ICAO UNITING AVIATION

CELEBRATING 70 YEARS OF THE CHICAGO CONVENTION

Airspace Design & CDO/CCO Implementation

Overview

Lesson 1

Facilitator: AFPP
June 2021

Outline

- ICAO Issues with PBN Implementation
- Airspace Design Issues
- ICAO Guidance Material
- Workshop Outline

Airspace Design & CDO, CCO Overview

ICAO ISSUES WITH PBN IMPLEMENTATION

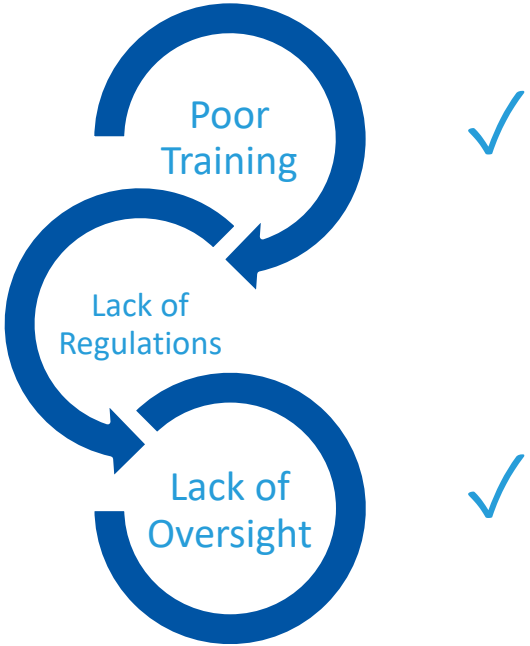
Background

- ICAO recently started working on a PBN strategy, which is divided into two broad areas:
  - Consolidation and Development.
- Based on feedback received at the ICAO 39th General Assembly (2016), the initial focus of work will be on the **consolidation** of the existing PBN concept:
  - Stay the course, focus on existing PBN principles.
- A39-14: Regional cooperation and assistance to resolve safety deficiencies, establishing priorities and setting measurable targets:
  - Urges Member States to utilize the Flight Procedures Program, where available, for PBN implementation.

Background

- In order to do this ICAO has started to gather all information regarding what has been identified as **barriers to PBN implementation:**
  - Poor training;
  - Lack of effective regulations;
  - Lack of oversight.
- ICAO is currently at this stage, because it is aware of many issues but is attempting to identify whether there is anything else that needs to be addressed:
  - Perhaps… validation?
    - Practice is to validate one procedure at a time for flyability.

Barriers to PBN Implementation



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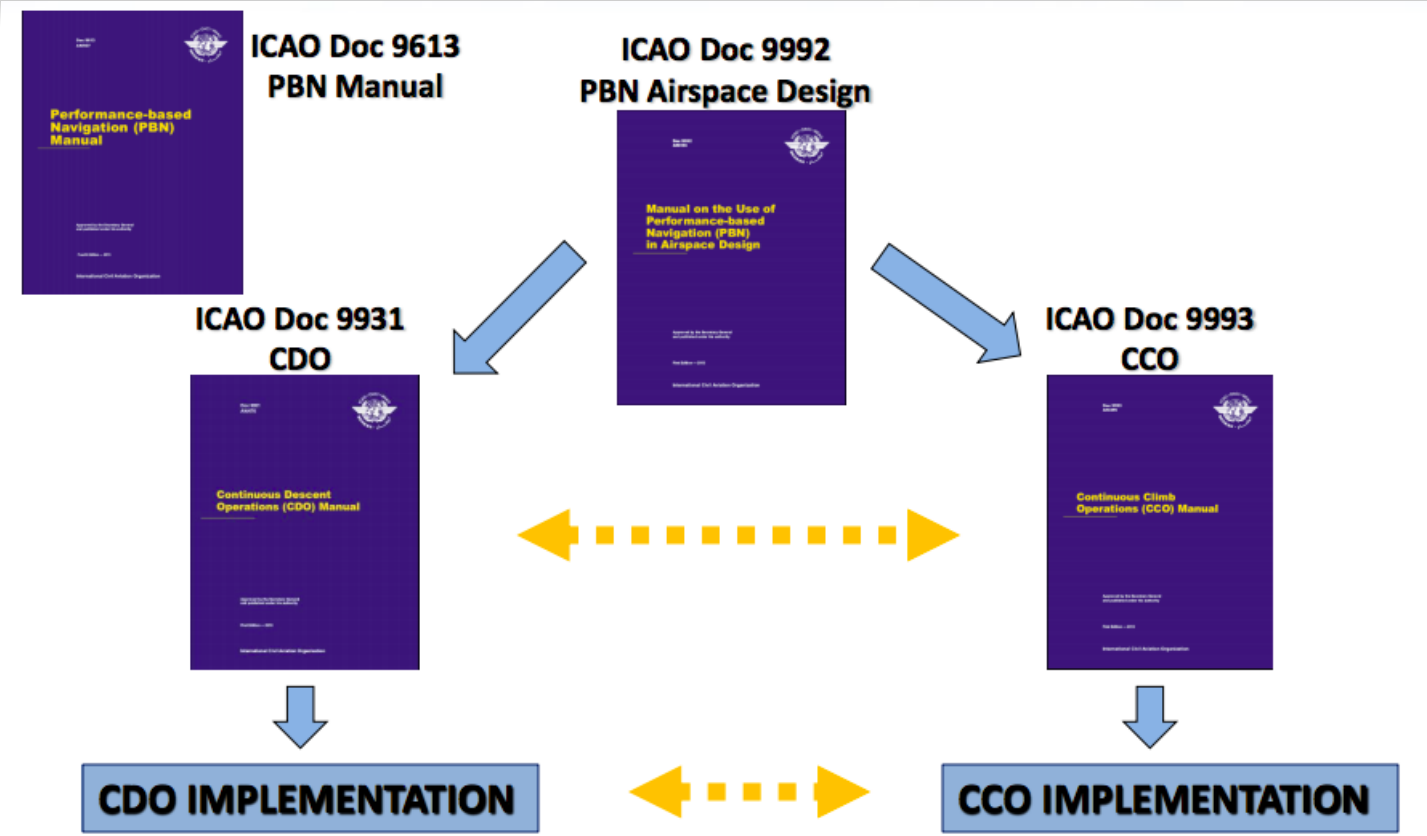
Training

- Training is not poor, there is just not enough of it because of:
  - Costing/Budget;
  - Difficult to dedicate one week to training… too much time away from job:
    - administrations ask for abbreviated workshops!
  - Availability of resources… classroom, instructors, etc.
  - Other issues…
- We are not reaching enough personnel, or not the right people:
  - Many specialists:
    - ATC;
    - Airspace Planning;
    - Procedure Design;
    - AIS/AIM.

Training Issues

Effective Regulations



Lack of Oversight

- This is a big issue!
- Again the CAA has different regulatory specialists responsible for:
  - Airlines… Flight Ops & Airworthiness Inspectors:
    - PBN Operational Approvals – **LACK OF OPS APPROVAL EXPERTISE !**
  - ANSP… Inspectors responsible for Oversight of PBN Implementation:
    - ATC… has appropriate training taken place;
    - Airspace Planning… has an efficient airspace design been implemented – **NOT BEING DONE CORRECTLY !**
    - Procedure Design… have correct criteria from PANS-OPS been used!
    - AIS/AIM… has appropriate publication process taken place – **CAN BE AN ISSUE!**
  - Aerodromes… Aerodrome Inspectors
    - Airport infrastructure… runways, parallel taxiway, rapid exit taxiways, holding bays, displaced thresholds;
    - Terminal… connection between terminals, contact gates/bus gates, passenger areas, parking, etc.

Summary of Issues

- So… ICAO has concluded that there is no need to produce **more regulatory documents/manuals** or another ‘implementation guide’;
- But… rather identify what areas need to be worked on to ensure that **issues** facing Regions or States which choose to implement PBN can be addressed;
- And… to see what can be done to **improve any areas identified** as presenting an issue today;
- **Training** is certainly one of the key areas to address;
- **Airspace design is another one!**

African Region

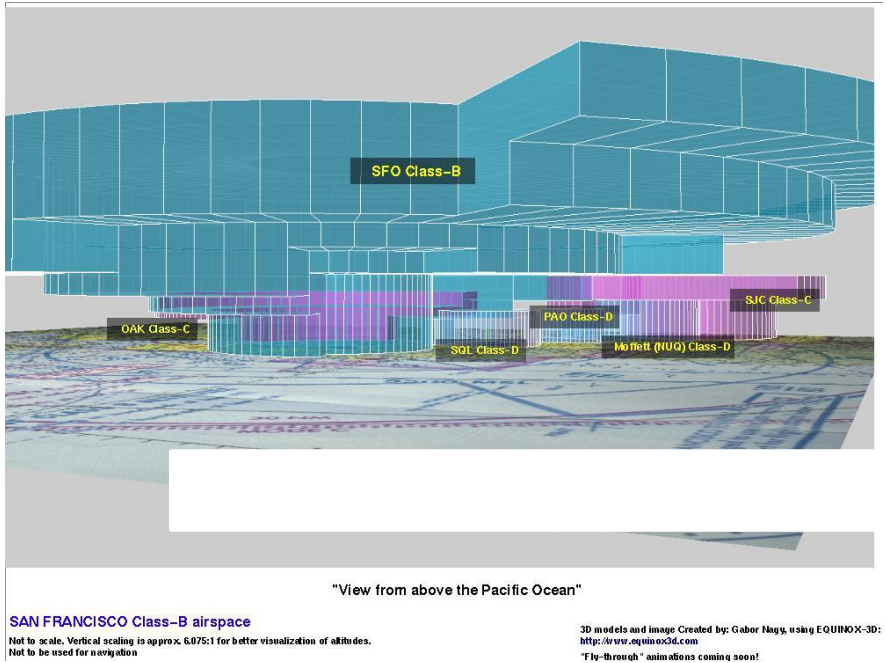
- PBN Implementation is taking place;
- Started with PBN approaches;
- TMAs have STARs and SIDs, but…
  - **Airspace planning is often not done properly**
  - **Lack of CDOs and CCOs!**
  - Charting is inconsistent not following industry best practices;
  - Issues with publication in some States… some procedures never get published!
- So, APIRG committed AFPP to develop a workshops to address "**airspace design**" with focus on **CDOs** and **CCOs implementation**.

AFI Region PBN Implementation

Airspace (Application)	Navigation Specifications	AFI Mid-Term (2013-2016)
Oceanic	RNAV 10 / RNP 4	100% by 2016
Remote Continental	RNAV 10 / RNP 4	N/A
Enroute	RNAV 5 / RNAV 2	100% by 2016
TMA	RNAV 1 / RNP 1	60% by 2014 100% by 2016
Approach	RNP APCH (Baro-VNAV) RNP AR APCH	70% by 2014 100% by 2016

Airspace Design & CDO, CCO Overview

AIRSPACE DESIGN ISSUES



Issues with Airspace Design

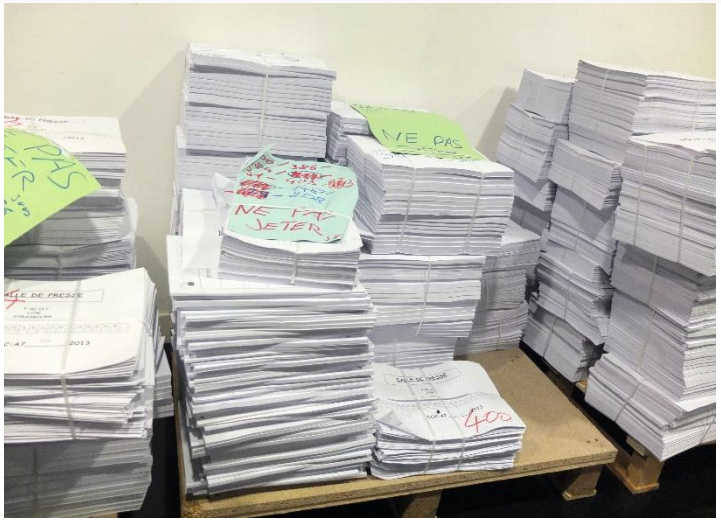
- **Airspace Design** is perhaps the **most important** aspect of making **PBN Implementation effective**.
- No amount of new technology in the cockpit, e.g. FMS performance and functionality, can be of benefit to Air Operators when controllers still resort to vectoring aircraft:
  - Something that has been in practice since the introduction of radar.
- There are many new TMA designs that have been implemented in different regions around the world by renowned firms that **simply do not work**.
- The proof whether a new TMA design will work or not, is quite simple…
- If controllers still vector aircraft after the PBN implementation, it means that the new airspace has not been designed well, and the entire project was a failure.

Reasons for poor Airspace Design

- Design firms have experience in procedure design but little experience in air traffic management from ATC point of view
- Review of existing airspace designs shows that little, if any guidance from Manual on the use of PBN in Airspace Design, or CDO or CCO Manuals has been applied.
- Too many STARs and SIDs are planned resulting in dozens of crossing points between STARs and SIDs.
- Crossing points result in level-offs during descent and climb, which nullify CDOs and CCOs.

Effects of poor Airspace Design

- Air traffic controllers are typically resistant to change.
- Many are skeptical about PBN because of hearsay and/or lack of education, resulting in inadequate understanding of the concept:
  - “I told you this will never work”, or…”How can you replace vectoring?”
  - Some are fearful that their jobs will be replaced by PBN and ATM automation tools.
- Subsequently, these failed airspace designs, which are popping up in all ICAO regions, are only adding to this negative perception of PBN, which is a discredit to the effort ICAO undertook to roll out PBN.

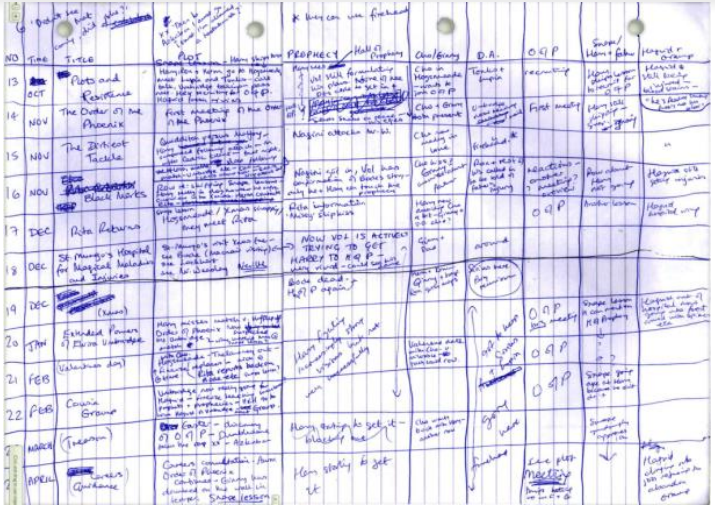


Airspace Design & CDO, CCO Overview

ICAO GUIDANCE MATERIAL

Reference Material

- Doc 9992 – Manual on the use of PBN in Airspace Design… process
  - Planning, Design, Validation and Implementation (17 Steps in all)
  - Design Phase very well explained with good illustrations (examples), including CDOs and CDOs.
- Doc 9931 – CDO Manual
  - Overview, implementation guidance
- Doc 9993 – CCO Manual
  - Overview, implementation guidance
- Doc 9613 – PBN Manual
  - Includes compendium of Nav Specs, important for design of STARs, SIDs and approaches
- But ICAO is finding that there are still many issues;
- Efficient and functional design not being implemented despite these 4 manuals;
- So what is the problem?



Airspace Design & CDO, CCO Overview

WORKSHOP OUTLINE

Workshop Outline

- Review of PBN Theory
  - Performance & Functionality, Nav accuracy and route structure, difference between RNAV and RNP Nav Specs
- Area Navigation
  - Fixes, turns, transitions, Path Terminators
- Area Navigation Systems
  - Need to determine aircraft capabilities, for example GNSS, DME/DME/IRU
- Nav Specs
  - Routes, STARs, SIDs and Approaches based on PBN Nav Specs (RNAV 2, RNAV 1, RNP 1 + RF, RNP APCH

Workshop Outline

- PBN Approaches
  - LNAV, LNAV/VNAV, LPV and RNP AR APCH performance requirements, and charting
- Planning CDOs and CCOs
  - Benefits, vertical profiles, implementation
- TMA Airspace Design guidelines
  - The “DOs and DON’Ts” of airspace planning
- STAR delaying techniques including Merge Point
  - Strategic delaying legs
- Exercises involving airspace design

Airspace Design &

CDO, CCO Overview

SUMMARY

Summary

- ICAO Issues with PBN Implementation
  - Poor training, Lack of effective regulations, Lack of oversight
- Airspace Design Issues
  - Not well understood, ATM expertise lacking
- ICAO Guidance Material
  - Doc 9613, Doc 9992, Doc 9931, Doc 9993
- Workshop Outline
  - Theory and many exercises

Comprehension Check

1. According to ICAO, what has been identified as barriers to PBN Implementation?
2. List the available documentations for airspace design.
3. What may be some other issues facing effective PBN Implementation?

Questions?

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