



Performance Based Navigation Literature Review

HCNF

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Heathrow
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Overview

- Introduction and Objective of the study
- Overview of documents that formed the study
- Summary of key themes and areas derived from the study

Introduction and Objective

- In support of the **Heathrow Community Noise Forum (CNF)**, a literature review has been conducted on a global body of **Performance Based Navigation (PBN) Documentation**
 - PBN: Airport arrival and departure procedures based on satellite navigation
- The review highlights the **impacts that PBN Implementation may have on local communities** of major airport hubs and complex airspace.
- The review identifies the **documented issues, risks and opportunities** associated with PBN implementations, based on
 - UK, US and other regional experiences of PBN implementations
 - ICAO and UK CAA guidelines on PBN implementations, design process and community engagement
- **Draw conclusions applicable to Heathrow environment based on key themes**

Reviewed Documents

The following industry documents were selected for the review based on industry **experiences**:

- Actual implementations of PBN
 - Consolidation of **NavCanada presentation slides** (2016)
- Community and stakeholder outreach and engagement recommendations in the context of the US federal system
 - **Report of the NextGen Advisory Committee** in Response to a Tasking from the US Federal Aviation Administration [**PBN Blueprint Community Outreach Task Group**, Approved by the NextGen Advisory Committee, June 2016]
 - **Airports' Role in the Development and Implementation of PBN Flight Procedures** [Airports Council International – North America (ACI-NA), **NextGen Working Group**, Version 1.1, March 2013]
 - Understanding the **Airport's role in Performance-based Navigation**: Resource Guide [**NextGen for Airports**, Volume 1, National Academy of Sciences]
- Tools to demonstrate track noise
 - **Best practices and tools to provide noise information to communities** [JDA Aviation Technology Solutions, 3 June 2015]

Reviewed Documents

The following industry documents were selected for the review based on industry **experiences (continued)**:

- Strategies for PBN implementation in the wider national and international strategies
 - **Performance-based Navigation – NAS Navigation Strategy [FAA, 19 January 2016]**
- Airspace complexities and technical considerations for airline operators
 - **Operational Benefits of Performance-based Navigation [David Nakamura, Senior Technical Fellow; and William Royce, Chief Pilot – Research, Flight Operations, **Aero Magazine**, **Boeing.com**, Quarter 02/08]**
 - **Implementation of Performance-based Navigation in the UK [Airports Commission’s Senior Delivery Group – Technical Report Number 01]**

Reviewed Documents

The following industry documents have been selected for the review based on **guidance and specifications**:

- Key factors for successful planning, design and integration of stakeholders, including the local community
 - Guidance on **Environmental Assessment** of Proposed Air Traffic Management Operational Changes [ICAO doc 10031, First Edition – 2014]
- Technical considerations of PBN types, including track-keeping performance
 - Performance-based Navigation (**PBN**) Manual [ICAO Doc 9613 AN/937, Third Edition – 2008]
- UK guidance for implementation of PBN at complex airports
 - CAP 1378 **Performance-based Navigation – Airspace Design Guidance: Noise mitigation considerations** when designing PBN departure and arrival procedures [CAA Safety and Airspace Regulation, April 2016]

Key Themes/Areas

Conclusions have been drawn in the following key themes/areas:

Appropriate **environmental planning and design process and guidance** for the assessment of emissions, fuel consumption and noise

- Defined national or local criteria should go beyond simply meeting levels of impact
- Account for parallel projects in same timeframe or geographical area

Need to **define a baseline to measure against**

- Form the basis for predictive modelling and determining net impact of changes
- Will aid planning, such as proactively designing to avoid noise-sensitive area(s)
- Future reference for design comparisons, including for the benefit of public viewing

Community outreach and engagement on noise issues and improvements

- Potential community impacts should be evaluated from the outset of planning
- Prior to design through to post implementation
- Aircraft operators can participate with airport operators to provide accurate operational information

Addressing **appropriate government legislation on noise**

- Government guidance should make distinction of those that are newly exposed to noise rather than simply total numbers
- CAA required a count of 'newly overflown' population to be included

Key Themes/Areas

Conclusions have been drawn in the following key themes/areas:

Appropriate **tools are necessary to demonstrate noise baseline and changes**

- Quality/quantity of noise info is key to productive dialogue with communities
- Mapping the location of complaints relative to flight paths demonstrates actual noise impact (can be used to fine-tune PBN or adapt other mitigation strategies)

Benefits and challenges should be **considered in the context of national airspace strategies**

- There are complexities of interacting routes and populations affected by noise and emissions around a major hub
- National strategies need to support more challenging PBN procedures

Practicalities in **designing noise respite and reduction for certain populations**

- The greater concentration of traffic around the route centreline may result in disturbance more regularly for those areas
- Potential to introduce alternative flight paths that can be switched on/off to provide some respite from overflights
- Routeing aircraft away from noise sensitive areas assumes that there is an adjacent area that is less sensitive to noise

Engagement with airspace users to **understand/develop aircraft capabilities**

- Aircraft operators can contribute site-specific information fundamental to the procedure design (including climb profiles and PBN capability levels of their fleet)
- Operators should carefully consider including RNP-related features in their ongoing fleet additions/modifications

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