An Introduction to Air Navigation Services:

From Conventional Air Traffic Control to CNS/ATM

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Outline

Historical introduction
- Definitions of Air Navigation Services
  - Scope
  - Objectives
- The development of Air Navigation Services

Legal Framework for the Establishment of Air Navigation Services
- States obligations under Art. 28 of the Chicago Convention
- National sovereignty
- Public service aspects
- Regulatory and service provision functions
- Cross-border service provision
Part I

Historical development of ANS
Air Navigation Facilities and Standard Systems

"Each contracting state undertakes, so far as it may find practicable, to:

provide, in its territory, airport, radio services, meteorological services and other air navigation facilities to facilitate international air navigation, in accordance with the standards and practices recommended or established from time to time, pursuant to this convention;

adopt and put into operation the appropriate standard system of communications procedure, codes, markings, signals, lighting, and other operational practices and rules which may be recommended or established from to time to time, pursuant to this convention;

collaborate in international measures to secure the publication of aeronautical maps and charts in accordance with standards which may be recommended or established from time to time, pursuant to this convention.
Air Navigation Services

- ANS
- MET
- ATM
- SAR
- CNS
- AIS
- ATS
- COM
- SUR
- NAV
- ATFM
- TEC
- FIS
- ACC
- APP
- ADC
- ALRS
- Calibration
- Obst.
Chicago Convention Article 37
Adoption of International Standards and Procedures

"Each contracting state undertakes to collaborate in securing the highest practical degree of uniformity in regulations, standards, procedures, and organisation in relation to aircraft, personnel, air ways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation."
"To this end the International Civil Air Navigation Organisation shall adopt and amend from time to time as may be necessary, international standards and recommended practices and procedures dealing with:
- communication system and air navigation aid, including ground marking;
- rules of the air and air traffic control practices;
- licensing of operating and mechanical personnel;
- log books;
- aeronautical maps and charts;
- and such other matters concern with the safety regularity, and efficiency of air navigation as may from time to time appear appropriate."
Chicago Convention Article 38
Departure from Standards and Procedures

"Any state which finds it impracticable to comply in all respects with any such international standard and procedure, or to bring its own regulations or practices into full accord with any international standard or procedure after amendment of the latter, or which deems it necessary to adopt regulations or practices differing in any particular respect from those established by an international standard, shall give immediate notification to the International Civil Aviation Organisation of the differences between its own practices and that established by the international standard."

(...)
Regulatory Framework

Chicago Convention

- Annex 11 to the Chicago Convention
- ICAO Document 4444 (PANS/ATM)
- ICAO Document 7030 (Regional Supplementary Procedures)
- Regional Air Navigation Plans
- Regional provisions (Regional regulatory authorities)
- National Prescriptions
- Local Procedures
Annex 11 (ATS): purpose

"Annex 11 pertains to the establishment of airspace, units and services necessary to promote a safe, orderly and expeditious flow of air traffic…. Its purpose, together with Annex 2, is to ensure that flying on international air routes is carried out under uniform conditions designed to improve the safety and efficiency of air operation."

ICAO Annex 11 (foreword)
Divisions of ATS (ICAO Annex 11)

The air traffic services shall comprise three services identified as follows:

✶ **The air traffic control service**, this service being divided in three parts as follows:
  ✶ **Area control service**
  ✶ **Approach control service**: The provision of air traffic control service for those parts of controlled flights associated with arrival or departure;
  ✶ **Aerodrome control service**: The provision of air traffic control service for aerodrome traffic.
✶ **The flight information service**.
✶ **The alerting service**.
Objectives of Air Traffic Control

- Prevent collisions between aircraft
- Prevent collisions between aircraft on the manoeuvring area and obstructions on that area
- Expedite and maintain an orderly flow of air traffic

\[ \text{ICAO Annex 11, § 2.2} \]
Traffic conflict management

**STRATEGIC CONFLICT MANAGEMENT**
Airspace organisation and management
Demand and capacity balancing

**SEPARATION PROVISION**
Pilot maintained separation
ATC provided separation

**COLLISION AVOIDANCE**
Safety nets
Airborne Collision Avoidance System (ACAS)
Short Term Conflict Alert (STCA)
VFR - Visual Flight Rules
See and Avoid!
IFR - Instrument Flight Rules

ATC prevents collisions between aircraft
Aerodrome control (ADC)
Approach control (APP)
Approach separations

Minimum 3 NM or 5.5 km

1000 ft or 300 m
Area control (ACC)
Separations up to Flight Level 410 (41 000 feet or 12 500 metres)

Minimum horizontal separation at the same altitude:
- 5 nautical miles (9 000 metres)

Minimum vertical separation:
- 1 000 feet (300 metres)
The Objectives of the Flight Information Service

- Provide advice and information useful for the safe and efficient conduct of flights

The Objectives of the Alerting Service

- Notify appropriate organisations regarding aircraft in need of search and rescue aid, and assist such organisations as required
Each contracting State may, subject to the provisions of this Convention, designate the route to be followed within its territory by any international air service and the airports which any such service may use.
Chicago Convention Article 69
Improvement of air navigation facilities

If the Council is of the opinion that the airports or other air navigation facilities, including radio and meteorological services, of a contracting State are not reasonably adequate for the safe, regular, efficient, and economical operation of international air services, present or contemplated, the Council shall consult with the State directly concerned, and other States affected, with a view to finding means by which the situation may be remedied, and may make recommendations for that purpose. No contracting State shall be guilty of an infraction of this Convention if it fails to carry out these recommendations.
Implementation of Air Traffic Services

Flight Information Region

- No Service
- Flight Information Service
- Alerting Service
Flight Information Regions

"An airspace of defined dimensions within which flight information service and alerting service are provided."

ICAO Annex 11, Definitions.

"Those portions of the airspace where it is determined that flight information service and alerting service will be provided shall be designated as flight information regions."

"Flight information regions shall be delineated to cover the whole of the air route structure to be served by such regions."

Annex 11 § 2.5.2.1 and § 2.9.2.1.
Flight Information Regions (FIR)
Air Navigation Services over the High Seas

"...Each contracting State undertakes to keep its own regulations in these respects uniform, to the greatest possible extent, with those established from time to time under this Convention. Over the high seas, the rules in force shall be those established under this Convention..."

Chicago Convention Article 12 (Rules of the air)
Air Navigation Services over the High Seas

"Those portions of the airspace over the high seas or in airspace of undetermined sovereignty where air traffic services will be provided shall be determined on the basis of regional air navigation agreements. A Contracting State having accepted the responsibility to provide air traffic services in such portions of airspace shall thereafter arrange for the services to be established and provided in accordance with the provisions of this Annex."

ICAO Annex 11, § 2.1.2
Air Navigation Services over the High Seas

"The Standards and Recommended Practices in Annex 11 apply in those parts of the airspace under the jurisdiction of a Contracting State wherein air traffic services are provided and also wherever a Contracting State accepts the responsibility of providing air traffic services over the high seas or in airspace of undetermined sovereignty. A Contracting State accepting such responsibility may apply the Standards and Recommended Practices in a manner consistent with that adopted for airspace under its jurisdiction."

ICAO Annex 11 (Scope)
Airspace organisation

Class A

Class D

Class G

Class C
ANS Infrastructures

Communication:
- Exchange of messages between:
  - Pilots and Air Traffic Controllers
  - Controllers and other ground facilities
- Original "procedural" ATC based on communications alone

Navigation:
- Ground based installations
- Allow the aircrews to know the aircraft positions at all times

Network organisation:
- Airways structure + airport needs

Surveillance:
- Allows ATC to know the aircraft positions at all times
- Radar (primary and secondary)
The limits of the conventional Air Traffic Control system
Traffic growth in Europe

IFR traffic in Europe
1960-2011 historical figures
2012-2018 forecast

Long-Term Trend
Before 2009

Actual Traffic
Forecast Traffic

Long-Term Average Growth

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Fatal accidents involving Air Traffic Management in Europe

Source EUROCONTROL

Linate, 8 October 2001
Überlingen, 1 July 2002
Causes for Delay

Primary Causes of Delay: September 2003 - August 2004
(Data provided by Airlines)

- Airline: 54%
- Airport: 17%
- En-Route: 15%
- Weather: 6%
- Security: 4%
- Misc: 4%

Source: EUROCONTROL
Limitations of the conventional ATS system

- Technical limitations
  - Communications
  - Navigation
  - Surveillance

- Operational limitations

- Institutional limitations
Operational and technical solutions alone will not solve the shortcomings of the current system. Built-in institutional deficiencies also need to be addressed:

- civil-military relationship
- a new understanding of sovereignty
  - Traditional national focus vs. the need for cross-border arrangements
- the inability of States to secure the funding of ANS infrastructures
Assessment of the present system

"One element of the airline's cost structure, however, is largely beyond the control of the airlines: the air traffic control system (ATC). The current ATC, administered by the FAA, has proven to be a burdensome component of the carrier's operating costs, accounting for losses, in some estimates, up to 5 billion annually".

Assessment of the present system

- "...aviation has become burdened with strict regulations that prevent pilots from travelling where, when, and how they desire. Foremost among these restrictions it is the air traffic control (ATC) system which confines aircraft to routes and altitudes dictated by FAA air traffic controllers…"

- "...the positive control system is inherently inefficient because it does not permit optimum use of available air space."

Part II

CNS/ATM: Overcoming the limits of conventional ATC
CNS/ATM

- Communication
- Navigation
- Surveillance
- Air Traffic Management

- The ICAO answer to the limits of the conventional ANS model:
  "The biggest revolution in international civil aviation since the Chicago Convention itself"

- Objective:
  Enable optimum use of ATS system capacity, available airspace & aircraft capability
CNS

- CNS is the technological infrastructure which will support future air navigation operations

- CNS based upon the capability of most advanced technology
  - satellite technology
  - digital technology
Communications

- Digital communication channels
  - quality of communications improved
  - number of available channels multiplied

- Datalinks will replace non critical voice exchanges (VDL=VHF Data Link)
  - Digital Automatic Terminal Information Service (DATIS)
  - Datakink Clearance delivery

- Satellites will ensure global coverage
Air Traffic Flow Management - ATFM

A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that ATC capacity is utilized to the maximum extent possible, and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.
Segregated systems

2 ATC systems
Poor data exchange and different functions.
MIL ATC unit co-located with Air Defence Unit.
CIV ATC Unit located remotely.
Displayed radar data differs between MIL and CIV units.
No direct communication between MIL and CIV positions.
Coordination ensured through third party.

Integrated system Segregated units

MIL ATC Unit stand alone, located remotely from CIV ATC Unit.
MIL and CIV ATC systems have similar functions.
Good level of data exchange.
Displayed radar data same between MIL and CIV ATC Units

Single ATC system Co-located units

One ATC system
MIL and CIV sectors co-located in same OPS room or same building

Single ATC system Single ATC unit

ATC service to MIL and CIV traffic provided by the same ATC sector
Airspace Management

Airspace Management means a planning function with the primary objective of maximising the utilisation of available airspace by dynamic time-sharing and, at times, the segregation of airspace among various categories of users based on short term needs.

Flexible Use of Airspace (FUA) is an airspace management concept which determines that airspace should not be designated as either pure civil or military airspace, but rather considered as one continuum in which all users requirements have to be accommodated to the maximum extent possible.

European Commission Directive laying down the implementation rules for the Flexible Use of Airspace
Airspace Management Levels

**STRATEGIC ASM LEVEL 1**
Definition and review of national airspace policy and ASM rules

**PRE-TACTICAL ASM – LEVEL 2**
Conduct of operational management Agreement between civil & military authorities involved

**TACTICAL ASM LEVEL 3**
On the day activation / de-activation or real-time allocation of airspace
Airspace allocation

**AMC**: A joint civil/military cell responsible for the day-to-day management and temporary allocation of national or sub-regional airspace under the jurisdiction of one or more State(s)
Airspace Management: Terminology

- **‘airspace reservation’** means a defined volume of airspace normally under the jurisdiction of one aviation authority and temporarily reserved, by common agreement, for exclusive use by another aviation authority.
- **‘airspace restriction’** means a defined volume of airspace taking the form of:
  - danger area: an airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times; or
  - restricted area: an airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions; or
  - prohibited area: an airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

- **‘conditional route’ (CDR)** means an ATS route or a portion thereof which can be planned and used under specified conditions.

Draft European Commission Directive laying down the implementation rules for the Flexible Use of Airspace (December 1, 2004, ed. 1.6)
<table>
<thead>
<tr>
<th>Type of Area</th>
<th>Definition</th>
<th>Potential Class of Manageability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary Reserved Area (TRA)</td>
<td>Defined volume of airspace temporarily reserved for specific activities, but through which civil and other traffic may be allowed to transit under ATC clearance</td>
<td>AMC-manageable</td>
</tr>
<tr>
<td>Temporary Segregated Area (TSA)</td>
<td>Defined volume of airspace temporarily segregated for specific activities, through which civil and other traffic will not be allowed to transit</td>
<td>AMC-manageable</td>
</tr>
<tr>
<td>Cross Border Area (CBA)</td>
<td>TSA established over international boundaries</td>
<td>AMC-manageable</td>
</tr>
<tr>
<td>Restricted Area (R)</td>
<td>Airspace volume of defined dimensions within which the flight is restricted in accordance with specific conditions</td>
<td>AMC-manageable, Non-AMC-manageable, Non-manageable</td>
</tr>
<tr>
<td>Danger Area (D)</td>
<td>Airspace volume of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.</td>
<td>AMC-manageable, Non-AMC-manageable, Non-manageable</td>
</tr>
<tr>
<td>Prohibited Area (P)</td>
<td>Airspace volume of defined dimensions within which the flight of aircraft is prohibited</td>
<td>Non-manageable</td>
</tr>
<tr>
<td>Conditional Route Level</td>
<td>Availability for Flight Planning AND ATC Purposes</td>
<td>Available to ATC ONLY (e.g. airborne rerouting)</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>CDR-1</td>
<td>Always available during published times in the national AIP, unless closed during the pre-tactical phase</td>
<td></td>
</tr>
<tr>
<td>CDR-2</td>
<td>NOT available for planning unless it is opened during the pre-tactical phase. The route is available for flight planning during the CDR-2 periods when published in CRAM messages issued by CFMU one day in advance</td>
<td>Available when closed for flight planning – subject to coordination with the military controlling unit</td>
</tr>
<tr>
<td>CDR-3</td>
<td>Never available for flight planning</td>
<td></td>
</tr>
</tbody>
</table>
From Air Traffic Services (ATS) to Air Traffic Management (ATM)

Air Traffic Management:

The aggregation of the airborne functions and ground-based functions (air traffic services, airspace management and air traffic flow management) required to ensure the safe and efficient movement of aircraft during all phases of operations.
Air Traffic Management

ATM

ATS

ASM

ATFM

FIS

ATC

ALRS

ACC

APP

ADC
Focus areas for the future

- Regional initiatives
  - The Single European Sky
- The selection and synchronised deployment of future technologies and operational procedures
  - SESAR and NextGen
  - From control of aircraft to trajectory management
- Aeronautical Information Management (AIM)
  - The growing significance of aeronautical data
- The virtualisation of technical infrastructures:
  - From monolithic integrated system to shared services
- Automation of ATM functions
- Autonomous aircraft
  - Airborne Separation Assurance Systems (ASAS)
  - Unmanned Aerial Vehicles (UAVs)
    - Remotely Piloted Aircraft (RPA)
- Human factors
Managed airspace
- ASAS separation
- ATC separation
- Visual separation

Unmanaged airspace
- ASAS separation
- ATC separation
- Visual separation

High density area
- ATC separation
- Visual separation

Airport
AIM (Aeronautical Information Management)

Static data production

NOTAM

Flight plan filing

Air Traffic Flow Management

AIP

Charting

Weather data

AFTN/CIDIN
Aeronautical Information Management

Controller's workstation display

Surveillance Data Processing

Data Processing Backend
  FDP
  EDP

Aircraft positions

Ground Situation

Air Situation

Flightplans

Environment Data

Safety Nets

Monitoring Aids

Decision Tools
Danger: overload

Maximum peak workload
Maximum system and team support

Comfort window

Maximum sustainable threshold load
High system and team support

Danger: boredom

Minimum workload
Low system and team support
Automation of ATM Functions

"Human air traffic controllers will become defunct within the next 20 years as a revolutionary airborne landing system comes onstream."

"The computerised cockpit revolution has been developed in pursuit of fuel savings and the elimination of human error – but it will cost the world's 40'000 air traffic controllers their jobs."

"While computers can accurately plot a path, the concern would be that pilots and passengers need the reassurance you can only get with human judgement... Alarms bells are ringing in terms of what the implications could be for safety."

"40'000 air traffic jobs at risk from automated system", The StraitsTime, August 25, 2003
Part III

Ze The Legal Framework for the Establishment of Air Navigation Services
Chicago Convention Article 28

Air Navigation Facilities and Standard Systems

"Each contracting state undertakes, so far as it may find practicable, to:

provide, in its territory, airport, radio services, meteorological services and other air navigation facilities to facilitate international air navigation, in accordance with the standards and practices recommended or established from time to time, pursuant to this convention;

adopt and put into operation the appropriate standard system of communications procedure, codes, markings, signals, lighting, and other operational practices and rules which may be recommended or established from time to time, pursuant to this convention;

collaborate in international measures to secure the publication of aeronautical maps and charts in accordance with standards which may be recommended or established from time to time, pursuant to this convention.
Sovereignty

"The contracting States recognise that every State has complete and exclusive sovereignty over the airspace above its territory."

Chicago Convention, article 1.
Sovereignty

A State's "competence to act judicially, legislatively and administratively...over all persons and things within its territory"


"...the right to exercise the functions of a State to the exclusion of all other States in regard to a certain area of the world."

Airspace sovereignty

“A State's right to regulate in a constraining manner the use of the airspace over its territory and to have such regulation enforced.”

Swiss federal Ordinance on the safeguard of airspace sovereignty, status April 19 2005, Art. 2, Definitions
Territorial sovereignty

- a State's territory covers "...the land areas and territorial waters adjacent thereto under the sovereignty, suzerainty, protection or mandate of such State...".
  - Chicago Convention, Article 2

- "...State may also have a “quasi-territorial” jurisdiction...above the high seas..."
Air Navigation Services as a "public service"

✎ Public Safety

"Public safety… is the protection of lives and goods of individuals against dangers resulting from natural phenomena or against man created risks..."

✎ Blaise KNAPP

✎ Safeguard of national sovereignty

"With the technical and operational means available, the Air Navigation Services shall monitor the Swiss controlled and uncontrolled airspace, in the view of safeguarding airspace sovereignty."

✎ Swiss Federal Ordinance on the Safeguard of airspace sovereignty in times of unrestricted air navigation

✎ Mandate entrusted to ANSPs independently from their ATC activities, because of the availability of necessary infrastructures
Air Navigation Services as a "public service"

Police activities

"Air navigation services is also about the performance of police activities..."

"Proposal for a modification to the Swiss Federal Law on Aviation", November 1991

"In short, it can be established that swisscontrol is responsible for the safety of air navigation in Switzerland. This constitutes to a large extent a police function: swisscontrol performs an air police function....".

"The legal fundament of swisscontrol", legal opinion by Prof. Thomas Fleiner-Gerster, April 1990

"State agents are vested with police powers: they give orders to crews, and notice infringements to regulation and to their orders, which in turn generate administrative actions against faulty pilots."


Support to mobility

The satisfaction of peoples' mobility needs and to secure access to remote locations.
Air Navigation Services as a "public service"

"Smooth operation of the air transport system requires air navigation services allowing optimum use of Europe's airspace and a consistent, high level of safety in air travel, in keeping with the duty of general interest of air navigation services, including public service obligations"… "Air traffic services are comparable to public authorities requiring functional or structural separation and are organised according to very different legal forms in the various Member States."

- SES Framework Regulation", preamble, § 3 and § 9.

"The provision of air traffic services, as envisaged by this Regulation, is connected with the exercise of the powers of a public authority, which are not of an economic nature justifying the application of the Treaty rules of competition".

- SES Service Provision Regulation, Preamble, § 5.
States and public service obligations
Main legal drivers

Sovereignty, obligations under Chicago Convention Article 28 and Public Service obligation explain:

- The traditional organisational model for ANS
  - A nationalistic approach
  - A State-controlled approach

Why ANS had evolved, institutionally, at a different pace and following a different path than other aviation sectors
Traditional organisational model

ียว A governmental Agency funded by public taxation and providing Air Navigation Services as a sovereign public service function within the limits of its State's national boundaries and, based on specific arrangements, over certain portions of the high seas.
Institutional reform

Motivation

- Improve the operational, financial and environmental performance of the ANS system
- Offer a better and quicker response to traffic growth and evolving airspace users' needs
- Need to finance major infrastructure improvements
- Need to separate service provision and regulation functions

Financial autonomy

- Free access to capital market, for the timely and adequate financing of infrastructure investments
- Financial self-sufficiency

Managerial autonomy

- Decision taking and management process from the private sector industry
Commercialisation

- Refers to **processes and practices**
  - Indicates the introduction of commercial business and management tools from the private sector

"Commercialisation"
- "An approach to management of facilities and services in which business principles are applied or emphasis is placed on development of commercial activities"
  - Privatisation in the Provision of Airports and Air Navigation Services, ICAO Circular 284 AT/120, March 2002
The service provider – user relationship

Flight Plan = Request

Service unilateral relationship

Administrative fee

Service

Charge

Contract?

Administrative relationship
Rationale for Change

“The ATC system was unable to respond quickly to its customers needs and to modernise its infrastructure”


"...increased efficiency, flexibility in managing our resources, and freedom from cumbersome regulations that have long restricted our ability to keep pace with advances in technology".


"... the funding for capital projects is sometimes spread out over so many years that technologies are out of date by the time they are deployed."

"Nightmare on Capitol Hill", Air Traffic Management, Summer 2005, p. 23
Rationale for Change

"As fiscal deficits and public sector debt increase, ministers were unable to secure funding for necessary infrastructure renewal investment - such as replacing a 25 years old air traffic services system".


"… so long as governments are responsible for ATC systems, controllers have no fear of being displaced by technological advancements"

Bill Robertson, EC-President ATC Association, Canada
Air Navigation Services comprise two aspects:
- a regulatory part; and
- a service provision part.

The regulatory function is meant to
- protect various groups of people from all types of risks which may potentially derive from the exercise of a given activity (in particular safety critical ones)
- protect the broader interests of the State itself, among which its sovereign prerogatives.
Separation and conflicts of interest

“…there should be, in the sphere of air traffic control, a proper separation between the regulator and the provider of the service, so as to encourage transparent decision-making and to ensure there is no conflict of interest.”

"Freeing Europe's - Airspace Commission Propose Air Traffic Control Reform to Increase the Efficiency of Air Travel and to Combat Congestion and Delays", European Commission, Press Release, 10/7/98.
Regulatory function vs. Service provision

Air Navigation Services

Performance regulation
- Safety Regulation
- Economic Regulation
- Airspace Regulation

Service provision
States' responsibilities

**Regulatory function (Executive)**
- Definition of the detailed regulatory framework
- Definition of compliance criteria

**Certification function**
- Verification that an operator meets the requirements for the performance of a regulated function

**Supervisory function**
- Verification of compliance with the regulatory framework

**Audit function**
- A specific certification/supervisory methodology
- Verification of compliance with defined compliance criteria
Service Provision

-outs

- Article 28 of the Chicago Convention
  - the responsibility for providing air navigation facilities is a "State responsibility"

- Nothing in the Chicago Convention prevents a State from designating another entity, be it a national, foreign, public or private organization
  - "When it has been determined that air traffic services would be provided, the State concerned should designate the authority responsible for providing such services... The authority responsible for establishing and providing the service may be a State or a suitable agency".
  - ICAO Annex 11, § 2.1.3.
The Need for Economic regulation

"Price is always a concern, Airservices Australia has a domestic monopoly and is run commercially, meaning there is the possibility of there being no limit to what they can charge".

Decentralisation of public functions

"Decentralisation can also aim at entrusting a specialised administration with the task of executing a particular public function which requires a specific knowledge or management model."

Autonomous authorities

"Autonomous ANS authority: An independent entity established for the purpose of operating and managing one or more ANS, and empowered to manage and use the revenues it generates to cover its costs. The word "authority" does not normally imply regulatory authority when used in this context."

Privatisation in the Provision of Airports and Air Navigation Services, ICAO Circular 284 AT/120, March 2002
Autonomous authorities

ICAO “encourages the establishment by States of autonomous authorities to operate their airports and air navigation services or both”

“…An autonomous authority refers to an independent entity or body established for the purpose of operating certain facilities and providing specific services, and being granted operational and financial freedom to carry out its functions.”

The move towards autonomous entities

“Air transportation has matured... It is no longer necessary for governments to manage every facet of the industry. Government can no longer afford to own, operate and manage all aspects of the industry.”

Corporatisation

하신이 the legal status of the ANS provider
하신이 indicates that the ANS Provider has been established as a private law entity, regardless of its owner.

"Creation of a legal entity outside government to manage certain facilities and services, either through a specific statute or under an existing statute such as company law. Once corporatised, the entity becomes autonomous."

Privatisation in the Provision of Airports and Air Navigation Services, ICAO Circular 284 AT/120, March 2002
Privatization

- Refers to **ownership**
- Indicates that the share capital has been sold to private investors, in whole or in part

"to make private, especially to change from public to private control or ownership",

"the word "privatisation" is used only in the context of the introduction by way of a sale of equity capital to non-government shareholders, i.e. third parties."

"Transfer of full or majority ownership of facilities and services from the public sector to the private sector."
Privatisation in the Provision of Airports and Air Navigation Services, ICAO Circular 284 AT/120, March 2002
Why Privatise?

"…governments worldwide have been selling state owned assets, primarily as an additional source of revenue".


"Government financing … is becoming increasingly difficult in many States. Governments are under pressure to finance other high-priority services, especially social services."

Privatisation in the Provision of Airports and Air Navigation Services, ICAO Circular 284 AT/120, March 2002
Forms of privatisation

- Management contract
- Lease (concessions)
- Transfer of minority ownership
Types of investments

FINANCIAL INVESTORS

Financial Institutions

Capital investment

STRATEGIC INVESTORS

ANSPs
Airlines
Suppliers
Airports

Capital investment
Cross-participation
Autonomy vs. Safety

"The idea … that the FAA should be corporatised will never be discussed sanely for the simple reason congressmen are worried about how the idea would be perceived by voters who tend to think that the air system is only safe if it's in federal hands."

"Is privatisation then answer?", Air Traffic Management, summer 2005, p. 20
"It may also be preferable to restrict the participation of airlines in the ownership and management of airports and Air Navigation Services to avoid conflicts of interest that may arise when the users become the owners."

Privatisation in the Provision of Airports and Air Navigation Services, ICAO Circular 284 AT/120, March 2002
"Every business activity has certain risks, and airports and Air Navigation Services are no exception. The major risks to States in private participation or privatisation in the provision of ... services are that:

- the private provider may ignore safety and security requirements;...

Privatisation in the Provision of Airports and Air Navigation Services, ICAO Circular 284 AT/120, March 2002
<table>
<thead>
<tr>
<th>National</th>
<th>Governmental</th>
<th>Org. separated</th>
<th>Autonomic</th>
<th>Corporatised</th>
<th>Privatised</th>
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States' concerns in respect of ANS

The many States's functions:

- States as airspace owner

Three central concerns:

- SAFETY
- SOVEREIGNTY
- CONTINUITY & AVAILABILITY

The organisation in charge of service provision must offer sufficient confidence that all concerns are adequately addressed.
"The future system requires global regulation, global planning, global implementation and global systems integration."

"Airspace structures can no longer only be based on national and domestic considerations. Major efficiency gains will be attained through global integration rather than rigid boundary structures. In order to achieve this goal, there is a need to focus on international rather than on purely national requirements."

Air Traffic Control & National Borders
The need for cross-border arrangements

"The delineation of airspace wherein air traffic services are to be provided, should be related the nature of the route structure and the need for efficient service rather than to national boundaries"

"Agreements to permit the delineation of airspace lying across national boundaries are advisable when such action will facilitate the provision of air traffic services (see 2.1.1). Agreements which permit delineation of airspace boundaries by straight lines will, for example, be most convenient where data processing techniques are used by air traffic services units."


"Particular efforts should be made to dissociate the limits of the sectors from national boundaries, whenever this is operationally beneficial"

Models for cross-border service provision

- Air Traffic Services Delegation
- Service concession
- Sub-contracting of services
- Multinational centres
Delegation of ATS

"...Annex 11, 2.1 makes specific arrangements whereby adjacent States are encouraged to conclude mutual arrangements which allow for the delegation of responsibility for the provision of ATS from one State to another..."

ICAO doc 9426-AN/924
Delegation of ATS

"Delegation of ATS: the process by which "one state delegates to another state the responsibility for establishing and providing air traffic services."

ICOA Annex 11, § 2.1.1
Informal Center to Center Delegation

STATE A

Centre A

STATE B

Centre B
Air Traffic Services Delegation

State A

Intergovernmental
ATS delegation
agreement

State B

Mandate to
effective service provider

ANSP
Sub-contracting model

STATE A

State Mandate

ANSP

Contract

STATE B

ANSP
Multinational Centre Model

STATE A

Intergovernmental Agreement

STATE B

Multinational ANSP