EASA RNP (AR) Workshop
The Landscape
Working Together

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Cologne

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EASA Certification Flight Standards
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
‘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

  - 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
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
RNP AR Operational Evaluation

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- ICAO Performance Based Navigation Operational Approval Handbook
RNP AR Operational Evaluation

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

- Appch Procedure Approval
- Operations Manual
  - RNP AR operating procedures, emergency situations
  - Flight crew recency & training
  - Safety management system
- Airworthiness Approval
- States
  - NAA Approval
  - OEB Evaluation
  - OEM

European Aviation Safety Agency

EASA
TYPE-CERTIFICATE
DATA SHEET
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