



## Course Description

# Performance-based Navigation I - Introduction to PBN, GNSS Theory and Area Navigation (RNAV)

**Activity Code:** TCVT-20 (Elective course / Diploma in **Management of Air Navigation Systems** OR Diploma in **Air Traffic Management**).

### General description

Performance-based Navigation I is a 5 day course that provides an overview of the history and evolution of the PBN concept, GNSS theory, Area Navigation (RNAV), RNP and airspace planning and design.

### How you will benefit

You will benefit by learning about:

- History and evolution of the ICAO Performance-based Navigation (PBN) Concept
- ICAO Global Plan for CNS/ATM Systems
- Types of Area Navigation (RNAV) systems
- Fundamentals of GNSS theory and GNSS separation standards and benefits
- Fundamentals of RNAV and RNP procedure design
- Instrument Approach Procedures
- Standard Instrument Departures and Arrivals (SIDs, STARs)

### Designed for:

- Air Traffic Controllers, managers and supervisors
- Air Navigation Service Provider managers and supervisors
- ATC Procedures and Airspace designers
- Aircraft operators and airline managers and personnel
- Aircraft Operations and Flight Planning managers and personnel
- Civil aviation authorities and regulators

### Course Content

History and evolution of ICAO Navigation Specifications leading up to the PBN Concept

- The need for a Global Plan for implementation and harmonization of CNS/ATM systems around the world
- The ICAO Global CNS/ATM Plan and timeline
- FANS, CNS/ATM, RNP, RNP/RNAV etc.
- Relevant ICAO Specifications, in particular for Enroute, Terminal Area and Approach
- Regional differences and harmonization
- PBN in relation to existing and future airspace structures



## Types of Area Navigation (RNAV) systems

- RNAV systems and the following individual navigation system technologies: DME/DME, IRU, INS, GNSS, GPS, SBAS, GBAS, Galileo etc.

## Fundamentals of GNSS theory and GNSS separation standards and benefits

- The evolution of GNSS constellations and their augmentations systems (ABAS)
- Space-based and ground-based GNSS augmentations (SBAS, GBAS)
- GPS receiver and Receiver Autonomous Integrity Monitor (RAIM)
- GNSS interference and relevant NOTAMs
- GNSS approvals
- GNSS (RNAV) approaches
- Lateral and longitudinal GNSS (RNAV) separation standards and benefits
- Other RNAV (GNSS) procedures
- Overview of how to validate RNAV and RNP procedures

## Fundamentals of RNAV and RNP procedure design

- Enroute and Terminal Manoeuvring Area (TMA) RNAV procedures
- Enroute Area Navigation, route spacing and the TLS
- Terminal Manoeuvring Area (TMA) Area Navigation
- Planning TMA Area Navigation Design and Implementation
- Different types of RNP and RNAV, and the regional variants

## Instrument Approach Procedures

- Conventional and Area Navigation (RNAV) procedures and their influence on airspace design
- Procedure protection areas and their effect on airspace structure

## Controlling aircraft using Standard Instrument Departures and Arrivals (SIDs, STARs)

- Modular approach to TMA area navigation implementation

## Area Navigation Review

- In-depth discussion on PBN and in particular RNAV and RNP to summarize all topics covered.
- Exam
- Course evaluation
- Graduation ceremony
- Closing