



**INTERNATIONAL CIVIL AVIATION ORGANIZATION**

*A United Nations Specialized Agency*

ASBU/SIP/LIMA/2013-WP/14

# Performance management – Identification of metrics

**H. Sudarshan**

Director, Air Navigation Bureau

# Outline

- Background
- Performance Framework
  - Requirements, terminology
- Measurement approach
- Metrics
- Next Steps



# Vision Statement



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

# What is a Global ATM System?

It is a system of systems 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.**

# Performance Framework Background



- Eleventh Air Navigation Conference, held in September 2003, urged ICAO to develop a performance framework for Air Navigation Systems
- 35<sup>th</sup> Session of the ICAO Assembly, held in September 2004, adopted Resolution A35-15, App B and 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

# 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 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 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 : In ASBU approach the module itself becomes performance objective – ASBU B0-RSEQ: Improve traffic flow through runway sequencing

- **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 Framework Terminology (3/3)



- **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 progressive achievement of performance objective.
- Example: Three percent increase in the capacity of terminal airspace

- **Performance Metric**

- Metrics are quantitative measures of system performance – through data.
- Example: Number of movements per day per aerodrome; Kilograms of fuel saved per operation; Kilograms of CO<sub>2</sub> emissions reduced per operation.

# Performance Framework Tools



**GAP analysis**  
operational enhancements/Technology



**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”

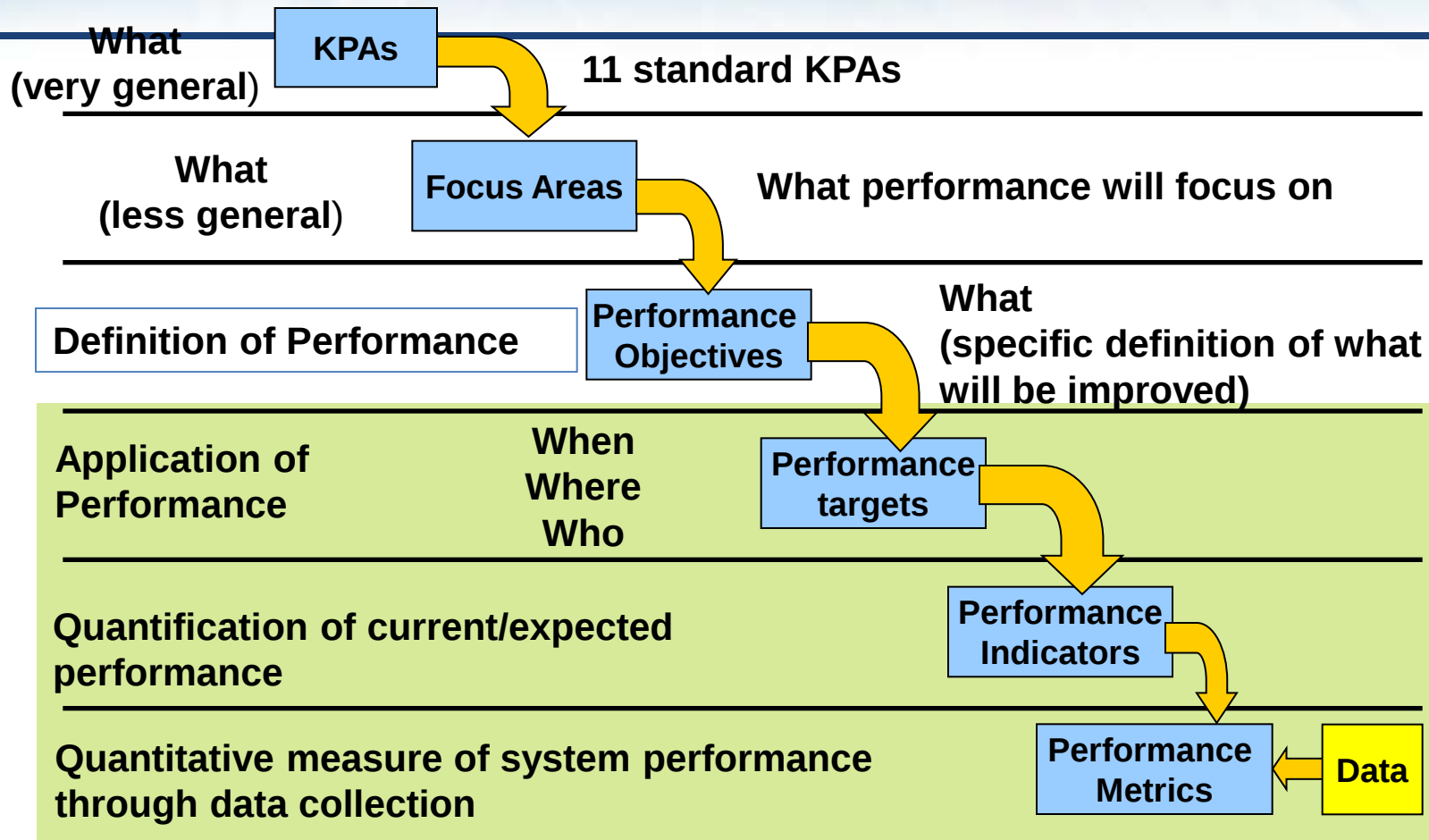
# Performance Framework Definition



- 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

- Success of global air navigation system implementation
  - Based on outcomes
  - Meet 11 expectations of ATM Community
  - Each PIRG will choose measurable metrics related to KPAs

# Measurement Approach



# REGIONAL AIR NAVIGATION PLANNING PERFORMANCE METRICS- EXAMPLES



| KPAs                  | Related Performance Metrics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Access & Equity    | 1. KPA/Access: Number of international aerodromes with APV<br>2. KPA/Access: Percentage of time Special Use Airspace (SUA) available to Civil Operations<br>3. KPA/Access: Percentage of requested flight level versus cleared flight level<br>4. KPA/Access: Number of access denials due to equipment failure<br>5. KPA/Equity Percentage of aircraft operators by class that equity is achieved<br>6. KPA/Equity: Percentage of different types of aircraft operating in a particular airspace or international aerodrome. |
| 2. Capacity           | 1. Number of operations (arrivals+departures) per international aerodrome per day<br>2. Average ATFM delay per flight at an international aerodrome<br>3. Number of landings before and after APV per international aerodrome<br>4. Average en-route ATFM delay generated by airspace volume<br>5. Number of aircraft in a defined volume of airspace for a period of time                                                                                                                                                    |
| 3. Cost effectiveness | 1. IFR movements per ATCO hour on duty<br>2. IFR flights (en-route) per ATCO hour duty                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 4. Efficiency         | 1. Kilograms of fuel saved per flight<br>2. Average ATFM delay per flight at the international aerodrome<br>3. Percentage of PBN routes                                                                                                                                                                                                                                                                                                                                                                                       |
| 5. Environment        | 1. Kilograms of CO <sub>2</sub> emissions reduced per flight (= KGs fuel saved per flight x 3.157)<br>2. The number of electronic pages dispatched                                                                                                                                                                                                                                                                                                                                                                            |

# REGIONAL AIR NAVIGATION PLANNING

## PERFORMANCE METRICS- EXAMPLES



| KPAs                                  | Related Performance Metrics                                                   |
|---------------------------------------|-------------------------------------------------------------------------------|
| 6. Flexibility                        | 1. Number of backups available in emergency                                   |
|                                       | 2. Number of changes approved to the flight plan                              |
|                                       | 3. Number of alternatives granted                                             |
| 7. Global Interoperability            | 1. Number of ATC automated systems that are interconnected                    |
| 8. Participation of the ATM Community | 1. Level of participation in meetings                                         |
|                                       | 2. Level of responses to planning activities                                  |
| 9. Predictability                     | 1. Arrival/departure delay (in minutes) at international aerodrome            |
| 10. Safety                            | 1. Number of runway incursions per international aerodrome per year           |
|                                       | 2. Number of incidents/accidents with MET conditions 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                                                                |

# REGIONAL AIR NAVIGATION PLANNING IMPLEMENTATION METRICS- EXAMPLES



| Infrastructure                                       | Related Implementation Indicators/Supporting Metrics                                            |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>Monitoring the Implementation of ASBU modules</b> | 1. Percentage of aircraft fitted with ADS-B IN                                                  |
|                                                      | 2. Percentage of aerodromes comply with Visual Aids for Navigation requirements as per Annex 14 |
|                                                      | 3. Percentage of certified aerodromes used for international operations                         |
|                                                      | 4. Number of States implemented WGS-84                                                          |
|                                                      | 5. Percentage of aircraft fitted with ACAS / logic Version 7.1                                  |
|                                                      | 6. Percentage of aerodromes with PBN STAR implemented                                           |
|                                                      | 7. Percentage of aerodromes with CDOs implemented                                               |
|                                                      | 8. Number of ADS-Cs available over oceanic/remote area                                          |
|                                                      | 9. Number of continental CPDLC systems established                                              |
|                                                      | 10. Percentage of aerodromes with PBN SIDs implemented                                          |
|                                                      | 11. Percentage of aerodromes with CCOs implemented                                              |
|                                                      | 12. Percentage of ATS units with ground based safety nets                                       |

# Performance Framework

## Next Steps



- The next step calls for establishment of measurement and reporting strategy.
- While PIRGs are progressively identifying a set of regional performance indicators and supporting metrics, States have recognized that data compilation, processing, storage and reporting for the identified regional performance metrics are fundamental to success of the performance-based approach.
- PIRG to assign the performance measurement to an existing subgroup of a PIRG or establish a new subgroup for this purpose;
- States to support the ICAO Regional Office by providing the requisite information to demonstrate operational improvements; and
- States, that have not yet done so, to establish a performance measurement strategy for their air navigation system.



North American  
Central American  
and Caribbean  
(NACC) Office  
Mexico City

South American  
(SAM) Office  
Lima

**ICAO  
Headquarters  
Montreal**

Western and  
Central African  
(WACAF) Office  
Dakar

European and  
North Atlantic  
(EUR/NAT) Office  
Paris

Middle East  
(MID) Office  
Cairo

Eastern and  
Southern African  
(ESAF) Office  
Nairobi

Asia and Pacific  
(APAC) Office  
Bangkok

**Thank You**