



Metrics and Performance Management

W. Post

General objective



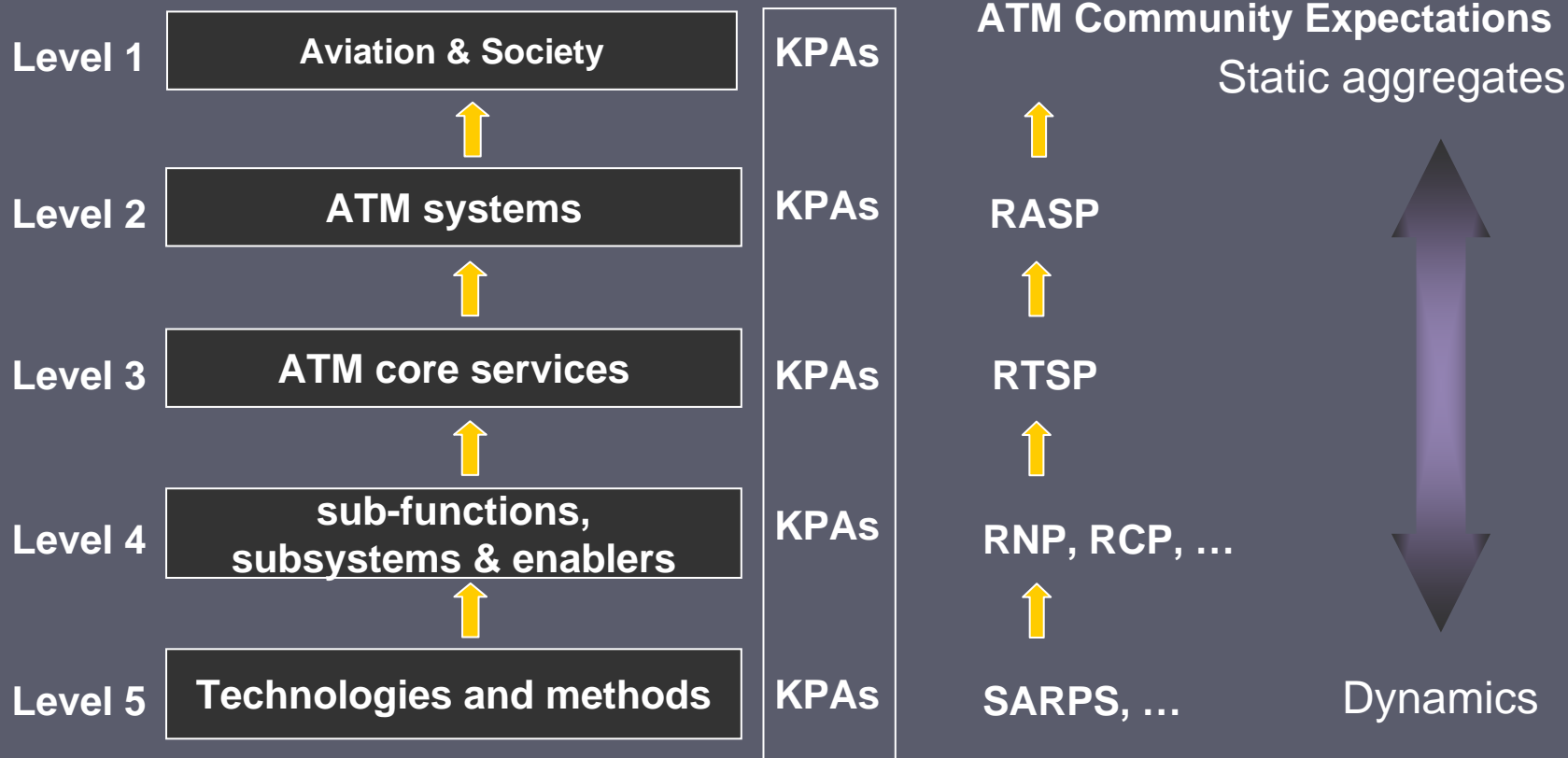
- ▶ create and reinforce working and personal relationships between leading experts and researchers in the ATM R&D community, share available results and reach consensus on major issues. Since the goal of these seminars is to “create and reinforce”, an emphasis in the selection process will be on identifying and tracking continuity and progress from previous seminars.

Track scope



- ▶ "ATM performance assessment, modeling and analysis techniques, gate-to-gate (en-route to en-route) capacity issues, demand forecasting, demand management; this also includes wider ATM business related issues."

Layered Performance Management in ATM



↑ = Impact relationship

Key Performance Areas



KPA 01 Access and Equity

KPA 02 Capacity

KPA 03 Cost Effectiveness

KPA 04 Efficiency

KPA 05 Environment

KPA 06 Flexibility

KPA 07 Global Interoperability

KPA 08 Participation by the ATM community

KPA 09 Predictability

KPA 10 Safety

KPA 11 Security

Note1:

Mostly applicable to upper 2 to 3 layers. Different KPAs could be applicable to lower layers

Coverage of track papers



Level	1	2	3	4	5
KPA 01 Access and Equity					
KPA 02 Capacity		Red	Yellow	Red	
KPA 03 Cost Effectiveness	Red	Yellow			
KPA 04 Efficiency	Yellow	Red			
KPA 05 Environment	Yellow	Yellow			
KPA 06 Flexibility					
KPA 07 Global Interoperability					
KPA 08 ATM community Participation					
KPA 09 Predictability			Yellow		
KPA 10 Safety		Yellow		Yellow	
KPA 11 Security		Yellow			

Observations



- ▶ Common set of KPIs for reporting at ATM system level (2) is still missing.
- ▶ Causality between the studied performance at lower level and desired change at system level is usually implicit.
- ▶ Are we focussing on the 1st, 2nd, or 3rd order effects?
- ▶ Studies are often specialised to a particular local problem.
- ▶ Data availability still often an issue.

Conclusions



- ▶ Main focus of papers in track is on few performance areas:
 - Capacity, Efficiency, Cost effectiveness, Environment, Safety (papers from SAF track not counted).
 - Some other areas are addressed in more detail in other tracks (e.g. safety, environment).
- ▶ Value of ATM interesting 'new' topic.

Conclusions



- ▶ Need for a commonly applied ATM performance framework is high.
 - R&D,
 - Daily performance assessment,
 - Target setting.
- ▶ Standardise metrics definitions.
- ▶ How to deal with trade-offs at all levels?
- ▶ Need to build common understanding of current and future (desired) ATM performance.

Further details



- ▶ Paper summaries can be found in subsequent slides of this presentation but are not presented.
- ▶ Some slides with definitions from ICAO ATM Performance Manual work are provided but not presented.



Questions?

Session 1



- ▶ Economic Contribution and Productivity of ATM -
Dr. Paula Leal de Matos – Eurocontrol.
 - KPA 03 – level 1.
- ▶ Amongst first studies to address ATM Added value
 - Difficulty to collect required economic data.
- ▶ North America and Europe: 22 billion US\$,
230.000 jobs.
- ▶ Productivity comparable to other technologically
advanced sectors.
- ▶ True value of ATM may need to be further clarified

Session 1

- ▶ Extent and Impact of Future NAS Capacity Shortfalls in the United States: A Socio-Economic Demand Study - Shahab Hasan – LMI/David Ballard – GRA, Inc.
 - KPA 03 – level 1.
- ▶ FAA Long term forecast & Capacity constraints from 2012.
- ▶ Lack of capacity would cost from 6.5 (2015) to 19.5 billion US\$. Cumulative between 90 and 230 billion US\$ for period 2015-2025.

Session 2

- ▶ **Flight Efficiency Studies in Europe and the United States** - Tarja Kettunen – ISA Software/Dave Knorr – FAA
 - KPA 04 – Level 2.
- ▶ **Indicator: Excess distance / direct distance.**
 - Radar data versus great circle route.
 - Inefficiency: 10%, distance and city-pair dependant. Extra Cost 1 billion €/year.
 - Causes: Route structure, TMA Ops, Mil. Areas.
 - ▶ 70% TMA, 30% en route. Same for US en EU.
 - Mature Indicator. Need to include vertical profile

Session 2

- ▶ A Preliminary Analysis of the Impact of Mile-In-Trail Restrictions on NAS Flight Operations – Tim Myers – Metron Aviation, Inc.
 - KPA 02 + 09 – Level 2 + 3
- ▶ NTML and ETMS data are not integrated.
- ▶ 32% of MITs < 5 flights. Necessary?
- ▶ Suggests no major impact on en route delay, actual en route spacing, or GDP arrival compliance.

Session 3

- ▶ Modeling Delays and Cancellation Probabilities to Support Strategic Simulations - David Lovell – University of Maryland
 - KPA 02 – Level 2
- ▶ Delays & Cancellations -> Cost.
- ▶ Simple & expedient models.
- ▶ Strategic simulations & Slot Auctions.
 - Low levels of airline proprietary information.

Session 3



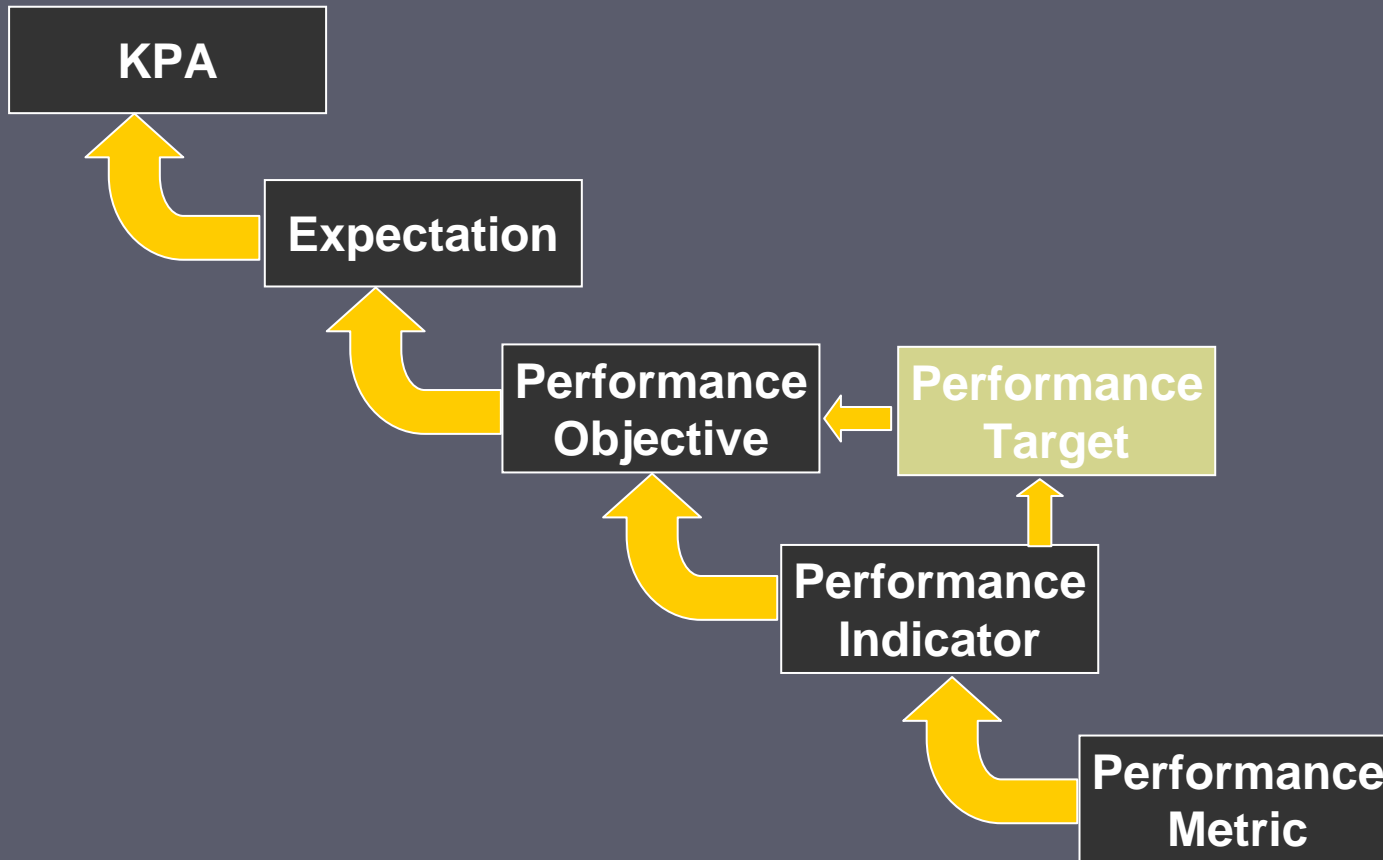
- ▶ Estimation of Arrival Capacity and Utilization at Major Airports - Husni Idris / Antony Evans – Titan Corporation
 - KPA 02 – Level 2 + 3.
- ▶ Using historic data and modelling.
- ▶ Achievable arrival capacity & current utilisation.
 - Smaller APTs underutilised by lack of demand.
 - ▶ No saturation.
 - BOS also underutilised by inefficient operations.
- ▶ Airport analysis of demand growth potential and/or efficiency improvement potential.

Session 3



- ▶ The Feasibility of Measuring Capacity in a Real-Time ATM Simulation Independent of Subjective Controller Workload Measurement – Mick van Gool – EUROCONTROL/ Kevin Corker – SJSU.
 - KPA 02 – Level 3 + 4
- ▶ Verify Integra output with Air MIDAS.
 - HITL experiments processed by both methods.
- ▶ Information Processing Load as Indicator.
- ▶ Similar patterns yet higher values for Integra.
 - Effect of Air MIDAS Scheduler?

Terminology



Terminology (1)

▶ Expectation

- 11 high level expectations of society are defined in the ICAO OCD (safety, capacity, cost effectiveness etc.).

▶ Key Performance Area (KPA)

- 11 KPAs, one per expectation as defined in the ICAO OCD. KPAs named after their corresponding expectation.
- Used as categories throughout the performance framework, to group related *performance objectives*.

▶ Performance Objective

- Each *expectation* should be reached through meeting a set of specific, measurable, achievable, relevant and timely (SMART) *objectives*.
- *Objectives* define – in a qualitative way - a desired trend from today's performance (eg improvement), within a well specified ATM planning environment (eg each objective is applicable within the scope of a given geographical area, time period and other scope-limiting criteria).

Terminology (2)



▶ Performance Indicator

- *Indicators* are defined when there is a need to numerically document current performance levels and progress in achieving an *objective*.

▶ 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 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.