International Civil Aviation Organization

**PERFORMANCE BASED AIR NAVIGATION IMPLEMENTATION PLAN - METRICS**

**Seminar/Workshop on the Implementation of the Performance Based Air Navigation Plan for the South American Region**
**(Lima, Peru, 9 to 13 May 2011)**

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## OBJECTIVE

This presentation provides introductory information on the performance based approach and the formulation of metrics to serve as a basis for the performance measurement of the Performance Based Air Navigation Plan for the South American Region

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## PERFORMANCE BASED APPROACH

- The notion of the Performance Based Approach (PBA) emanated from good industry practices and evolution of the aviation industry into a less regulated and more corporatized environment, with greater accountability
- ICAO supports and encourages the global adoption of performance management techniques as a step towards a Performance Based Global Air Navigation System as enivsaged in the *Global Air Traffic Management Operational Concept* (Doc 9854) and the *Manual on Air Traffic Management System Requirements* (Doc 9882)



## PERFORMANCE BASED APPROACH

**The PBA is based on the following three principles**

- A strong focus on desired/required results: Instead of prescribing *solutions*, the desired/required *performance* is specified. This implies finding what the current situation is, what the most appropriate result should be , as well as clarifying who is accountable for achieving those results
- Informed decision making, driven by desired/required results: This means working backwards, from the "what (result)" – the primary approach –to decisions about "how"
- Reliance on facts and data for decision making: Results desired/required, drivers, constraints, deficiencies, shortcomings, options expressed in quantitative terms (not in qualitative). Rationale "if you can't measure it, you can't manage it"



## PERFORMANCE BASED APPROACH

**PBA is expected to provide the following advantages:**

- It is result oriented, allows customer focus and promotes accountability
- Policy making becomes much more transparent when the goals to be reached are publicly stated in terms of performance outcome (rather than solutions)
- Shift from *prescribing solutions* to *specifying desired/required performance* gives more freedom and flexibility in selecting suitable solutions.
- "Technology driven approach" and "Solutions searching for a problem to solve" can be avoided
- Stress on rigorous scientific approach in place of anecdotal evidence
- Focus on desired/required results helps decision makers to set right priorities, make most appropriate trade offs, choose optimum solution and resource allocation
- Provides more predictability of benefits
- Typically results in cost savings, which often is much more than the investment made in applying the approach

## PERFORMANCE BASED APPROACH

Once an organization (or State, region etc.) has decided to adopt the PBA approach, it must acknowledge that following ingredients are essential for success:

- Commitment *(at the top)*
- Agreement on goals *(desired results)*
- Organization *(who is responsible/accountable for various functions)*
- 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)*

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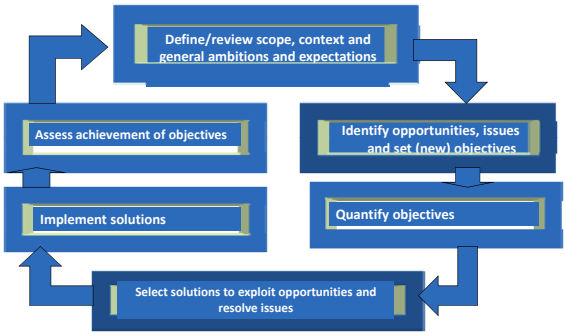
## PERFORMANCE MANAGEMENT PROCESS

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## PERFORMANCE MANAGEMENT PROCESS

| PROCESS | PRINCIPLE |
|---|---|
| Step<br>Define/review the scope, context and ambitions and general expectations | Strong approach on desired/required results |
| Step 2<br>Identify opportunities, problems and set objectives (new) | |
| Step 3<br>Quantify the objectives | Support in fact and data based decision taking |
| Step 4<br>Select solutions to take advantage of opportunities and solve the problems | Informed decision taking, impulsed by desired/required results |
| Step 5<br>Implement solutions | |
| Step 6<br>Evaluate the achivement of objectives | Support in fact and data based decision taking |

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## PERFORMANCE METRICS MEASUREMENT

Performance measurement is carried out through the collection of data for the support metric (which generates the need to collect costs and flight data). The support metric has three functions:

- to serve as a basis for evaluating and supervising the provision of ATM services;
- to define the ATM services the user values; and
- to provide common criteria for the cost-benefit analysis for the development of air navigation systems.

This metric is used to calculate the performance indicator values. In other words, the metric is the quantitative measure of the system's performance: how well the system is working.

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## PERFORMANCE METRICS MEASUREMENT

The ATM systems performance supervising and measurement requires metrics in areas such as:

access and equity;
capability;
cost-effective;
efficiency;
environment;
flexibility;
prediction capability; and
safety.

The Region, on the basis of its experience, could determine the appropriate metric for its situation. The metrics should use simple definitions and permit easy comprehension.

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## PERFORMANCE METRICS MEASUREMENT

| Key Performance Area | Corresponding proposed metrics |
|---|---|
| **1. Access and equity** | Civil flights using fixed airspace;<br>Unusable airspace due to navigation restriction;<br>Number of access denials;<br>Number of airports with published approaches. |
| **2. Capacity** | Average daily airport capacity for a group of 35 airports measured as a 5 year moving average;<br>Hourly number of IFR movements (departure + arrivals) during IMC;<br>Total number of operations per day;<br>Number of aircraft in a specified volume of airspace;<br>Airspace throughput/TMA-number of aircraft per 100 nmi3;<br>Traffic density i.e. number of aircraft per 100 nmi3;<br>Enroute utilization i.e. number of aircraft per 100 nmi3;<br>Airside Capacity i.e. number of operations per hour;<br>Airborne delay i.e. minutes per flight;<br>Arrival/departure delay i.e. minutes per flight. |

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## PERFORMANCE METRICS MEASUREMENT

| Key Performance Area | Corresponding proposed metrics |
|---|---|
| **3. Cost effectiveness** | Total operating cost plus cost of capital divided by IFR flights;<br>Average cost per flight at a system wide annual level;<br>Investment cost;<br>Cost per retrofit;<br>Out of service cost;<br>Operating and Maintenance cost. |
| **4. Efficiency** | Estimated fuel savings (year 2000 as baseline);<br>Percent of flights departing on-time;<br>Percentage of instrument runway ends with an approach procedure with vertical guidance (APV), (BARO-VNAV and/or augmented GNSS) either as the primary approach or as a back-up for precision approaches;<br>PBN Routes implemented and published in enroute;<br>Number of certified aircrafts and pilots for PBN operations for enroute and TMA;<br>Percent of flights with normal flight duration;<br>Traffic movements i.e. # of movements;<br>Unused capacity i.e. # of movements;<br>Number of ATC automated systems that are interconnected;<br>Number of terminal areas with SID/STAR implemented. |

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## PERFORMANCE METRICS MEASUREMENT

| Key Performance Area | Corresponding proposed metrics |
|---|---|
| **5. Environment** | Amount of emissions which are attributable to inefficiencies in ATM service provision;<br>Pounds of fuel burn per operation;<br>Local noise foot print;<br>Number of noise complaints. |
| **6. Flexibility** | Proportion of rejected changes for which an alternative was offered and taken;<br>Enroute flight distance Percentage of flights off-on ATC preferred routes;<br>Number of backups available for emergency;<br>Flexibility in sequencing;<br>Number of restrictions. |
| **7. Predictability** | Variability in delay for arrival time./departure time/enroute and Taxi time i.e. Minutes /flight;<br>Number of aircraft held i.e. # Aircraft /hr;<br>Number of cancellations/diversions/misconnections i.e. #of flights. |
| **8. Safety** | Number of runway incursions per year;<br>Number of operational errors per year;<br>Number of accidents per 100,000 departures;<br>Number of fatalities per 100,000 departures;<br>Number of LHD reports. |

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## PERFORMANCE METRICS MEASUREMENT

**Conclusion 16/33— ADOPTION OF PERFORMANCE MONITORING AND MEASUREMENT PROGRAMME FOR THE CAR/SAM REGIONS**

Considering the importance to monitor and measure the achievement of the performance objectives defined for the CAR/SAM Regions, that States, Territories and International Organizations of CAR/SAM Regions:

a) adopt the set of metrics related to key performance areas of access, capacity, cost effectiveness, efficiency, environment, flexibility, predictability and safety; described in Appendix A of this part of the report, to monitor and measure the implementation advances of the regional performance objectives;
b) incorporate these metrics into their performance monitoring programmes, collect relevant data and submit to the ICAO Lima and Mexico regional offices on a regular basis;
c) coordinate with ATM community members to promote information and data collection; and
d) inform ICAO Regional Offices of their advances by 30 November 2010.

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## PERFORMANCE METRICS MEASUREMENT

| REGIONAL PERFORMANCE OBJECTIVE: SAM 08<br>IMPROVEMENTS TO THE AERONAUTICAL FIXED SERVICE IN THE SAM REGION | |
|---|---|
| **Benefits** | |
| **Safety** | • Reduction of operational coordination errors between adjacent ACCs.<br>• Increased ATM situational awareness.<br>• Reduced pilot and controller workload. |
| **Environmental protection and sustainable development of air transport** | • Increased capacity and availability of aeronautical fixed service in support of ATS, MET, AIS and SAR applications.<br>• Support to ATFM / CDM. |
| **Metrics** | • Number of States interconnected to the AMHS.<br>• Number of States that have operationally implemented AIDC.<br>• Percentage of phases implemented for improving the regional ATN network. |

***2012 – 2018***
***Strategy***

| ATM OC COMPONENTS | TASKS | PERIOD | RESPONSIBILITY | STATUS |
|---|---|---|---|---|
| **AOM**<br>**ATM-SDM**<br>**DCB**<br>**CM**<br>**AUO** | a) Complete the implementation of AMHS systems in those States that do not have such systems yet. | (*) - 2013 | States | In progress |
| | b) Agreement for AMHS interconnection through the establisment of MoUs | (*) - 2014 | States | In progress |
| | c) Implement communication services for the centralised ATFM | 2015 - 2018+ | States | Valid |
| | d) Implement AIDC in the automated centres of the SAM Region; | (*) - 2013 | States | In progress |
| | e) The operational implementation of AIDC for the automatic hand-off of flight plans between ACCs of adjacent States. | (*) - 2014 | States | In progress |
| | f) Improve the regional ATN network | 2012 -2015 | States | Valid |
| | g) Monitor implementation progress | 2012-2017 | GREPECAS | Valid |
| **Relation-ship with GPIs** | GPI/6: ATFM, GPI/9: situational awareness, GPI/ 16: decision support and alerting systems, GPI/18: aeronautical information, GPI/17: data link applications, GPI/19: meteorological systems, GPI/22: communication infrastructure. | | | |

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## CONCLUSIONS

Planning the implementation of air navigation systems based on specific performance objectives upon emphasizing on desired/required results aids decision takers in establishing correct priorities, achieving an appropriate compensatory balance, selecting the best solution and assigning resources.

The ATM systems performance monitoring and measurement requires metrics with the aim of verifying the progress in the implementation of the expected result.

The metrics should be associated in areas such as access, capability, cost effectiveness, efficiency, environment, flexibility, prediction capability and safety.

The Region, on the basis of its experience, could determine the appropriate metric for its situation. The metrics should use simple definitions and permit easy comprehension.

Further information in the *Manual on Global Performance of the Air Navigation System* (Doc 9883).

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THANK YOU.
ANY QUESTIONS?

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