

PBN Syllabus Aeroplane		
Training phase	Topic	Learning Objective
Theoretical training	PBN concept (as described in ICAO Doc 9613)	
	PBN principles	List the factors used to define RNAV or RNP system performance requirements (accuracy, integrity, continuity and functionality).
		Explain the concept of continuity.
		Explain the concept of integrity.
		State that, unlike conventional navigation, performance-based navigation is not sensor-specific.
	PBN components	List the components of PBN as NAVAID infrastructure, navigation specification and navigation application.
		Identify the components from an example.
	PBN scope	State that in oceanic/remote, en route and terminal phases of flight PBN is limited to operations with linear lateral performance requirements and time constraints.
		State that in the approach phases of flight PBN accommodates both linear and angular laterally guided operations.
Practical training	Navigation specifications	
	RNAV and RNP	State the difference between RNAV and RNP in terms of the requirement for on-board performance monitoring and alerting.
	Navigation functional requirements	List the basic functional requirements of RNAV and RNP specifications (continuous indication of lateral deviation, distance/bearing to active waypoint, g/s or time to active waypoint, navigation data storage and failure indication).
	Designation of RNP and RNAV specifications	Interpret "X" in RNAV X or RNP X as the lateral navigation accuracy (total system error) in nautical miles, which is expected to be achieved at least 95 per cent of the flight time by the population of aircraft operating within the airspace, route or procedure.
	Performance-based navigation system architecture	
	Performance-based navigation system design	
	Performance-based navigation system implementation	

	<p>State that aircraft approved to the more stringent accuracy requirements may not necessarily meet some of the functional requirements of the navigation specification having a less stringent accuracy requirement.</p>
	<p>State that RNAV10 and RNP4 are used in the oceanic/remote phase of flight.</p>
	<p>State that RNAV5 is used in the en route and arrival phase of flight.</p>
	<p>State that RNAV2 and RNP2 are also used as navigation specifications.</p>
	<p>State that RNP2 is used in the en route and oceanic/remote phases of flight.</p>
	<p>State that RNAV1 and RNP1 are used in the arrival and departure phases of flight.</p>
	<p>State that RNP APCH is used in the approach phase of flight.</p>
	<p>State that RNP AR APCH is used in the approach phase of flight.</p>
	<p>State that RNP 0.3 navigation specification is used in all phases of flight, except for oceanic/remote and final approach, primarily for helicopters.</p>
Use of PBN	
Airspace planning	<p>State that navigation performance is one factor used to determine minimum route spacing.</p>
Approval	<p>State that the airworthiness approval process assures that each item of the area navigation equipment installed is of a type and design appropriate to its intended function and that the installation functions properly under foreseeable operating conditions.</p>
	<p>State that some PBN specifications require operational approval.</p>
Specific RNAV and RNP system functions	<p>Recognise the definition of an RF leg.</p>
	<p>Recognise the definition of a fixed radius transition.</p>
	<p>Recognise the definition of a fly-by-turn and a fly-over.</p>
	<p>Recognise the definition of a holding pattern.</p>
	<p>Recognise the definition of an “ARINC 424 path terminator”.</p>
	<p>Recognise the definition of the following path terminators: IF, TF, CF, DF, FA, CA.</p>
	<p>Recognise the definition of an offset flight path.</p>
Data processes	<p>State that the safety of the application is contingent upon the accuracy, resolution and integrity of the data.</p>
	<p>State that the accuracy of the data depends upon the</p>

		processes applied during data origination.
PBN operations		
PBN principles		Recognise the definition of path definition error. Recognise the definition of flight technical error. Recognise the definition of navigation system error. Recognise the definition of total system error.
On-board performance monitoring and alerting		State that on-board performance monitoring and alerting of flight technical error is managed by on-board systems or crew procedures. State that on-board performance monitoring and alerting of navigation system error is a requirement of on-board equipment for RNP. State that on-board performance monitoring and alerting of path definition error are managed by gross reasonableness checks of navigation data.
Abnormal situations		State that abnormal and contingency procedures are to be used in case of loss of the PBN capability.
Database management		State that, unless otherwise specified in operations documentation or AMC, the navigational database must be valid for the current AIRAC cycle.
Requirements of specific RNAV and RNP specifications		
RNAV10		State that RNAV10 requires that aircraft operating in oceanic and remote areas be equipped with at least two independent and serviceable LRNSs comprising an INS, an IRS FMS or a GNSS. State that aircraft incorporating dual inertial navigation systems (INS) or inertial reference units (IRU) have a standard time limitation. State that operators may extend their RNAV10 navigation capability time by updating.
RNAV5		State that manual data entry is acceptable for RNAV5.
RNAV/RNP1/2		State that pilots must not fly an RNAV/RNP1/2 SID or STAR unless it is retrievable by route name from the on-board navigation database and conforms to the charted route. State that the route may subsequently be modified through the insertion (from the database) or deletion of specific waypoints in response to ATC clearances. State that the manual entry, or creation of new waypoints by manual entry, of latitude and longitude

		or place/bearing/ distance values is not permitted.
	RNP4	<p>State that at least two LRNSs, capable of navigating to RNP4 and listed in the flight manual, must be operational at the entry point of the RNP airspace.</p>
	RNP APCH	<p>State that pilots must not fly an RNP APCH unless it is retrievable by procedure name from the on-board navigation database and conforms to the charted procedure.</p> <p>State that an RNP APCH to LNAV minima is a non-precision instrument approach procedure designed for 2D approach operations.</p> <p>State that an RNP APCH to LNAV/VNAV minima has lateral guidance based on GNSS and vertical guidance based on either SBAS or BaroVNAV.</p> <p>State that an RNP APCH to LNAV/VNAV minima may only be conducted with vertical guidance certified for the purpose.</p> <p>Explain why an RNP APCH to LNAV/VNAV minima based on BaroVNAV may only be conducted when the aerodrome temperature is within a promulgated range.</p> <p>State that the correct altimeter setting is critical for the safe conduct of an RNP APCH using BaroVNAV.</p> <p>State that an RNP APCH to LNAV/VNAV minima is a 3D operation.</p> <p>State that an RNP APCH to LPV minima is a 3D operation.</p> <p>State that RNP APCH to LPV minima requires an FAS data-block.</p>
	RNP AR APCH	State that RNP AR APCH requires authorisation.
	A-RNP	<p>State that Advanced RNP incorporates the navigation specifications RNAV5, RNAV2, RNAV1, RNP2, RNP1 and RNP APCH.</p> <p>State that Advanced RNP may be associated with other functional elements.</p>
Flight instructions	Pre-flight operations and departure	<p>PBN departure (if applicable): Check that the correct procedure has been loaded in the navigation system; and</p> <p>Cross-check between the navigation system display and the departure chart.</p> <p>Instrument departure procedures, including PBN departures, and altimeter setting</p>

	En-route IFR procedures (Must be performed by sole reference to instruments)	Use of navigation system and radio aids
	Arrival procedures	<p>PBN arrival (if applicable): Check that the correct procedure has been loaded in the navigation system; and</p> <p>Cross-check between the navigation system display and the arrival chart.</p>
	3D operations (Must be performed by sole reference to instruments)	<p>Setting and checking of navigational aids Check Vertical Path angle For RNP APCH: Check that the correct procedure has been loaded in the navigation system; and</p> <p>Cross-check between the navigation system display and the approach chart.</p> <p>Approach and landing briefing, including descent/approach/landing checks, including identification of facilities</p> <p>Holding procedure</p> <p>Compliance with published approach procedure</p> <p>Approach timing</p> <p>Altitude, speed heading control, (stabilised approach)</p> <p>Go-around action</p> <p>Missed approach procedure / landing</p> <p>ATC liaison — compliance, R/T procedures</p>
	2D operations (Must be performed by sole reference to instruments)	<p>Setting and checking of navigational aids For RNP APCH: Check that the correct procedure has been loaded in the navigation system; and</p> <p>Cross-check between the navigation system display and the approach chart.</p> <p>Approach and landing briefing, including descent/approach/landing checks, including identification of facilities</p> <p>Holding procedure</p> <p>Compliance with published approach procedure</p> <p>Approach timing</p> <p>Altitude/Distance to MAPT, speed, heading control (stabilised approach), Stop Down Fixes (SDF(s)), if applicable</p> <p>Go-around action</p>

		Missed approach procedure/landing
		ATC liaison – compliance, R/T procedures