DOC 8168
PANS OPS
RELEVANCE
INTRODUCTIONS
Setting the tone

What is PANS OPS?
A brief presentation on what to expect

Instrument Flight Procedure Design

Relationship with Aeronautical Charts
What to do as Aeronautical Cartographers?
About Us

Expert Advice for when you need it the most

Instrument flight procedure design is a complex subject matter and if you combine it with the fact that you need to deal also with surveys, aeronautical information management, charting, ATC and other disciplines it can sometime become overwhelming.

FLYGHT7 mission is to accompany your vision of a better airspace that is able to cope with demand with safety always first.
What We Do

**FOCUS ON YOUR NEEDS**

We are here to improve your operations as such, we will take time to listen and analyze the current baseline and your expected outcome.

**FIND SOLUTIONS FOR YOUR OPERATION**

Once we have gathered the initial data be it on-site or through other means we will work together to bring solutions that benefit your operation.

**DELIVER**

Everything we do is focused on bringing value and delivering the utmost quality, as we work together from day one we believe our service will improve your operations.
Our Services

Instrument Flight Procedure Design (IFPD) - PANS OPS
- Conventional Design
- PBN Design
- 5 year cycle review
- Procedure Audit “Independent Review”
- Training
- On the Job Training
- Aeronautical Obstacle Survey
- Obstacle Limitation Surfaces
- Ad-hoc consulting
- Procedure Flight Validation (Aircraft & Simulator Evaluation)

Aeronautical Information Management
- Aeronautical Charting
- AIXM
- FPL
- NOTAM
- AIP/eAIP
- Training

TRAINING AND SUPPORT
- Help for jump starting your operation with expert advice
- Consulting and Knowledge-transfer
Main Stakeholders

**AIR TRAFFIC SERVICES**
Require the enhancement of operational safety and efficiency

**INDUSTRY (Airlines)**
Require the improvement of operations as well as reducing issues due to weather that increases revenue

GOAL IS TO HAVE A WIN-WIN SITUATION FOR ALL PARTIES INVOLVED
What is PANS-OPS?
ICAO document hierarchy
Instrument Flight Procedure Design

Definition and Areas where you can apply it
Instrument flight procedure design (IFPD) can be inferred from the definition provided for Instrument flight procedure design service (IFPDS) and we can say that IFPD is involved in the design, documentation, validation, continuous maintenance and periodic review of instrument flight procedures necessary for the safety, regularity and efficiency of air navigation.
Areas where IFPD can be used

- IFP Design
- 5-Yearly reviews
- OLS review
- Feasibility Studies
Instrument approach procedure (IAP)

A series of predetermined maneuvers by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en-route obstacle clearance criteria apply.
Conventional vs RNAV vs PBN

What is the difference?
Conventional Navigation
Area Navigation (RNAV)

Increased Airspace Efficiency
Required Navigation Performance (RNP)
Basic PANS-OPS Principles
Important

The design of procedures in accordance with PANS-OPS criteria assumes normal operations.

It is the responsibility of the operator to provide contingency procedures for abnormal and emergency operations.
Segments of Instrument Approach Procedures
Alignment

This is the angle we have in between one segment and the next segment.

What we are looking for is that a maximum angle of turn is never to be exceeded and this will depend on the type of procedure and in what part of the procedure the aircraft is
Each track that we design has a distance between the start and the end points.

The length needs to accommodate any descent that we require, and it is influenced by the gradient if its is acceptable or not and in PBN the minimum stabilization distance is also a factor.
Gradient

The change in altitude divided by the overall length or the rise over run is one of those criteria that will make us iterate over the length specially in challenging terrain.
Area

\[ W_{sp} = W_{s1} + \frac{D_p}{L} (W_{s2} - W_{s1}) \]
Area

Figure I-4-2-3. DME arc — length of the arrival segment greater than or equal to 46 km (25 NM)
Minimum Obstacle Clearance (MOC)

The MOC is the minimum obstacle clearance that we need to apply that will allow to fly the aircraft safely over terrain or obstacles.

There are different variables that were factored in when determining the values that are applicable that included the terrain, aircraft characteristics and pilot ability, so the values that are mentions in PANS OPS are to be considered the minimum which included also considerations for communications (COM) and aerodromes and ground aids (AGA) so they can't be reduced further in a safe way.
In the primary areas the **full** MOC is to be applied while in the secondary areas we will reduce this value linearly from 100% at the edge of the primary area to 0% at the outer edge of the secondary area, always considering perpendicular to the nominal track.
Sample MOC applied per segment

Initial                          300m
Intermediate              150m
NPA Final Approach     75m (with FAF) / 90m (without a FAF)
Missed Approach
- Initial Phase              Same as Final Approach*
- Intermediate Phase     30m
- Final Phase                50m

* There is an exception if the extension of the intermediate missed approach surface backwards requires less clearance
Mountainous Area

What is it?

How do we calculate it?
What do we have to do in mountainous areas?

In mountainous areas due to the nature of the terrain there are considerations like altimeter error and pilot control issues due to bad weather (winds over 20KTS) that will require the increase of the MOC by as much as 100%.
1.3.2 MOC in mountainous areas

1.3.2.1 In mountainous areas, the MOC shall be increased, depending on variation in terrain elevation as shown in the table below. The MOC in the buffer area is half the value of the primary area MOC (see Figure II-3-1-1).

<table>
<thead>
<tr>
<th>Elevation</th>
<th>MOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between 900 m (3 000 ft) and 1500 m (5 000 ft)</td>
<td>450 m (1 476 ft)</td>
</tr>
<tr>
<td>Greater than 1 500 m (5 000 ft)</td>
<td>600 m (1 969 ft)</td>
</tr>
</tbody>
</table>

1.3.2.2 Mountainous areas shall be identified by the State and promulgated in the State Aeronautical Information Publication (AIP), section GEN 3.3.5, “Minimum flight altitude”.
What exactly are mountainous areas?

**Mountainous area**

An area of changing terrain profile where the changes of terrain elevation exceed 900 m (3 000 ft) within a distance of 18.5 km (10.0 NM).

The increased used and areas of applicability is to be published in the Aeronautical Information Publication (AIP) GEN 3.3.5 Minimum Flight Altitude.
Mountainous Area Calculation


What about turns?
Wind Spirals
Turn Protection

Primary area

Secondary area

Not to scale

Figure 1-2-3-4. Wind spiral

c1 is perpendicular to still air track
wind effect for $E_g$
cyclogenic turn
still air track
Relationship with Aeronautical Charts

What does the aeronautical cartographer needs to do?
<table>
<thead>
<tr>
<th>INSTRUMENT APPROACH CHART</th>
<th>AERODROME ELEV 4.57 m (15 ft)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>HEIGHTS RELATED TO THR RWY 07 ELEV 15 ft</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
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<tr>
<th></th>
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<td>APP</td>
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<tr>
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<td>GND</td>
<td>121.9</td>
</tr>
<tr>
<td>ATIS</td>
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</tr>
</tbody>
</table>

Belize City

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