EASA RNP (AR) Workshop
The Landscape
Working Together

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Cologne

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EASA Certification Flight Standards

Content ‘Aspects for Consideration’

- ‘Conventional’ versus ‘RNP AR’ approaches

- Approach Procedure Design & Approval
- Airworthiness / Equipment Approval
- Operational Evaluation & Approval

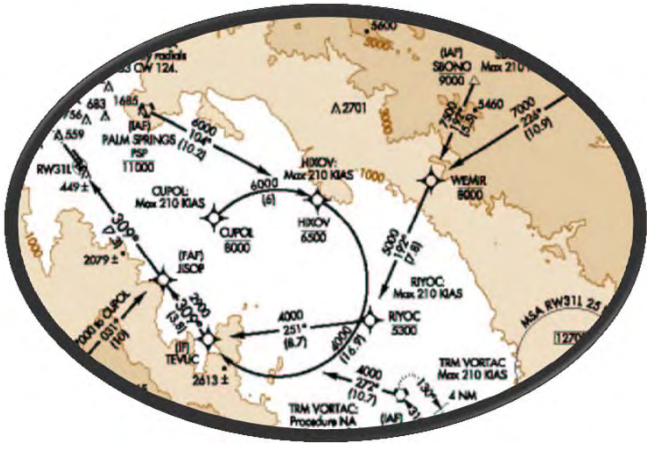
- Process taking into account:
  - complexity of the task
  - available resources
  - European aviation system

RNP AR – The Landscape

- **'Conventional' navigation systems:**
  - **procedure design, aircraft equipment/avionics, and operating procedures are generally considered in isolation**
    - **standard interfaces (common design, procedures, training, etc.)**
- **'RNP AR' approaches:**
  - **depend upon integration of aircraft, operations and procedure design**
  - **require a full operational evaluation of all aspects of the operation (aircraft equipment, configuration and capability, operating procedures, approach design, etc.)**
    - **fewer common standards and interfaces (in avionics, displays, alerting, etc.)**

Approach Procedure Development & Approval

- **ICAO Doc 9905 – Required Navigation Performance Authorization required (RNP AR) Procedure Design Manual**

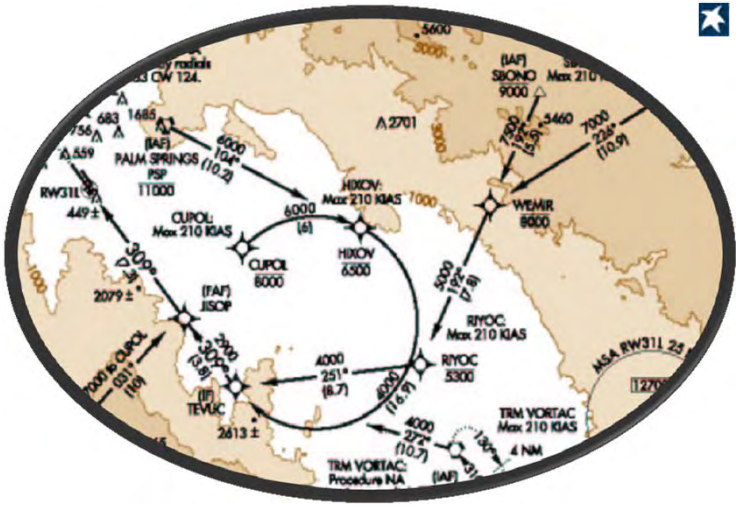


- generic guidance for similar procedures
  - ✈ can be applied generally
  - ✈ to a range of appropriate aircraft types
  - ✈ for qualified crews

- **RNP AR procedures are generally characterized by**
  - support for RNP < 0.3
  - lateral obstacle clearance 2 x RNP
  - vertical obstacle clearance by a vertical error budget
  - radius-to-fix (RF) legs enabling circular flight paths

Approach Procedure Development & Approval

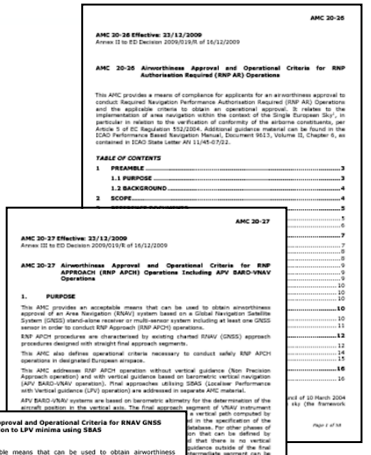
- General design criteria may create operational limitations



  - Variations
    - make use of full capability of specific aircraft types
    - provide better solutions in local conditions
    - require a case-by-case flight operational safety assessment & individual operational approval
- Large number of RNP AR procedures have been developed by industry
  - sponsored by airlines
  - approved by States
    - evaluation on a case-by-case basis
    - for a specific aircraft type
    - for an individual operator

Airworthiness / Equipment Approval

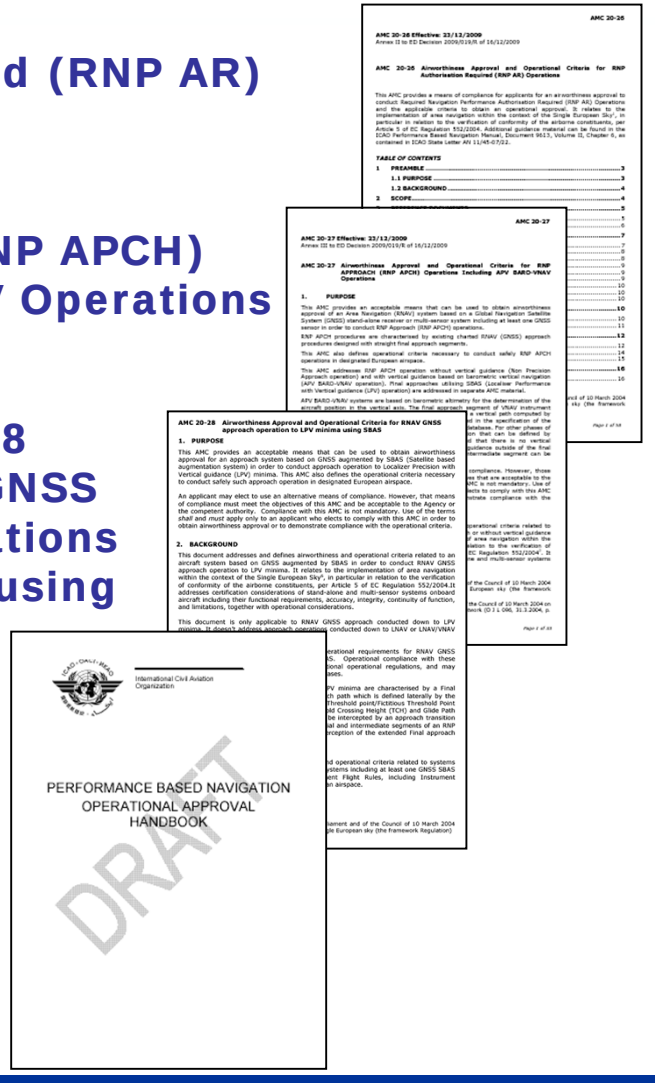
- **EASA AMC 20-26 –RNP Authorisation Required (RNP AR) Operations**
- **EASA AMC 20-27 –RNP APPROACH (RNP APCH) Operations Including APV BARO-VNAV Operations**
- **EASA AMC 20-28 (NPA) –RNAV GNSS approach operations to LPV minima using SBAS**



Airworthiness Approval

RNP AR Operational Evaluation

- EASA AMC 20-26 –RNP Authorisation Required (RNP AR) Operations
- EASA AMC 20-27 –RNP APPROACH (RNP APCH) Operations Including APV BARO-VNAV Operations
- EASA AMC 20-28 (NPA) –RNAV GNSS approach operations to LPV minima using SBASs
- ICAO Performance Based Navigation Operational Approval Handbook



RNP AR Operational Evaluation

Operations Manual

- ….
- ….
- RNP AR operating procedures, emergency situations
- Flight crew recency & training
- Safety management system
- ….
- ….

NAA Approval

OEB Evaluation

OEM

Operational Evaluation

- in accordance with EASA AMC 20-26, 20-27 & 20-28
- requires prior airworthiness approval
- Aircraft Flight Manual (AFM) or Pilot‘s Operating Handbook (POH) should
  - identify the equipment for RNP APCH operation
  - address RNP APCH in the sections on Limitations, Normal and Abnormal Procedures

Operational Evaluation

Flight Operations Documentation

- Ops Manual, check lists, QRH to address RNP APCH operations and procedures
- MMEL to identify the minimum required equipment for RNP APCH operations

Aircraft operational suitability

- continuous numerical display of vertical & lateral deviations (minimum resolution of 10ft / 0.01nm)
- path steering performance
- navigation system monitoring & alerting

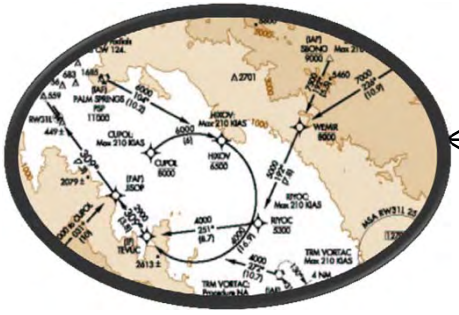
- Operational Evaluation
  - Flight Crew Training
    - RNP APCH Concepts
      - RNP APCH relationship with RNAV
      - Regulatory requirements
      - Required navigation equipment
      - Procedure characteristics
      - Retrieving a procedure from the database
      - Procedure change at destination (alternate airport)

- Operational Evaluation
  - Flight Crew Training
    - Flying the procedure (use of systems, speed limitations, error / deviation recognition, interception, use of supporting systems, contingency procedures)
    - RNP APCH Concepts
      - Baro-VNAV requirements (altimeter settings, temperature limitations, altitude crosschecks)
      - Compensation of temperature deviations
      - ATC procedures
    - Abnormal procedures
    - Contingency procedures
    - Recurrent training & checking

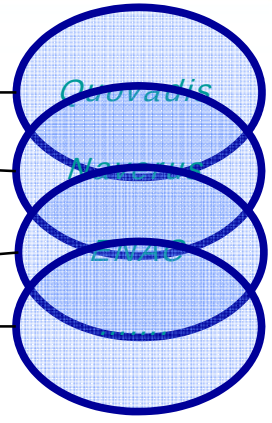
- **Operational Evaluation**
  - **Approach Procedure Verification, Aerodrome Competence**
    - **operational validation required for each of the procedures applicable to the type of aircraft operated**
      - **RNP APCH design IAW Doc 9905?**
      - **RNP APCH segments used (TF, RF, missed approach)**
      - **RNP APCH aircraft type suitability**
    - **aerodrome competence**
      - **required level of competence (EU OPS 1.975)**
      - **mountainous environment, proximity to obstacles, climb gradient, radar coverage, etc.**

- **Operational Evaluation**
  - **Navigation Database Management**
    - supplier to hold a Type 2 Letter of Acceptance (LoA) from EASA/FAA or an Acknowledgment Letter from TCCA (EU OPS 1.873)
  - **Reportable Events**
    - operator to establish system for investigating RNP ocurrences

RNP AR Process



Appch Procedure Approval



Operations Manual

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- ….

NAA Approval

OEB Evaluation

Airworthiness Approval

OEM

RNP AR – The Landscape

- **RNP AR operations development requires a combined approach**
  - **Stakeholders (OEMs, operators, …)**
  - **States (NAAs, NSPs, Aerodromes)**
  - **EASA**
- **Existing structures and processes do not support optimum use of expertise and resources**
- **EASA should take a coordinating role to**
  - **Support RNP AR implementation efficiently**
  - **Establish and manage a pool of expertise**
  - **Provide a central depository for the exchange of RNP AR data**

thank you