

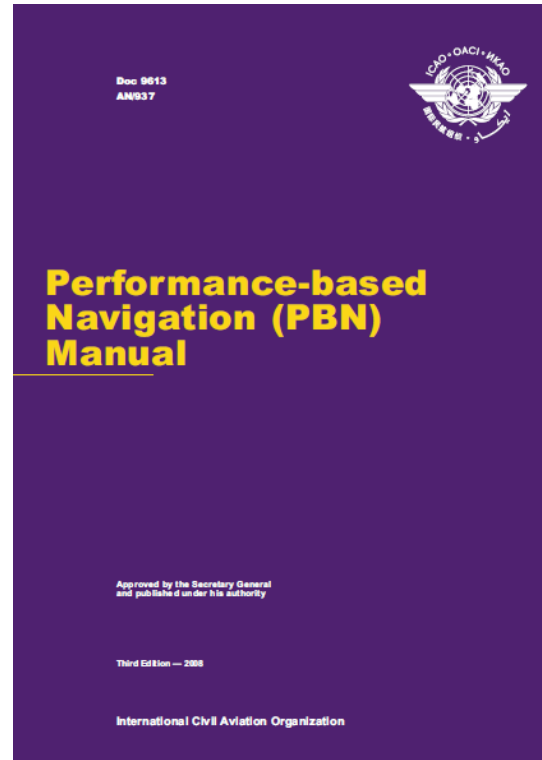
An introduction to performance-based navigation (PBN)

Heathrow Community Noise Forum

28 April 2021

Background

- Move from the *old* system-based approach: navigate using specified and approved systems
 - VOR
 - DME
 - ILS
- Move to a *new* performance-based approach: navigate to a required capability
 - Accuracy
 - (Integrity)
 - Availability
 - Continuity
- Different performance requirements for different operations
- Technology agnostic but in effect means satnav (GPS) plus...



- PBN is mandatory
 - ICAO
 - Regulations 716/2014 and 2018/1048

of the European Union L 190/19

REGULATION (EU) No 716/2014
June 2014
Project supporting the implementation of the European Air Traffic Management Master Plan
(IEA relevance)

European Union, L 189/15

REGULATION (EU) 2018/1048
018
ing procedures concerning performance-based navigation

Union,

Parliament and of the Council of 20 February 2008 on the European Aviation Safety Agency, and repealing Council Directive 2004/66/EC, and in particular Article 8b(6)

mands on the use of available airspace, thus heightening the provision of air traffic management/migration (PBN) can bring safety, capacity and efficiency benefits from instrument approach procedures. In order to achieve a more efficient air traffic management network, harmonised instrument approach procedures should be provided for.

shall be based on the rules developed by the International Civil Aviation Organization (ICAO) Global Air Traffic Management Master Plan.

No 923/2012 (1) and in particular point SERA.501.5(a) (65/2012 (1) and in particular point ORB.GEN.3.10(d)) implemented by Annex 1 to Commission Regulation (EU) 2016/1011, require that aircraft be equipped and flight crew procedures. Those requirements should be complemented by appropriate flight procedures and routes.

if manoeuvring areas, as required by Commission Regulation (EU) 2016/1011, to improve the precision of approach trajectory and to minimise and environmental impact in descent and approach, the requirements of this Regulation should No 716/2014.

013 on the definition of common projects, the establishment of the European Air Traffic Management Master Plan

number 2012 laying down the common rules of the air and on amending Implementing Regulation (EU) No 1815/2011 (2006, EC) No 1051/2006 and (EU) No 251/2010 (08 L 281, laying down technical requirements and administrative procedures for the European Parliament and of the Council (08 L 281, 2010/08 L 281).

(1) Commission Regulation (EU) No 472/2014 of 29 April 2014 laying down technical requirements and administrative procedures related to air operations of third country operators pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (2014/0216) (2014, L 113, 4.5.2014, p. 12).

(2) Commission Implementing Regulation (EU) No 716/2014 of 27 June 2014 on the establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan (031.190.28.6.2014, p. 13).

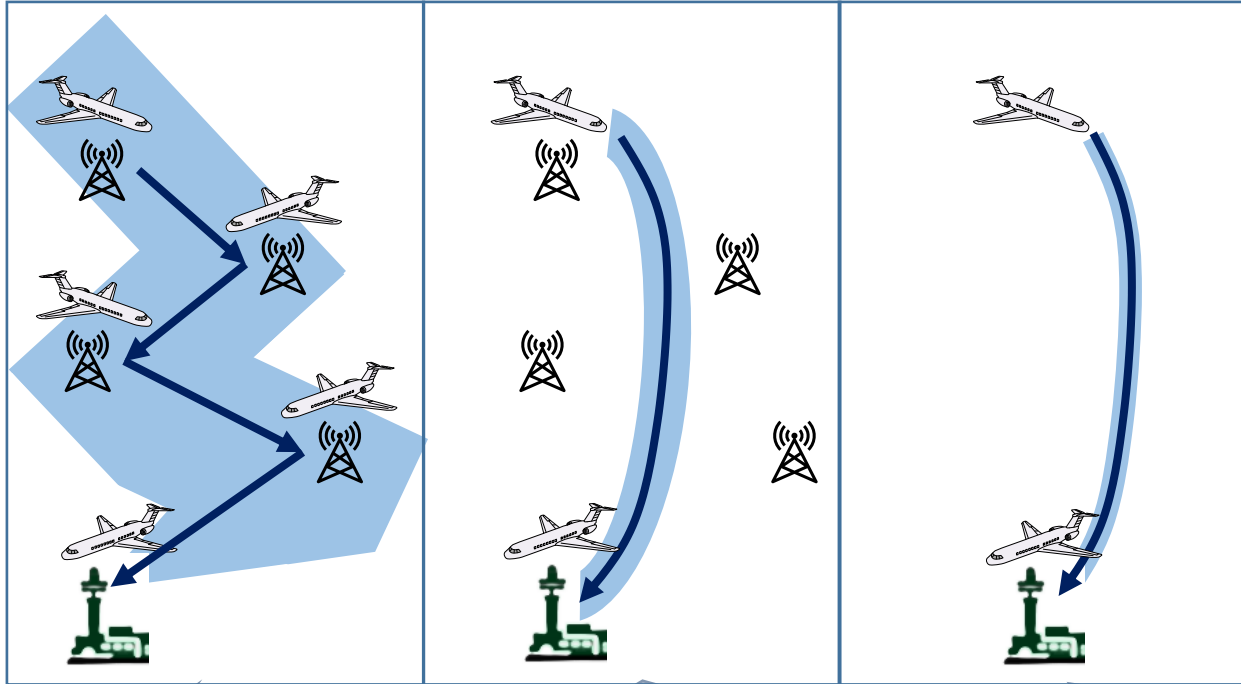
PBN – a street-map analogy

To understand the effects of PBN we can draw an analogy with conventional ground-based satellite navigation, as is used in many modern vehicles. Traditional navigation through a town, from point A to point B (1), would rely on a set of conventional signposts (2); this results in a distribution of traffic across multiple routes (3). Introducing satellite navigation using a predefined route (4) concentrates all traffic along the route (solid line) (5). This concentration of traffic can be dispersed again by distributing traffic across multiple pre-defined routes (6).



Tiers of PBN

While PBN can increase airspace efficiency by providing more direct paths, (thereby reducing aircraft fuel burn and emissions), it also results in aircraft concentrating along their particular route.

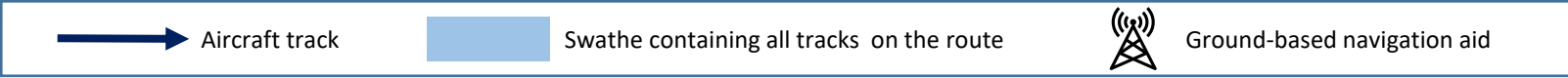


The key difference between **RNP** and **RNAV** them is that RNP requires on-board performance monitoring and alerting. This increases confidence in the accuracy of navigation and can enable closer spacing between routes.

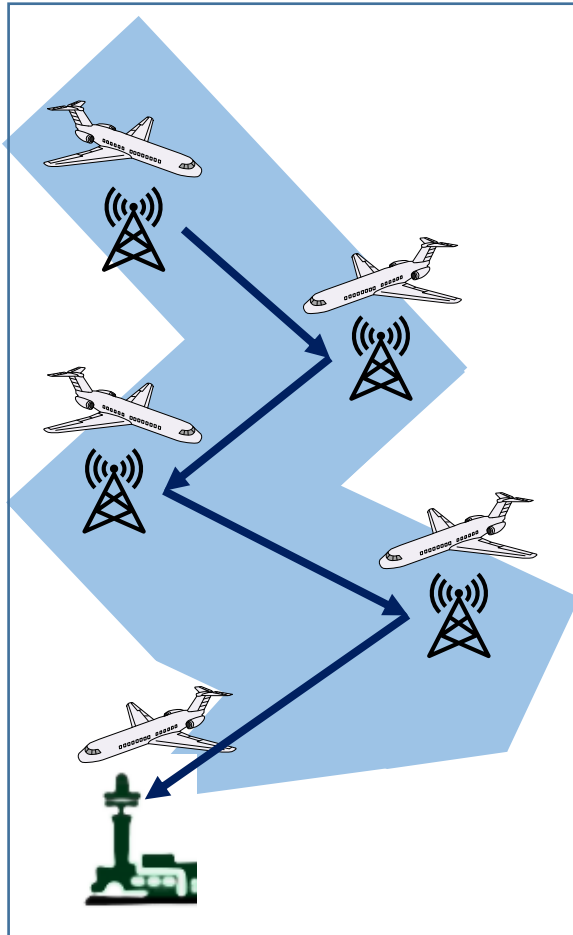
With **Traditional Navigation**, aircraft have been required to fly routes between and over ground-based navigational aids. The performance of these aids is low so flight paths are dispersed and routes must be widely spaced

Area Navigation (RNAV) – Area navigation allows an aircraft to choose any course within a network of ground-based navigation beacons rather than navigating directly to and from the beacons. Flight paths are more direct than in traditional navigation and because navigation accuracy is increased, flights follow routes more precisely

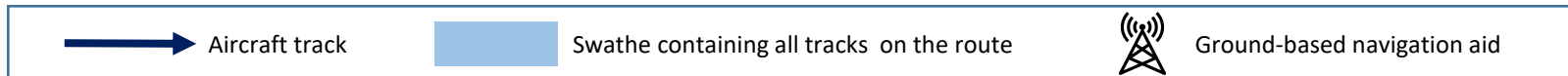
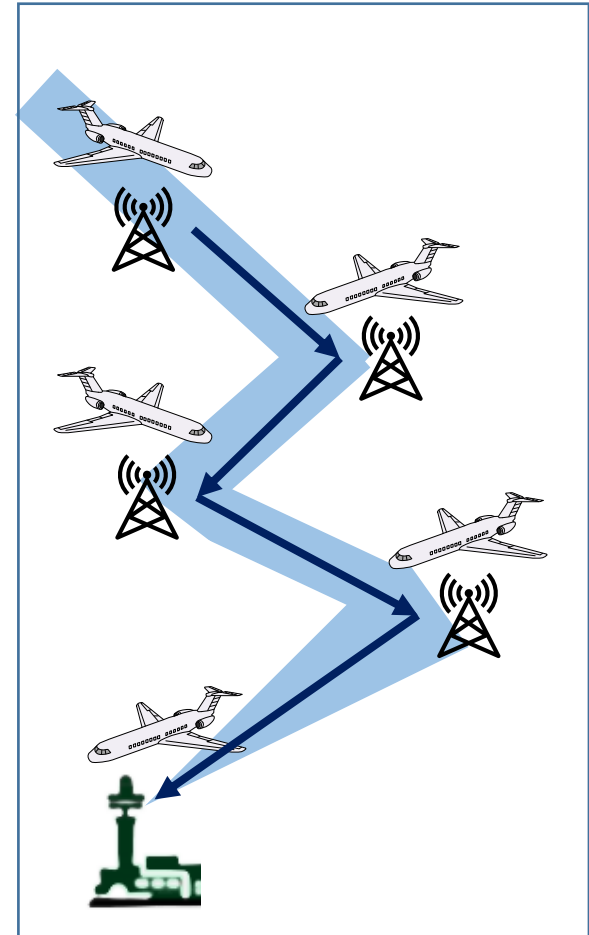
Required Navigation Performance (RNP) – RNP is a type of PBN where the aircraft monitors its navigation performance



Even without PBN



Increased navigation accuracy



Impacts depend on how PBN is used

- Routes
- Alternation/Respite
- Dispersion
- Procedures

