Air traffic management

**Definitions ICAO**

The present **Air Navigation System (ANS)** (ICAO, > 1946) provides international **Air Traffic Services (ATS)** for civil aviation.

The provision of these services is based on the availability of **Communication, Navigation, Surveillance (CNS)** systems and automated **Air Traffic Control (ATC)** systems with various levels of capabilities.

International air traffic is channelled along specified air routes and each air route is part of a network of generally fixed air routes within a **Flight Information Region (FIR)**

**Air Traffic Services (ATS)**

ATS= Air Traffic Management + Flight Information Service + Alerting Service

ATM= Air Traffic Control + Air Space Management + Air Traffic Flow Management

- **ATC:** Maintain a safe distance between aircraft and obstacles within a confined airspace and also on the airport surface
- **ASM:** Maximize, within a given airspace structure, the utilization of available airspace by dynamic time sharing and segregation of airspace among competing categories of users based on short-term needs
- **ATFM:** ensure an optimum flow of air traffic through areas during times when demands (is expected to) exceed the available capacity of ATC service
- **FIS:** Collect, handle and disseminate flight-related information to assist the pilot to conduct his flight in a safe and efficient manner (ex ATIS)
- **AL:** initiate an early search and rescue activity for aircraft in distress


ATIS

A service of an airport for traffic in its TMA or CTR

ATIS is a repeated message (VHF) containing information about

- Weather
- The QNH
- Transition level, transition altitude
- Operational issues

<u>Airspace Organisation</u>

- **Control zone (CTR):** local ATC (TWR) usually circular area around airport
- **Terminal Control Area (TMA):** local ATC (APP), incoming and outgoing flights between CTR and CTA
- **Control Area (CTA):** General ATC (ACC) within FIR, below certain flight level (lower airspace)
- **Upper Control Area (UTA):** General ATC, across FIRs (upper airspace; ex Eurocontrol)

*Drawing see slide 11*

<u>SIDs and STARs</u>

**Standard Instrumental Departure**
Defines the route flown between aircraft departure and an ATS route ('highway in the sky')
(connects CTR with CTA, through TMA)

**Standard Terminal Arrival Route**
Defines the route flown between an ATS route and an approach fix  (Connects CTA with CTR through TMA)

<u>ACAS</u> → Airborne Collision Avoidance System

<u>FANS: Future Air Navigation System</u>

Current operating ANS is not expected to be able to accommodate foreseen growth in air traffic (in 2008)
Shortcomings of existing CNS and ATS will become more apparent over time

**Summary of general shortcomings**

- Lack of real time information
- Short and long term intent of aircraft on certain parts of existing air-routes
- Procedurals of ATC do not provide most efficient flight profiles → Planned through intermediate waypoints
- Capabilities of modern airborne systems cannot be fully exploited

**Communication**

- SSR mode S → regional
- VHF data link (VDL) → regional
- Satellite data link (AMSS) → global

**Navigation**

- Global Navigation Satellite System (GNSS) → GPS + GLONASS + GALILEO

**Surveillance**

- SSR mode S → regional
- Automatic Dependent Surveillance (ADS) → global
- Airborne Separation Avoidance System (ASAS) → global

**ADS**

- An on-board avionics function that automatically transmits via a digital data link→ real time surveillance information
- Allows surveillance in oceanic and other areas which are beyond coverage of radar or LOS communication
- Surveillance is dependent in ADS because its operation and quality depend upon the performance of the aircraft's navigation system

*Data blocks*

*Basic*

- Time of day
- Aircraft identification
- Three dimensional position

*Additional can include*

- Aircraft velocity and heading (4D)
- Aircraft intent (waypoints stored in FMS)
- Meteorological data

**ADS-B**

- Each ADS-B equipped aircraft periodically broadcasts its position, altitude and vector information
- Any user could receive and process the information
- Everyone in the system would have real time access to precisely the same data