



Global Air Navigation System

~Elements~

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National Performance Framework
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Presentation outline

- Strategic vision of ATM community
- Air navigation system limitations
- Need for change
- Development of concept – FANS to CNS/ATM to Global ATM
- AN system elements – ATM, CNS, AIM, AGA and MET

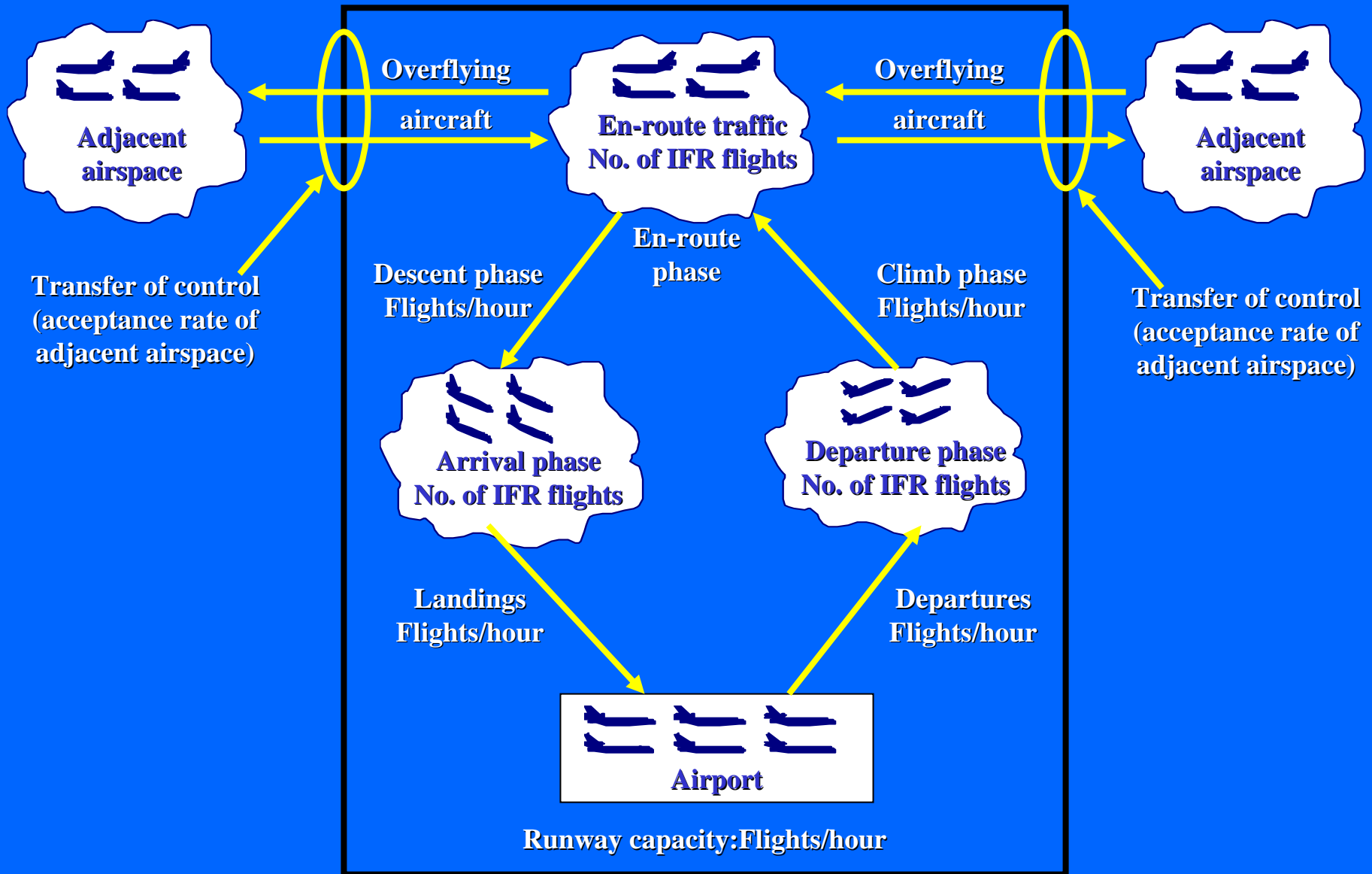
ATM Community

~ Strategic vision ~

To foster the implementation of an interoperable global air traffic management 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

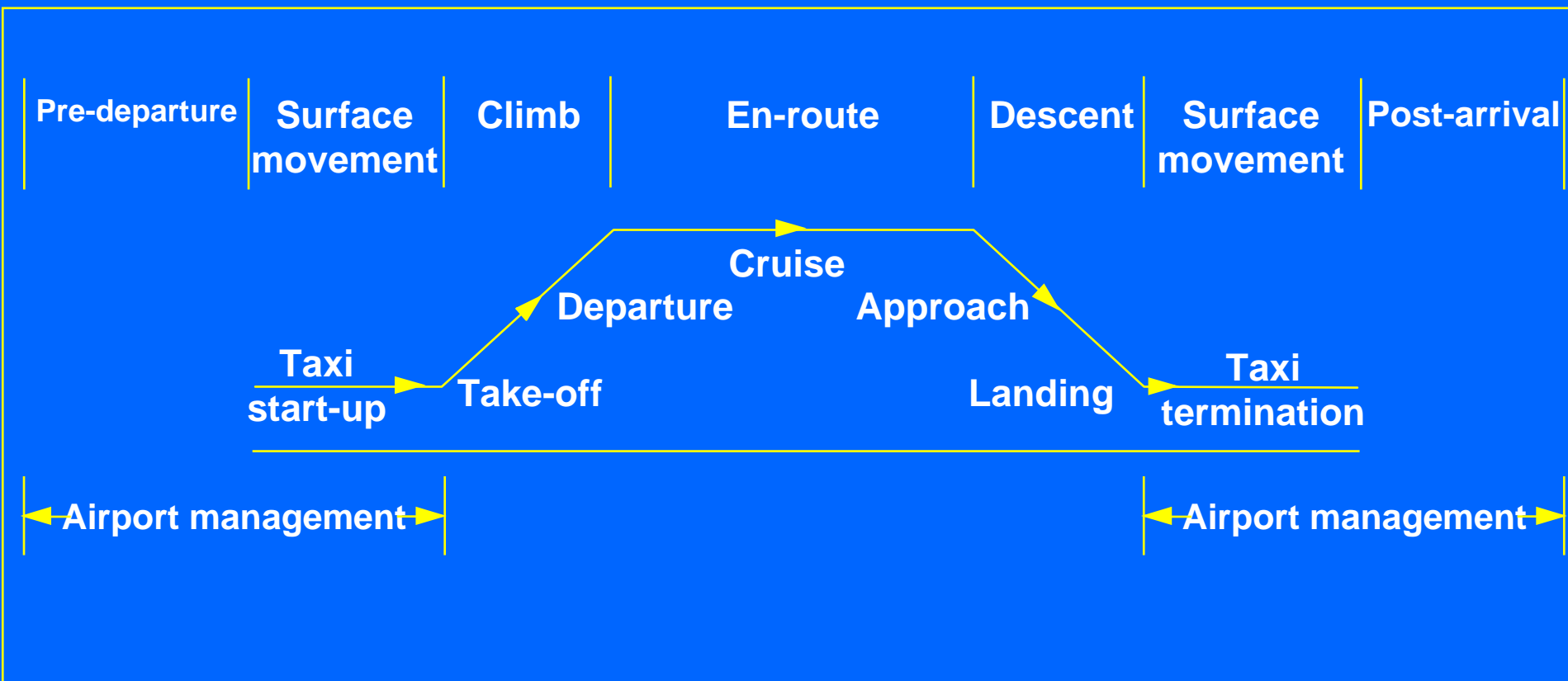
AREA OF RESPONSIBILITY OF A STATE



Capacity assessment for ATM

Phases of flight

Gate to Gate Operation

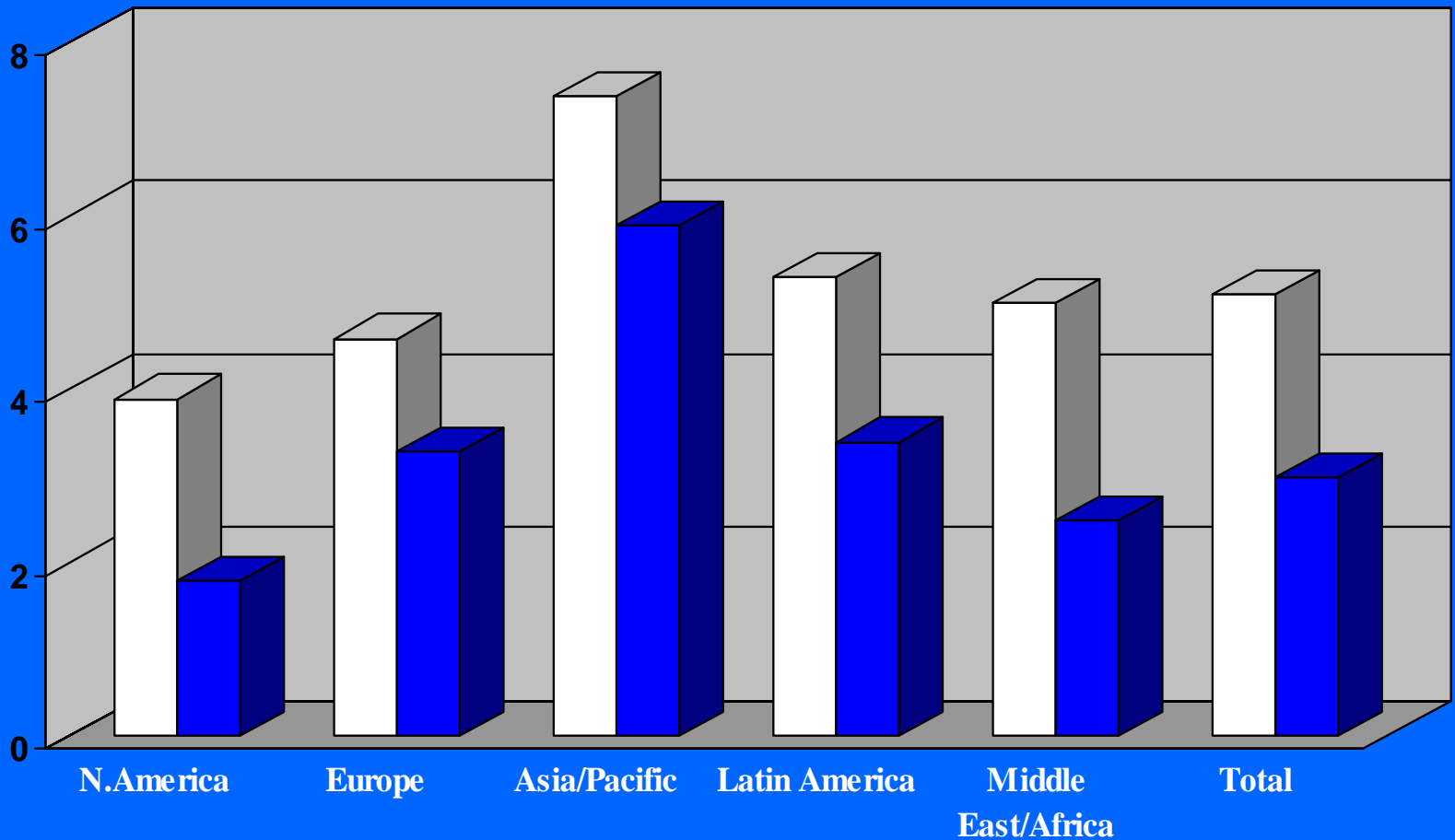


Air Navigation System Limitations

- **Line-of-sight propagation of ground based CNS facilities**
- **Difficulty in the implementation of ground based CNS facilities in large parts of the world**
- **Lack of Digital Air Ground Data interchange Systems**

Projected Growth in Air Traffic Demand

Average Annual Increases in Traffic Movements 1992 – 2010



Need for change

- Increased growth in air traffic
- Limitations of ground based CNS systems
- New technologies provide solutions
- Requirement for global consistency



- **FANS (Future Air Navigation Systems) Committee was established to address the above issues**

CNS/ATM System concept development – Background

- **ICAO Assembly endorses
FANS concept: Sept. 92**
- **ICAO CNS/ATM systems
implementation task force
addressed funding, cost recovery
& promotion of the concept: Dec. 94**

CNS/ATM distinct features ...

- a) have a mix of satellite and ground-based systems**
- b) provides global coverage**
- c) uses interoperable systems**

CNS/ATM distinct features

- d) provides seamlessness**
- e) employs air/ground data link**
- f) employs digital technologies**
- g) comprises various levels of automation**

What is Global ATM system?

Global ATM system can be understood as a worldwide system which:

- **facilitates interoperability of different technologies,**
- **accommodates different procedures, and**
- **provides harmonization leading to seamlessness across regions**

This is achieved through progressive, cost effective and cooperative implementation of air navigation systems worldwide.

Global ATM system -Elements

Air Navigation system architecture to Support ATM Operational Concept : Elements

- **ATM**
- **CNS**
- **AIM**
- **AGA**
- **MET**

Air Traffic Management

Air Traffic Management

~ Definition (March 2007)~

Air traffic management is the dynamic, integrated management of air traffic and airspace (including ASM,ATS and ATFM)—safely, economically, and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground based functions

ATM - Elements

AIR TRAFFIC MANAGEMENT

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graph TD; ATM[AIR TRAFFIC MANAGEMENT] --> AOM[Airspace Organization & management]; ATM --> ATS[Air Traffic Services]; ATM --> ATFM[Air Traffic Flow Management];
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**Airspace
Organization &
management**

**Air Traffic
Services**

**Air Traffic Flow
Management**

Airspace organization and management

- Airspace organization
 - ATS route structure
 - fixed routes
 - PBN routes
- Airspace management
 - fixed and flexible use of airspace
 - civil/military coordination
 - optimized sectorization

Air traffic services ...

- **Air Traffic Control : Conflict management**
 - flight information control
 - area control
 - approach control
 - aerodrome control
 - surface movement control
- **Search and Rescue**
 - Emergency locator transmitter (ELT) of COSPAS and SARSAT(406 MHz from 1 Feb 2009) and no satellite coverage for 121.5 MHz

Air traffic services ...

- **Decision support systems**
 - conformance monitoring; MTCA/STCA; MSAW
 - PRM for independent IFR approaches to closely spaced runways
 - arrival metering and sequencing system
 - AIDC
- **Separation standards**
 - Reduced Horizontal Separation Minimum (RHSM) and Reduced Vertical Separation Minimum (RVSM)

Air traffic services

➤ Applications

- data link
- use of curved and segmented approaches
- A-SMGCS

Air traffic flow management (ATFM) ...

➤ ATFM Objective

- to ensure an optimum flow of air traffic through areas during times when demand exceeds or is expected to exceed the available ATC capacity
- Demand and capacity balancing
- Traffic synchronization

➤ Application of ATFM

- re-routing; and
- allocation of slots

ATFM ...

~ Phases of ATFM activity ~

- **Strategic phase:** Strategic activities are research, planning and coordination activities carried out in the period from two days to several months in advance of the day of operation
- **Pre-tactical phase:** Pre-tactical activities are planning and coordination activities carried out within the two days prior to the day of operation
- **Tactical phase:** Tactical activities are ATFM activities carried out on the day of operation
- **Airborne flights:** ATFM shall take action on individual flights before their departure and shall not normally intervene in the progress of airborne flights which are the responsibility of the appropriate ATC unit. However, airborne flights may be subject to additional tactical ATFM measures

Communications/Navigation/ Surveillance
(will be covered in a separate
presentation)

Aeronautical Information Management

Aeronautical Information Management

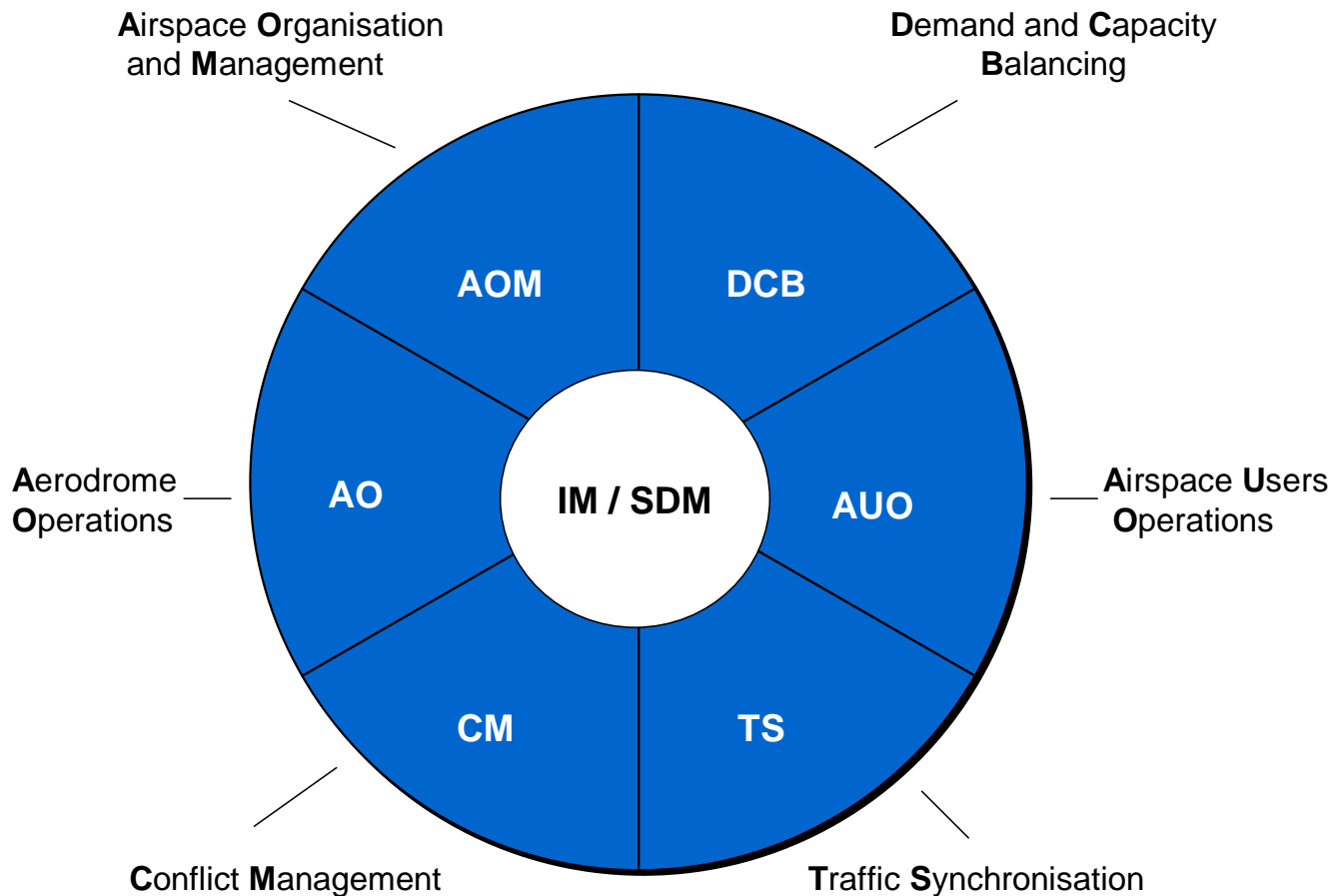
~ Definition (Dec. 2008)~

Aeronautical Information Management is the dynamic, integrated management of aeronautical information services — safely, economically, and efficiently — through the provision and exchange of quality assured digital aeronautical data in collaboration with all parties.

AIM - Elements

- **Phase 1 : Consolidation**, mainly quality requirements; AIRAC adherence; WGS-84; and the provision of terrain and obstacle data.
- **Phase 2 : Going digital**, introduction of database-driven processes (eAIP, AIXM); enhance the quality and availability of existing products.
- **Phase 3 : Information Management**, new products and services; provision of the new data that will be required by the future ATM components.

IM Central component of ATM System



IM / SDM = Information Management / ATM Service Delivery Management

Transition to AIM

- **2009, AIS-AIMSG** first meeting 2-4 Dec. 2008, see <http://www.icao.int/anb/aim>,
 - Preliminary review of Amendment 36 Annex 15 & Amendment 56 Annex 4;
 - Amendment 2 Doc 8126 (AIS Manual);
 - Amendment 30 PANS-ABC.
- **2010, Going digital**
 - Start developing Amendment 37 Annex 15 & Amendment 57 Annex 4;
 - Recommendations and guidance on data exchange, no obligations.
 - eAIP, AIXM, Training, Quality Guidance Material

Transition to AIM

➤ 2013, Information Management

- Amendment 37 Annex 15 & Amendment 57 Annex 4 become applicable.
- Possible **Divisional Meeting** to agree on new requirements for data exchange.

➤ 2016, Transition achieved

- Amendment 38 Annex 15 & Amendment 58 Annex 4 would become applicable including recommendation of divisional meeting;

Aerodrome Operations

AGA -Elements

- **aerodrome certification**
- **new visual aids for prevention of runway incursions**
- **visual aids for denoting wind turbines**
- **advanced VDGS to improve apron safety**
- **enhanced rescue and fire fight provisions**
- **wildlife strike hazard reduction**
- **heliports**

Aerodrome Certification

▪As of 27 Nov 2003,
States shall certify
aerodromes used for
international
operations in
accordance with the
specifications
contained in Annex
14, Vol I,



Future Works (by 2012)

- **New runway safety provisions on:**
 - **runway end safety area (RESA)**
 - **visual aids to prevent runway incursions**
 - **surface friction measurement and reporting**
- **Enhanced provision on Aerodrome Emergency Plan (AEP) and Rescue and fire fighting (RFF)**
- **New efficiency provisions on use of light emitting diodes (LED) technology for visual aids**

Meteorology

MET in support of safety and efficiency - methods

- **enhanced accuracy & timeliness of OPMET info**
 - **Where: en-route, in terminal area & at aerodromes**
 - **When: during flight planning & in-flight**
- **consolidation of certain services to a limited number of regional/global MET centres**

MET in support of safety and efficiency – impact

- **Optimization of flight trajectory**
 - **Avoiding hazardous weather and volcanic ash**
 - **Preventing unnecessary closure of airspace (min. safe re-routing of aircraft)**
 - **Minimizing the environmental impact**
- **Optimum use of available airport capacity**
- **Increased cost effectiveness**

MET elements (1/2)

- **WAFS: world area forecast system**
 - **2 world area forecast centres**
- **IAVW: international airways volcano watch**
 - **9 volcanic ash advisory centres**
- **ITCW: international tropical cyclone watch**
 - **7 tropical cyclone advisory centres**

Above elements in line with CNS/ATM features

- 1. Global coverage**
- 2. Seamless**
- 3. Using digital technologies**
- 4. mix of satellite and ground-based systems**

MET elements (2/2)

- **MET Watch**
 - **Some 200 MET watch offices**
- **Aerodrome MET service
(including terminal area)**
 - **100's of meteorological offices
(MET Offices)**

Changes in 2010 (1/2)

➤ WAFS

- Gridded forecasts for CB, icing & turbulence (will eventually replace SIGWX forecasts)
- Enhanced temporal & spatial resolutions

➤ IAVW

- Enhancements to accuracy & timeliness of info related to volcanic ash

Changes in 2010 (2/2)

- **Air-reporting**
 - **Elimination of voice routine reports (in view of ~ 200000 automated daily reports)**
- **QMS (in support of SMS)**
 - **Mandatory concerning all MET elements**
- **Aerodrome MET service**
 - **Fully automated local MET reports**

Future developments (beyond 2010)

- Aerodrome MET service
 - Migration from alpha-numerical codes to XML
 - Enhancement of MET support to ATM
 - To be based on evolving ATM requirements
 - Expected to evolve beyond aerodrome/terminal area
- MET watch
 - Consolidation of the issuance of SIGMET to regional centres corresponding to *functional airspace blocks*

— END —