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
Airspace Organisation

- **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*

SIDs and STARs

**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)

ACAS ➔ Airborne Collision Avoidance System

FANS: Future Air Navigation System

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 \(\rightarrow\) regional
- VHF data link (VDL) \(\rightarrow\) regional
- Satellite data link (AMSS) \(\rightarrow\) global

Navigation

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

Surveillance

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

ADS

- An on-board avionics function that automatically transmits via a digital data link \(\rightarrow\) 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