NPF/SIP/2010-WP/5

Performance Framework for Efficiency and Safety of Air Navigation Systems

H.V. SUDARSHAN
International Civil Aviation Organization

Workshop on development of
National Performance Framework for
Air Navigation Systems
(Nairobi, 6-10 December 2010)

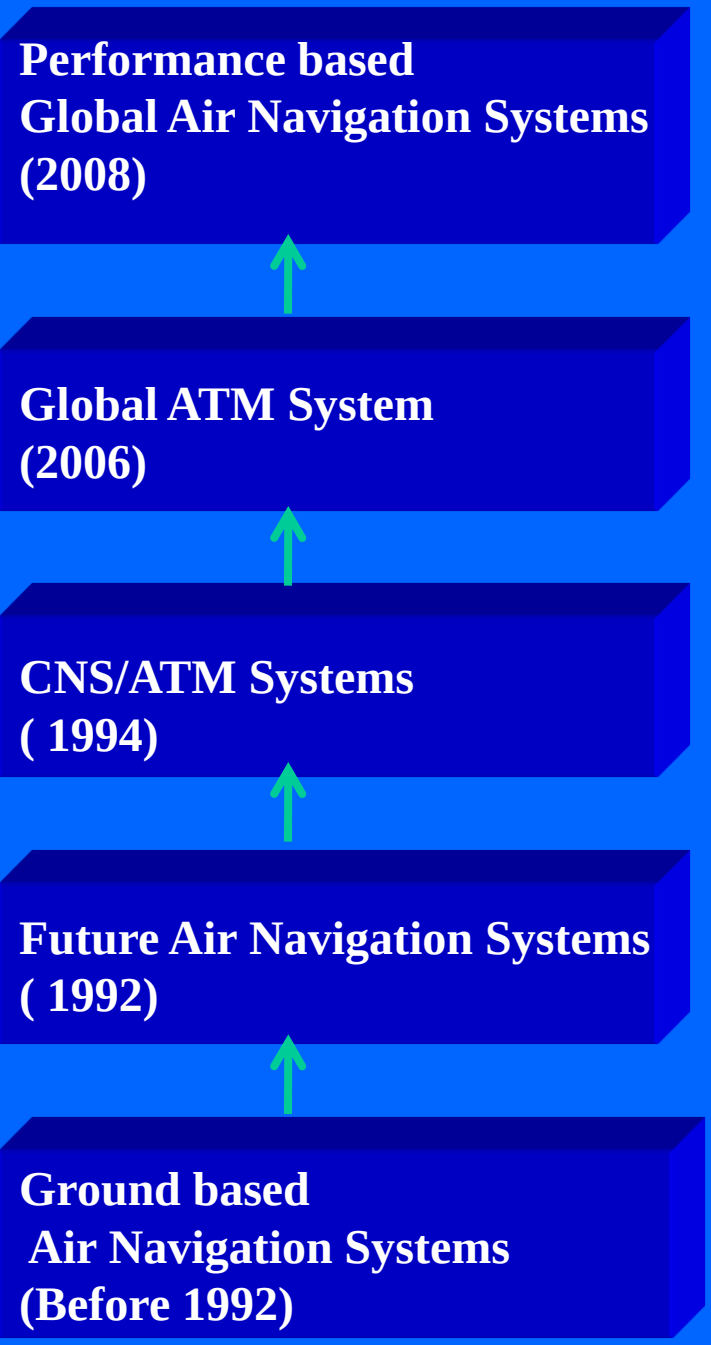
Overview

- Background
- Performance Framework
- Monitoring and Measurement
- Rollout
- Challenges
- Way forward

~ Vision Statement ~
ICAO/ATM Community members

To achieve an interoperable global ATM 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**



EVOLUTION TO PERFORMANCE BASED GLOBAL AIR NAVIGATION SYSTEMS

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.

Operation of airports and air navigation services

Organization issues in the 1990s

- The Council recommends that where economically viable and in the best interest of providers (airports and ANSPs) and users, States consider establishing autonomous entities to operate their airports or air navigation services. (Paragraphs 11-14 of Doc 9082 regarding autonomy and privatization refers)
- Many States in 1990/early 2000s established autonomous entities for the provision of air navigation services, known as ANSPs.
- ANSConf 2000, Recommendation 2/1, also empathized and called upon States to establish autonomous entities to operate their airports and air navigation services.

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 ICAO 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 (1/3)

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 (2/3)

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 (3/3)

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** (Available on ICAONET)

Performance Framework
Principles

- **Focuses on results**
  - through adoption of performance objectives and targets
- **Encourages collaborative decision making**
- **Relies on facts and data for decisions**
- **Emphasizes on performance monitoring**

Performance Framework

Requirements

- **Once an organization, State or a region has adopted performance based planning, it must acknowledge the following :**
  - **Commitment *(at the top)***
  - **Agreement on goals *(desired results)***
  - **Responsibility *(who is accountable)***
  - **Human resources and know-how *(Culture & Skills)***
  - **Data collection, processing, storage and reporting**
  - **Collaboration and coordination *(with other partners)***
  - **Cost implication *(what does it cost)***

Performance Framework
Advantages

- Result oriented, transparent and promotes accountability
- Shift from prescribing solutions to specifying performance
- Employs quantitative and qualitative methods
- Avoids a technology driven approach
- Allows optimum resource allocation

Performance Framework
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 ATM 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. For capacity, focus area could be enroute airspace or terminal airspace.

Performance Framework
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 is defined in a qualitative way - a desired trend from today's performance (e.g. improvement), within a well specified ATM planning environment. In other words it is a*** **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 document current performance levels and progress in achieving an objective. It is a measure of achievement of performance objective. Example: Reduction in separation standards is an indicator for increase in airspace capacity.**

Performance Framework
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’.
  - Example: Ten percent increase in the capacity of 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. **Metrics are quantitative measures of system performance – how well the system is functioning**
  - Example: Traffic volume, number of city pair flights, airspace throughput.

Performance Framework

Tools

GAP analysis

Technology/operational enhancements

Safety analysis

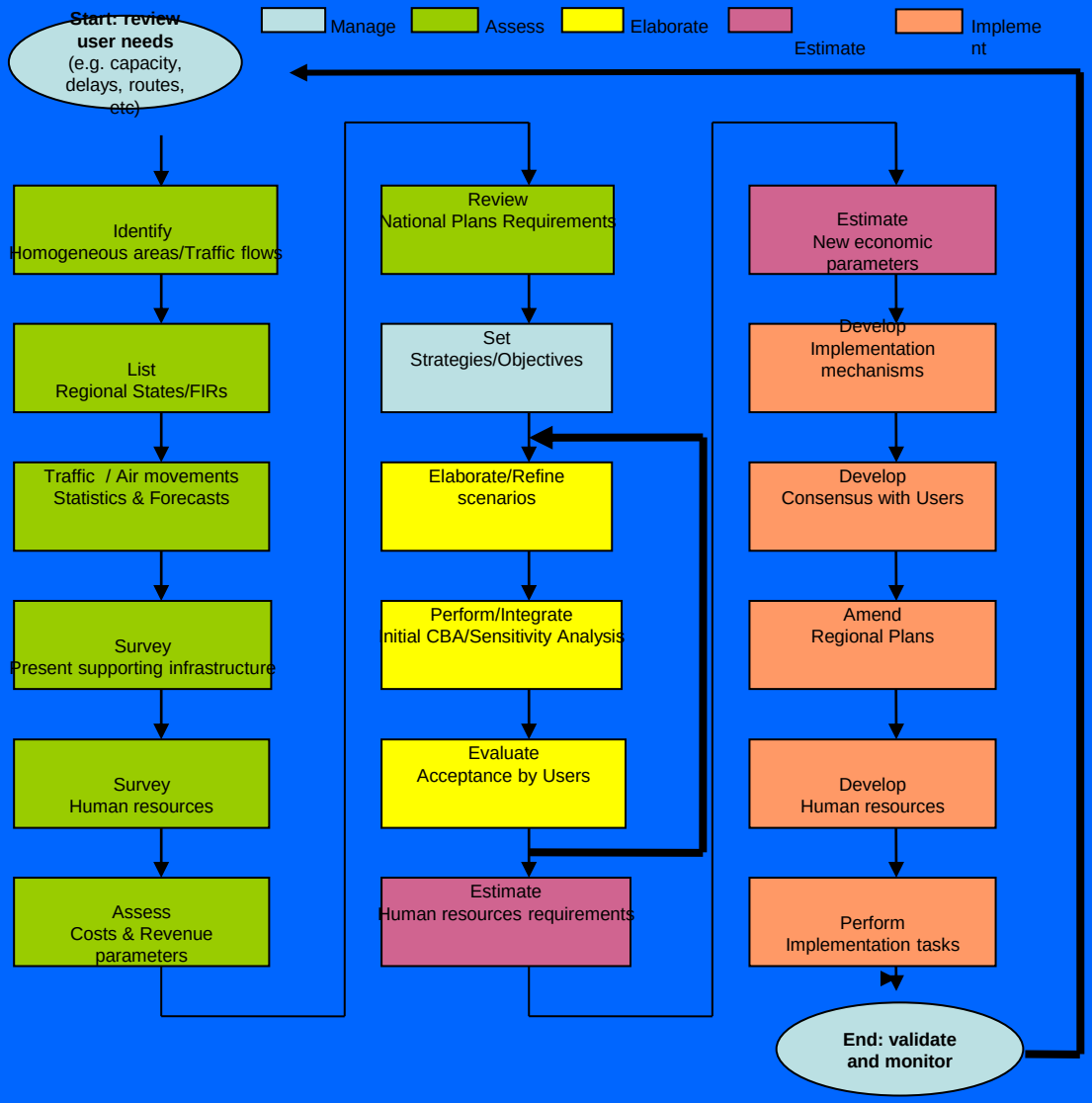
Safety case and safety assessment

Economic analysis

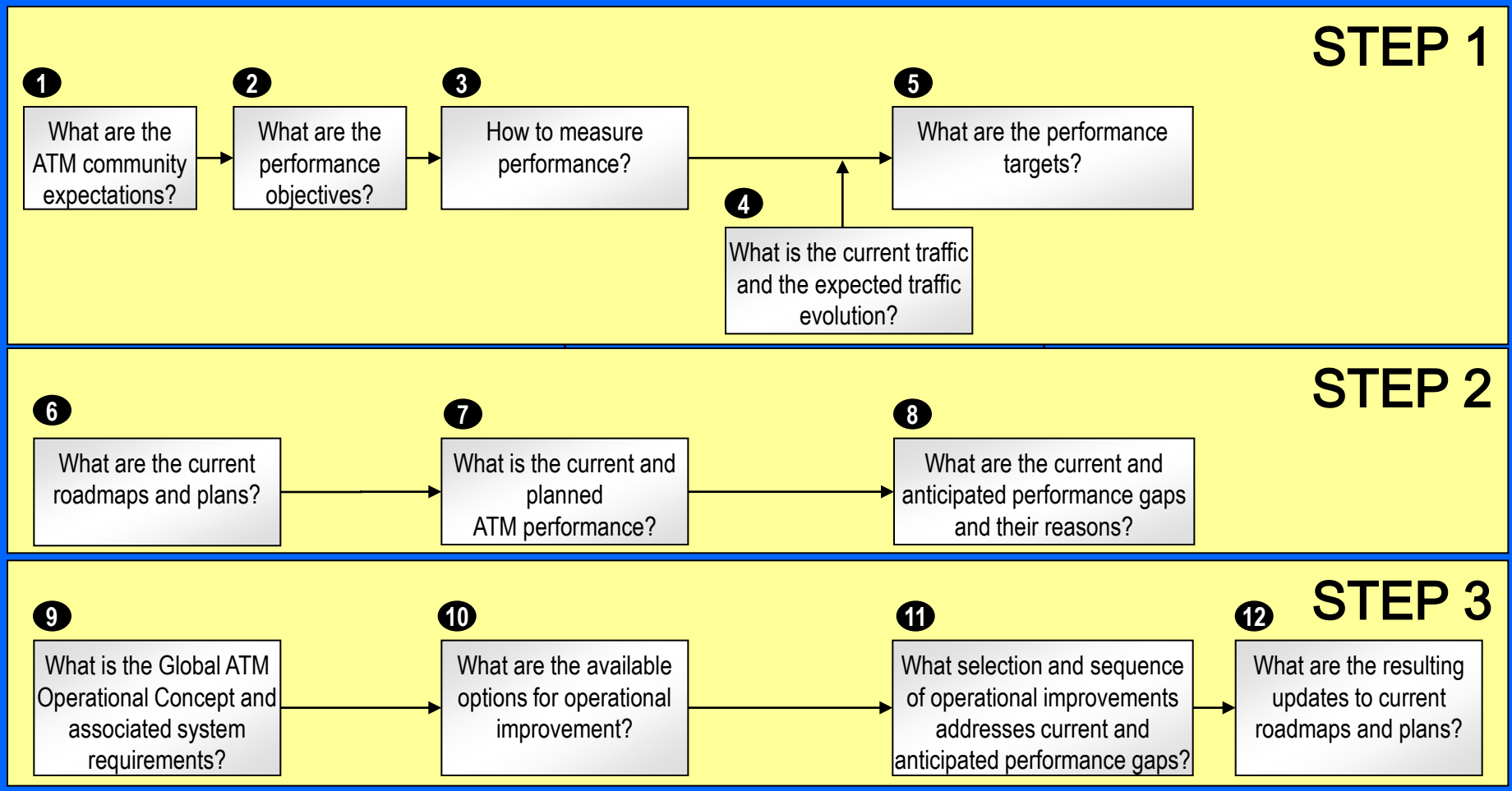
Develop aircraft movement forecasts, assess costs and benefits of technology, calculate NPV, determine funding sources, agree on cost recovery methodology, identify risk factors and implement risk mitigation techniques – the process is known as "Business case"

Planning flow chart

Extracted from Global Air Navigation Plan, Doc 9750, Chapter 1



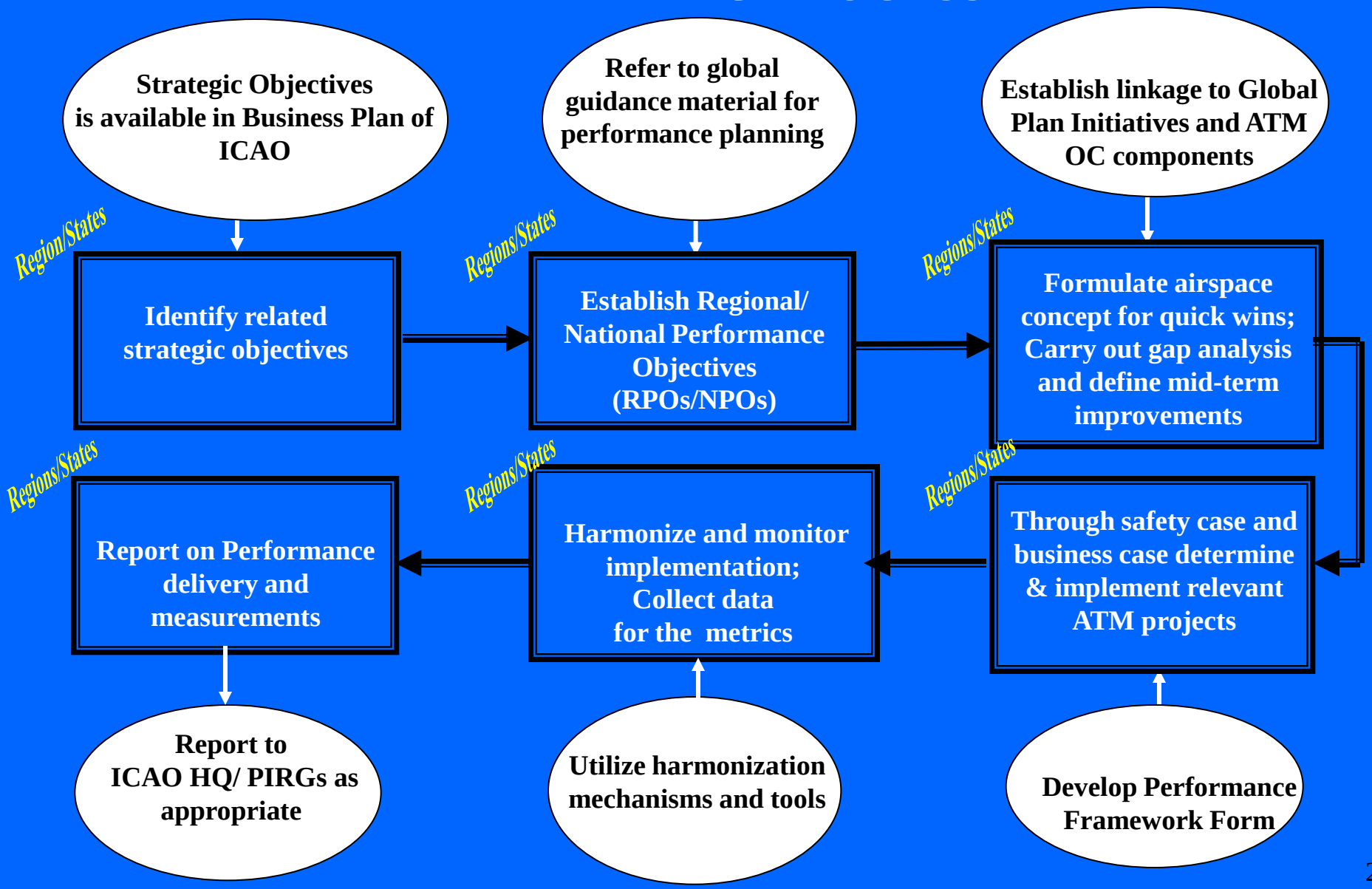
Performance Based Approach



Extracted from Part II of the *Manual on Global Performance of the Air Navigation System*, Doc 9883

REGIONAL/NATIONAL PERFORMANCE FRAMEWORK FOR AIR NAVIGATION SYSTEMS

— PLANNING PROCESS —



PERFORMANCE FRAMEWORK FORM *(for illustration purpose only)*

PERFORMANCE OBJECTIVE ENHANCE ENROUTE AIRSPACE CAPACITY AND EFFICIENCY				
Performance Benefits				
Safety	• safety level maintained or improved			
Environment	• reduced green house gas emissions through shorter flights and use of optimum routes/trajectories			
Efficiency	• increased capacity through better utilization airspace resources			
Cost effectives	• fuel cost reduction through availability of more optimized routes/trajectories and ability of aircraft to conduct flight more closely to preferred trajectories			
Performance 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; reduce horizontal separation between aircraft			
	• implement PBN			
	• Implement WGS-84			
	• transition to new flight plan			
	• improve data and voice communications and enhance situational awareness			
	• Timely distribution , reception, and use of information prepared within WAFS, IAVW and ITCW			
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.			

Performance Framework
Definition

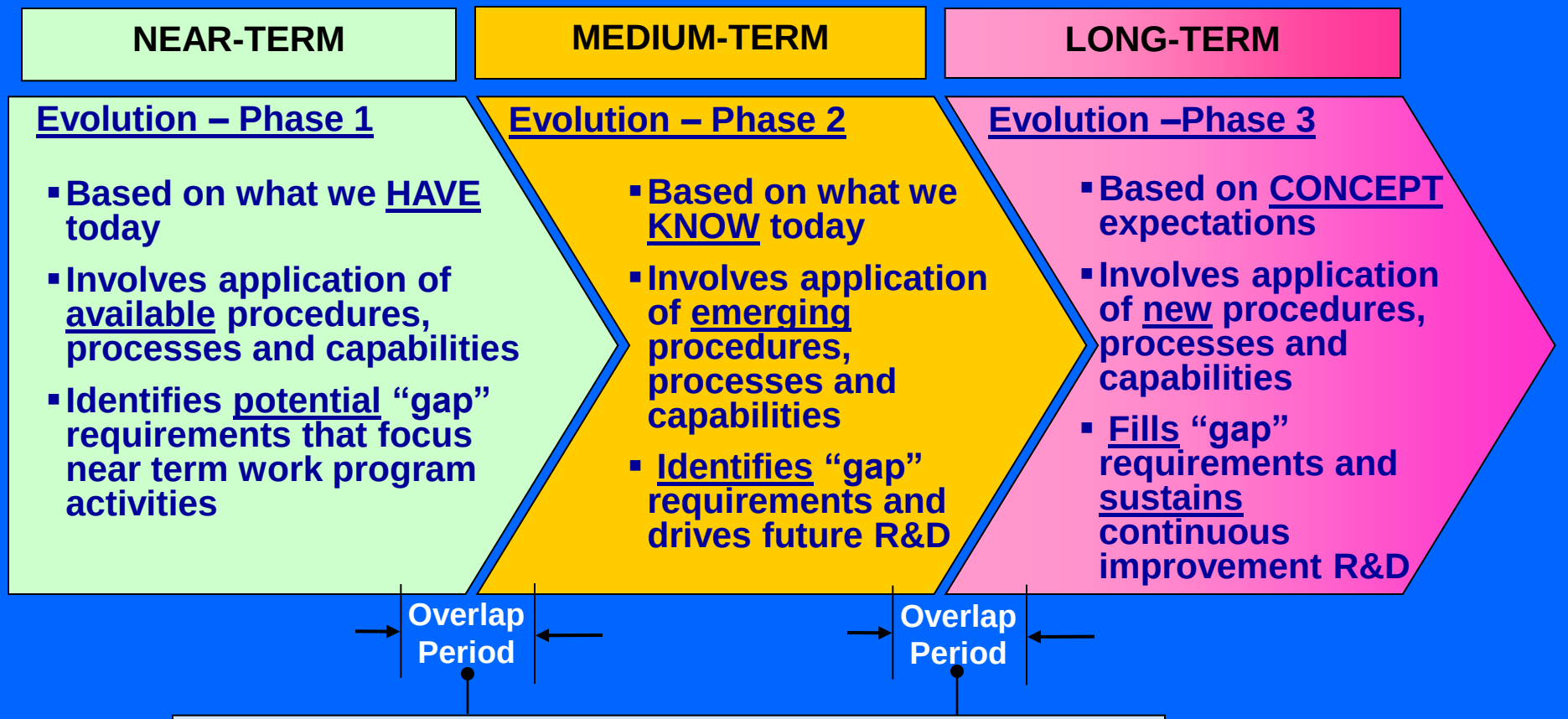
- In essence, a **Performance Framework** is a set of
  - principles
  - requirements
  - terminology
  - describes the building blocks/tools
  - used by ATM community members to collaborate and cooperate on performance driven activities/tasks

Performance Framework
Global/Regional/National Tasks

- Transition from systems based to performance based

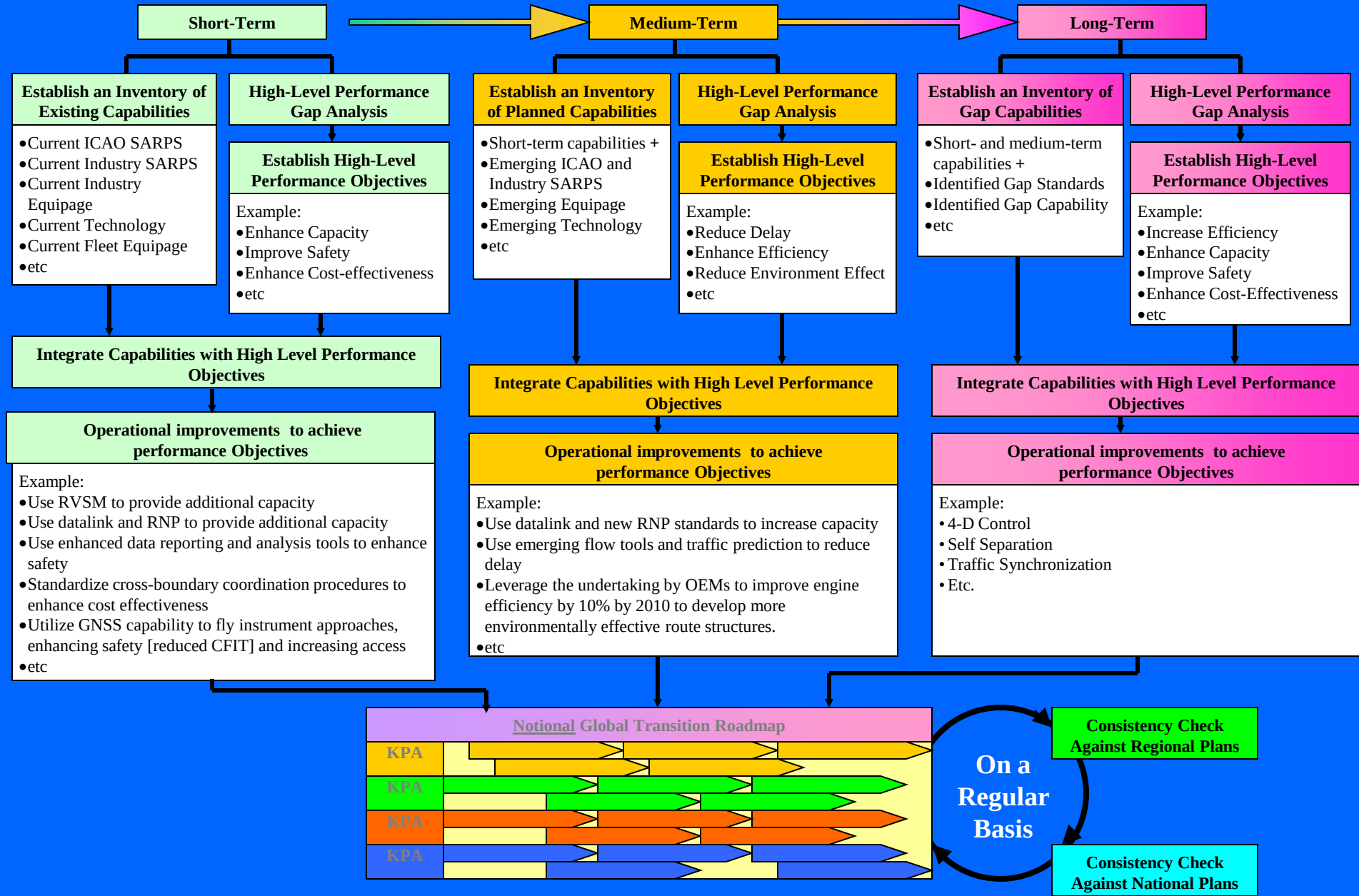
- What ICAO is doing:
  - Shifting towards performance based SARPs
  - Determining high level performance indicators
  - Developing system performance: Communications, Navigation and Surveillance (RCP, PBN, RSP)
- What Regions and States are doing:
  - Developing Regional/National performance objective and Performance framework forms
  - Determining the gaps and implementing projects that would meet performance targets

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.

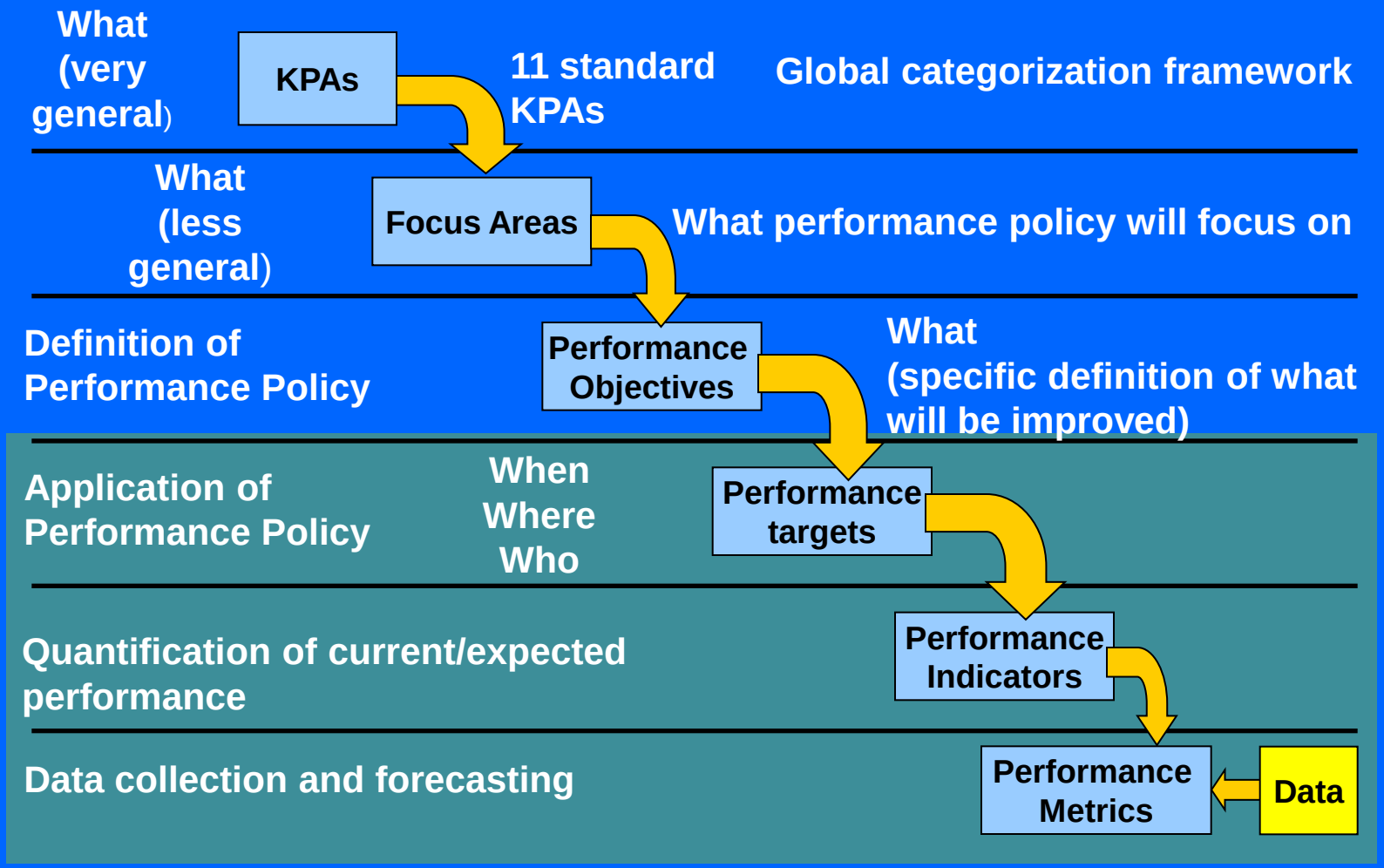
Transition Roadmap



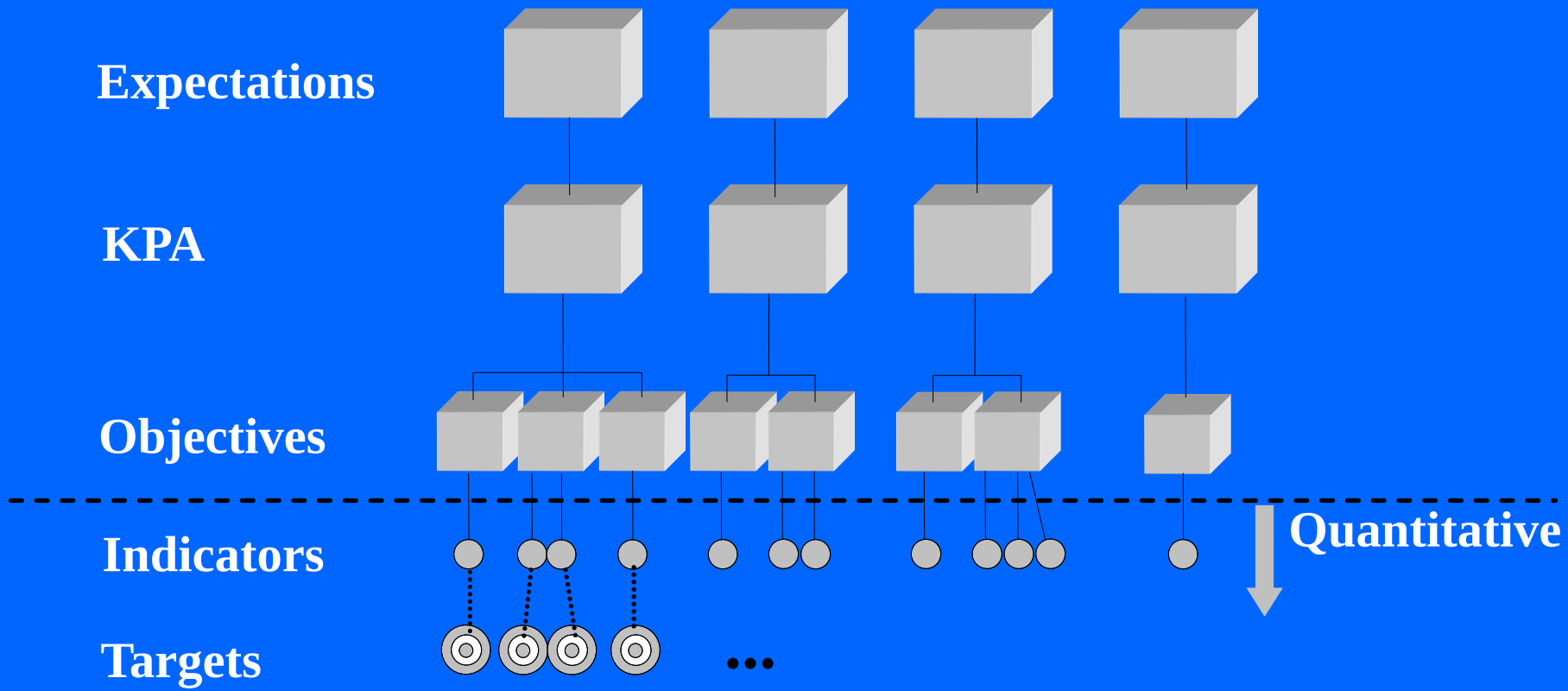
Measuring success

- **Success of ICAO**
  - **Performance driven draft Business Plan 2011-2013 Proposals include :**
    - **Three Strategic Objectives(SO) for the organization**
    - **For each SO, corresponding programmes are listed**
    - **In turn, global/regional projects are identified for each programme**
    - **Each programme will have measurable metrics**
- **Success of global air navigation system**
  - **Based on outcomes**
  - **Meet 11 expectations of ATM Community**
  - **Each PIRG will have measurable metrics**

Measurement Approach

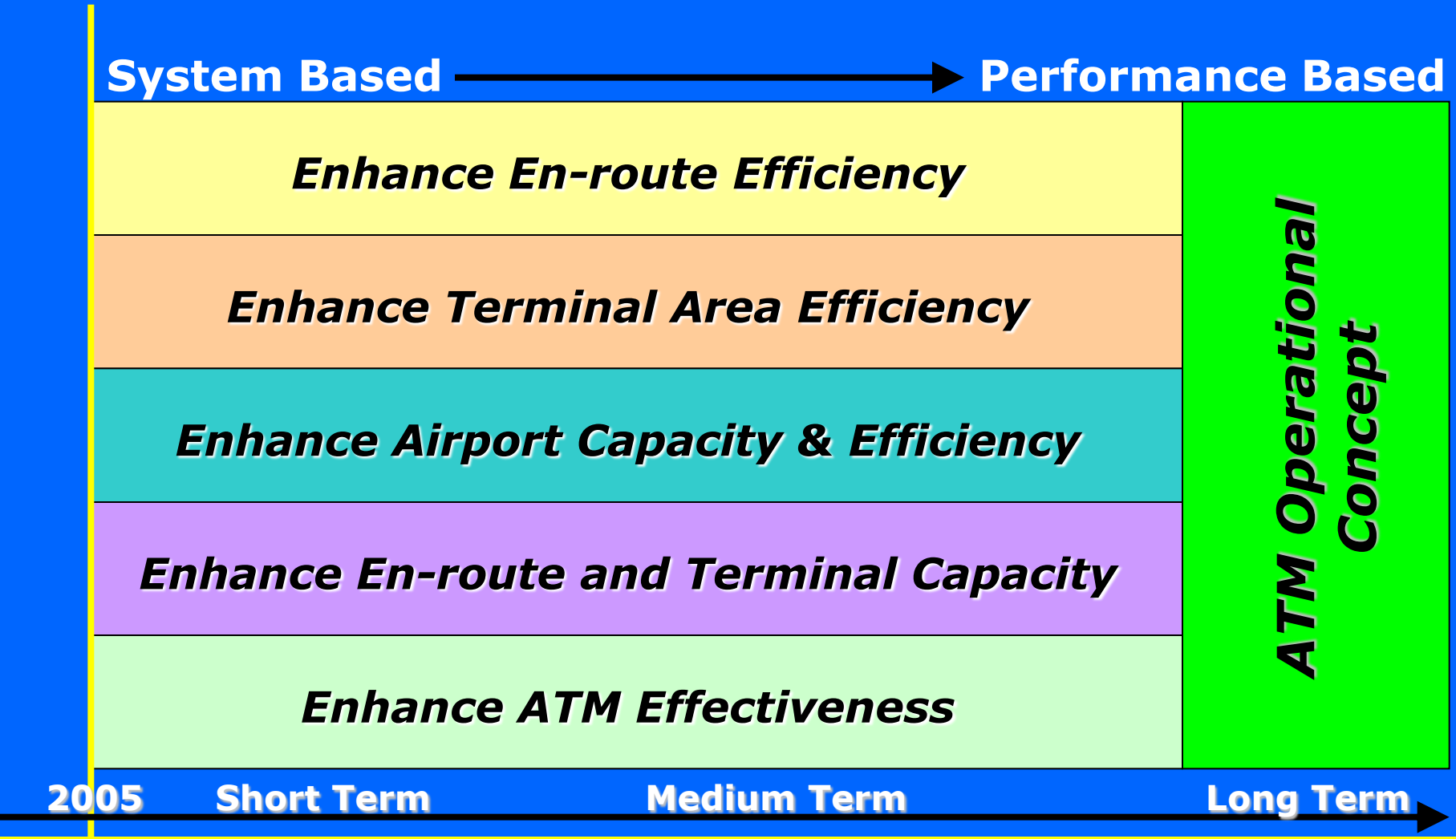


PERFORMANCE MEASUREMENT



Objective is met when indicators meet or exceed targets

Performance objectives – examples



Indicators and Metrics – examples (1/3)

Indicators	Metrics
Flexibility: number of user preferred route requests granted	➢ The percentage of flights subject to an Air Traffic Control (ATC) preferred route
Flexibility: reduced 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: Reduced impact of system outages	➢ Total of number of cancellations and diversions at major airports within the affected area ➢Total delay of departures ➢total difference between scheduled and actual arrival times

Indicators and Metrics – examples (2/3)

Indicators	Metrics
Access: airports with precision approach capability	➢ **The number of airports that have at least one precision approach**
Access: civilian utilization of special use airspace	➢ **Percentage of flights that use special use airspace**
Capacity: Reduced ground movement times at key airports during peak operations	➢ **Monthly average taxi in and taxi out times at 25 major airports.**

Indicators and Metrics – examples (3/3)

Indicators	Metrics
Safety: Avoidance of accidents	➢ **number of accidents per 100,000 departures**
Cost effectiveness: Minimizing operating costs	➢ **Total operating cost plus cost of capital divided by IFR flights**
Capacity: increase in air cargo capacity	➢ **Tons of cargo per year**

Performance Framework
Flight Safety

- Performance Framework Process is the same for safety and efficiency
- PFFs for Flight safety (FS) issues were developed and presented to AFI Special RAN meeting in November 2008. Also OPS section is working closely with RASG-PA on PFFs
- For Performance planning related to FS:
  - Reference is made to Global Aviation Safety Plan (GASP)
  - Linkage is shown to Global Safety Initiatives (GSIs)
  - Projects are drawn from Global Aviation Safety Road Map (GASR)
  - Metrics are identified by the outcome

Performance Framework
Rollout (2008-2009)

- All the PIRGs have adopted performance driven approach to planning and implementation of air navigation systems. In turn, all the PIRGs have called upon States to develop performance driven plans
- Conducted Performance workshops for the States of CAR/SAM/MID/ASIA/PAC /Eastern Europe regions
- All the PIRGs have finalized the regional performance objectives
- States in Middle East, Asia/Pacific, Europe and CAR/SAM regions are progressing well in developing performance driven national plans

Performance Framework
Challenges

- Need to increase performance awareness
- States require further support for transition to performance based planning
- In terms of performance framework for flight safety, regions require additional guidance
- Establishing a process by States for data collection/analysis of performance metrics is a challenging task

Performance Framework
Way forward: 2010-2011 (1/4)

- Workshops is planned for the AFI Region in December 2010
- PIRGs/Regions continue to use performance based approach in all subgroup/taskforce meetings thus increasing performance awareness of States
- Next steps call for performance monitoring and measurement
  - All PIRGs are being requested to identify suitable metrics and call upon States and international organizations to establish a process to collect data, process and submit to the regional office
  - HQ to determine a set of common metrics for all regions

Performance Framework

Way forward: 2010-2011 (2/4) – ATB initiatives

✓Introduction of a new Form on Accidents and serious incidents of civil aircraft, consistent with ADREP standards.

✓Implementation of a form on aviation personnel licenses and training capacities.

✓Collection of aircraft movements data annually from ANSPs through States, in close collaboration with CAEP for an update of their Common Operations Database (COD) with a view to avoiding duplication.

✓ Introduction of a new collection process on fuel consumption by commercial air carriers as per GIACC recommendation.

✓Data requirement needs in terms of airport capacity constraints that could be induced by continuous air traffic growth.

Performance Framework
Way forward: 2010-2011 (3/4)

- Proposed to introduce at every PIRG meeting, a regional performance review report (RPRR)of air navigation systems
  - This RPRR will provide an annual progress report in both qualitative and quantitative terms
  - It will highlight the issues/challenges and also suggest solutions in achieving performance objectives

- In consultation with Regional Offices and PIRGs, a standardized format for this RPRR will be developed

- Regional Offices with the assistance of the OPS section will address the performance driven plan for safety

Performance Framework

Way forward: 2010-2011 (4/4) – TCB initiatives

- **Technical Cooperation approach to Performance based projects**
  - **Regional project: performance based planning and implementation of air navigation systems for Caribbean region is in progress – to be launched in January 2011**
  - **National project: performance based planning workshops – was launched in February 2010 for India; next one is planned for Republic of Korea in 2011**
  - **Training centres: introduction of PBA in CATC training programmes – coordination is in progress with CATC, Thailand**

Thank you