

COMMUNICATIIN NAVIGATION SURVEILLANCE-ATM-II

Let us move to the next part



CNS/ATM PARTNERS AND TOOLS

- ▶ Planning for implementation of facilities and services associated with CNS/ATM systems involves
 - ▶ the **combined efforts of ICAO**, States, users, **service providers and industry**.
 - ▶ These entities are more commonly known as the CNS/ATM partners.
 - ▶ The partners conduct their work at several levels with the **aim of developing planning documentation** which, for development of the regional ANPs.
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ICAO Policies on CNS/ATM

- ▶ CNS/ATM Systems Implementation and Operation,
 - ▶ stipulates **principles of universal accessibility**, sovereignty authority and responsibility of Contracting States of ICAO.
 - ▶ This statement also sets out the precepts **concerning technical cooperation**, institutional arrangements, airspace organization and utilization, **continuity and quality of service and cost-recovery**.
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Planning CNS/ATM Infrastructure

- ▶ **Step 1.** Identify homogeneous ATM areas and/or major traffic flows.
 - ▶ **Step 2.** List the ICAO region(s), flight information region(s) and State(s) involved in the homogeneous ATM areas and/or major international traffic flows.
 - ▶ **Step 3.** Carry out air traffic forecasts and ascertain airspace user needs.
 - ▶ **Step 4.** Perform an operational analysis of the current infrastructure for the areas identified
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- ▶ **Step 5.** Determine the ATM objectives for the areas identified
 - ▶ **Step 6.** Establish CNS and other technical and automation requirements **necessary to support the desired ATM** objectives identified
 - ▶ **Step 7.** Analyze the benefits/improvements resulting from Steps 5 and 6 in order to establish (operational analysis):
 - ▶ a) **costs/benefits**;
 - ▶ b) relative priority;
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- ▶ **Step-8** repeat as necessary Steps 5, 6 and 7 to determine the most appropriate Operational solution
 - ▶ **Step 9.** Develop an ATM **implementation plan based on** the outcome of steps 1 through 8 using the results of the operational analysis.
 - ▶ A safety assessment **should demonstrate** that any new systems, or changes to the present systems, will achieve an acceptable level of safety.
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- ▶ **Step 10.** Examine the possibilities of funding the implementation of the CNS/ATM systems infrastructure for States requiring financial assistance.
 - ▶ **Step 11.** Determine the means and methods of cost-recovery.
 - ▶ **Step 12.** Establish a framework to interface with all the CNS/ATM partners on a continuing basis to ensure the harmonious and **integrated implementation of CNS/ATM systems**
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CNS/ATM–Communication System

- ▶ Communications element of CNS/ATM systems provides
 - ▶ for the **exchange of aeronautical data** and messages between aeronautical users and/or automated systems.
 - ▶ Communications systems are also used in **support of specific** navigation and surveillance functions.
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Communication System

- ▶ There are basically two categories of aeronautical communications:
- ▶ a) **safety-related communications** requiring high integrity and rapid response:
 - ▶ Air traffic services communications (ATSC) carried out among ATS units or between an ATS unit and an aircraft for ATC, flight information, alerting, etc;
 - ▶ Communications carried out by aircraft operators on matters related to safety, regularity and efficiency of flights; and
- ▶ b) **non-safety related communications**

Navigation System

- ▶ The navigation element of CNS/ATM systems is meant to
 - ▶ Provide accurate, reliable and **seamless position determination** capability, worldwide,
 - ▶ Through introduction of satellite-based aeronautical navigation.
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Navigation System–RNP

- ▶ **REQUIRED NAVIGATION PERFORMANCE (RNP)**
 - ▶ Modern aircraft are increasingly equipped with RNAV,
 - ▶ the use of which facilitates a **flexible route system**.
 - ▶ Also, by using the concept of RNP, the need for selection between competing systems can be avoided.
 - ▶ However, **international standardization** of navigation techniques, which are in wide use internationally, is still required.
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RNP

- ▶ The RNP concept for en-route operations has been approved by ICAO (Annex 11, Chapter 2) and
 - ▶ Has been **extended to cover approach, landing and departure** operations.
 - ▶ RNP is a **statement of navigation performance accuracy** within a defined airspace based on the combination of the navigation sensor error, airborne receiver error, display error and flight technical error.
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Global Navigation Sattellite System (GNSS)

- ▶ The GNSS is a worldwide **position and time determination system**,
 - ▶ which includes one or more satellite constellations,
 - ▶ aircraft receivers, and system integrity monitoring,
 - ▶ augmented as necessary **to support the RNP** for the actual phase of operation.
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Global Positioning System

- ▶ The satellite navigation systems in operation are the Global Positioning System **(GPS)** of the United States
- ▶ and the global orbiting navigation satellite system **(GLONASS)** of the Russian Federation.
- ▶ Both systems were offered to ICAO as a means to support the evolutionary development Global Navigation Satellite System.

GPS

- ▶ GPS space segment is composed of **twenty four Satellites**.
- ▶ The GLONASS space segment consists of twenty-four operational Satellites
- ▶ To overcome inherent system limitations and
- ▶ **to meet the performance requirements** (accuracy, integrity, availability and continuity of service) for all phases of flight,

Surveillance System

- ▶ The surveillance systems presently in use can be divided into two main types:
- ▶ **Dependent surveillance and Independent Surveillance.**
- ▶ In dependent surveillance systems, the aircraft position is **determined on board** and then transmitted to ATC.
- ▶ The current voice position reporting is a dependent surveillance system in which the position of the aircraft is **determined from on-board navigation equipment** and then conveyed by the pilot to ATC by radiotelephony

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- ▶ Independent surveillance is a system
 - ▶ that measures **aircraft position from the ground.**
 - ▶ Current surveillance is either based on voice position reporting or based on Surveillance radar/Secondary Surveillance Radar , **which measures range and azimuth of aircraft** from the ground station.
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Functional Aspects

- ▶ Voice position reporting
 - ▶ Surveillance **through voice position** reporting is mainly used in oceanic airspace and
 - ▶ aerodrome control service or area control service outside radar coverage.
 - ▶ **Pilots report their position** using VHF and/or HF radios.
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Primary Surveillance Radar

- ▶ Primary Surveillance Radar (PSR)
- ▶ **The ground-based PSR** system provides information on the bearing and distance of the aircraft.
- ▶ PSR does **not require carriage** of any equipment by aircraft and is capable of detecting almost any moving target

Primary Surveillance Radar

- ▶ Primary radars are currently used for **surface movement detection** as well as weather detection.
 - ▶ **Precision approach radars (PARs)** are primary radars used for **approach operations** based on specific procedure for pilot/controller.
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Secondary Surveillance Radar(SSR)

- ▶ The SSR interrogates transponder equipment installed in the aircraft.
 - ▶ In **Mode “A”**, the aircraft transponder provides identification information, aircraft bearing and distance and in
 - ▶ **Mode “C”**, it provides pressure–altitude information.
 - ▶ **SSR Mode S** is the appropriate surveillance tool in high–density traffic areas. The interconnection of ground stations in clusters provides an enhanced surveillance and communications system.
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Automatic Dependent Surveillance System (ADS)

- ▶ ADS is an application for use by ATS in which **aircraft automatically transmit**, via a data link, data derived from on-board navigation systems.
 - ▶ As a minimum, the data include the four-dimensional position, **but additional data may be provided as appropriate.**
 - ▶ The ADS data will be used by the automated ATC system to present information to the controller
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Airborne Collision Avoidance System (ACAS)

- ▶ The airborne collision avoidance system (ACAS) is an aircraft system
 - ▶ which operates independently of ground-based equipment to
 - ▶ **provide advice to the pilot** on potential conflicting aircraft that are equipped with SSR transponders (Mode C or Mode S);
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REQUIRED SURVEILLANCE PERFORMANCE (RSP)

- ▶ The emergence of several types of surveillance systems has raised concern that the air navigation system is becoming too complex.
 - ▶ To **facilitate the planning**, one solution would be to translate all relevant operational requirements into a series of surveillance performance parameters.
 - ▶ The term “required surveillance performance (RSP)” refers to **a set of well-quantified surveillance performance requirements such as capacity, availability and accuracy.**
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Aeronautical Information Services (AIS)

- ▶ The major objective of AIS is to ensure the **flow of information necessary for the safety**, regularity and efficiency of international civil aviation.
 - ▶ In that respect, each Contracting State is **required to provide this service** and is responsible for the information provided.
 - ▶ It must be made **available to personnel**, including flight crews and those involved with flight planning and air traffic services
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Aeronautical Charts

- ▶ **For the safe performance** of air operations, it is essential that current, comprehensive and authoritative navigation data be available at all times, and
- ▶ that **aeronautical charts** supply that information in a manageable and condensed manner.
- ▶ As all segments of aviation make reference to aeronautical charts for air traffic control, planning and navigation, **it is essential to place curate charts in the hands of users**

Aeronautical Information Publication(AIP)

- ▶ Aeronautical information services are **required to publish in their Aeronautical Information Publications (AIPs)**
 - ▶ The description and list of available aeronautical charts series, together with an indication of their intended use.
 - ▶ The provision of aeronautical information and aeronautical charts services **to support international civil aviation** is primarily the responsibility of States.
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Aeronautical Information

- ▶ The aeronautical information provided is related to **the FIR and aerodromes within a given region.**
 - ▶ This information is provided to pilots in face-to-face briefings at the aerodrome AIS unit or in flight, through air traffic control.
 - ▶ **Communication of the latest information** to users is effected through the aeronautical fixed telecommunication network (AFTN) in the form of notices to airmen (NOTAM)
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Let us Go over what we Discussed?

- ▶ Background of CNS
 - ▶ **Benefits of CNS**
 - ▶ ICAO Planning structure of CNS/ATM–National Regional–Global
 - ▶ **In detail.** Covered Communication System; Navigation System and Surveillance System
 - ▶ Aeronautical Information–Aeronautical Chart(MAP)
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Any Question??



► See You.....

