PBN Operational Approval
Operating Procedures & Training

Operating Procedures

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- Standard Operating Procedures for:
  - Normal operations
  - Non-normal (contingency) operations
- Procedures should follow those laid down by the manufacturer
- General aviation pilots should have adequate checklists

Note: Operating procedures for stand-alone receivers may be significantly different to FMS and must be thoroughly understood

Normal Operations

- Flight Planning
- Pre-flight
- Prior to commencing PBN operations
- During PBN operations

Flight Planning/Pre-flight

- Flight Plan Field 18
- Current navigation database
- Navaid availability
- GNSS availability
- Action in the event of loss of PBN capability
- Serviceability/MEL

Filing a Flight Plan

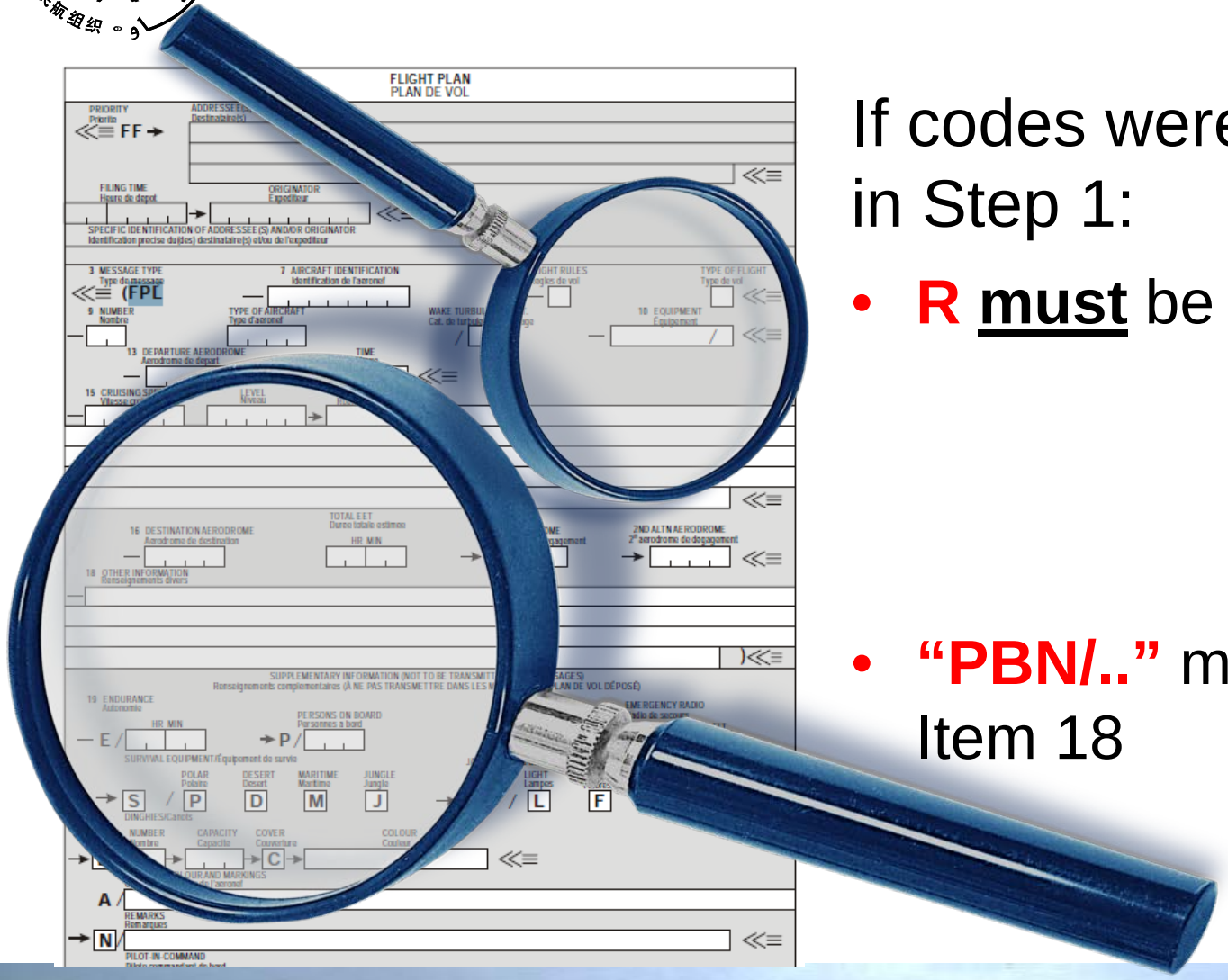
1	**Identify which to PBN NAV spec “approvals” you hold for each phase of flight (from Oceanic to Approach)**
2	**File “R” for PBN in Item 10**
3	**Enter “PBN/” in Item 18 and apply the rules to reduce the number of indicators in item 18 (max 8)**
4	**Identify the specific NAV equipment supporting each Nav Spec and file in Item 10 ensuring conformity with the content of Item 18**

Filing a Flight Plan

Identify all relevant codes by flight phase and sensor equipage.

		All permitted sensors	GNSS	DME/DME	VOR/DME	DME/DME/IRU (or INS/IRS
Oceanic	**RNAV 10**	**A1**				
	RNP 4	**L1**				
En-Route	**RNAV 5**	**B1**	**B2**	**B3**	**B4**	**B5**
	RNAV 2	**C1**	**C2**	**C3**		**C4**
	RNAV 1	**D1**	**D2**	**D3**		**D4**
Terminal	**RNAV 1**	**D1**	**D2**	**D3**		**D4**
	RNP 1	**O1**	**O2**	**O3**		**O4**
Final	**RNP APCH**	**S1**				
	RNP APCH with Baro VNAV	**S2**				
	RNP AR APCH with RF	**T1**				
	RNP AR APCH without RF	**T2**				

Filing a Flight Plan



If codes were identified in Step 1:

- **R <u>must</u>** be in Item 10

- **"PBN/.."** must be filed in Item 18

Filing a Flight Plan

Apply the following rules to reduce the number of indicators in Field 18 (max 16 characters)

- For **RNAV 10** and **RNP 4**, file **A1** or **L1**
- **RNAV 5**:
  - File **B1** instead of B2, B3, B4, B5
- For **RNAV 2**, **RNAV 1** and **RNP 1**:
  - File **C4, D4** or **O4** if DME/DME and DME/DME/IRU capable

    *e.g. file **C4** if C3 and C4 apply, **D4** for D3 and D4, **O4** for O3 and O4*
  - If "all sensors but IRU" capable and all sensors allowed, then only file **C1, D1** or **O1**

    *e.g. file **C1** for C2 and C3, **D1** for D2 and D3, **O1** for O2 and O3.*
- For **RNP APCH** only file **S1** or **S2** (subject to capability)
- For **RNP AR APCH** only file **T1 or T2** (subject to capability)

Prior to Commencing PBN Operations

- Correct procedure loaded from database
- Cross-check against chart
  - Correct route
  - Key elements

Warning: Incorrect procedure selection is a common crew error and a significant safety risk.

- Appropriate sensor signals acquired
- RNP selected
- Contingency procedures

During PBN Operations

- Follow manufacturer's instructions/procedures
- Appropriate displays selected
  - Particularly where necessary to ensure adequate FTE monitoring
- Use authorized method of flight control
  - (CDI/HSI/Map Display/Flight Director/Autopilot)
- Monitor lateral and vertical tolerances
  - Discontinue approach if limits exceeded
- Discontinue operation if alerted

Non-normal Operations

Actions in the event of a contingency:

- Advise ATC
- Navigation errors
- Unexpected deviations from the lateral or vertical flight path
- Significant misleading information
- Total loss of navigation equipment
- Multiple failures of navigation equipment
- Ground-based navaids significant error

Post Flight

- Operator should have a system of crew reporting:
  - Significant navigation errors
  - Operations outside normal parameters
  - Equipment failures
  - Navigation database errors
  - Crew comments
- Report serious incidents to CAA

Note: RNP AR APCH requires specific reporting to CAA

Flight Crew Training

The amount and type of training required for flight crews depends on:

- Previous training and experience
- Complexity of operations
- Aircraft equipment

In many cases flight crews have relevant operating experience and only the differences associated with PBN requirements require training

Core Training

- Area navigation principles
- Navigation systems principles (e.g. GNSS)
- Equipment operation and functionality
- Flight planning
- Operating procedures
- Monitoring and alerting
- Limitations

Many pilots successfully conduct area navigation operations but have not completed any formal training. Any deficiencies should be addressed during operational approval

Common Elements

- Flight planning and use of PBN suffixes
- Chart depiction and procedure description
- Checking navigation databases
- Capabilities and limitations of navigation system
  - Sensors, sensor selection/exclusion, system prioritization and effects of updating/loss
  - Levels of automation
  - Functional integration with other systems
  - Alerts, reversions and degradation
  - Interpretation of displays and symbols
  - Resolution of route discontinuities

Common Elements

- Aircraft configuration and operational conditions required to support PBN operations (CDI scaling, etc)
- Monitoring procedures including across track deviation.
- Interacting with the procedures
  - Select procedure/route from the database
  - Modify flight plan
  - Fly direct
  - Rejoin after radar vector
  - Intercept track
  - Holding
  - Perform parallel off-set (not required for RNAV10, RNAV 5)

Common Elements

- Flying the procedure
  - Fly-by, fly-over, RF and FRT turns
  - Managing the vertical profile
  - Adhering to speed, time and altitude constraints
- R/T Phraseology
- PBN-related airspace management and ATC procedures
- Contingency procedures

Specific Training

- RNP APCH
  - Charting/terminology
  - Stand-alone vs FMS operations
  - Operating tolerances
- Baro VNAV
  - Barometric principles
  - Limitations
- RNP AR APCH
  - RNP selection
  - RF Turns
  - Navaid deselection

NOTE: Only a few selected examples are noted here. Specific training for each type of operation must include all relevant topics

Training

- Training requirements listed in each navigation specification
- Training must be based upon the company operating procedures
- Training method can vary
  - Self study courses
  - Web-based
  - Classroom
  - Simulator
- Initial training
- Upgrade training
- Recurrent training

Documentation

- Training programme must be fully documented.
- Records of completed training must also be maintained for all flight crew, dispatchers and, where applicable, maintenance staff.

En-Route/Oceanic

RNP 10, RNP 4, RNP 2, RNAV 5

- Core training
- Ground training
- Flight training (airborne or simulator) not required
- Line training/conversion training normally sufficient

Note: Air carrier pilots generally have relevant en-route navigation experience. General aviation pilots or pilots without relevant area navigation experience may require additional training

Arrival & Departure

RNAV 1 and 2, RNP 1, RNP 2

- Core training
- Ground training
- Flight training (airborne or simulator) not required
- Line training/conversion training normally sufficient

Note: General aviation pilots or pilots operating stand-alone receivers may require specific training to manage equipment functionality limitations (VNAV)

RNP APCH

RNP APCH LNAV, LNAV/VNAV, LPV

- Core training
- Ground training (Baro VNAV, SBAS etc.,)
- Flight training (airborne or simulator) usually required
- Proficiency check recommended

Note: Many operators do not consider flight training is required based on previous approach experience. Flight training/proficiency checks should be required unless the operator can demonstrate thorough crew competency. Inspectors should conduct line checks before granting approvals in such cases

RNP APCH

STAND-ALONE RECEIVERS

Training for pilots operating stand-alone GNSS recceivers requires particular attention

There are significant human factors considerations and normally multiple in-flight training exercises are required to obtain proficiency

Attention should be placed on in-flight re-programming, holding, missed approach, multiple approaches and navigation system operation and functionality.

RNP AR APCH

- Core training
- Ground training (Baro VNAV, RF legs etc.,)
- Flight training (airborne or simulator) required
- Proficiency check recommended

Note: Thorough ground and flight training is mandatory for all RNP AR APCH operations

Tip: It is often more efficient to combine training for RNP APCH LNAV/VNAV to be combined with RNP AR APCH training as many elements are common.

Questions???