Agenda Item 5:
Latest developments :
ICAO SARPs /Guidance Material/ITU-WRC-07

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First Meeting of Africa-Indian Ocean (AFI) VSAT Networks Managers
(Kwa-Zulu Natal, South Africa, 13-15 June 2011)

Overview

- Global Operational Concept
  - Next steps
- ATN
- SARPs /Guidance Material/WRC-07
- Conclusion

Overview

- The vision of the global air traffic management operational concept.
- Performance-based system.
- The Aeronautical Telecommunication Network
- Use of Satellite Technology in the AFI Region
- Towards an integrated, interoperable and sustainable satellite telecommunications networks

Vision

To achieve an interoperable global air traffic management system for all users during all phases of flight, that

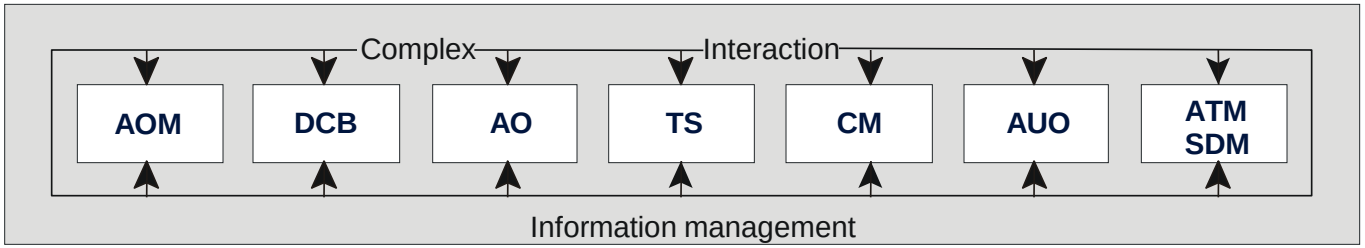
- meets agreed levels of safety
- provides for optimum economic operations
- is environmentally sustainable and
- meets national security requirements.

Components

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

ATM System: A Holistic Entity

Disaggregated for discussion and role understanding



All components must be present in the ATM system

ATM System: A Holistic Entity

The ATM system cannot, however, function without all of its components. The components must be integrated.

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

Performance-based system

- Technology is not an end in itself
- Based on clearly-established operational requirements
- Strategic Guidance Established
  - ATM system requirements
  - Transition strategy
  - Performance framework

Performance objectives

- **Global Performance Objectives**:

  Improvements to the Air Navigation System that are on the critical path towards the Global Operational Concept.

- **Regional Performance Objectives**:

  Consider operating environments and priorities specific to a regional level.

AIM

- **AIM will ensure the cohesion and linkage between the seven concept components**
  - Provides quality-assured and timely information to support ATM operations.
  - An information-rich environment will be key to the concept.

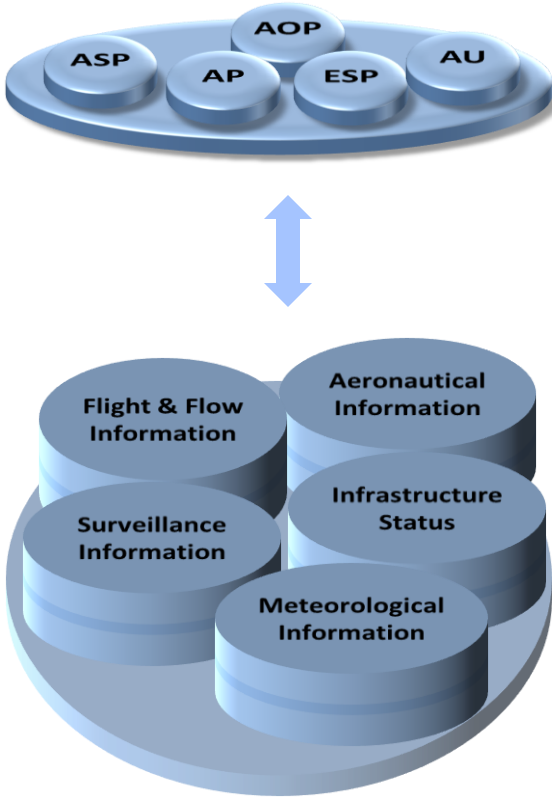
MET

- **Tailored to meet ATM requirements**

- **Benefits:**
  1. optimize real time flight trajectory planning and prediction;
  2. increased availability of meteorological information from on-board sensors ;and
  3. minimize aviation impact on environment.

Information for a Collaborative Environment (ICE)

- Dynamic Information-rich environment
- Interacting information domains require standardization and compatibility on:
  - Information
  - Communication mechanisms
- Participants
  - Wider information access
  - Access controlled
- FF-ICE Concept focuses on:
  - Flight and Flow Data

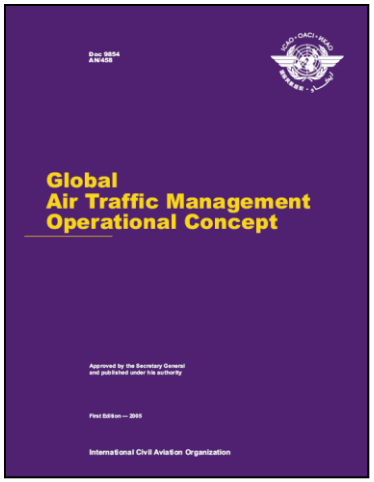


Information for a Collaborative Environment (ICE)

DATA DISTRIBUTION

- Anticipate shift from point-to-point to system-wide information distribution
- Caveat: Interoperable but heterogeneous environment
  - Not all regions implement SWIM
  - Technical implementations may vary

→ *Facilitates collaboration*
→ *Improves information consistency*
→ *Supports system evolution*
→ *Accommodates multiple points of entry*



Information must be shared on a system-wide basis

Pertinent information will be available when and where it is required

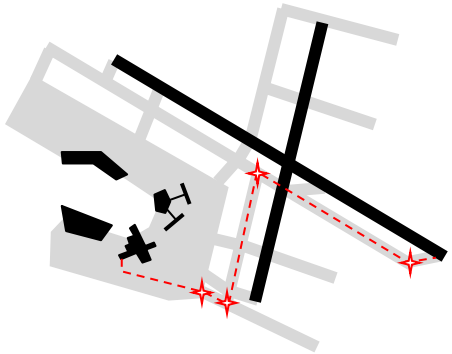
Information for a Collaborative Environment (ICE)

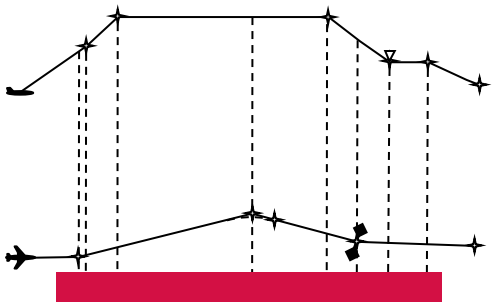
Flight Deck Interaction

- Envisage exchange of flight information with flight deck
- Examples:
  - In-flight trajectory negotiation
  - Additional information for improved separation provision

Information for a Collaborative Environment (ICE)

- 4D-Trajectory gate-to-gate
- Multiple trajectory types:
  - Agreed
  - Desired
  - Ranked
  - Executed
  - Negotiating
- Consists of: departure, airborne and arrival segments
- Trajectory-based items:
  - Performance
  - Flight rules
  - Alternates
  - Aircraft intent
  - Constraints
  - Tolerances





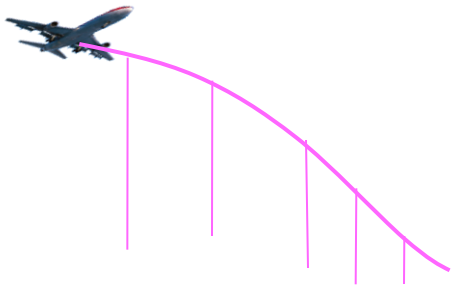
4D Trajectory

- Broader set:
  - Communications
  - Navigation
  - Surveillance
  - Wake-turbulence
  - Safety-net
  - Noise
  - Emissions
  - Runway Requirement
- Trajectory-based
  - Performance varies along trajectory
  - Infrastructure dependence

→***Service delivery depends on actual performance, not average for class***

Operations affect:

Wake Vortex



Low noise/emissions

What is Global ATM?

- ICAO has developed a global ATM Operational Concept which was widely endorsed (AN/CONF/11, 2003)
- ICAO provides the planning framework through the Global Air Navigation Plan, the regional air navigation plans and several other documents and tools
- Every ICAO Region has identified performance objectives and has developed work programs to foster near and medium term benefits while integrating those programmes with the extensive work already accomplished
- **Global interoperability and harmonization** are key to making further improvements

Seamlessness and Interoperability

A seamless, interoperable, worldwide system based on:

- Physical connectedness
  - Homogeneous ATM areas and Major Traffic flows
- Common requirements, Standards and procedures
  - Integration (TMAs, aerodromes)
  - Performance based equipment carriage requirements
- Seamless safety across all regions
  - For all users during all phases of flight
- Common aeronautical information exchange models

Air Navigation Conferences

- Need for a **Global Coordinated Plan for Transition** to Global ATM
- **CNS focus is on New Technologies**
- States and PIRGs to consider the Global Air Navigation Plan as a catalyst for change, providing a **Global Safety and Interoperability Framework** while allowing regional or local adaptation to efficiently meet regional and local needs

Air Navigation Conferences

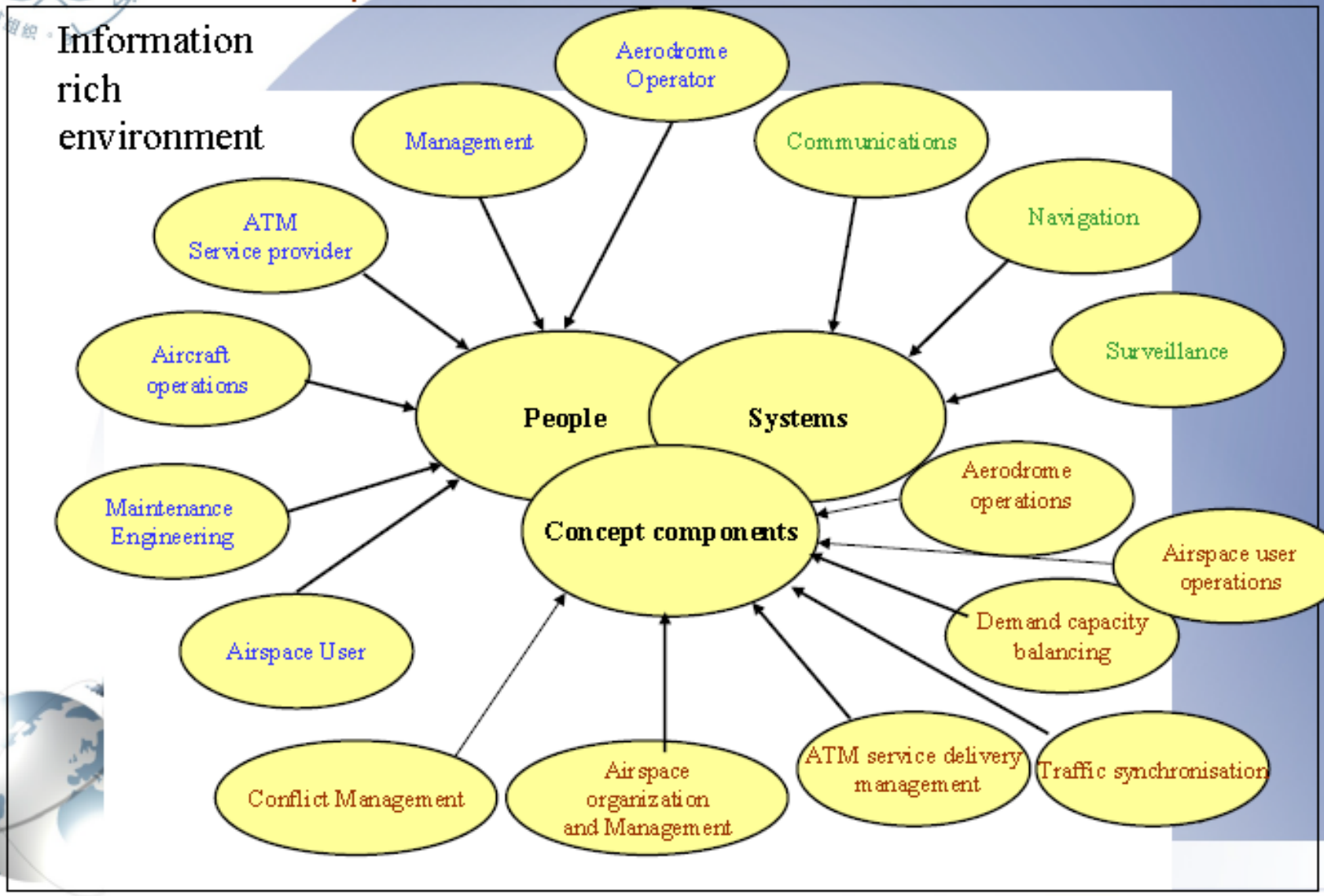
ICAO requested to:

- When developing the ATM Requirements, define corresponding requirements for **safe and efficiency global aeronautical information management to support a digital, real-time, accredited and secure aeronautical information** environment
- Urgently **adopt a common aeronautical information exchange model**
- Develop **new specifications for Annex 4 and 15 that would govern provision, electronic storage, on-line access** to , and maintenance of aeronautical information and charts

ICAO Assembly

- Calls upon States, regional planning groups and the aviation industry to use the ICAO Global ATM Operational Concept as the common framework to guide planning and implementation of CNS/ATM systems and to focus all such development work on the operational concept .

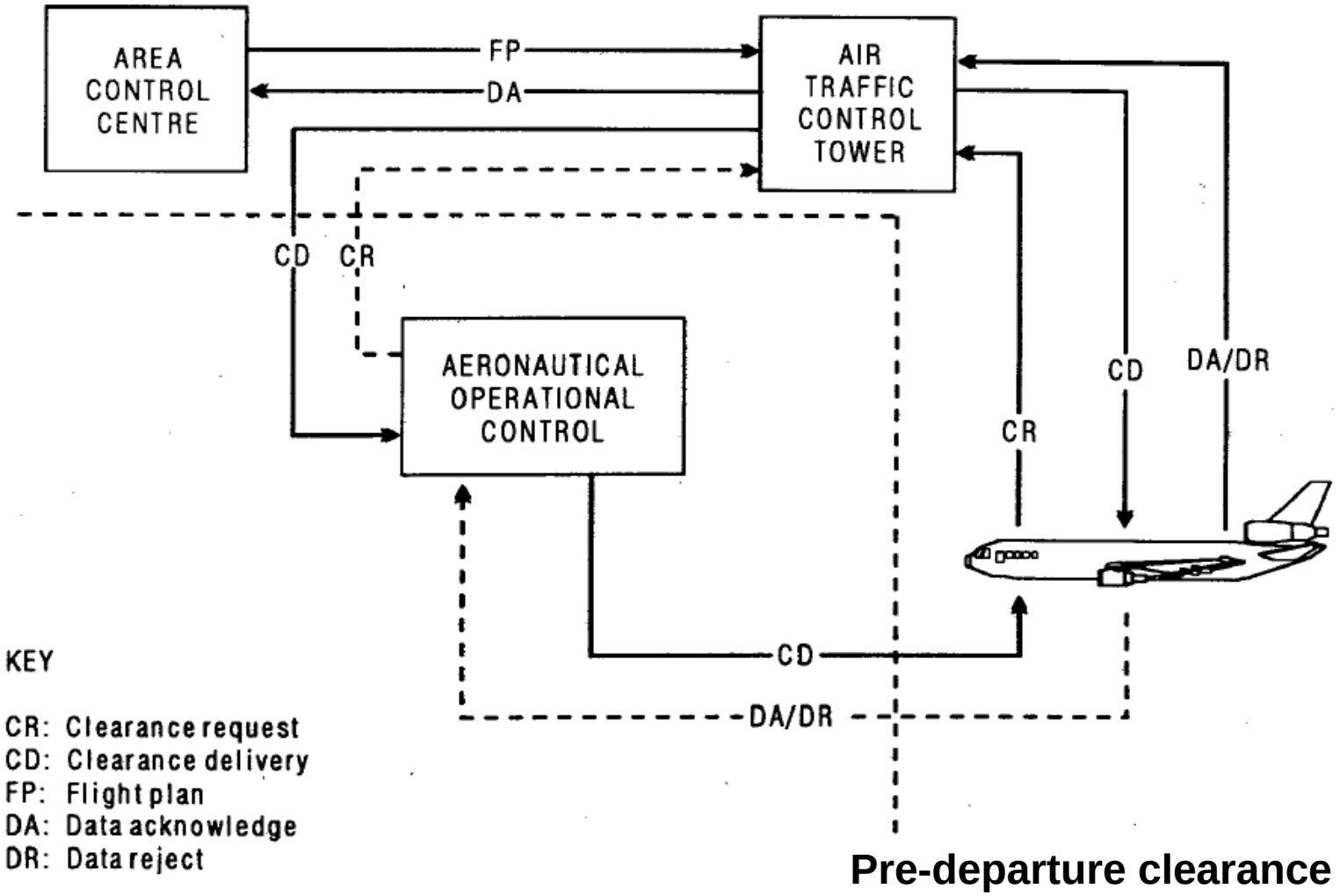
The global ATM Operational Concept
A global and seamless ATM System operates in an information rich environment



Air Traffic Management (ATM) Data Communication Requirements

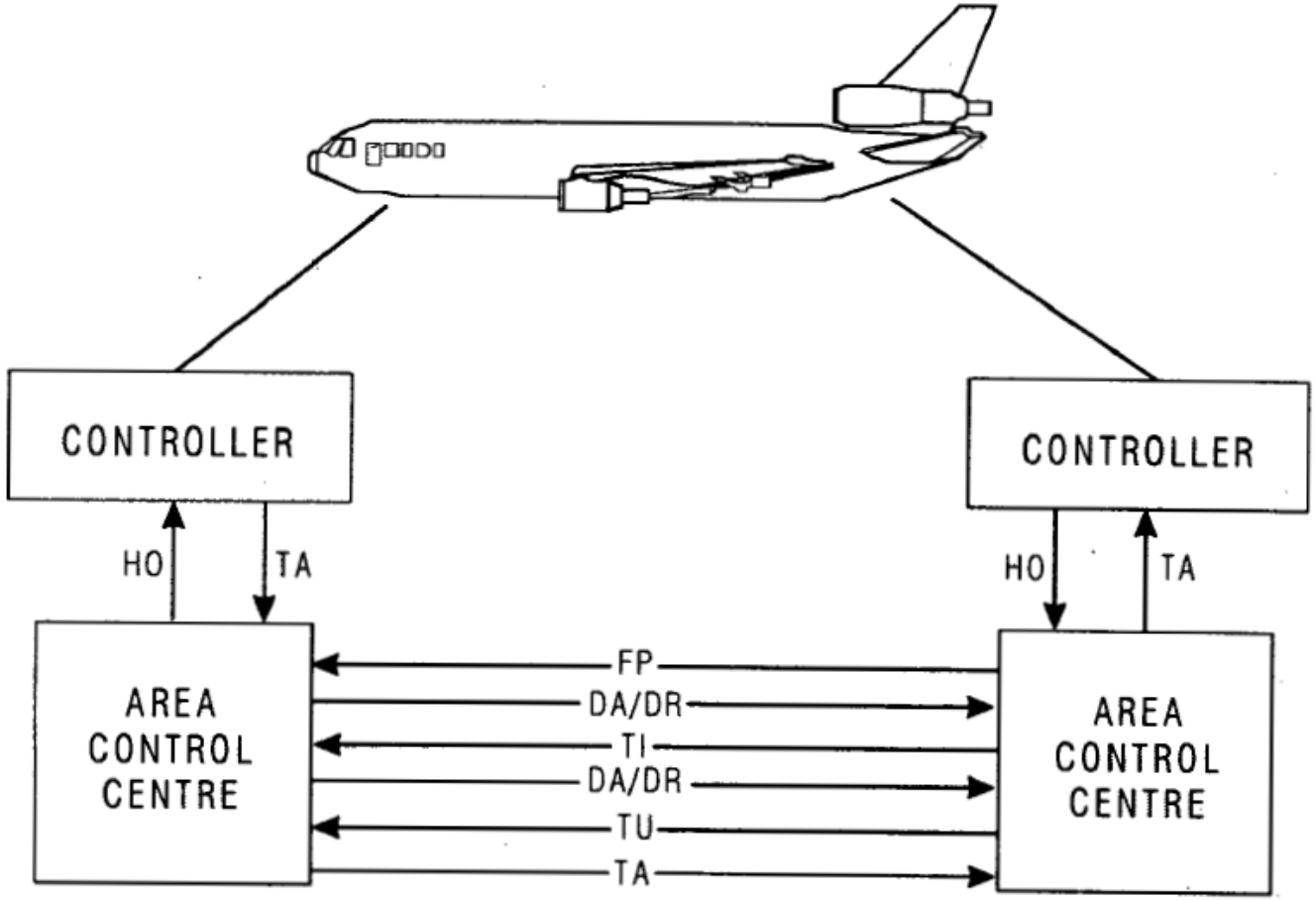
- ATM consists of a ground part and an air part, both of which are needed to ensure the safe and efficient movement of aircraft during all phases of operation.
- The ATC system is the primary component of ATM. The execution of ATM calls for a close integration of the ground part and the air part through well-defined procedures.

Automated ground-ground scenario



Pre-departure clearance

Automated ground-ground scenario



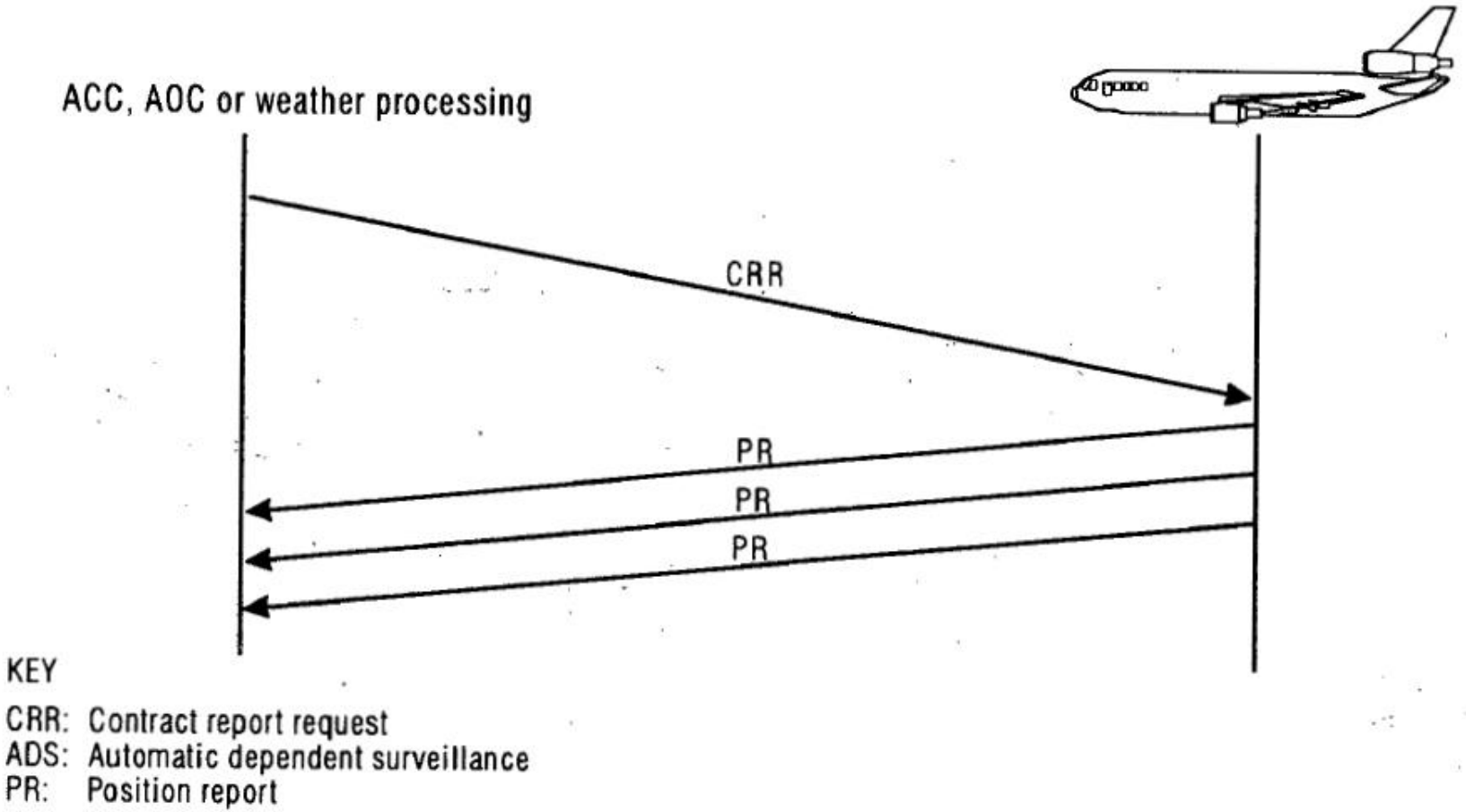
KEY

FP: Flight plan
DA: Data acknowledge
DR: Data reject
TA: Transfer accept

HO: Hand off
TI: Tract initiate
TU: Tract update

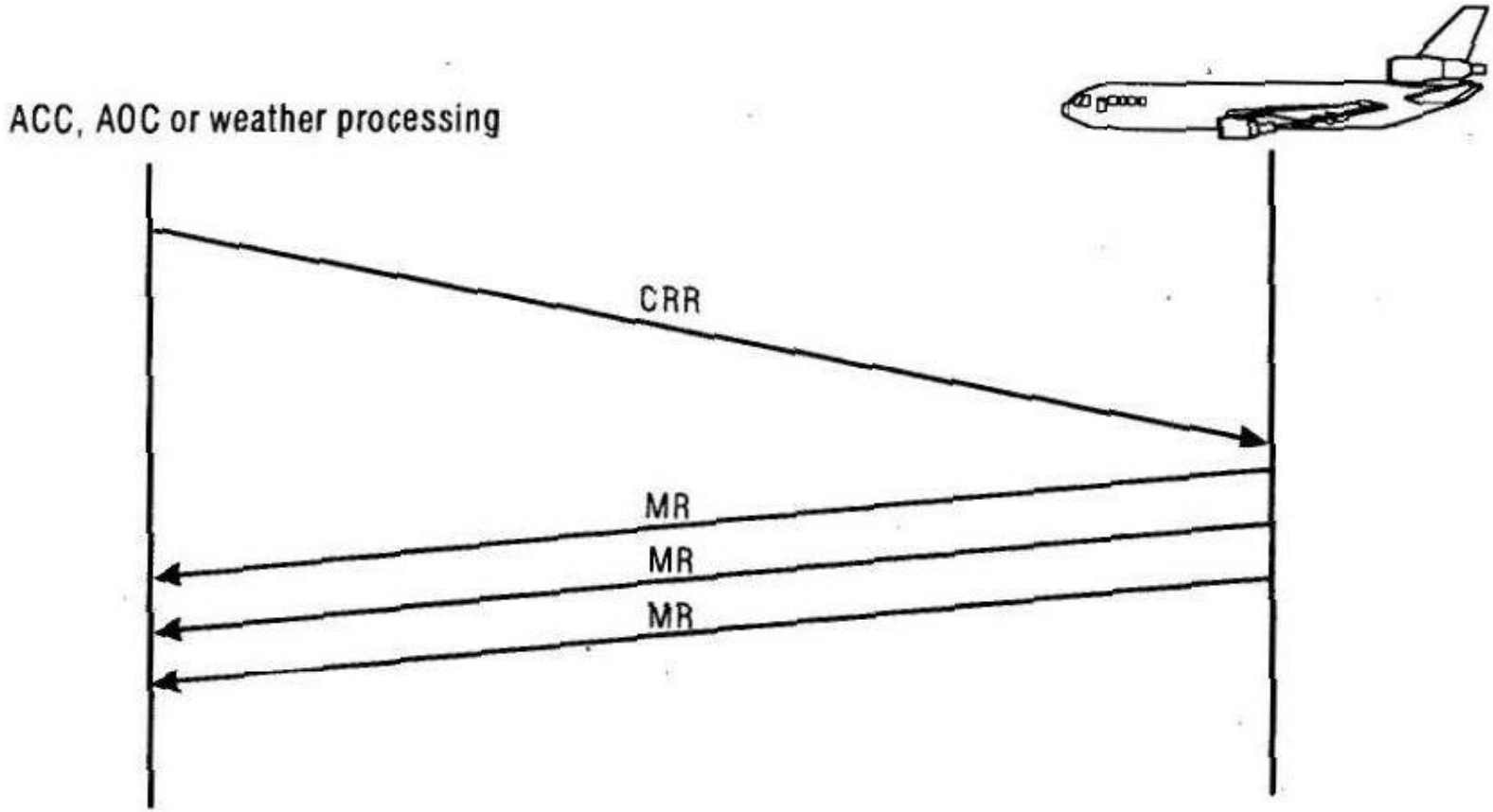
Transfer of control

Automated ground-ground scenario



ADS reporting

Automated ground-ground scenario

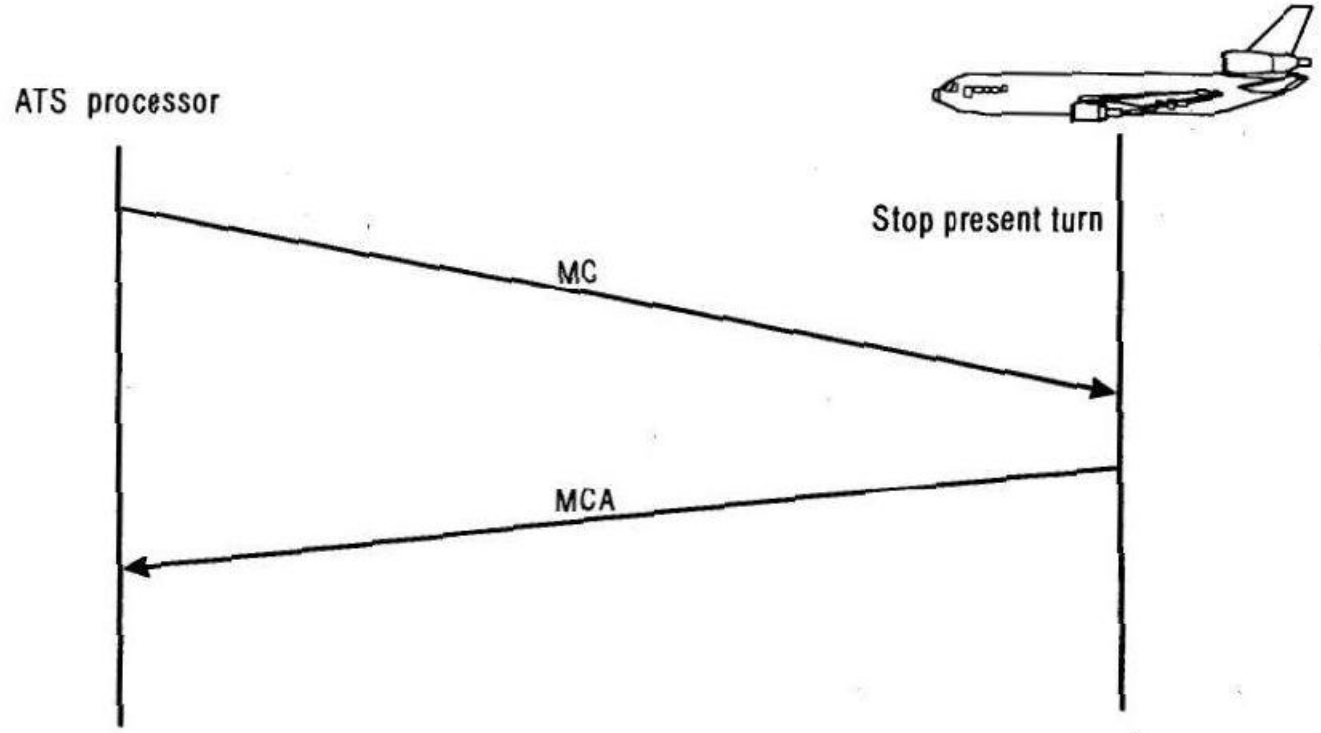


KEY

CRR: Contract report request
MR: Meteorological report

Meteorological reporting

Automated ground-ground scenario

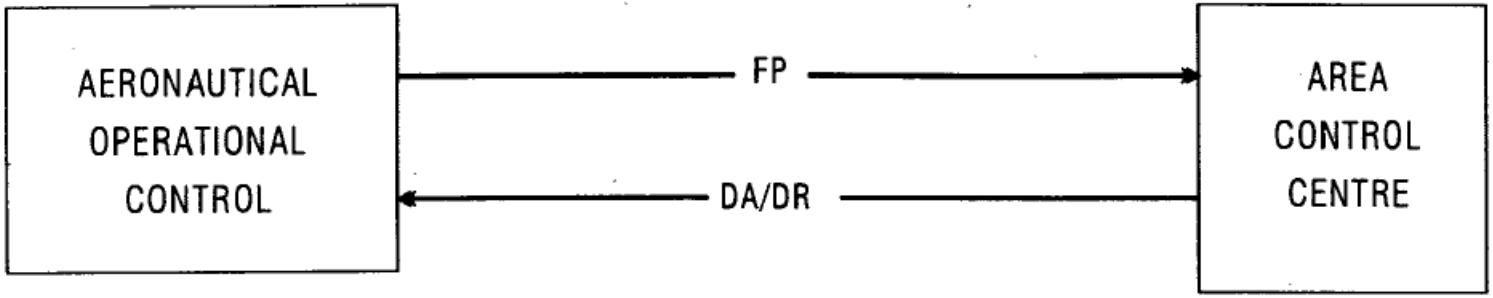


KEY

MC: Manoeuvre control
MCA: Manoeuvre control acknowledge

Manœuvre control

Automated ground-ground scenario

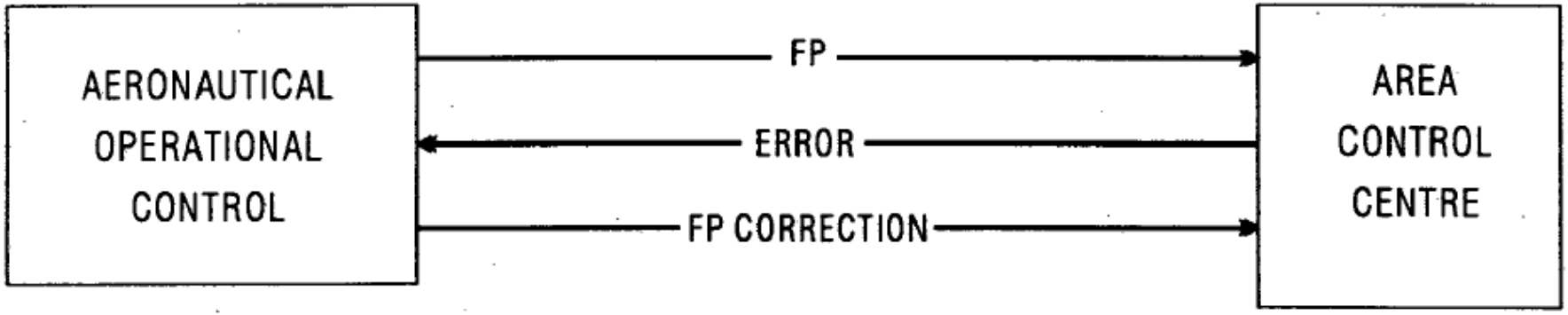


KEY

FP: Flight plan
DA: Data acknowledge
DR: Data reject

IFR Flight Plan filing

Automated ground-ground scenario

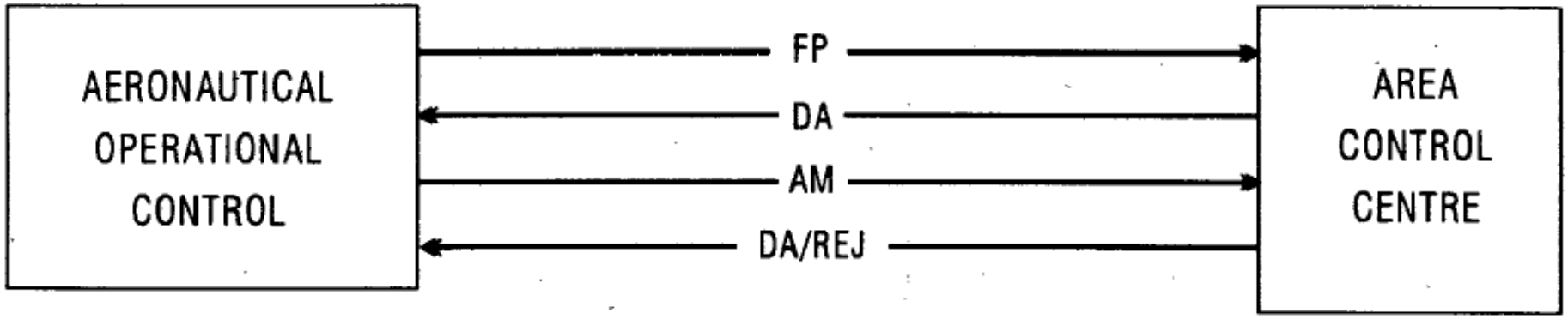


KEY

FP: Flight plan

Flight Plan correction

Automated ground-ground scenario



KEY

FP: Flight plan
DA: Data acknowledge
AM: FP amendment
REJ: Reject

Flight Plan amendment

Required Principles

The principles necessary to satisfy the ATM objectives include – inter alia- the following:

- **functional compatibility of the data exchanged between the air-ground (A-G) as well as the ground-ground (G-G) components** is essential to ensure the global efficiency of the system;
- **international harmonization and, ultimately, integration are needed** to provide for consistency in operations across national boundaries; and
- **the Aeronautical Telecommunication Network (ATN) must be designed to work effectively between aeronautical authorities, aircraft operating agencies and service providers.**

ATN - Definition

- ATN is a Telecommunications Data Network:
  - It supplies a Common Service of Integrated ATS and AOC Communications and uses existing communications
  - It meets the safety requirements of ATS and AOC applications
  - It provides the various levels of service required by ATS and AOC applications

What is ATN?

- ATN is:
  - A ground based network providing communications services between ground users; and an air-ground network of communications services between airborne users and the ground
- ATN has the following advantages
  - Use of existing and future infrastructure
  - High availability
  - Mobile communications
    - *Global connectivity*
  - Prioritised end-to-end resource management
  - Scalability and adaptation to future needs
  - Routing based on preferences of administrations and organizations
  - Use of commercial off-the-shelf equipment (COTS)

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ICAO SARPs and Guidance Material

- **Annex 10 – Aeronautical Telecommunications**
  - Volume II - Communication Procedures including those with PANS status
  - Volume III - Communication Systems
    - Part I Digital Data Communication Systems
    - Part II Voice Communication Systems
- **Doc 9880 - Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols**
  - Part I – Air-Ground Applications
  - Part II - Ground-Ground Applications - ATS Message Handling Service (ATSMHS)
  - Part III - Upper Layer Communications Service (ULCS) and Internet Communications Service (ICS)
  - Part IV – Directory Services, Security Services and Systems Management

ICAO SARPs, Vol.III

- Paragraph 3.3.2 requires that **implementation of the ATN shall be made on the basis of regional air navigation agreements**.
- Paragraph 3.4.1 requires that ATN shall either use
  - International Organization for Standardization **(ISO) communication standards** for Open System Interconnection (ISO)
  - or use the Internet Society (ISOC) communications standards for **the Internet protocol Suite (IPS)**
- These agreements shall specify the area in which the communication standards for **ATN/OSI or the ATN/IPS** are applicable.
- Paragraph 3.4.2 stipulates that AFTN/AMHS gateway shall ensure the interoperability of AFTN and CIDIN stations and network with the ATN.
  - ***This envisages that the AFTN applications will continue to be supported.***

ICAO Doc 9880, Part II

- **1. Introduction**
- 1.1 Overview
- 1.2 End systems providing the ATSMHS
- 1.3 Terminology

- **2. System Level Provisions**
- 2.1 ATSMHS users
- 2.2 AMHS model
- 2.3 Organization of the AMHS
- 2.4 AMHS management domain configurations
- 2.5 Naming and addressing principles
- 2.6 AMHS routing and re-routing
- 2.7 AMHS traffic logging upon origination

ICAO Doc 9880, Part II

- **3. ATSMHS Specifications**
- 3.1 ATS message user agent specification
- 3.2 ATS message server specification
- 3.3 Parameters
- 3.4 Subsetting rules

- **4. AFTN/AMHS Gateway Specifications**
- 4.1 General
- 4.2 AFTN/AMHS gateway components
- 4.3 General functions
- 4.4 AFTN to AMHS conversion
- 4.5 AMHS to AFTN conversion

ITU WRC-2007 (Recommendation 724)

Use by civil aviation of frequency allocations on a primary basis to the fixed-satellite service

<< …considering

a) that remote and rural areas often still lack a terrestrial communication infrastructure that meets the evolving requirements of modern civil aviation;

b) that the cost of providing and maintaining such an infrastructure could be expensive, particularly in remote regions;

c) that satellite communication systems operating in the fixed-satellite service (FSS) may be the only medium to satisfy the requirements of the International Civil Aviation Organization's (ICAO) communication, navigation, surveillance and air traffic management (CNS/ATM) systems, where an adequate terrestrial communication infrastructure is not available;

ITU WRC-2007 (Resolution 724)

…considering

- *d) that the use of VSAT systems, operating in the FSS and being deployed on a large scale in aeronautical communications, has the potential to significantly enhance communications between air traffic control centres as well as with remote aeronautical stations;*
- *e) that establishing and utilizing satellite communication systems for civil aviation would also bring benefits for developing countries and countries with remote and rural areas by enabling the use of VSAT systems for non-aeronautical communications;*
- *f) that in the cases identified in considering e) it is necessary to draw attention to the importance of aeronautical communications as opposed to non-aeronautical communications, noting*
  - *a) that the FSS is not a safety service;*
  - *b) that Resolution* ***20 (Rev.WRC-03) resolves to instruct the Secretary-General "to encourage ICAO to continue its assistance to developing countries which are endeavouring to improve their aeronautical telecommunications ...",***

ITU WRC-2007 (Resolution 724)

Recommends

- 1 that administrations, in particular in developing countries and in countries with remote and rural areas, recognize the importance of VSAT operations to the modernization of civil aviation telecommunications systems and encourage the implementation of VSAT systems that could support both aeronautical and other communication requirements;
- 2 that administrations in developing countries be encouraged, to the maximum extent possible and as necessary, to expedite the authorization process to enable aeronautical commu-nications using VSAT technology;
- 3 that arrangements should be made to provide for urgent service restoration or alternative routing in case of a disruption of a VSAT link associated with the aeronautical communications;
- 4 that administrations implementing VSAT systems in accordance with *recommends 1 to 3 should do so in satellite networks operating in frequency bands with a primary allocation to the satellite services;*

ITU WRC-2007 (Resolution 724)

Recommends

- 5 to invite ICAO, noting Resolution 20 (Rev.WRC-03), to continue its assistance to developing countries to improve their aeronautical telecommunications, including interoperability of VSAT networks, and provide guidance to developing countries on how they could best use VSAT technology for this purpose,

Requests the Secretary-General

- to bring this Recommendation to the attention of ICAO.>>

Conclusion

- AFI VSAT Networks Managers are invited to note the latest developments concerning :
  - ICAO work on the implementation of ATM Global Operational Concept
  - ICAO SARPs and Guidance Material pertaining to ATN; and
  - ITU WRC-07 Recommendation 724 – on Use by civil aviation of frequency allocations on a primary basis to the fixed-satellite service (FSS)

THANK YOU