



SIP/2009-WP/8

Business case

Global Air Navigation Systems

~ Performance framework ~

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**Workshop on the Development of Business Case
for the Implementation of CNS/ATM Systems
(Antigua and Barbuda, 28 September –
2 October 2009)**

Overview

- **Background**
- **Performance Framework**
- **Methodology and Measurement**
- **Transition strategy**
- **Way forward**

ATM Community

~ Strategic vision ~

To foster the implementation of an **global air traffic management** system for all users during all phases of flight that:

- meets agreed levels of safety
- provides for optimum economic operations
- is environmentally sustainable
- meets national security requirements

**Performance based
Global ATM system
(2008)**



**Global ATM system
(2006)**



**CNS/ATM systems
(1994)**



**Future AN systems
(1992)**



**Ground based AN systems
(Before 1992)**

Summary
**Evolution from Ground based AN systems to
Performance based Global ATM system**

**A PERFORMANCE BASED
GLOBAL ATM SYSTEM**

Global ATM system

It is a worldwide system which:

- Facilitates interoperability of different technologies;
- accommodates different procedures;
- covers all elements of AN systems (ATM, CNS, AGA, AIM and MET); and
- provides harmonization

thus leading to seamlessness across regions

This is achieved through progressive, cost effective and cooperative implementation of air navigation systems worldwide

Eleventh Air Navigation Conference (September 2003)

- **Endorsed the global ATM operational concept**
- **Noted that corporatization and a more structured regulatory environment were placing increasing pressure on accountability**
- **Urged ICAO to develop a performance framework for Air Navigation Systems**

35th Session of the Assembly

September 2004

- **Called upon States, PIRGs and the aviation industry to use the ICAO Global ATM Operational Concept as the common framework**
- **Requested ICAO to develop the transition strategies, ATM requirements and SARPs necessary to support implementation of a global ATM system**
- **Urged ICAO to ensure that the future global ATM system is performance based and that the performance objectives and targets for the future system are developed in a timely manner**

Documentation developed for Performance Planning ...

Document	Description	Objective	Role	Guidance
ATM Operational Concept (Doc 9854) (Available on ICAONET)	The ATM Operational Concept (ATMOC) presents the ICAO vision of an integrated, harmonized global air traffic management system. The planning horizon is up to and beyond 2025.	To achieve an interoperable global air navigation system, for all users during all phases of flight, that meets agreed levels of safety, provides for optimum economic operations, is environmentally sustainable and meets national security requirements.	Vision	ATM System Requirements document (Doc 9882) (Available on ICAONET), will ensure that all ATM related standards making and industry work will be in support of the operational concept

Documentation developed for Performance Planning ...

Document	Description	Objective	Role	Guidance
Global Air Navigation Plan (Doc 9750) (Available on ICAONET)	Strategic document that describes the methodology for global air navigation harmonization.	Establishes the focus for near and medium term activities	Strategy	Manual on Global Performance of the Air Navigation System (Doc 9883) (available on ICAONET). Part I provides a comprehensive understanding of the intent, expected benefits and delivery mechanisms of the performance-based air navigation system and provides guidance on measuring and evaluating ATM performance; Part II provides transition strategies and supports the Global Plan as a transition planning document.
Global Plan Initiatives (Part of Global Plan)	A set of implementation methodologies derived from operational environment	Measurable progress towards the implementation of the ATMOC	Tactical	

Documentation developed for Performance Planning

Document	Description	Objective	Role	Guidance
Regional Plans (Available on ICAONET)	Regional work programmes including the planning and monitoring of the detailed activities and their timelines which, inter alia, lead to the realization of a global air traffic management system as envisaged in the operational concept.	Contains the performance directives and associated requirements for facilities and services, established through regional air navigation agreements, in support of the global air navigation infrastructure.	Action	ICAO Business Plan ICAO Strategic Objectives (Available on ICAONET)

PBA Principles

- **Focus on results through adoption of performance objectives and targets**
- **Collaborative decision making driven by the results**
- **Reliance on facts and data for decision making**
- **Assessment of achievements is checked through a performance review, which in turn requires adequate performance measurement and data collection capabilities**

PBA

Advantages

- **Result oriented, transparent and promotes accountability**
- **Shift from prescribing solutions to specifying desired performance**
- **Employs quantitative and qualitative methods**
- **Avoids a technology driven approach**
- **helps decision makers to set priorities, makes the most appropriate trade-offs, and allows optimum resource allocation**

PBA

Requirements

- Once an organization (or State, region etc.) has decided to adopt the PBA approach, it must acknowledge the following :
 - Commitment (*at the top*)
 - Agreement on goals (*desired results*)
 - Organization (*who is accountable*)
 - Human resources and know-how (*Culture & Skills*)
 - Data collection, processing, storage and reporting
 - Collaboration and coordination (*with other subject areas and stakeholders*)
 - Cost implication (*dedicated data management & IT infrastructure*)

PBA

Terminology (1/3)

- **Expectation or Key Performance Area**
 - 11 high level expectations are defined in the OCD (Access/ Equity, Capacity, Cost-effectiveness, Efficiency, Environment, Flexibility, Global interoperability, Participation by the air navigation system community, Predictability, Safety and Security)
- **Focus Area**
 - Focus areas may be defined as areas where performance must be addressed in a any given KPA. For example, in the safety KPA, focus may be in such areas as CFIT accidents, runway incursions, or mid-air collisions for general aviation aircraft.
 - Sometimes expectation itself is referred to as a KPA

PBA

Terminology (2/3)

➤ Performance Objective

- *Each expectation should be reached through a set of specific, measurable, achievable, relevant and timely (SMART) performance objectives.*
- *Performance Objectives define – in a qualitative way - a desired trend from today's performance (eg improvement), within a well specified ATM planning environment. In other words it is high level statement of outcome that satisfies ATM community expectations. Example : Enhance terminal airspace capacity*

➤ Performance Indicator

- Indicators are defined when there is a need to numerically document current performance levels and progress in achieving an objective. It is measure of achievement of performance objective. Ex: increased number of aircraft in a defined terminal airspace

PBA

Terminology (3/3)

➤ Performance Target

- A set of agreed numerical values of related performance indicators, representing the minimum performance levels at which an objective is considered to be 'achieved'. Performance targets can only be specified after indicators have been defined. Example: Y number of additional aircraft in terminal airspace.

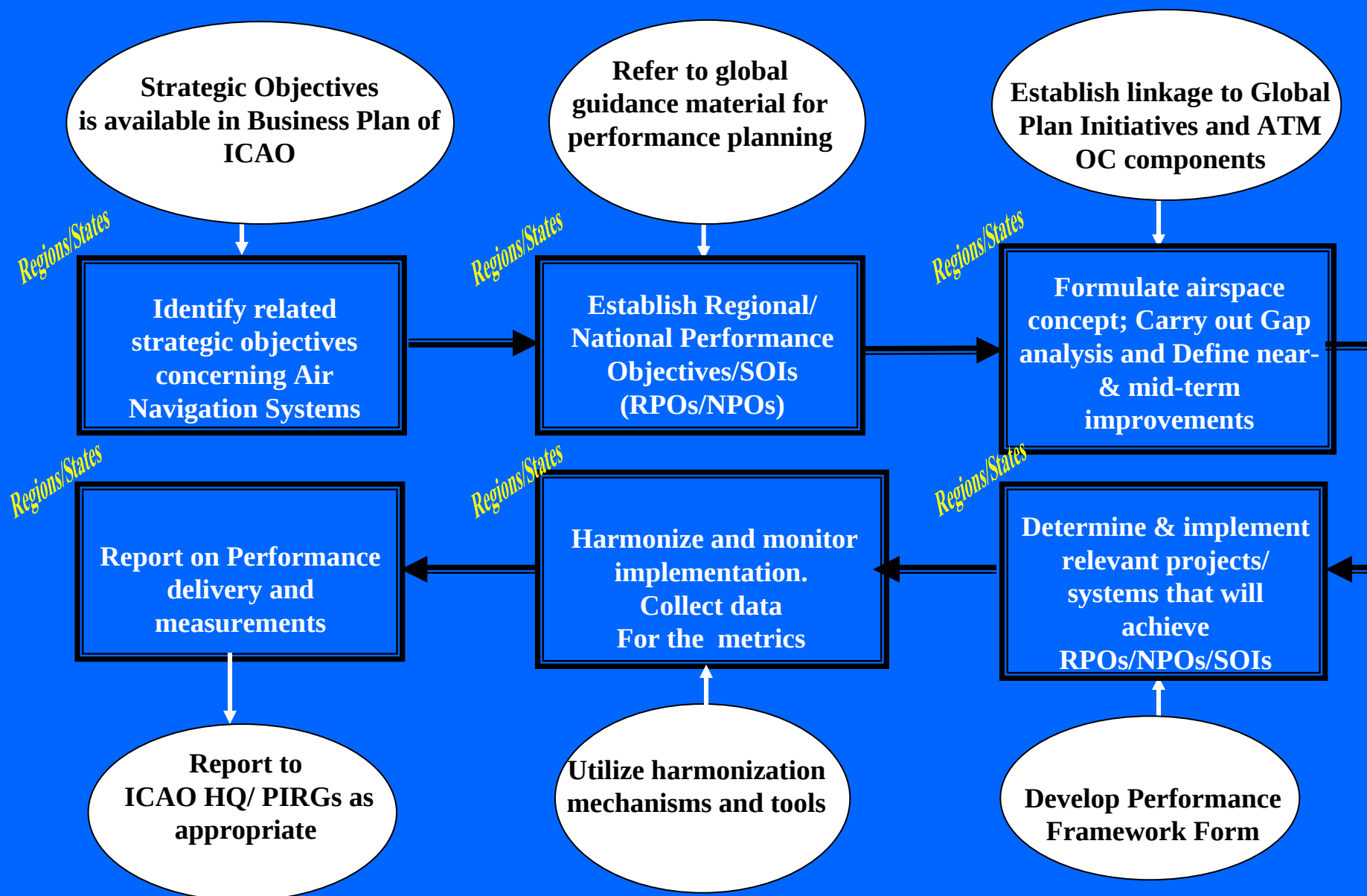
➤ Performance Metric

- A generic definition of what can be measured, how it can be measured and in which context and scope this should be done. Defines also the units in which the measurement is to be expressed. Metrics are quantitative measure of system performance – how well the system is functioning The data needs to be collected to calculate values of performance indicators .Ex: Traffic density, number of city pair flights

Performance framework - Global/Regional/National

- Transition from systems based to performance based
- What ICAO is doing:
 - Based on 11 expectations of ATM community identifying key performance areas (KPAs) such as safety, efficiency, capacity, flexibility, security etc
 - Determining high level metrics for safety and efficiency, such as number of fatal accidents, tonnes of fuel consumed, Number of PBN routes etc
 - Development System performance: Communications, Navigation and Surveillance (RCP, PBN, RSP)
- What Regions and States can do:
 - Develop Regional/National performance objective and Performance framework forms
 - Determine the gaps and implement projects that would meet targets
 - Establish performance monitoring and measurement

REGIONAL/NATIONAL PERFORMANCE FRAMEWORK FOR AIR NAVIGATION SYSTEMS — PLANNING PROCESS



PBA -Tools

- **Safety case – addresses any operational changes, such as reductions in horizontal/vertical separation minima**
- **Business case – facilitates investment decisions in air navigation infrastructure. It includes cost/benefit analysis, funding sources, cost recovery and risk management**

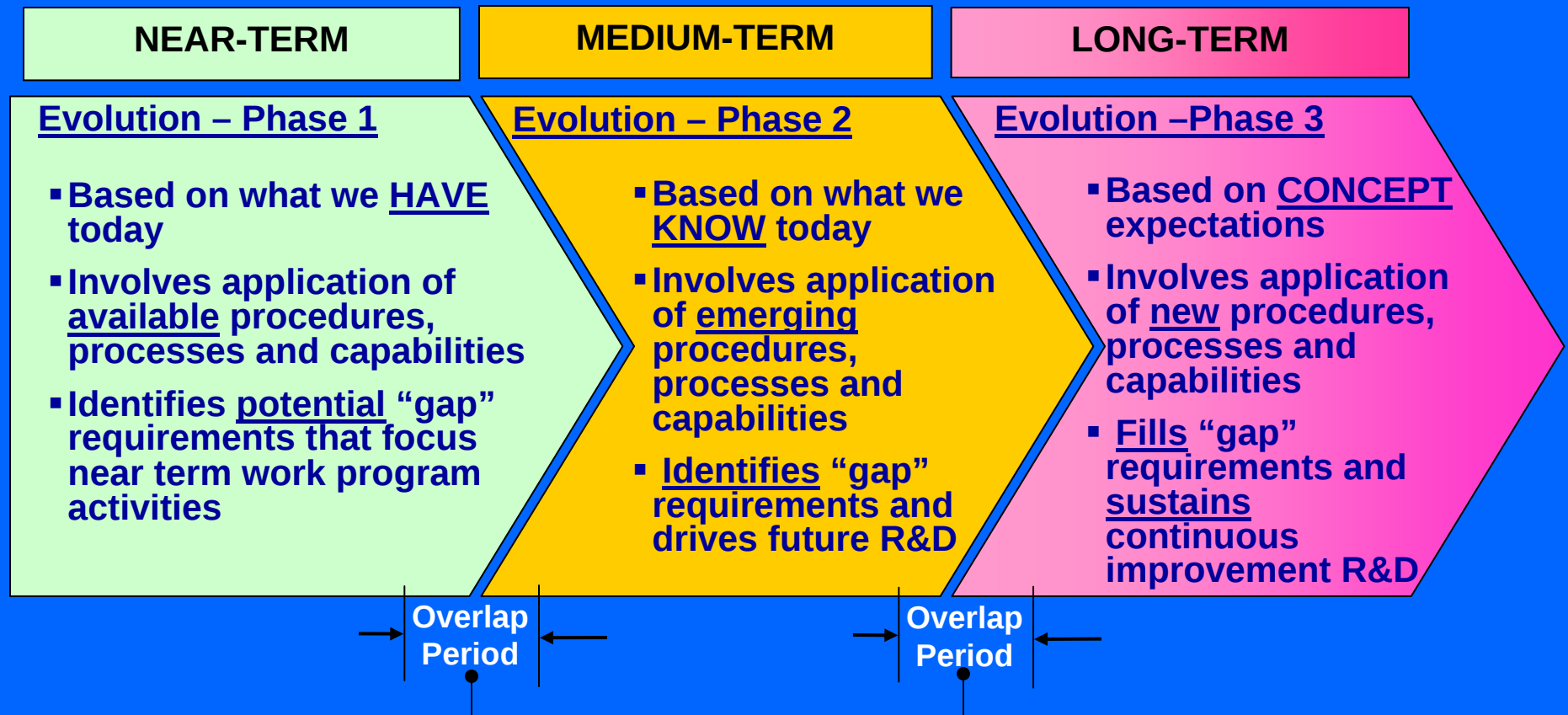
Performance Framework

- The performance based methodology provides decision makers with a consistent approach to apply when implementing changes to the Air Navigation System.
- In essence, a **Performance Framework** is the set of definitions, requirements and terminology describing the building blocks used by a group of ATM community Members to collaborate on performance management of activities.

PERFORMANCE FRAMEWORK FORM *(for illustration purpose only)*

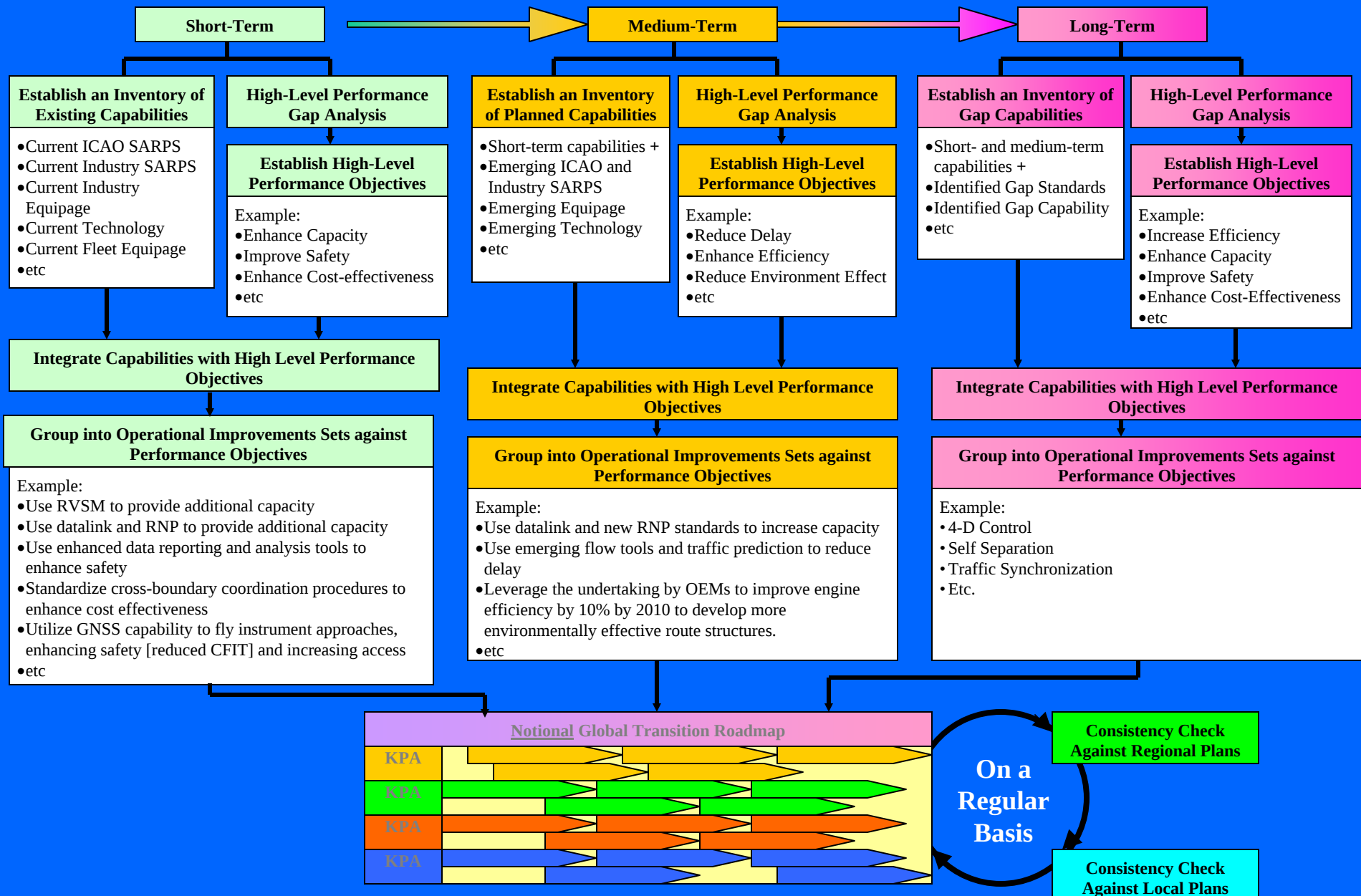
STRATEGIC OPERATIONAL IMPROVEMENT/ NATIONAL PERFORMANCE OBJECTIVE ENHANCE ENROUTE AIRSPACE CAPACITY AND EFFICIENCY				
Benefits				
Environment	• reductions in fuel consumption;			
Efficiency	• ability of aircraft to conduct flight more closely to preferred trajectories; • increase in airspace capacity; • facilitate utilization of advanced technologies (e.g., FMS based arrivals) and ATC decision support tools (e.g., metering and sequencing), thereby increasing efficiency.			
Measurement				
Metrics	• number of PBN routes implemented; • Percent difference between optimal and actual route • Number of aircraft entering a specified volume of airspace/hr • Pounds of fuel burn per operations			
Strategy Medium term (2010 - 20013)				
ATM Operational Concept Components	PROJECTS / TASKS	TIME FRAME START-END	RESPONSIBILITY	STATUS (as of)
Airspace organization and management (AOM)	• formulate airspace concept and determine requirements	May 2010 - October 2010	CAA/Country X	Database under preparation
	• analyze the en-route ATS route structure and implement all identifiable improvements;			
	• reduce horizontal separation between aircraft			
	• implement PBN			
	• migration to WGS-84/eAIP/AXIM			
	• transition to new flight plan			
	• improve data and voice communications and enhance situational awareness			
	• enhance meteorological forecast systems			
Linkage to GPIs	GPI/5: performance-based navigation; GPI/7: dynamic and flexible ATS route management; GPI/8: collaborative airspace design and management; GPI/9: situational awareness; GPI/12: FMS-based arrival procedures; GPI/17 Data link applications; GPI/18 Aeronautical information; GPI/19 Meteorological systems; GPI/20 WGS-84; GPI/21 Navigation systems; and GPI/22 Communication infrastructure.			

Transition Strategy



The “Overlap Period” indicates that there is no set date by which the objectives of each transition should be met – other than within a time band of perhaps 2-3 years. It also recognizes that some States or Regions may not have a specific performance requirement that would need the application of changes identified in the transition maps at the same time as another State or Region.

Transition Roadmap



Performance objectives – examples

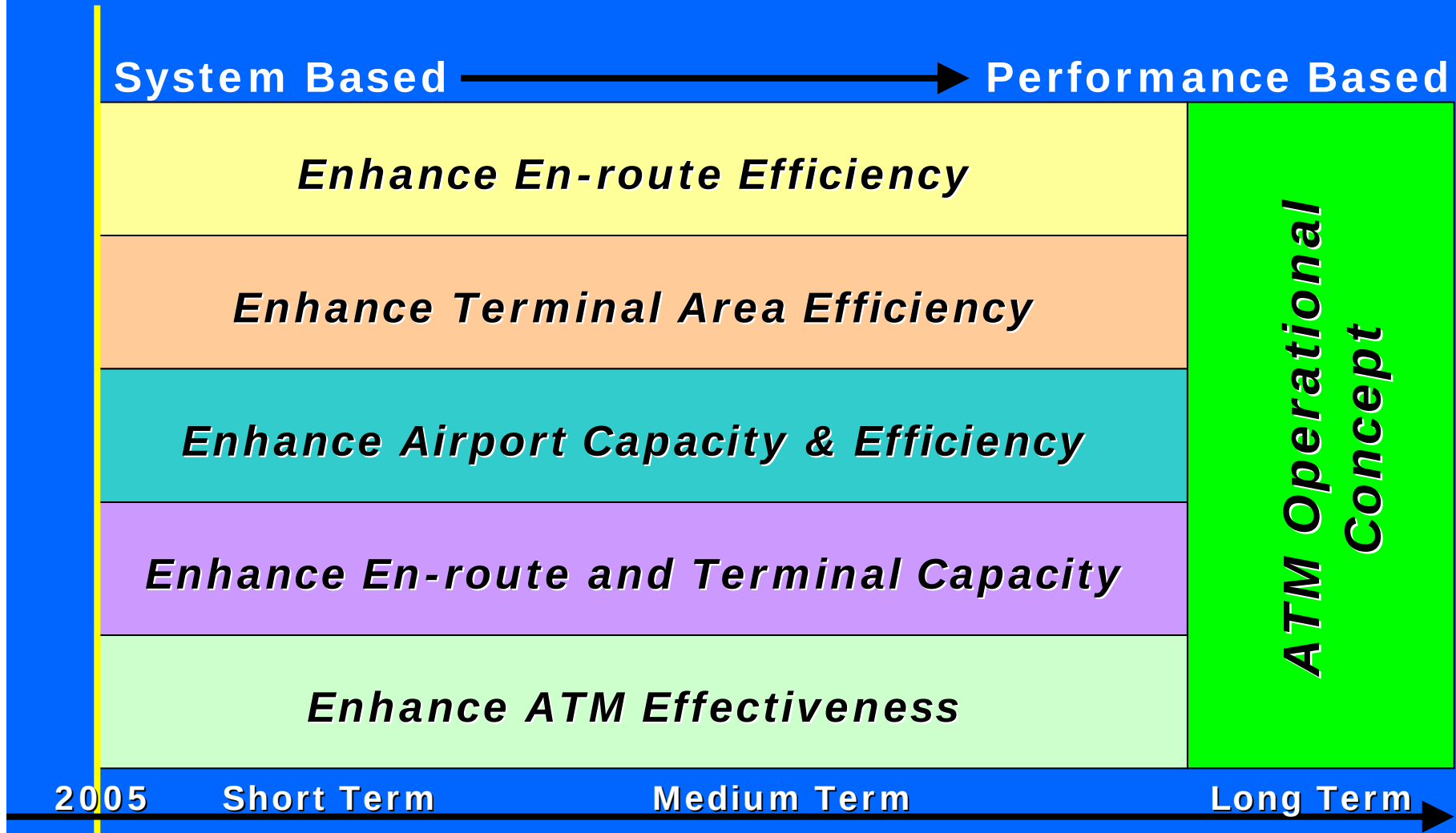
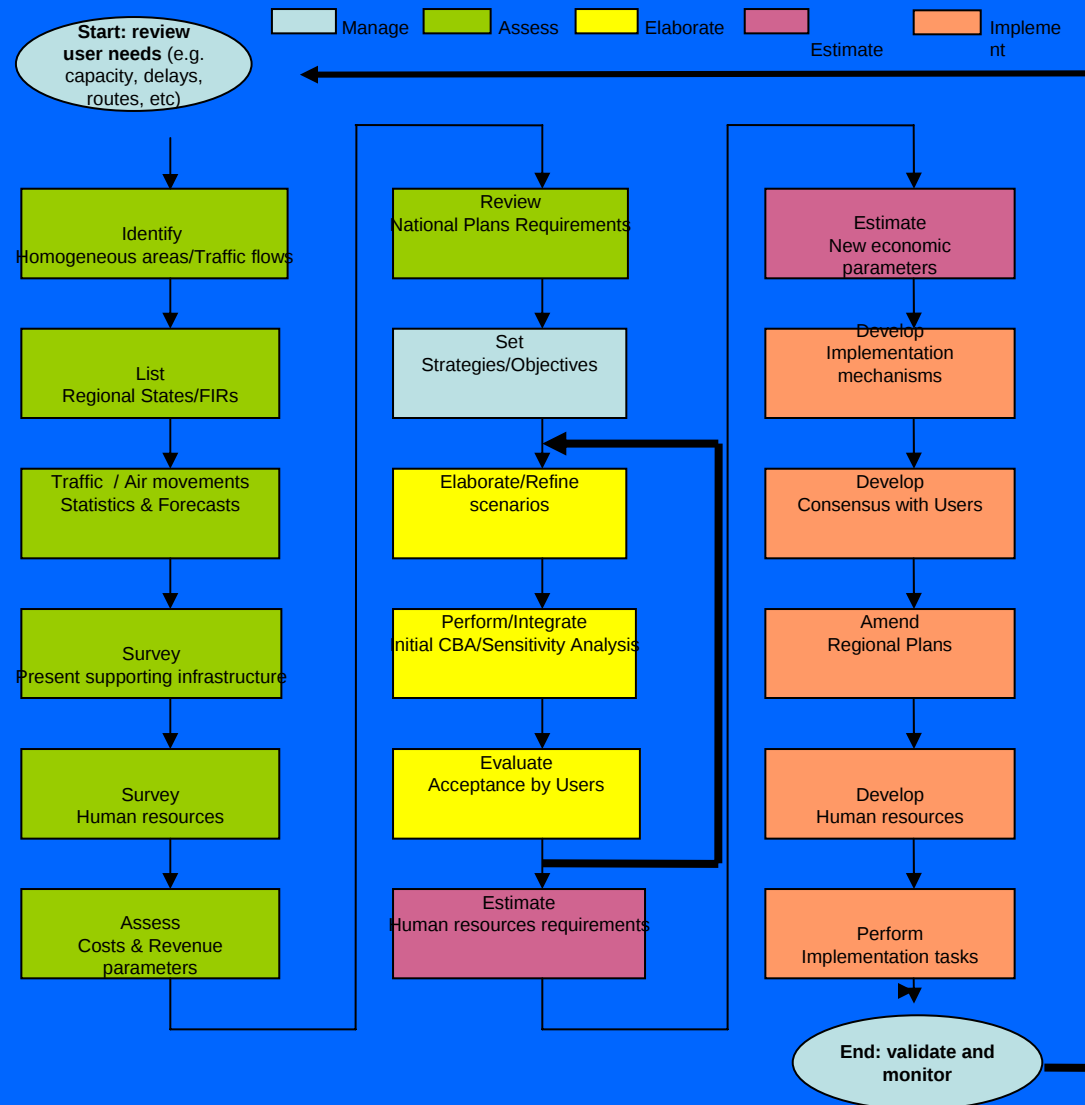
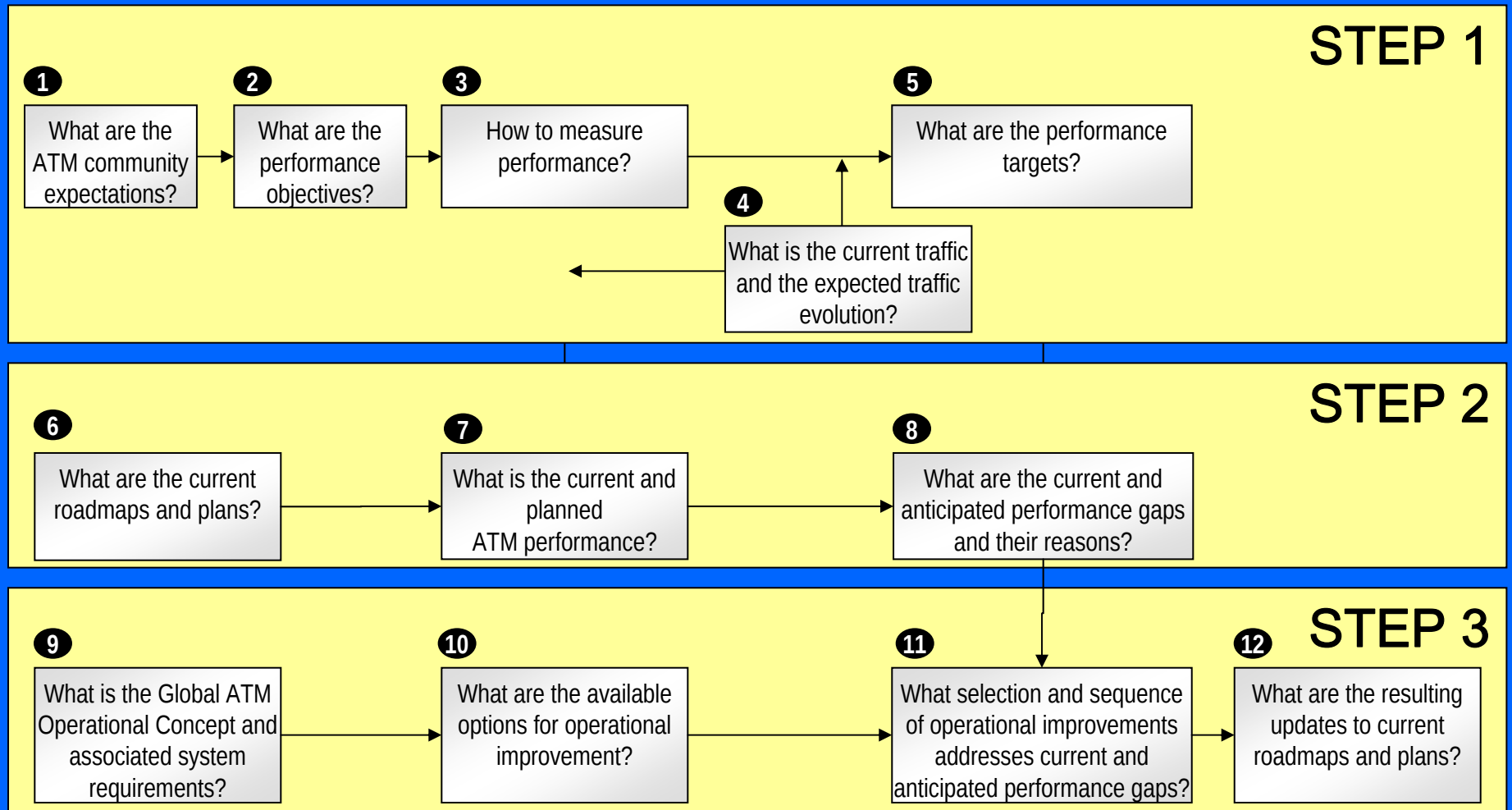


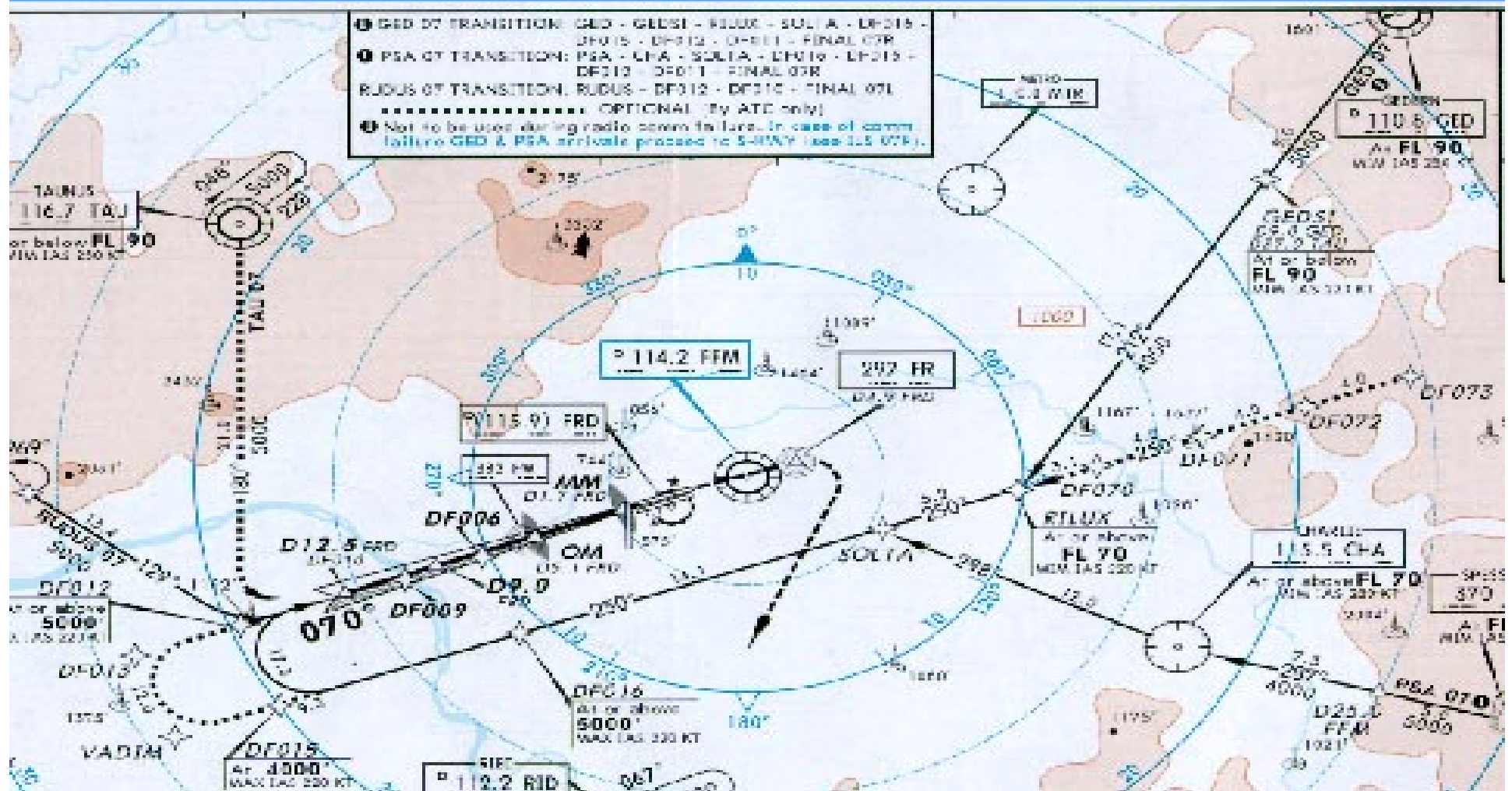
Figure 1. Planning flow chart
Extracted from Global Air Navigation Plan -Doc 9750, Chapter 1

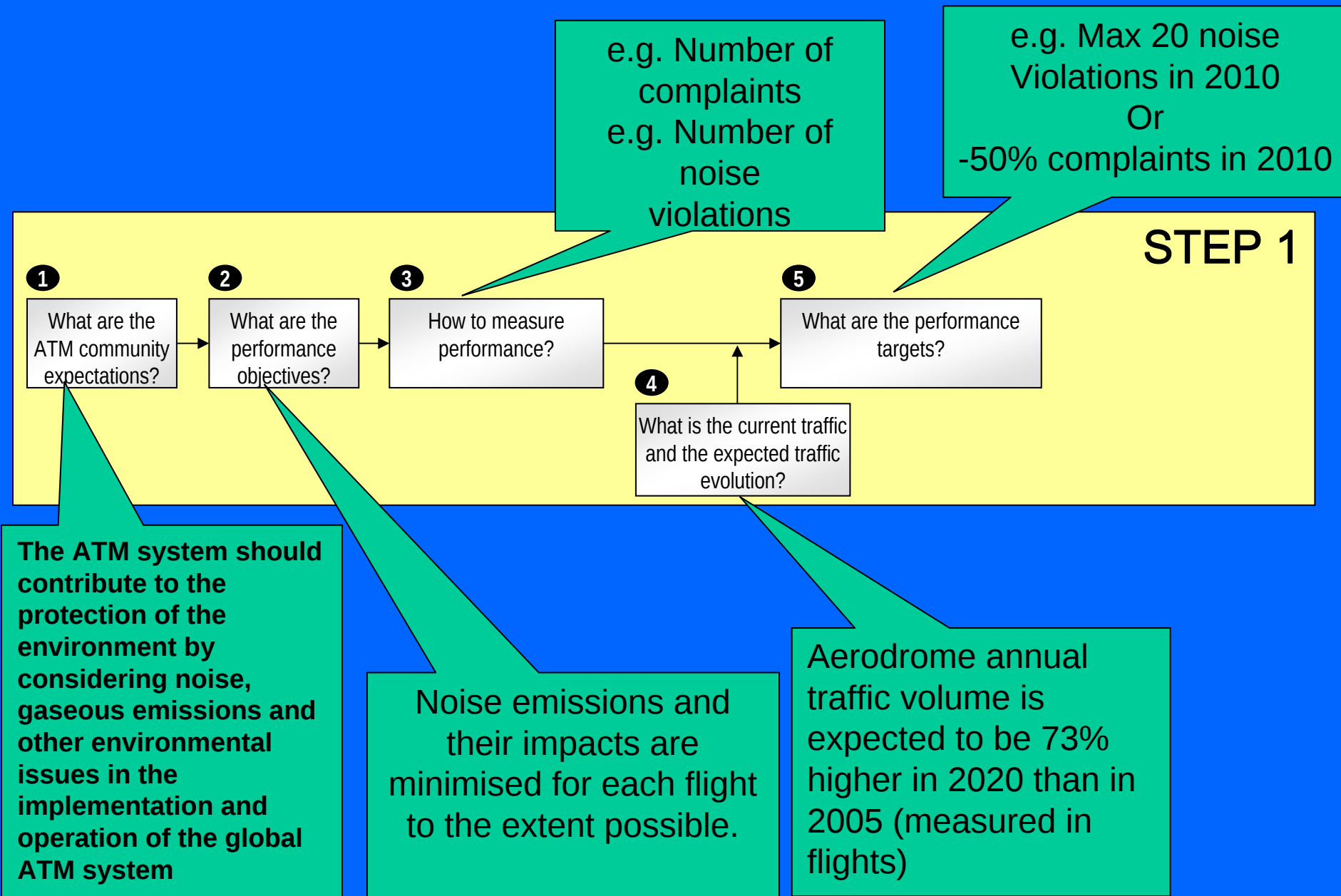


Performance Based Approach



An example: - Airport approaches - Environment/Noise





STEP 2

6

What are the current roadmaps and plans?

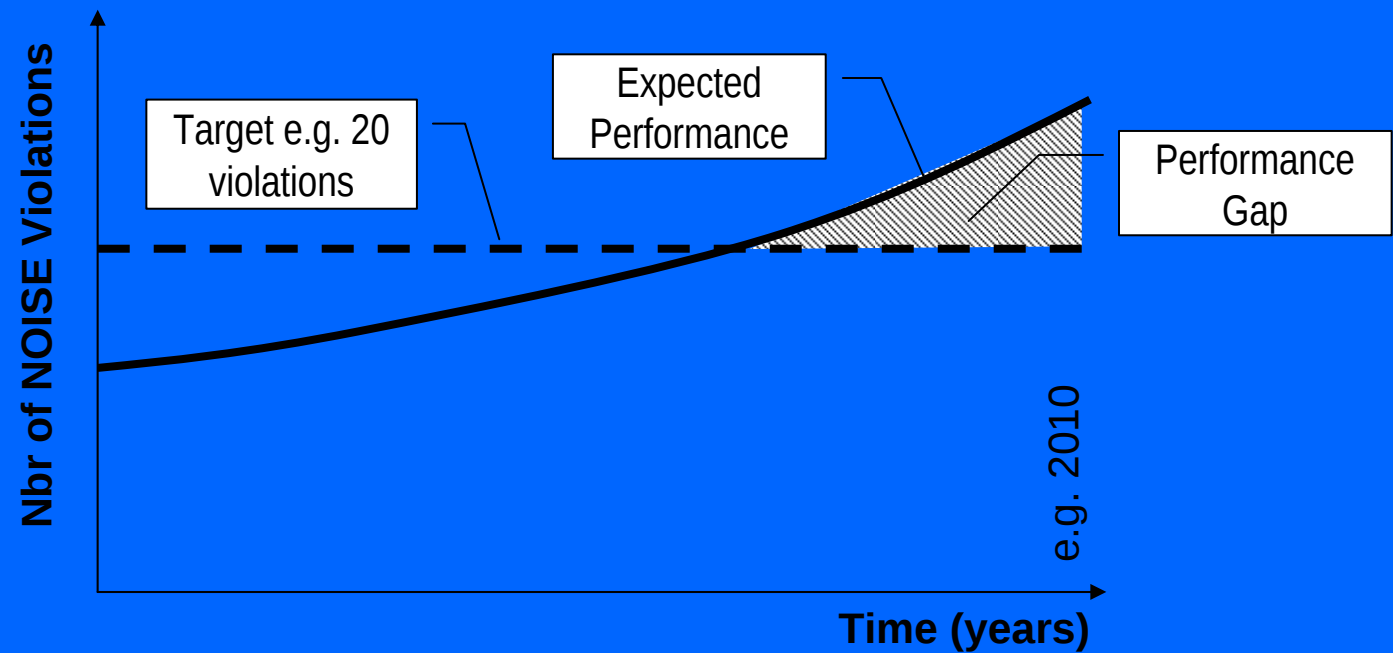
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What is the current and planned ATM performance?

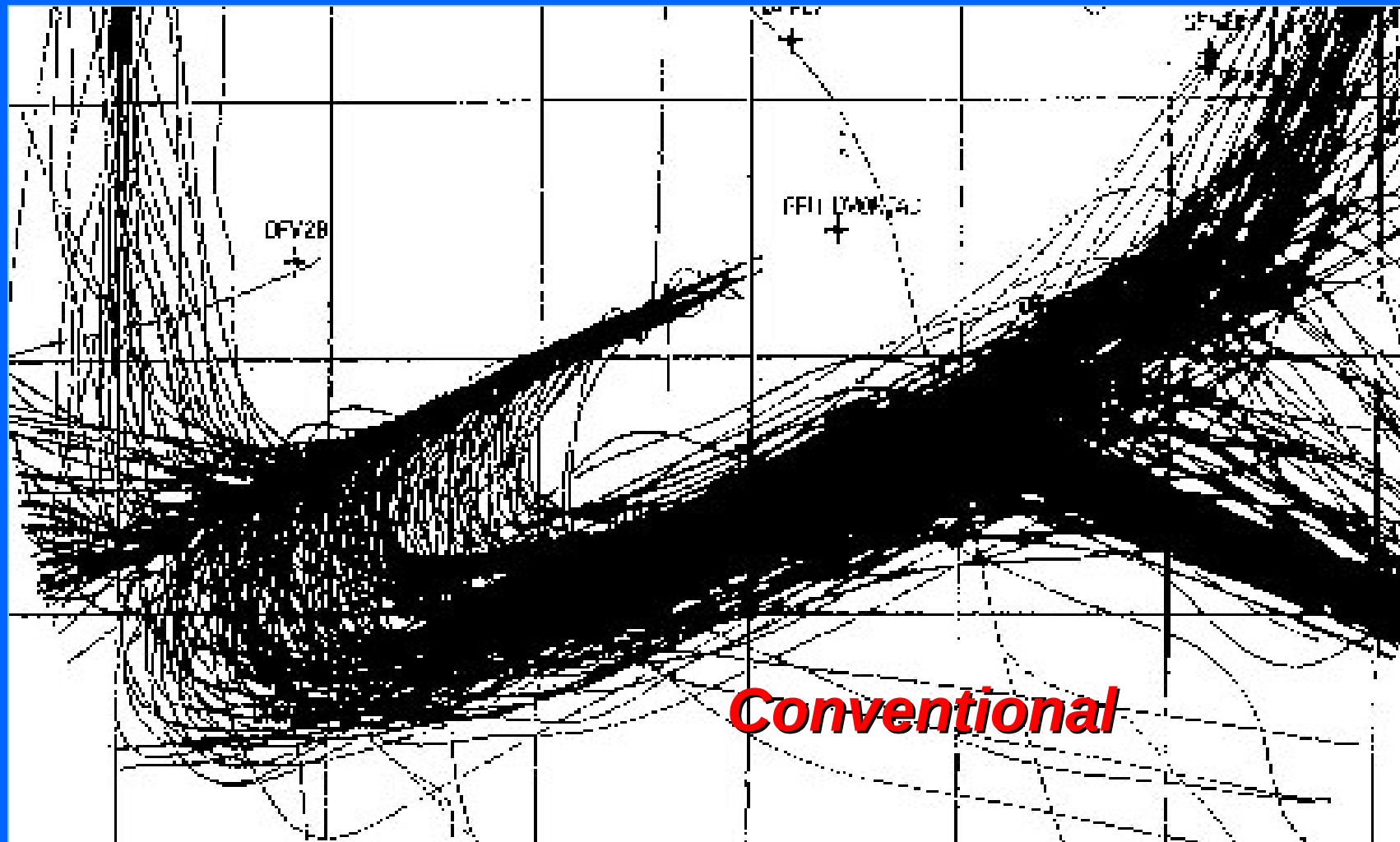
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What are the current and anticipated performance gaps and their reasons?

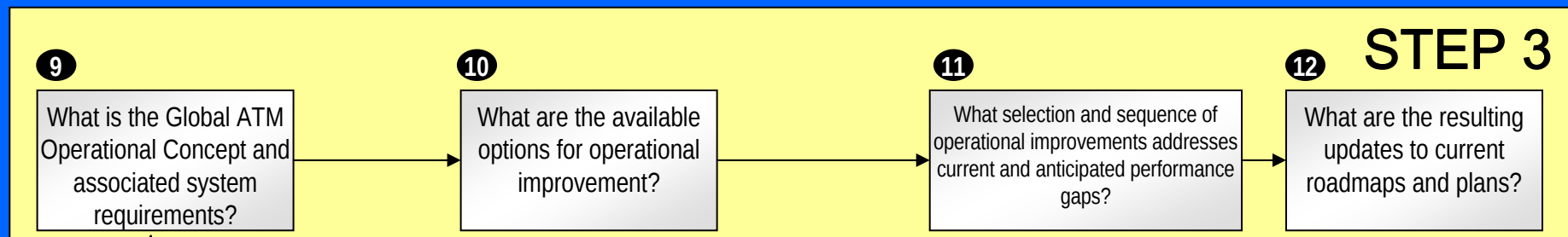
Maintain
Conventional
Arrivals



Current Roadmap: Conventional Arrivals



Conventional

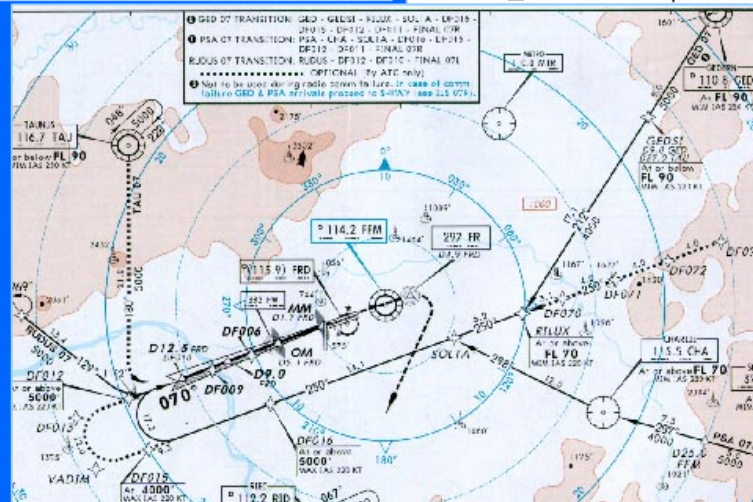
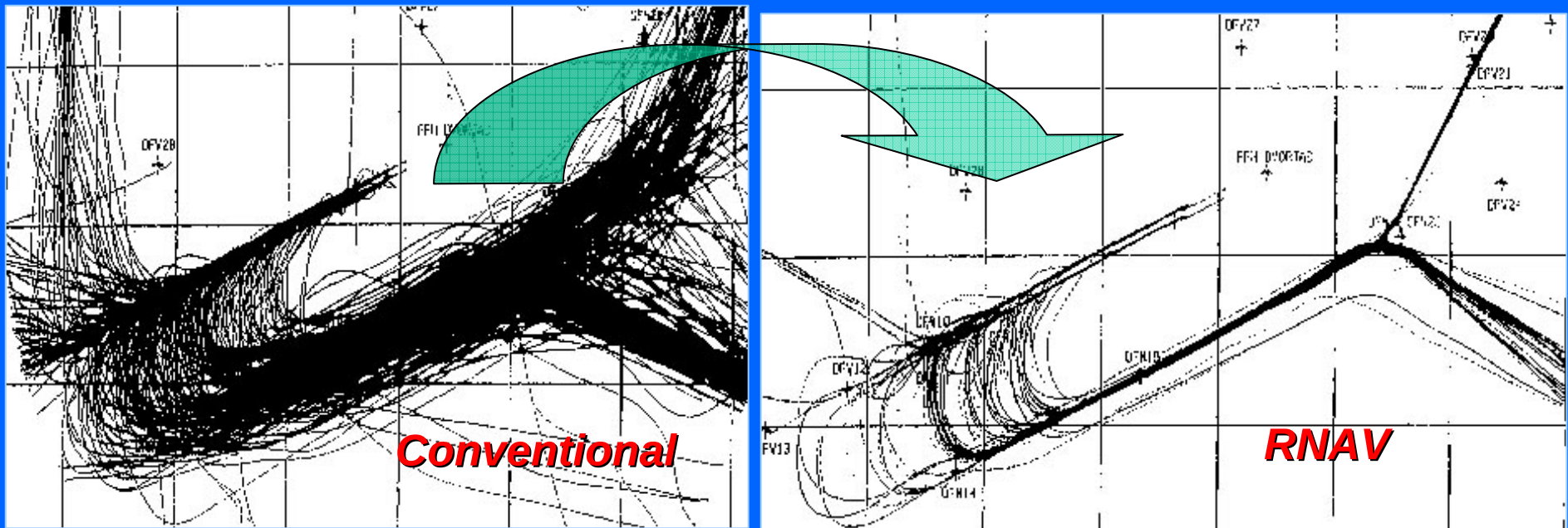


Ensure that environmental issues are considered in the design, development, and operation of all aspects of the ATM system

Understanding performance Influence
Trade-offs

From Conventional to RNAV Arrivals

Harmonising aircraft performance



Measuring success ...

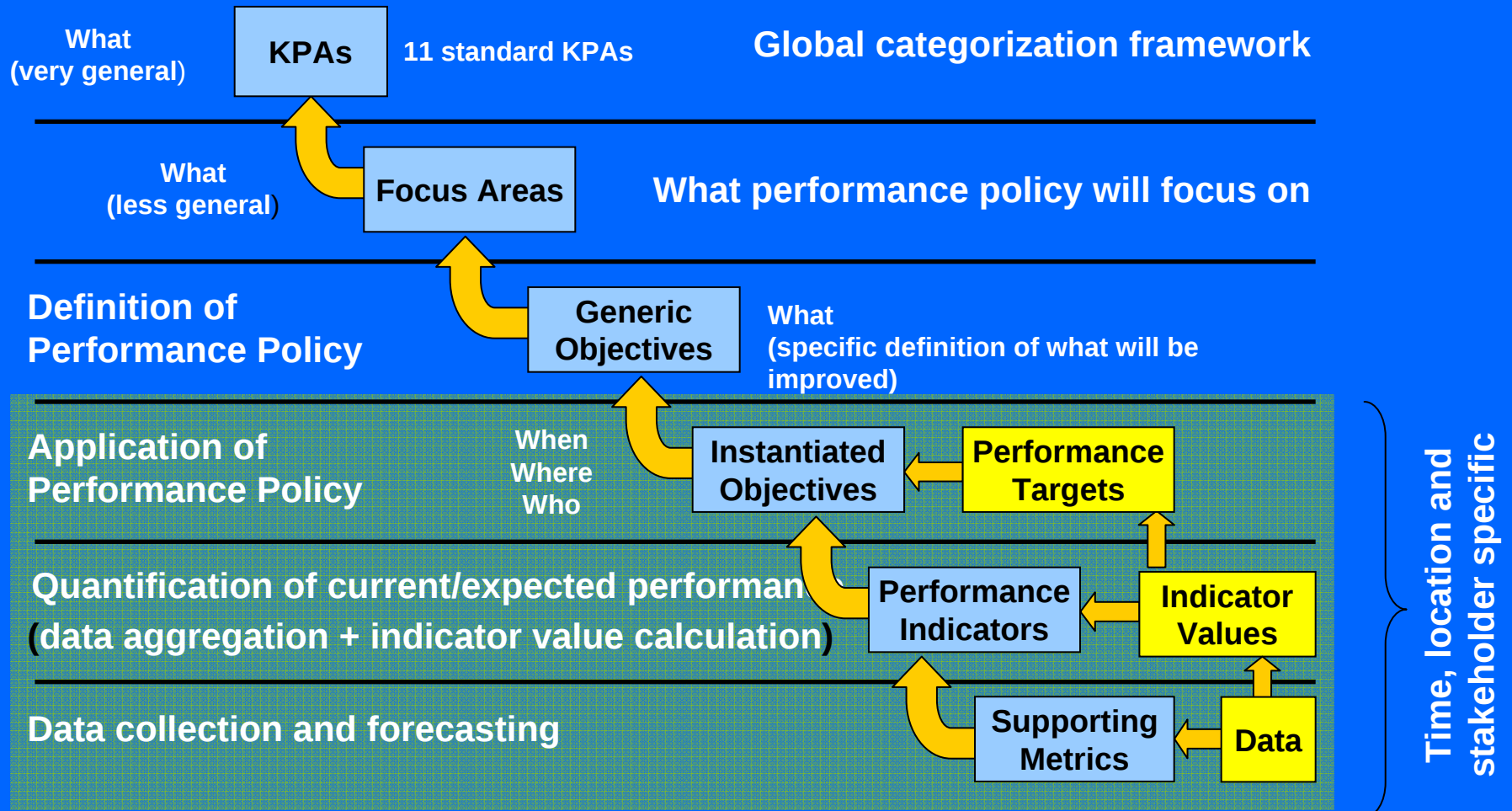
➤ Success of ICAO

- Business Plan and timelines

➤ Success of the Global air navigation system

- capacity
- efficiency
- environment
- flexibility
- interoperability
- Safety

Measurement Approach



Indicators and Metrics – examples

Indicators	Metrics
Flexibility: Increase the number of user preferred route requests granted	➤ The percentage of flights subject to an Air Traffic Control (ATC) preferred route, separately above and below flight level 180.
Flexibility: Reduce the deviation between route requested and route flown	➤ Number of flights whose maximum altitude equalled the requested altitude in their flight plans. ➤ Excess time from top of descent to wheels down. ➤ Mean lateral deviation between the flight planned and the actually flown route.
Predictability: Reduce the impact of system outages	➤ Total of number of cancellations and diversions at major airports within the affected area. ➤ Total delay of departures, and ➤ total difference between scheduled and actual arrival times.

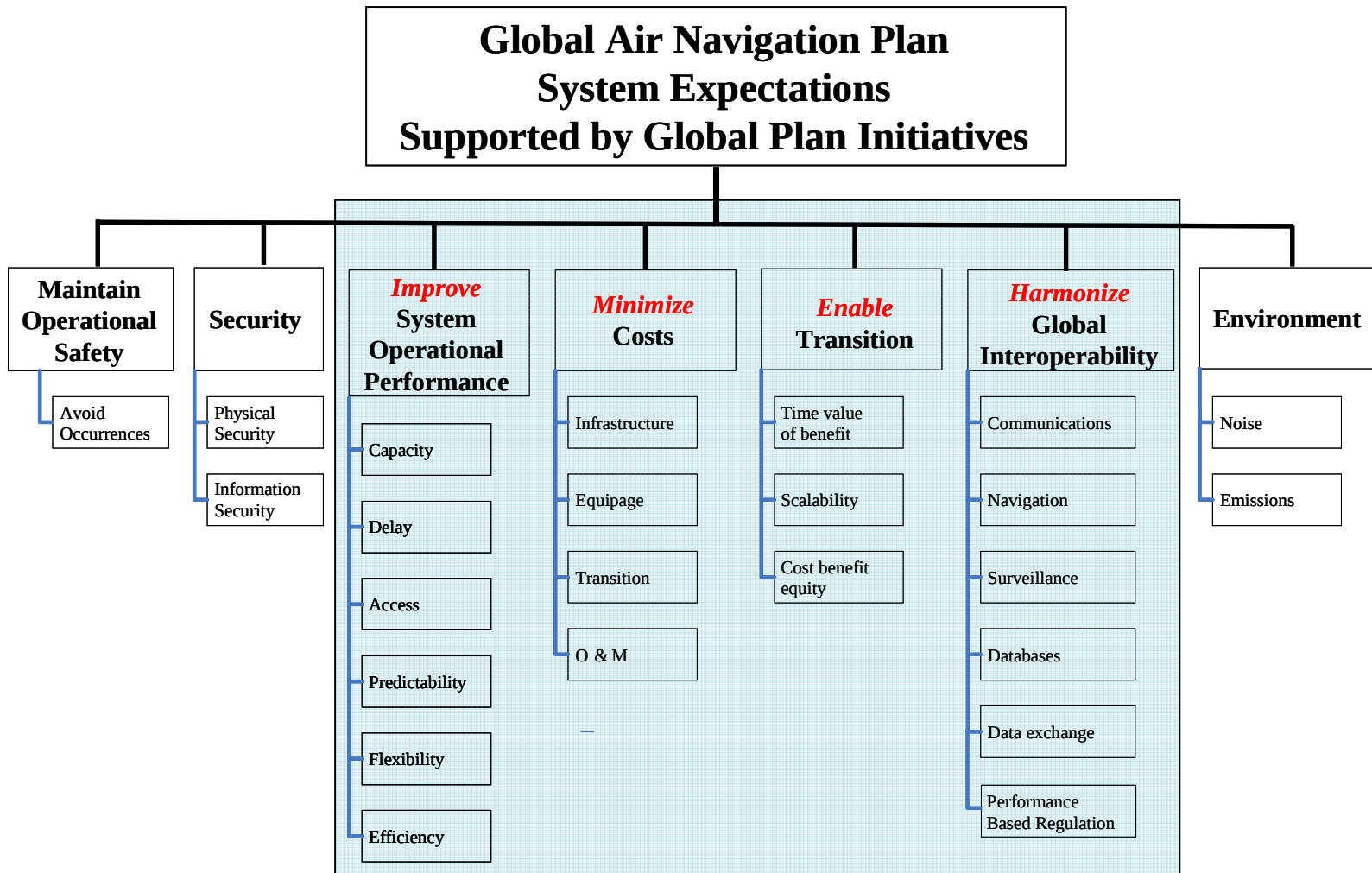
Indicators and Metrics

Indicators	Metrics
Access: Increase the number of airports with precision approach capability	➤ The number of airports that have at least one precision approach
Access: Increase civilian utilization of special use airspace	➤ Percentage of air carrier flights that penetrate Special Use Airspace
Capacity: Reduce ground movement times at key airports during peak operations	➤ Monthly average taxi in and taxi out times at 25 major airports.

Indicators and Metrics

Indicators	Metrics
Safety: Avoid accidents	➤ number of accidents per 100,000 departures
Cost effectiveness: Minimize operating costs	➤ Total operating cost plus cost of capital divided by IFR flights
Capacity: increase air cargo capacity	➤ Tons of cargo per year

Expectations



Efficiency Strategic Objective Focus Areas

**•Provides consistent
information
for performance
measurement**

**•Automates &
integrates
Business Plan
processes**

**The
Global Air
Navigation Plan
is an Implementation
Framework
that ...**

**•Produces
the baseline
for measurable
achievements and
implementation
of the ICAO ATM
Operational Concept**

**•Shares
common data
& processes**

Way forward

- States to adopt a performance framework for planning and implementation of air navigation systems
- The performance framework should include identification of regional/national performance objectives and completion of regional/national performance framework forms
- GREPECAS to choose appropriate metrics
- GREPECAS to call upon States to provide requisite data to Regional office for the chosen metrics

Summary

- Discussed the performance framework, its principles and advantages
- Noted transition strategy and the guidance material available in ICAO
- Recognized the way forward

— END —