

SIP/2009-WP/04

ATM

Operational

Concept



Global Air Navigation System ATM Operational Concept

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**Workshop on the Development of
National Performance Framework
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Presentation Outline



- History and Background
- Air Navigation System Community
- Concept components
- Guiding principles
- Expectations / KPA's
- Key Conceptual Changes
- Information Management
- Expected benefits
- Summary

History and Background

- FANS
- Tenth Air Navigation Conference
- CNS/ATM Systems
- Global Coordinated Plan for Transition to ICAO CNS/ATM Systems
- Planning and Implementation Regional Groups embarked on an extensive effort
- SARPs, PANS, Guidance material
- Global Air Navigation Plan for CNS/ATM Systems (Doc 9750)
- Eleventh Air Navigation Conference
- ICAO's commitment to adopt a business process approach.

Vision statement



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.

Global Air Navigation System Operational Concept



- ➔ The global air navigation system operational concept is a vision that;
 - ✓ describes how an integrated global ATM system should operate
 - ✓ describes what is envisaged on the basis of services
 - ✓ describes how the services form an integrated system
 - ✓ utilizes an information rich environment, that solves most problems strategically, through a collaborative process
 - ✓ provides States and industry with clearer objectives for the design and implementation of ATM and supporting CNS systems

Transition to a Performance Based Air Navigation System



- Technology is not an end in itself
- Requires a comprehensive concept for an integrated, global air navigation system, based on clearly-established operational requirements
- Concept endorsed by the 11th Air Navigation Conference
- Concept endorsed by the 35th Assembly (2004)
- Strategic Guidance Established
 - ✓ ATM system requirements
 - ✓ Transition strategy
 - ✓ Performance framework
- **Next steps**
 - ✓ Global Performance Objectives to achieve measurable progress towards achievement of the vision of the concept

Performance Objectives



➔ Global Performance Objective:

Global Performance Objectives are improvements to the Air Navigation System that are on the critical path towards the Global Operational Concept and result in a direct performance enhancement, and through which differences that are obstacles to global interoperability are resolved. Global Performance Objectives are designed to measure the effectiveness of the transition strategy and may be used to verify consistent and harmonized progress/commitment by all stakeholders.

➔ Regional Performance Objective:

Regional Performance Objectives are improvements to the Air Navigation System that are required to evolve the air navigation system in support of the Global Performance Objectives, and in keeping with operating environments and priorities specific to a regional level. The regional level is defined by a division of the world into homogeneous regions with similar characteristics, a common interest in terms of performance and transition planning, and that is under by a common planning and implementation group.

Air Navigation System Community



The aggregate of organizations, agencies or entities that may participate, collaborate and cooperate in the planning, development, use, regulation, operation and maintenance of the air navigation system

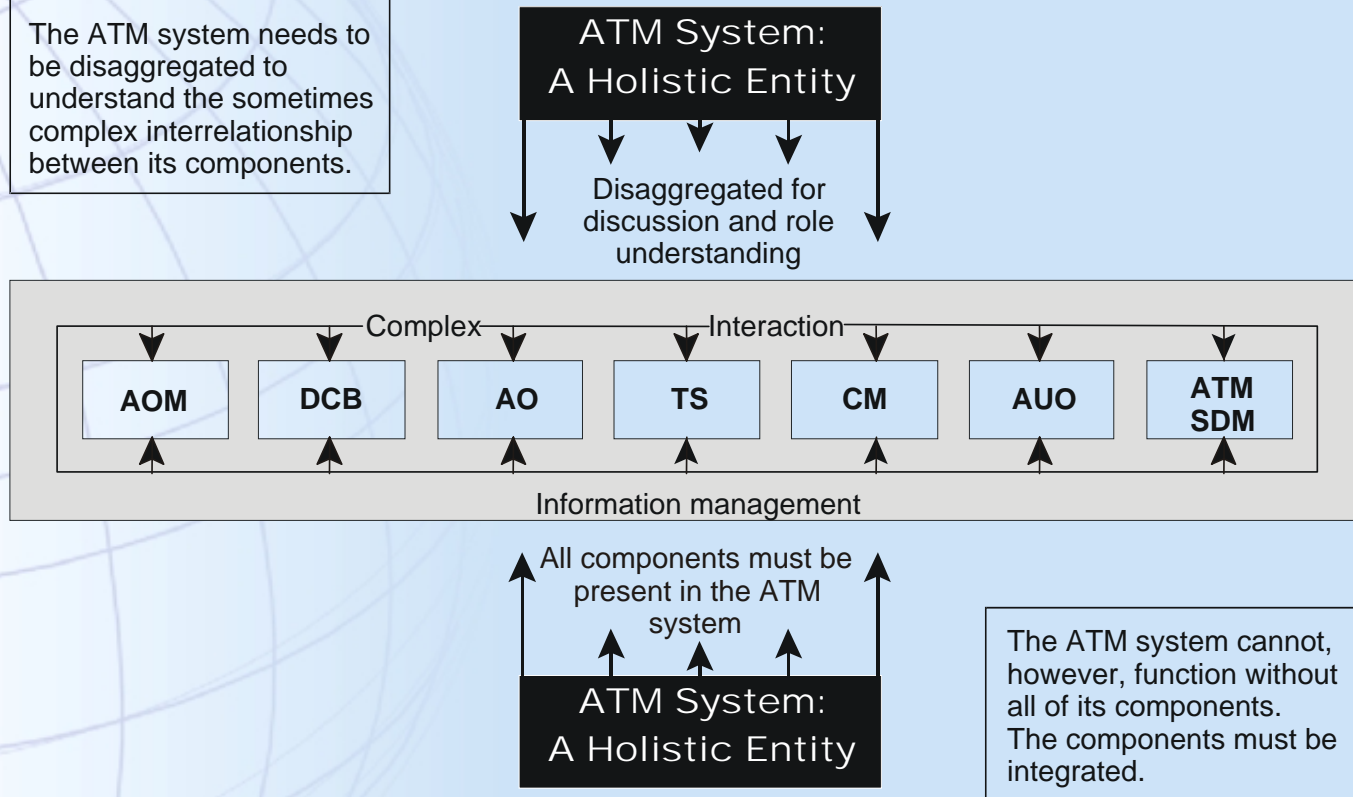
Members of the Air Navigation System Community

- Aerodrome community
- Airspace providers
- Airspace users
- ATM service providers
- ATM support industry
- ICAO
- Regulatory authorities
- States

The seven ATM concept components



The ATM system needs to be disaggregated to understand the sometimes complex interrelationship between its components.



AOM — Airspace organization and management
DCB — Demand/capacity balancing
AO — Aerodrome operations
TS — Traffic synchronization

CM — Conflict management
AUO — Airspace user operations
ATM SDM — ATM service delivery management

Seven Concept Components

- Airspace organization and management (AOM)
- Aerodrome operations (AO)
- Demand and capacity balancing (DCB)
- Traffic synchronization (TS)
- Airspace user operations (AUO)
- Conflict management (CM)
- ATM service delivery management (SDM)

Guiding Principles in six main areas:



- Safety
- Humans
- Technology
- Information
- Collaboration
- Continuity

Eleven Expectations / KPA's (in alphabetical order)



- Access and Equity
- Capacity
- Cost-effectiveness
- Efficiency
- Environment
- Flexibility
- Global interoperability
- Participation by the air navigation system community
- Predictability
- Safety
- Security

Key Conceptual Changes

Three Conflict Management Layers



- Strategic conflict management
- Separation provision
- Collision avoidance

Key Conceptual Change

Strategic Conflict Management



- Achieved through airspace organization and management, demand and capacity balancing and traffic synchronization
- “Strategic” is used here to mean “in advance of tactical”
- Strategic conflict management measures aim to reduce the need to apply the second layer — separation provision

Key Conceptual Change

Separation Provision

- The tactical process of keeping aircraft away from hazards by at least the appropriate separation minima
- Only used when strategic conflict management (i.e. airspace organization and management, demand and capacity balancing and traffic synchronization) cannot be used efficiently
- The separator is the agent responsible for separation provision for a conflict and can be either the airspace user or a separation provision service provider
- Self-separation is the situation where the airspace user is the separator for its activity in respect of one or more hazards
- Distributed separation occurs when, for an airspace user's activity, there are different separators for different hazards.
- A separation provision service will be available when safety or ATM design requires
- Full separation provision service occurs when the service provider is the separator for an airspace user's activity from all hazards

Key Conceptual Change

Collision avoidance



- The third layer of conflict management
- Must activate when the separation mode has been compromised
- Collision avoidance is not part of separation provision
- Collision avoidance systems are not included in determining the calculated level of safety required for separation provision
- Collision avoidance systems will, however, be considered as part of ATM safety management.

Key Conceptual Change

Conflict Management: Terms



- ➔ Conflict: Any situation involving aircraft and hazards in which the applicable separation minima may be compromised
- ➔ Conflict horizon is the extent to which hazards along the future trajectory of an aircraft are considered for separation provision

Key Conceptual Change

Conflict Management : Terms



- Hazards that an aircraft will be separated from are
 - ✓ other aircraft
 - ✓ terrain
 - ✓ weather
 - ✓ wake turbulence
 - ✓ incompatible airspace activity
 - ✓ surface vehicles and other obstructions on the apron and maneuvering area.

Key Conceptual Change

Conflict Management: Terms



- Separation minima are the minimum displacements between an aircraft and a hazard that maintain the risk of collision at an acceptable level of safety
- Separation mode is an approved set of rules, procedures and conditions of application associated with separation minima
- Separation provision is the tactical process of keeping aircraft away from hazards by at least the appropriate separation minima

Key Conceptual Change

Separation Provision: Terms

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Key Conceptual Changes

Collaborative Decision Making Terms

- ➔ Means achieving an acceptable solution that takes into account the needs of those involved
- ➔ Requires a spirit of cooperation
- ➔ Primarily invoked to resolve competing demands for an ATM resource and to organize a safe sharing of that resource among airspace users

Aeronautical Information Management (AIM)



- **Aeronautical Information Management (AIM) will ensure the cohesion and linkage between the seven concept components**
- ✓ Information management provides accredited, quality-assured and timely information used to support ATM operations. Information management will also monitor and control the quality of the shared information and provide information-sharing mechanisms that support the ATM community.
 - ✓ Information management will assemble the best possible integrated picture of the historical, real-time and planned or foreseen future state of the ATM situation. Information management will provide the basis for improved decision making by all ATM community members. Key to the concept will be the management of an information-rich environment.
 - ✓ Information management will contribute to meeting the expectations of the ATM community through all operational services. Its more direct contribution to improvements in the ATM system will be in the quality of the information that will, in turn, provide significant additional benefits. In particular, the wide availability of high-quality, relevant aeronautical data presented to all airspace users in a usable format will contribute to increased aviation safety.

Meteorological information



- The provision of meteorological information will be an integrated function of the ATM system. The information will be tailored to meet ATM requirements in terms of content, format and timeliness.
- The main benefits of meteorological information, for the ATM system, will be related to the following:
 1. the improved accuracy and timeliness of meteorological information will be used to optimize flight trajectory planning and prediction, thus improving the safety and efficiency of the ATM system;
 2. the increased availability of shared meteorological information on-board the aircraft will allow the preferred trajectory to be refined in real time;
 3. better identification, prediction and presentation of adverse weather will allow the management of its effects more efficiently, thereby improving safety and flexibility, for example, by providing accurate and timely information on the need for diversion or re-routing;
 4. improved aerodrome reports and forecasts will facilitate the optimum use of available aerodrome capacity;
 5. increased availability of meteorological information (air-reports) from on-board meteorological sensors will contribute to improving forecast meteorological information and the display of real-time information; and
 6. meteorological information will contribute to minimizing the environmental impact of air traffic.

Other essential services



- ➔ **There are other essential activities that the ATM system will provide information to, or may receive information from. These include the following:**
 - ✓ ***Air defence systems and military control systems*** will need timely and accurate information on flights and ATM system intents. They will be involved in airspace reservations and notification of air activities and in enforcing measures related to security.
 - ✓ ***Search and rescue organizations*** will need timely and accurate search and rescue information on aircraft in distress and accidents because such information plays an important role in the quality of the search function.
 - ✓ ***Aviation accident/incident investigation authorities*** will need to exploit recordings of flight trajectory data and ATM actions.
 - ✓ ***Law enforcement (including customs and police authorities)*** will need flight identification and flight trajectory data, as well as information about traffic at aerodromes.
 - ✓ ***Regulatory authorities*** will need to implement the regulatory framework within the legal powers given to them and to monitor the safety status of the ATM system.

Expected Benefits in General

- ➔ Improved safety management processes will ensure that safety performance remains the highest priority
- ➔ Business cases will ensure efficient and cost-effective air navigation system developments and operations
- ➔ Collaborative decision making and system-wide ATM information will enable airspace user participation in balancing the demands on the air navigation system, thereby providing flexibility and predictability

Expected Benefits Specifically

- ➔ All airspace will be available as a usable resource, resulting in improved access, increased opportunity for user-preferred trajectories and, through community cooperation, increased capacity

Expected Benefits Specifically

- ➔ Improved surface management of the aerodrome will provide predictable departure and gate-arrival times, thereby improving overall air navigation system predictability and subsequent capacity
- In particular, improved runway design, together with improved operational procedures, will increase capacity

Expected Benefits Specifically

- ➔ Improved information exchange and cooperation within the air navigation system community will maximize system capacity
- ➔ Improved all-weather operations will maintain maximum capacity
- ➔ Improved information concerning demand and system capabilities will prevent system overloads, ensuring manageable workloads

Expected Benefits Specifically

- ➔ Provision of accredited, quality-assured and timely information will allow an informed decision-making process
- ➔ The air navigation system community will contribute to the protection of the environment by taking into consideration the consequences of airspace activities

Summary



- CNS/ATM systems was a first step
- We needed a vision: the operational concept
- Concept consists of 7 integrated services
- The future system will be an information rich environment, that solves most problems strategically, through a collaborative process
- 35th Assembly endorsed the concept
- Future work consists of developing
 - ✓ ATM system requirements
 - ✓ Transition strategies
 - ✓ Performance framework
- **Global Performance Objectives will achieve measurable progress towards achievement of the vision of the ATM Operational Concept**

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Thank You