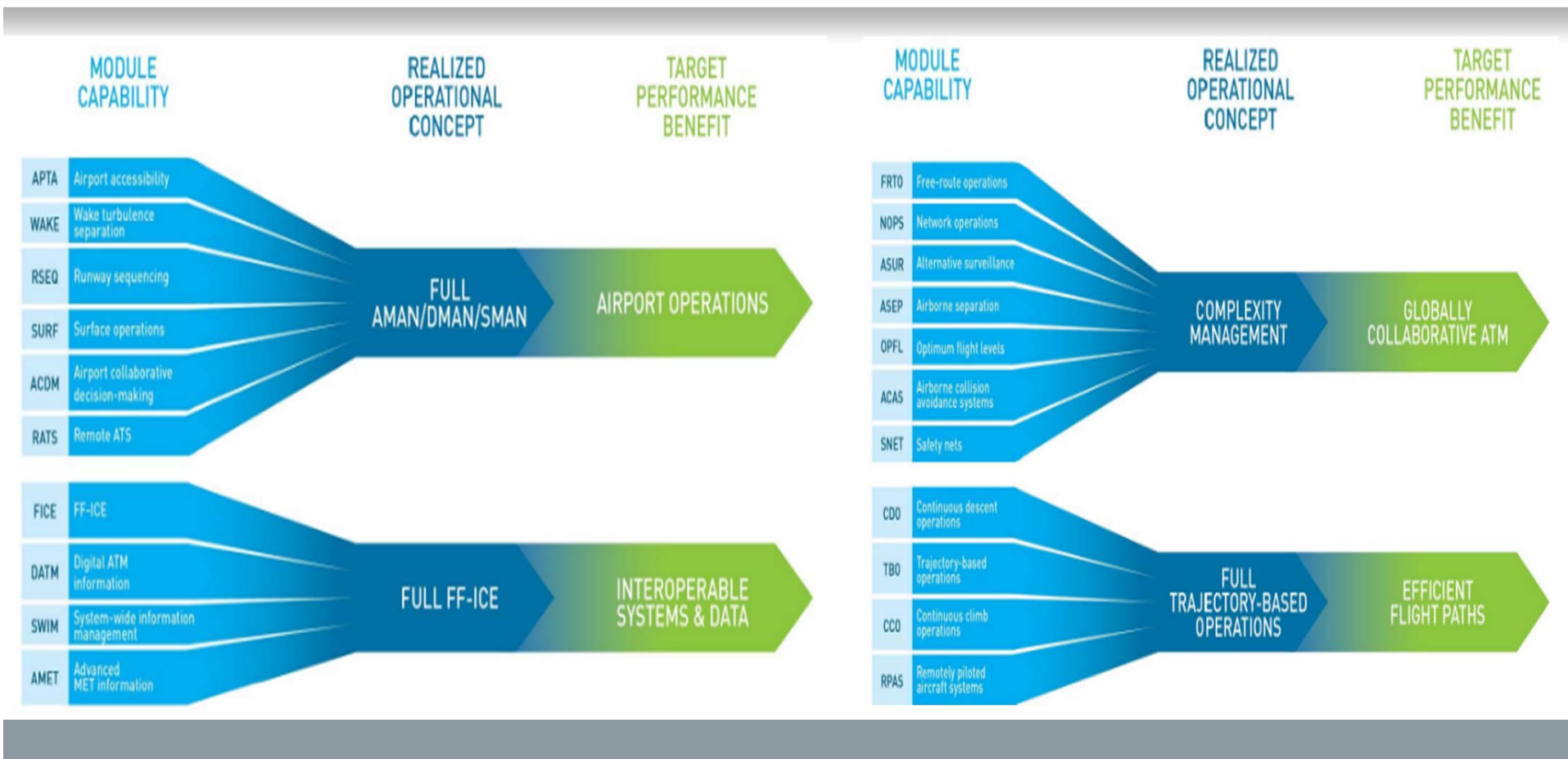


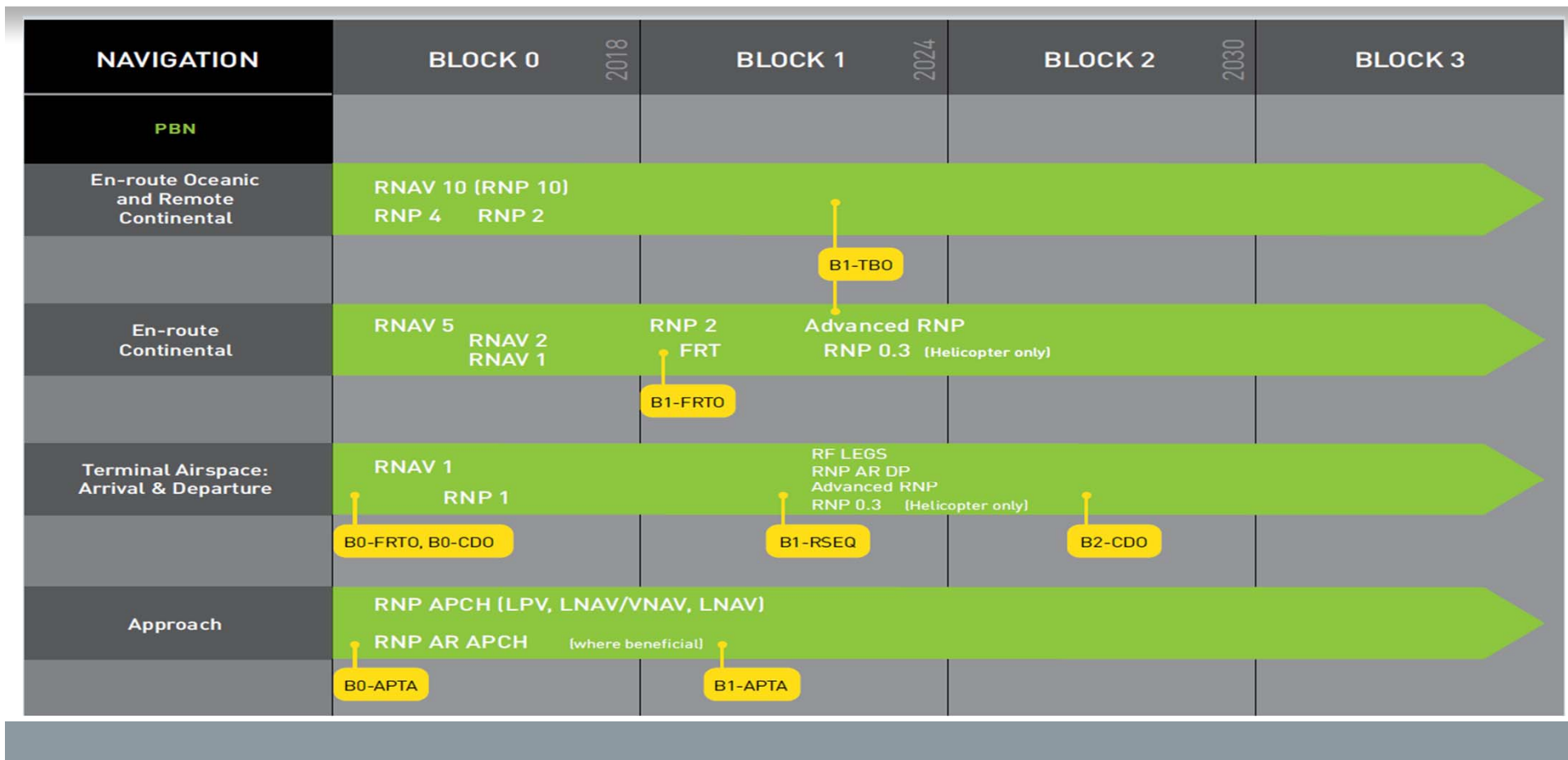
**Aviation System Block Upgrades (ASBU) Methodology**

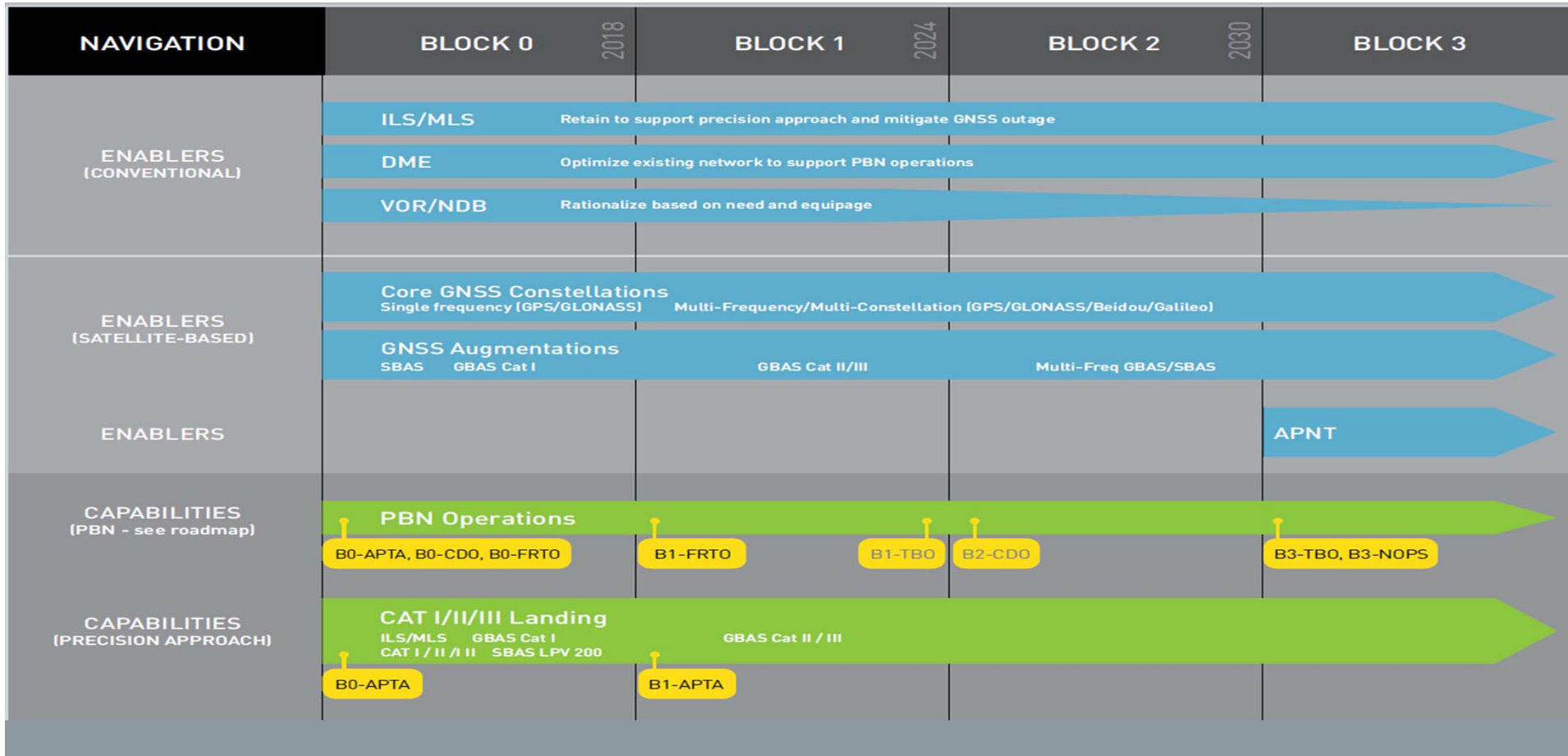


**Technology Roadmaps and Module Dependencies**











KPA	EFFICIENCY		CAPACITY		PREDICTABILITY	
FOCUS AREA(S)	ADDITIONAL FLIGHT TIME & DISTANCE	ADDITIONAL FUEL BURNS	CAPACITY, THROUGHPUT & UTILIZATION	CAPACITY SHORTFALL & ASSOCIATED DELAY	PUNCTUALITY	VARIABILITY
<b>CORE KPIs</b>	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
<b>ADDITIONAL KPIs</b>	KPI04 Filed Flight Plan en-Route Extension KPI05 Actual en-Route Extension KPI08 Additional time in terminal airspace	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	



<b>B1-APTA</b>	<b>Optimized airport accessibility</b>
<p>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.</p>	
<b>Applicability</b>	
<p>This Module is applicable to all runway ends.</p>	
<b>Benefits</b>	
<b>Efficiency</b>	<p>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.</p>
<b>Environment</b>	<p>Environmental benefits through reduced fuel burn.</p>
<b>Safety</b>	<p>Stabilized approach paths.</p>
<b>Cost</b>	
<p>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.</p>	

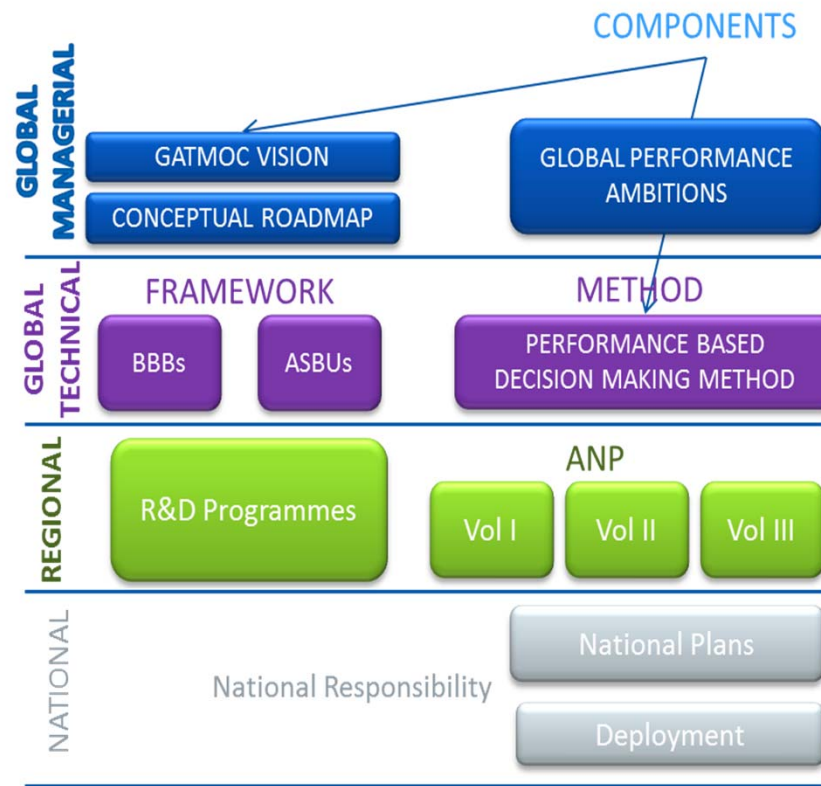
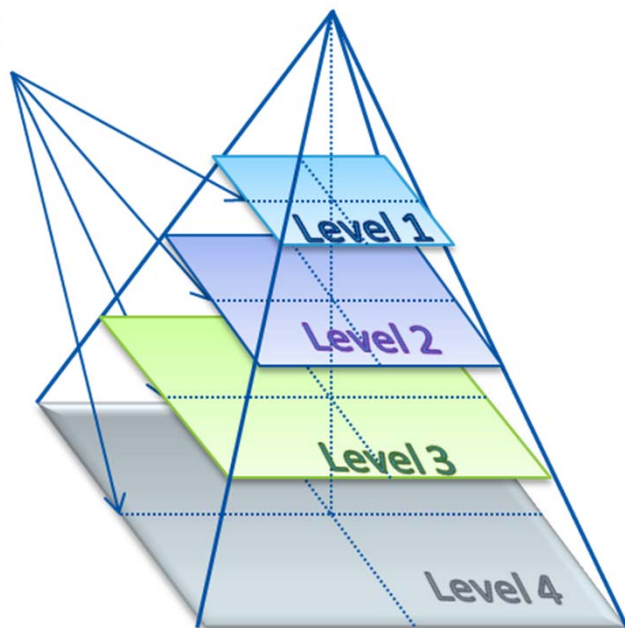


B1-CDO		Improved flexibility and efficiency in descent profiles (CDOs) using VNAV	
		To enhance vertical flight path precision during descent, arrival, and to enable aircraft to fly an arrival procedure not reliant on ground-based equipment for vertical guidance. The main benefit is higher utilization 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.	



# Creating a Multilayer Structure

LAYERS





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
<b>Core KPIs</b>	<b>KPI02</b> Taxi-out additional time <b>KPI13</b> Taxi-in additional time			<b>KPI09</b> Airport peak arrival capacity <b>KPI10</b> Airport peak arrival throughput		<b>KPI01</b> Departure punctuality <b>KPI14</b> Arrival punctuality	<b>KPI15</b> Flight time variability
<b>Additional KPIs</b>	<b>KPI04</b> Filed flight plan en-route extension <b>KPI05</b> Actual en-route extension <b>KPI08</b> Additional time in terminal airspace	<b>KPI17</b> Level-off during climb <b>KPI18</b> Level capping during cruise <b>KPI19</b> Level-off during descent	<b>KPI16</b> Additional fuel burn	<b>KPI06</b> En-route airspace capacity <b>KPI11</b> Airport arrival capacity utilization	<b>KPI07</b> En-route ATFM delay <b>KPI12</b> Airport/Terminal ATFM delay	<b>KPI03</b> ATFM slot adherence	





**Aviation System Block Upgrades (ASBUs)**: a global operational framework that allows all Member States to advance their air navigation capabilities based on their specific operational requirements.

**ASBU Performance Improvement Area**: main area of the air navigation system that requires improvement in order to achieve the vision outlined in the Global ATM Operational Concept.

**ASBU Thread**: key feature area of the air navigation system that needs improvement in order to achieve the vision outlined in the Global ATM Operational Concept.

**ASBU Element**: a specific change in operations designed to improve the performance of the air navigation system under specified operational conditions.

**ASBU Enabler**: component (standards, procedures, training, technology, etc.) required to implement an element.

**ASBU Block**: a six year timeframe whose starting date defines a deadline for an element to be available for implementation.

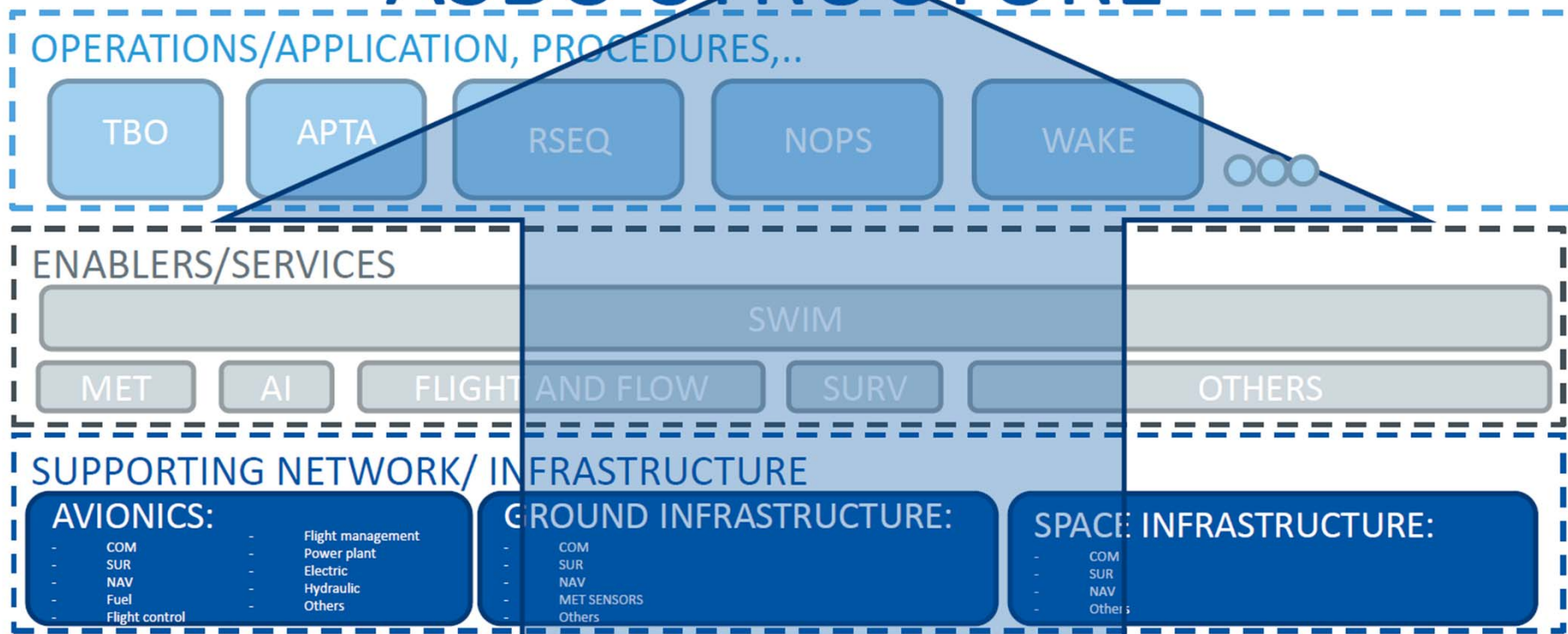
**ASBU Module**: a group of elements from a thread that, according to the enablers' roadmap, will be available for implementation within the defined deadline established by the ASBU Block.

**Key Performance Areas**: expectations of the ATM community as defined in Doc 9854 "Global ATM Operational Concept".

**Key Performance Indicator**: specific and measurable metric within a key performance area.



# ASBU STRUCTURE





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



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)



**The meeting is invited to take into consideration the latest developments related to the update of GANP and ASBU framework during the discussions on the update of the MID Air Navigation Strategy Part related to PBN.**





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THANK YOU