



INTERNATIONAL CIVIL AVIATION ORGANIZATION

A United Nations Specialized Agency

WKSP/ASBU/NAIROBI/2013-PPT/08

Approach to implementation Process and checklist

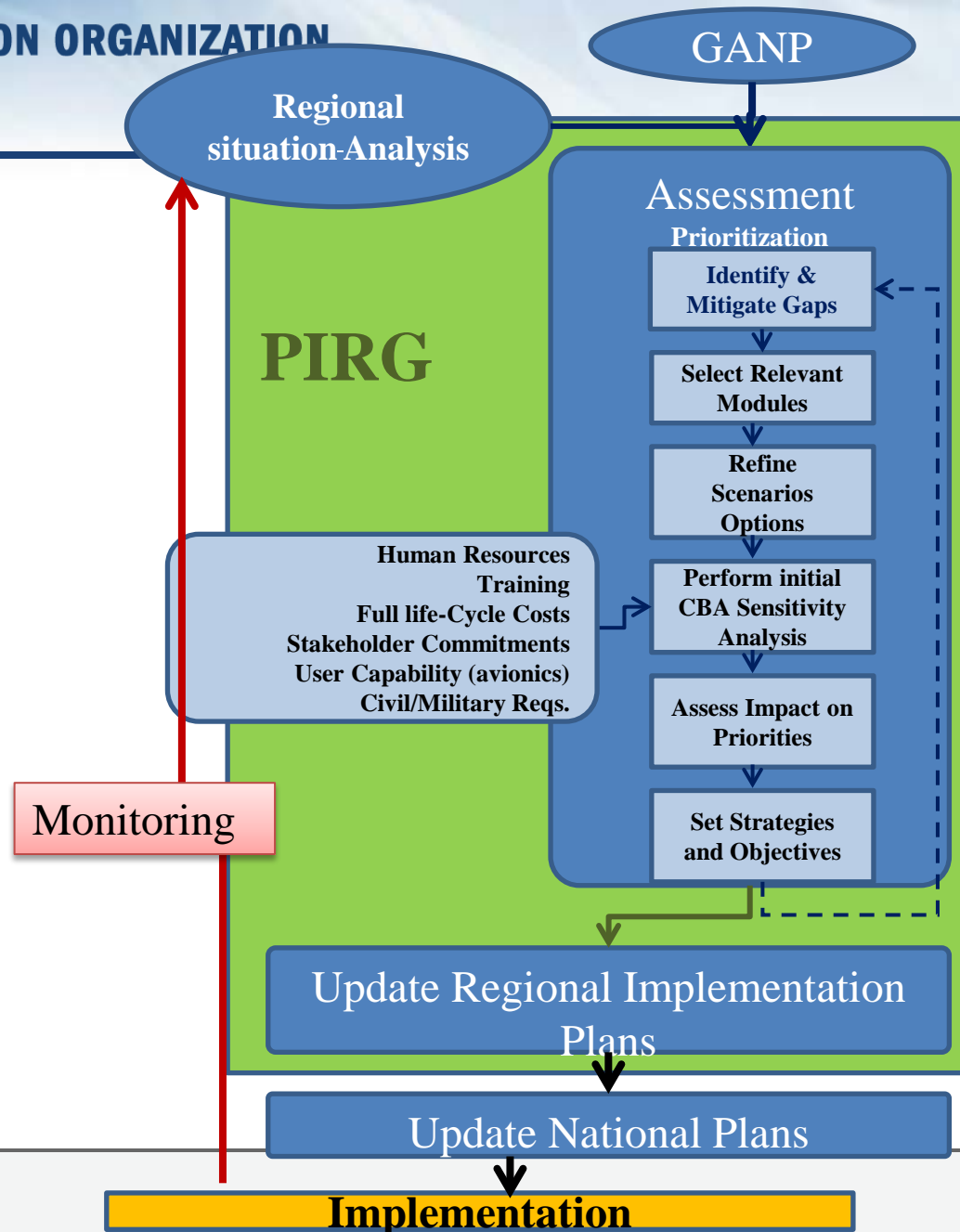
Air Navigation Bureau



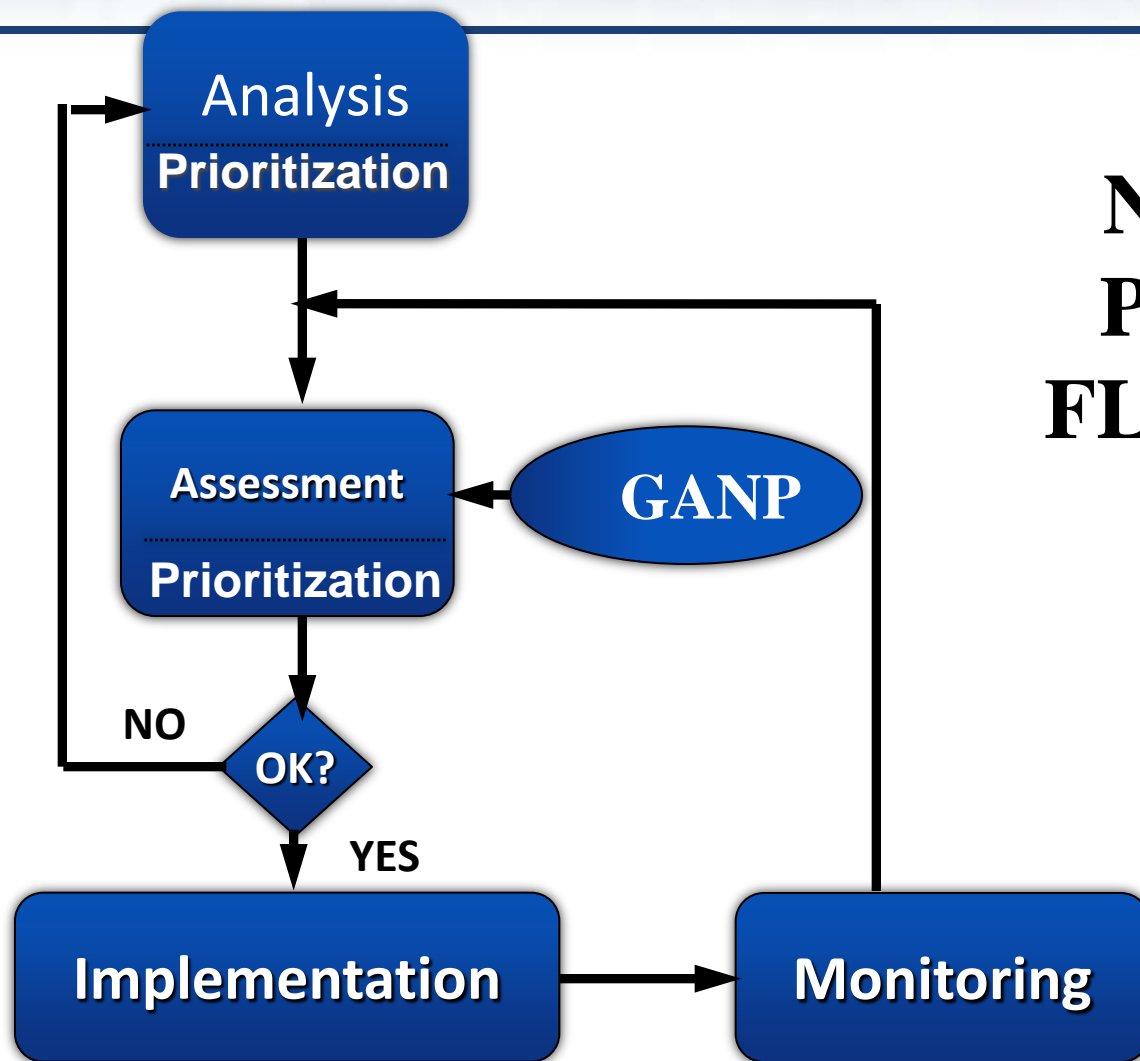
INTERNATIONAL CIVIL AVIATION ORGANIZATION

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From the GANP to Regional Planning

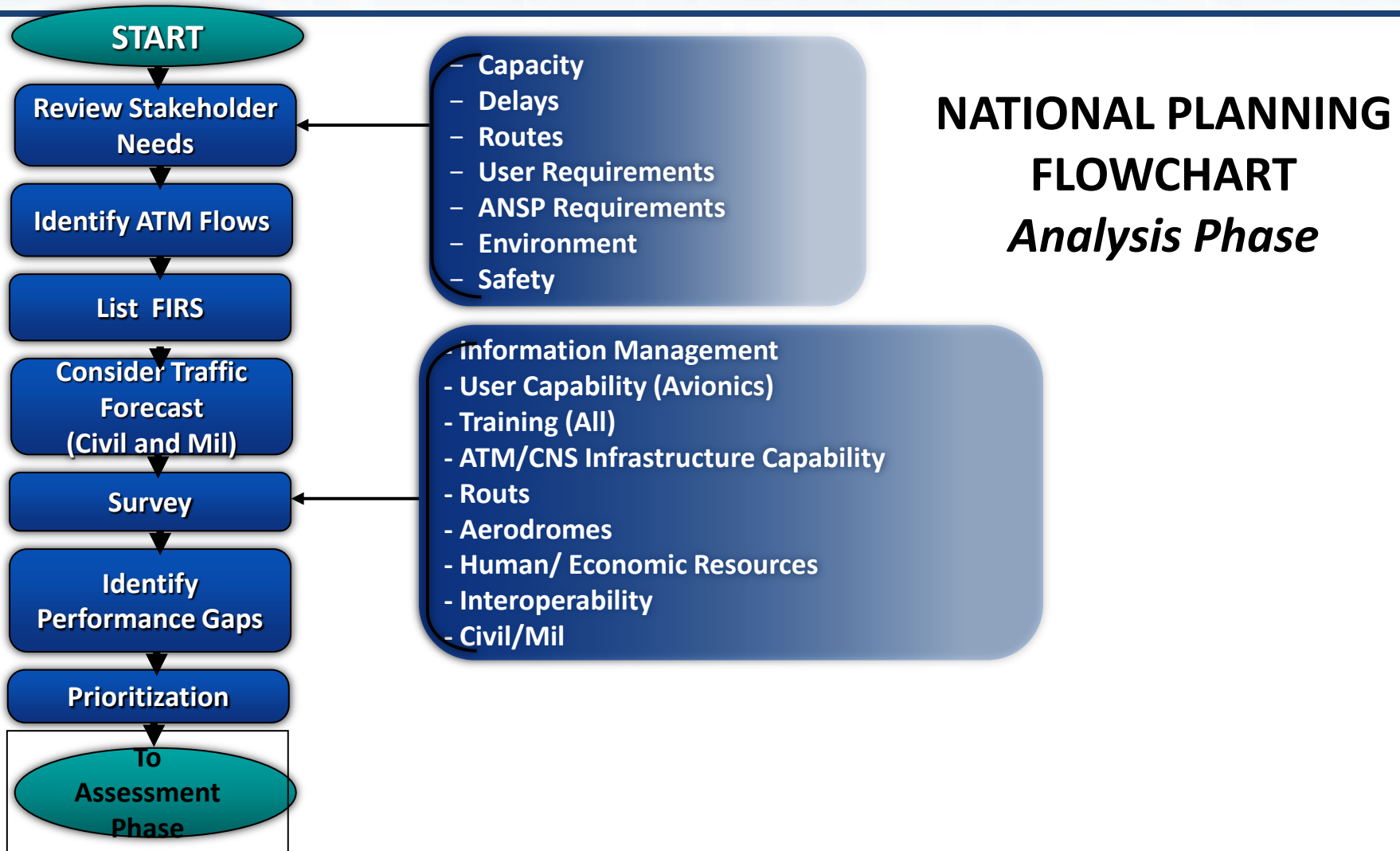


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NATIONAL PLANNING FLOWCHART

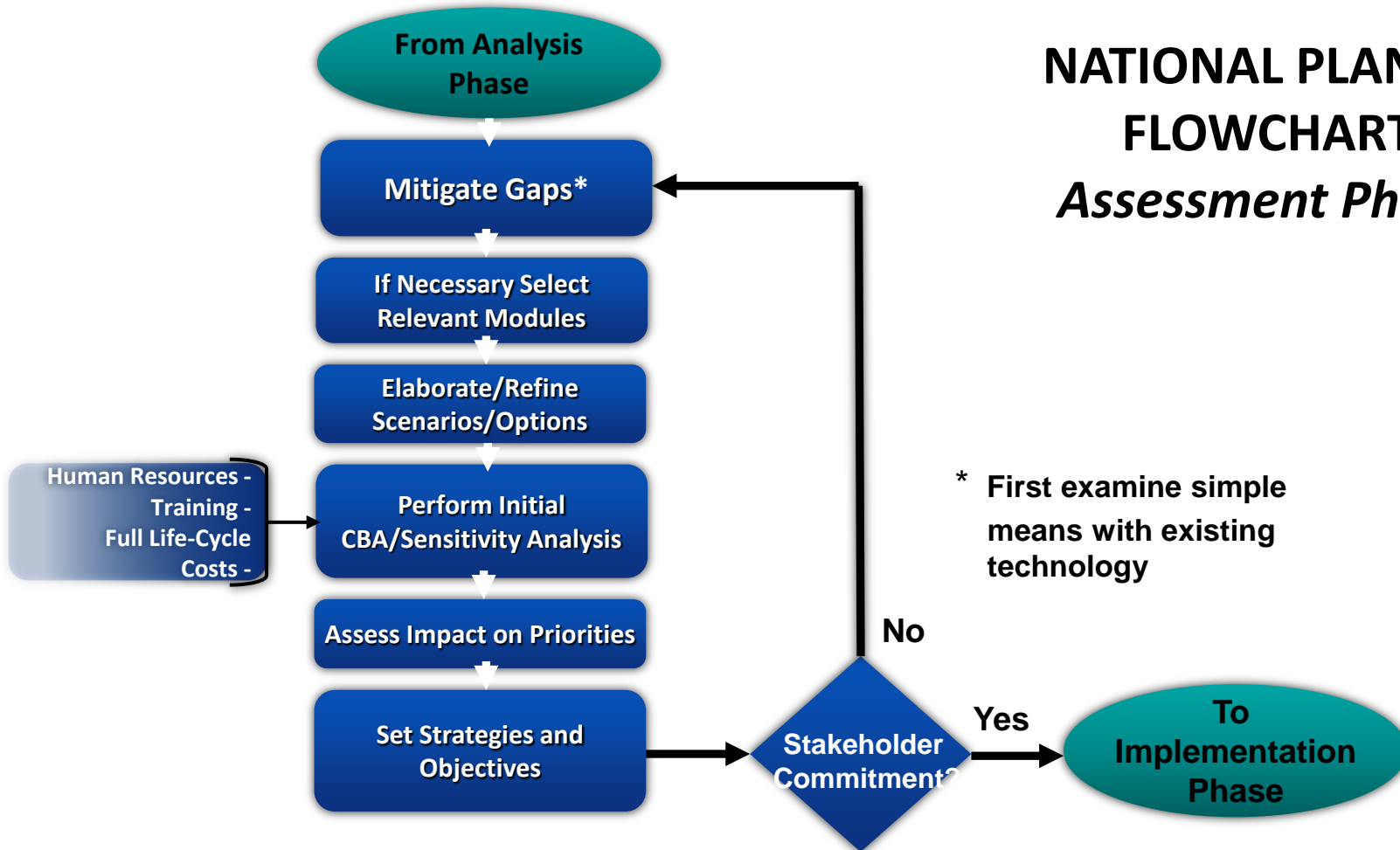
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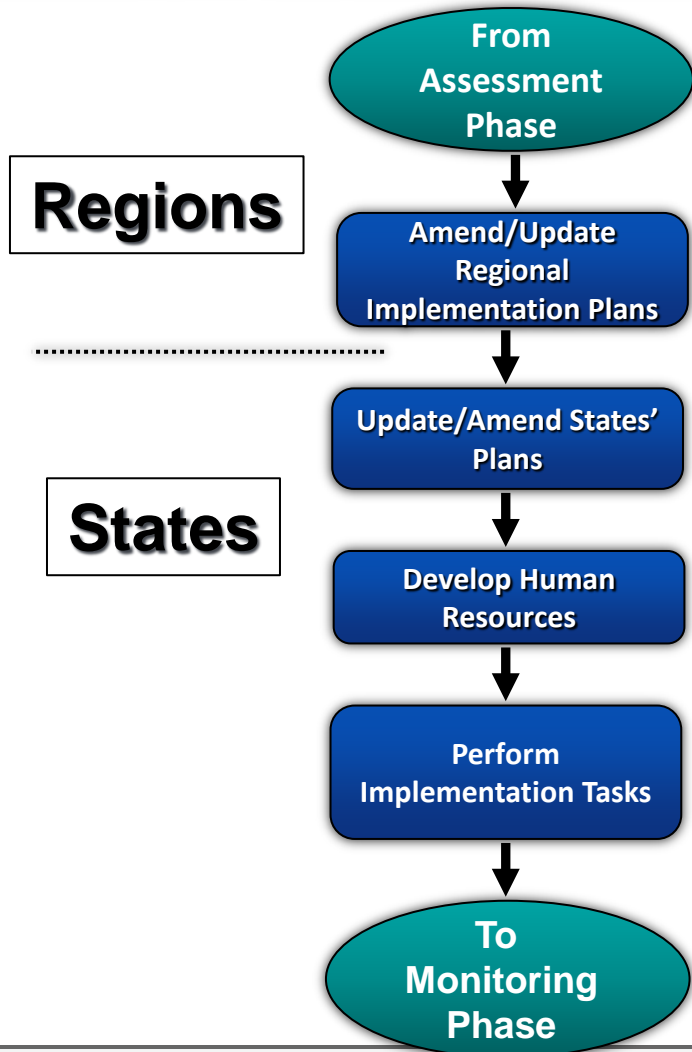
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NATIONAL PLANNING FLOWCHART *Assessment Phase*

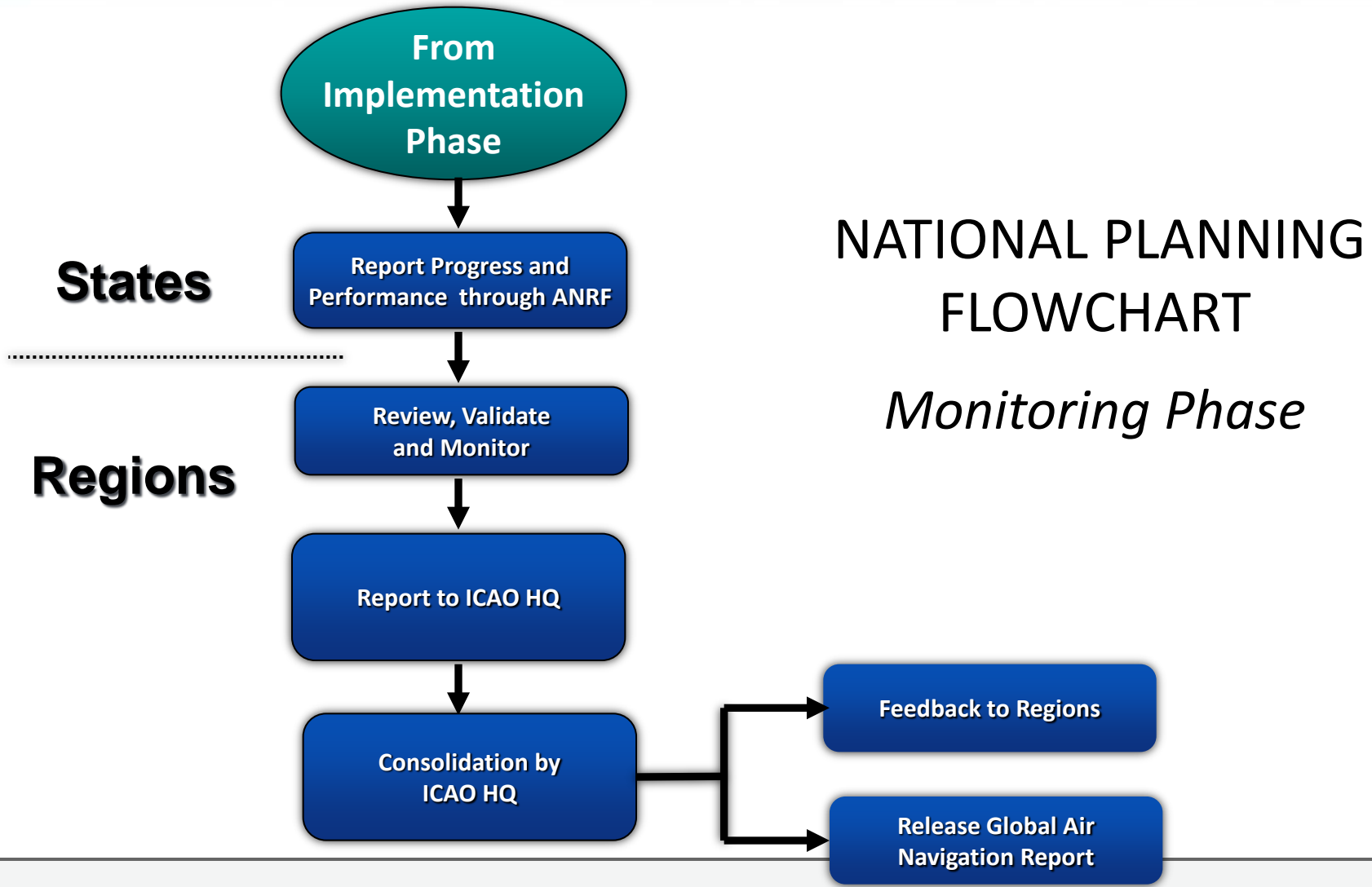


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**NATIONAL PLANNING
FLOWCHART**
Implementation Phase

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Performance Improvement Area 1: Airport Operations

Title of the Module: B0-APTA: Optimization of Approach Procedures Including Vertical Guidance					
Elements: 1. APV with Baro VNAV 2. APV with SBAS 3. APV with GBAS		Equipage/Air - Basic IFR GNSS avionics integrated with Baro VNAV functionality - SBAS avionics - GBAS avionics		Equipage/Ground - SBAS (reference stations, master stations, GEO satellites) - GBAS	
Implementation monitoring and intended performance impact					
Implementation progress	Qualitative performance benefits associated with five main KPAs only				
1. Indicator: <i>Percentage of international aerodromes having instrument runways provided with APV on the basis of Baro VNAV/SBAS/GBAS</i>	KPA-Access/Equity Increased aerodrome accessibility	KPA-Capacity Increased runway capacity	KPA-Efficiency Reduced fuel burn due to lower minima, fewer diversions, cancellations, delays	KPA-Environment Reduced emissions due to reduced fuel burn.	KPA-Safety Increased safety through stabilized approach paths.

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Performance Improvement Area 1: Airport Operations

<u>Title of the Module:</u> B0-WAKE: Increased Runway Throughput through optimized Wake Turbulence Separation					
<u>Elements</u> 1.Revision of current ICAO wake separation minima 2.Increasing International aerodrome Arrival Operational Capacity 3.Increasing International aerodrome Departure Operational Capacity		<u>Equipage/Air</u> - Nil		<u>Equipage/Ground</u> - A support tool to aid in the application of the new set of 6 categories of ICAO wakes separation. - Wind sensors and automation support is needed for element 3	
Implementation monitoring and intended performance impact					
<u>Implementation progress</u>		Qualitative performance benefits associated with five main KPAs only			
1. Indicator: <i>Percentage of international aerodromes applying the 6 categories of wake vortex separation.</i>		<u>KPA-Access/Equity</u> Not Applicable	<u>KPA-Capacity</u> Aerodrome capacity and departure/arrival rates will increase as the wake categories are increased from 3 to 6	<u>KPA-Efficiency</u> Not Applicable	<u>KPA-Environment</u> Not Applicable
					<u>KPA-Safety</u> Not Applicable

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Performance Improvement Area 1: Airport Operations

Title of the Module: B0-SURF: Safety and Efficiency of Surface Operations (A-SMGCS Level 1-2)						
Elements 1. Surveillance 2. Alerting systems 3. (Not included in the Module but added here as they are closely linked to this Module) Visual aids for navigation and Wild life strike hazard reduction		Equipage/Air - ADS-B / SSR transponder system		Equipage/Ground - SMR/SSR Mode S/ ADS B/ Multilateration - Surveillance display with alerting functionalities in the tower. - A cooperative transponder system for vehicles - Visual aids for navigation		
Implementation monitoring and intended performance impact						
Implementation progress		Qualitative performance benefits associated with five main KPAs only				
1. Indicator: <i>Percentage of international aerodromes with SMR/ SSR Mode S/ ADS-B Multilateration</i> 2. Indicator: <i>Percentage of international aerodromes with a cooperative transponder systems on vehicles</i> 3. Indicator: <i>Percentage of international aerodromes complying with visual aid requirements as per Annex 14</i>		<u>KPA-Access/Equity</u> Improves KPA-Access/Equity to portions of the manoeuvring area obscured from view of the control tower for vehicles and aircraft. Ensures equity in ATC handling of surface traffic regardless of the traffic's position on the international aerodrome.	<u>KPA-Capacity</u> Sustained level of aerodrome capacity during periods of reduced visibility	<u>KPA-Efficiency</u> Reduced taxi times through diminished requirements for intermediate holdings based on reliance on visual surveillance only. Reduced fuel burn.	<u>KPA-Environment</u> Reduced emissions due to reduced fuel burn	<u>KPA-Safety</u> Reduced runway incursions. Improved response to unsafe situations. Improved situational awareness leading to reduced ATC workload.

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Performance Improvement Area 1: Airport Operations

Title of the Module: B0-ACDM; Improved Airport Operations through Airport-CDM					
Elements: 1. Airport –CDM 2. (Not included in the Module but added here as they are closely linked to this Module) Aerodrome certification, Aerodrome emergency planning, Airport planning and Heliport operations		Equipage/Air - Nil		Equipage/Ground - Interconnection of ground systems of different partners for Airport-CDM - Rescue and Fire Fighting (RFF) Equipment as per Annexe 14	
Implementation monitoring and intended performance impact					
Implementation progress	Qualitative performance benefits associated with five main KPAs only				
1. Indicator: <i>percentage of international aerodromes with Airport-CDM</i> 2. Indicator: <i>Percentage of certified international aerodromes</i> 3. Indicator: <i>Percentage of international aerodromes with RFF equipment as per Annex 14</i>	KPA-Access/Equity Enhances equity on the use of aerodrome facilities.	KPA-Capacity Enhanced use of existing gate and stands (unlock latent capacity). Reduced workload, better organization of the activities to manage flights.	KPA-Efficiency Improved operational efficiency (fleet management); and reduced delay. Reduced fuel burn due to reduced taxi time and lower aircraft engine run time.	KPA-Environment Reduced emissions due to reduced fuel burn	KPA-Safety Not Applicable

ASBU – Checklist



Performance Improvement Area 1: Airport Operations

Title of the Module: B0-RSEQ: Improve Traffic Flow Through Runway Sequencing (AMAN/DMAN)					
Elements: 1.AMAN 2.DMAN		Equipage/Air - Nil		Equipage/Ground - Automation support	
Implementation monitoring and intended performance impact					
Implementation progress 1. Indicator: <i>Percentage of international aerodromes with AMAN/DMAN</i>		Qualitative performance benefits associated with five main KPAs only			
KPA-Access/Equity Not Applicable		KPA-Capacity Time-based metering will optimize usage of terminal airspace and runway capacity.	KPA-Efficiency Efficiency is positively impacted as reflected by increased runway throughput and arrival rates.	KPA-Environment Not Applicable	KPA-Safety Not Applicable

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Performance Improvement Area 2: Globally Interoperable Systems and Data – Through Globally Interoperable System Wide Information Management

Title of the Module:					
B0-FICE: Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration					
Elements:		Equipage/Air		Equipage/Ground	
1. AIDC 2. (Not included in the Module but added here as they are closely linked to this Module) AMHS/IPS		- Nil		- A set of AIDC messages in FDPS - AFTN (AMHS/IPS)	
Implementation monitoring and intended performance impact					
Implementation progress	Qualitative performance benefits associated with five main KPAs only				
1. Indicator: <i>Percentage of ATS units with AIDC</i>	<u>KPA-Access/Equity</u> Not Applicable	<u>KPA-Capacity</u> Reduced controller workload and increased data integrity supporting reduced separations translating directly to cross sector or boundary capacity flow increases.	<u>KPA-Efficiency</u> The reduced separation can also be used to more frequently offer aircraft flight levels closer to the optimum; in certain cases, this also translates into reduced en-route holding.	<u>KPA-Environment</u> Not Applicable	<u>KPA-Safety</u> Better knowledge of more accurate flight plan information.
2. Indicator: <i>States implementing AMHS/IPS</i>					

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Performance Improvement Area 2: Globally Interoperable Systems and Data – Through Globally Interoperable System Wide Information Management

Title of the Module: B0-DATM; Service Improvement through Digital Aeronautical Information Management					
Elements: 1.AIXM 2.eAIP 3.Digital NOTAM 4.(Not included in the Module but added here as they are closely linked to this Module) WGS-84; eTOD; and QMS for AIM		Equipage/Air - Nil		Equipage/Ground AIXM; eAIP and Digital NOTAM WGS-84; eTOD; QMS for AIM The aeronautical information is made available to external users via either a subscription to an electronic access or physical delivery; The electronic access can be based on Internet protocol services.	
Implementation monitoring and intended performance impact					
Implementation progress	Qualitative performance benefits associated with five main KPAs only				
1. Indicator: <i>States implementing AIXM; eAIP, Digital NOTAM WGS-84; eTOD; QMS for AIM</i>	KPA-Access/Equity Not Applicable	KPA-Capacity Not Applicable	KPA-Efficiency Not Applicable	KPA-Environment Reduced amount of paper for promulgation of information	KPA-Safety Reduction in the number of possible inconsistencies

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Performance Improvement Area 2: Globally Interoperable Systems and Data – Through Globally Interoperable System Wide Information Management

Title of the Module:					
B0-AMET: Meteorological information supporting enhanced operational efficiency and safety					
<u>Elements:</u> 1. WAFS-IAVW-TCW 2. Aerodrome warning, wind shear warning and alerts 3. SIGMET information		<u>Equipage/Air</u> - Nil		<u>Equipage/Ground</u> - Connection to the AFS satellite and public Internet distribution systems - Connection to the AFTN - Local arrangements for reception of aerodrome warning ,wind shear warning and alerts	
Implementation monitoring and intended performance impact					
<u>Implementation progress</u>	<u>Qualitative performance benefits associated with five main KPAs only</u>				
1 Indicator: <i>States implementation of SADIS 2G satellite broadcast and/or Secure SADIS FTP service.</i>	<u>KPA-Access/Equity</u> Not Applicable	<u>KPA-Capacity</u> Optimized usage of airspace and aerodrome capacity due to MET support	<u>KPA-Efficiency</u> Reduced arrival/departure holding time, thus reduced fuel burn due to MET support	<u>KPA-Environment</u> Reduced emissions due to reduced fuel burn due to MET support	<u>KPA-Safety</u> Reduced incidents/accidents in flight and at international aerodromes due to MET support.
2. Indicator: <i>States implementation of WAFS Internet File Service (WIFS)</i>					

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Performance Improvement Area 3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM

Title of the Module:					
B0-FRTO: Improved Operations through Enhanced En-Route Trajectories					
<u>Elements:</u> 1. Airspace planning 2. Flexible Use of airspace 3. Flexible Routing		<u>Equipage/Air</u> - FANS 1/A and ACARS		<u>Equipage/Ground</u> - CDM through Internet portal	
Implementation monitoring and intended performance impact					
<u>Implementation progress</u>	<u>Qualitative performance benefits associated with five main KPAs only</u>				
1. Indicator: <i>Percentage of time segregated airspaces are available for civil operations in the State</i>	<u>KPA-Access/Equity</u> Better access to airspace by a reduction of the permanently segregated volumes of airspace.	<u>KPA-Capacity</u> Flexible routing reduces potential congestion on trunk routes and at busy crossing points. The flexible use of airspace gives greater possibilities to separate flights horizontally. PBN helps to reduce route spacing and aircraft separations.	<u>KPA-Efficiency</u> In particular the module will reduce flight length and related fuel burn and emissions. The module will reduce the number of flight diversions and cancellations. It will also better allow avoiding noise sensitive areas.	<u>KPA-Environment</u> Fuel burn and emissions will be reduced.	<u>KPA-Safety</u> Not Applicable
2. Indicator: <i>Percentage of PBN routes implemented</i>					

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Performance Improvement Area 3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM

<u>Title of the Module:</u> B0-NOPS: Improved Flow Performance through Planning based on a Network-Wide view					
<u>Elements:</u> Air Traffic Flow Management		<u>Equipage/Air</u> - Nil		<u>Equipage/Ground</u> - System software for ATFM	
Implementation monitoring and intended performance impact					
<u>Implementation progress</u>	Qualitative performance benefits associated with five main KPAs only				
1. Indicator: <i>Percentage of ATS units using ATFM services.</i>	<u>KPA-Access/Equity</u> Improved Access and equity in the use of airspace or aerodrome by avoiding disruption of air traffic. ATFM processes take care of equitable distribution of delays.	<u>KPA-Capacity</u> Better utilization of available capacity, ability to anticipate difficult situations and mitigate them in advance.	<u>KPA-Efficiency</u> Reduced fuel burn due to better anticipation of flow issues; Reduced block times and times with engines on.	<u>KPA-Environment</u> Reduced fuel burn as delays are absorbed on the ground, with shut engines; or at optimum flight levels through speed or route management.	<u>KPA-Safety</u> Reduced occurrences of undesired sector overloads

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Performance Improvement Area 3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM

Title of the Module:					
B0-ASUR: Initial capability for ground surveillance					
Elements: 1.ADS-B 2.Multilateration		Equipage/Air - ADS-B OUT. - Mode S radar transponders for Multilateration		Equipage/Ground - FDPS and SDPS - ADS-B - Multilateration	
Implementation monitoring and intended performance impact					
Implementation progress 1. Indicator: <i>Percentage of international aerodromes with ADS-B/MLAT</i>		Qualitative performance benefits associated with five main KPAs only			
KPA-Access/Equity Not Applicable		KPA-Capacity Typical separation minima are 3 NM or 5 NM enabling an increase in traffic density compared to procedural minima. TMA surveillance performance improvements are achieved through high accuracy, better velocity vector and improved coverage.	KPA-Efficiency Not Applicable	KPA-Environment Not Applicable	KPA-Safety Reduction of the number of major incidents. Support to search and rescue.

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Performance Improvement Area 3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM

<u>Title of the Module:</u> B0-ASEP: Air Traffic Situational Awareness(ATSA)					
<u>Elements:</u> 1.ATSA-AIRB 2.ATSA-VSA		<u>Equipage/Air</u> - ADS-B OUT - ADS-B IN - Traffic display		<u>Equipage/Ground</u> - Nil	
Implementation monitoring and intended performance impact					
<u>Implementation progress</u>	Qualitative performance benefits associated with five main KPAs only				
1. <i>Indicator: Percentage of aircraft with ADS-B OUT</i>	<u>KPA-Access/Equity</u> Not Applicable	<u>KPA-Capacity</u> Not Applicable	<u>KPA-Efficiency</u> Improved situational awareness in identifying level change opportunities with current separation minima (AIRB) and improved visual acquisition (VSA).	<u>KPA-Environment</u> Not Applicable	<u>KPA-Safety</u> Improved situational awareness and reduced likelihood of wake turbulence encounters and missed approaches.
2. <i>Indicator: Percentage of aircraft with ADS-B IN</i>					

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Performance Improvement Area 3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM

<u>Title of the Module:</u>					
B0-OPFL: Improved KPA-Access/Equity to Optimum Flight Levels through Climb/Descent Procedures using ADS-B					
<u>Elements:</u> ITP using ADS-B		<u>Equipage/Air</u> - ADS-B IN - ADS-B OUT		<u>Equipage/Ground</u> - Conflict probe logics	
Implementation monitoring and intended performance impact					
<u>Implementation progress</u>	Qualitative performance benefits associated with five main KPAs only				
<i>1. Indicator: Percentage of aircraft used ITP</i>	<u>KPA-Access/Equity</u> Not Applicable	<u>KPA-Capacity</u> Improvement in capacity on a given air route.	<u>KPA-Efficiency</u> Increased efficiency on oceanic and potentially continental en-route	<u>KPA-Environment</u> Reduced emissions	<u>KPA-Safety</u> A reduction of possible injuries for cabin crew and passengers.

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Performance Improvement Area 3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM

Title of the Module: B0-ACAS: ACAS Improvements					
Elements: ACAS II (TCAS version 7.1)		Equipage/Air - TCAS V7.1		Equipage/Ground Nil	
Implementation monitoring and intended performance impact					
Implementation progress	Qualitative performance benefits associated with five main KPAs only				
1. Indicator: <i>Percentage of aircraft with ACAS, logic Version 7.1</i>	KPA-Access/Equity Not Applicable	KPA-Capacity Not Applicable	KPA-Efficiency ACAS improvement will reduce unnecessary resolution advisory (RA) and then reduce trajectory deviations.	KPA-Environment Not Applicable	KPA-Safety ACAS increases safety in the case of breakdown of separation.

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Performance Improvement Area 3: Optimum Capacity and Flexible Flights – Through Global Collaborative ATM

<u>Title of the Module:</u> B0-SNET: Increased Effectiveness of Ground-Based Safety Nets					
<u>Elements:</u> 1.Short Term Conflict Alert (STCA) 2.Area Proximity Warning (APW) 3.Minimum Safe Altitude Warning (MSAW)		<u>Equipage/Air</u> - SSR Mode C/S transponder - ADS-B OUT		<u>Equipage/Ground</u> - Short Term Conflict Alert, - Area Proximity Warnings and - Minimum Safe Altitude Warnings	
Implementation monitoring and intended performance impact					
<u>Implementation progress</u>		Qualitative performance benefits associated with five main KPAs only			
1. Indicator: <i>Percentage of ATS units with ground based safety nets</i>		<u>KPA-Access/Equity</u> Not Applicable	<u>KPA-Capacity</u> Not Applicable	<u>KPA-Efficiency</u> Not Applicable	<u>KPA-Environment</u> Not Applicable
					<u>KPA-Safety</u> Significant reduction of the number of major incidents

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Performance Improvement Area 4: Efficient Flight Path – Through Trajectory-based Operations

Title of the Module:					
B0-CDO: Improved Flexibility and Efficiency in Descent Profiles (CDO)					
Elements:		<u>Equipage/Air</u>	<u>Equipage/Ground</u>		
1. CDO 2. PBN STARs		- Nil	- Nil		
Implementation monitoring and intended performance impact					
<u>Implementation progress</u>	<u>Qualitative performance benefits associated with five main KPAs only</u>				
1. Indicator: <i>Percentage of international aerodromes with CDO implemented</i>	<u>KPA-Access/Equity</u> Not Applicable	<u>KPA-Capacity</u> Not Applicable	<u>KPA-Efficiency</u> Cost savings through reduced fuel burn. Reduction in the number of required radio transmissions.	<u>KPA-Environment</u> Reduced emissions as a result of reduced fuel burn	<u>KPA-safety</u> More consistent flight paths and stabilized approach paths. Reduction in the incidence of controlled flight into terrain (CFIT).
2. Indicator: <i>Percentage of international aerodromes/TMAs with PBN STARs implemented</i>					

ASBU – Checklist



Performance Improvement Area 4: Efficient Flight Path – Through Trajectory-based Operations

<u>Title of the Module:</u> B0-TBO: Improved Safety and Efficiency through the initial application of Data Link En-Route					
<u>Elements:</u> 1.ADS-C over oceanic and remote areas 2.Continental CPDLC		<u>Equipage/Air</u> - FANS 1/A; ATN B1		<u>Equipage/Ground</u> - ADS-C - VDL Mode 2/Continental CPDLC	
Implementation monitoring and intended performance impact					
<u>Implementation progress</u> 1. Indicator: <i>Number of ADS-C /CPDLC procedures available over oceanic and remote Areas</i>		Qualitative performance benefits associated with five main KPAs only			
<u>KPA-Access/Equity</u> Not Applicable		<u>KPA-Capacity</u> A better localization of traffic and reduced separation allow increased capacity. Reduced communication workload and better organization of controller tasks allowing increasing sector capacity.	<u>KPA-Efficiency</u> Routes/tracks and flights can be separated by reduced minima, allowing to apply flexible routings and vertical profiles closer to the user-preferred ones.	<u>KPA-Environment</u> Reduced emissions as a result of reduced fuel burn.	<u>KPA-safety</u> ADS-C based safety nets supports cleared level adherence monitoring, route adherence monitoring, danger area infringement warning and improved search and rescue. Reduced occurrences of misunderstandings; solution to stuck microphone situations.

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Performance Improvement Area 4: Efficient Flight Path – Through Trajectory-based Operations

Title of the Module:					
B0-CCO: Improved Flexibility and Efficiency in Departure Profiles (CCO)					
Elements: 1.CCO 2.PBN SIDs		Equipage/Air - Nil		Equipage/Ground - Nil	
Implementation monitoring and intended performance impact					
Implementation progress	Qualitative performance benefits associated with five main KPAs only				
1. Indicator: <i>Percentage of international aerodromes with CCO implemented</i>	<u>KPA-Access/Equity</u> Not Applicable	<u>KPA-Capacity</u> Not Applicable	<u>KPA-Efficiency</u> Cost savings through reduced fuel burn and efficient aircraft operating profiles. Reduction in the number of required radio transmissions.	<u>KPA-Environment</u> Authorization of operations where noise limitations would otherwise result in operations being curtailed or restricted. Environmental benefits through reduced emissions.	<u>KPA-Safety</u> More consistent flight paths. Reduction in the number of required radio transmissions. Lower pilot and air traffic control workload
2. Indicator: <i>Percentage of international aerodromes with PBN SIDs implemented</i>					

REGIONAL AIR NAVIGATION PLANNING PERFORMANCE BENEFIT METRICS- EXAMPLES



KPA's	Related Performance Metrics
1. Access & Equity	<ol style="list-style-type: none"> 1. KPA/Access: Number of international aerodromes with APV 2. KPA/Access: Percentage of time Special Use Airspace (SUA) available to Civil Operations 3. KPA/Access: Percentage of requested flight level versus cleared flight level 4. KPA/Access: Number of access denials due to equipment failure 5. KPA/Equity Percentage of aircraft operators by class that equity is achieved 6. KPA/Equity: Percentage of different types of aircraft operating in a particular airspace or international aerodrome.
2. Capacity	<ol style="list-style-type: none"> 1. Number of operations (arrivals+departures) per international aerodrome per day 2. Average ATFM delay per flight at an international aerodrome 3. Number of landings before and after APV per international aerodrome 4. Average en-route ATFM delay generated by airspace volume 5. Number of aircraft in a defined volume of airspace for a period of time
3. Cost effectiveness	<ol style="list-style-type: none"> 1. IFR movements per ATCO hour on duty 2. IFR flights (en-route) per ATCO hour duty
4. Efficiency	<ol style="list-style-type: none"> 1. Kilograms of fuel saved per flight 2. Average ATFM delay per flight at the international aerodrome 3. Percentage of PBN routes
5. Environment	<ol style="list-style-type: none"> 1. Kilograms of CO₂ emissions reduced per flight (= KGs fuel saved per flight x 3.157) 2. The number of electronic pages dispatched

REGIONAL AIR NAVIGATION PLANNING PERFORMANCE BENEFIT METRICS- EXAMPLES



KPA's	Related Performance Metrics
6. Flexibility	<ol style="list-style-type: none"> 1. Number of backups available in emergency 2. Number of changes approved to the flight plan 3. Number of alternatives granted
7. Global Interoperability	<ol style="list-style-type: none"> 1. Number of ATC automated systems that are interconnected
8. Participation of the ATM Community	<ol style="list-style-type: none"> 1. Level of participation in meetings 2. Level of responses to planning activities
9. Predictability	<ol style="list-style-type: none"> 1. Arrival/departure delay (in minutes) at international aerodrome
10. Safety	<ol style="list-style-type: none"> 1. Number of runway incursions per international aerodrome per year 2. Number of incidents/accidents with MET conditions as as a contributory factor 3. Number of ACAS RA events 4. Number of CFIT accidents 5. Number of missed approaches avoided due to use of CDO
11. Security	Not Applicable



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South American
(SAM) Office
Lima

ICAO
Headquarters
Montreal

Western and
Central African
(WACAF) Office
Dakar

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Thank You