

## Performance Based Navigation – Definition and Abbreviations

The following definitions and abbreviations covers the terminology used in reference to Performance Based Navigation. These are provided for clarity and to avoid confusion in the use of these terms. These are based on the ICAO PBN Manual 3<sup>rd</sup> Edition.

### ABBREVIATIONS

ABAS	Aircraft-based augmentation system
ADS-B	Automatic dependent surveillance — broadcast
ADS-C	Automatic dependent surveillance — contract
AFE	Above field elevation
AIP	Aeronautical information publication
ANSP	Air navigation service provider
ATM	Air traffic management
ATS	Air traffic services
CDI	Course deviation indicator
CDU	Control and display unit
CF	Course to fix
CFIT	Controlled flight into terrain
CRC	Cyclic redundancy checking
CRM	Collision risk model
DA	Decision altitude
DME	Distance measuring equipment
EASA	European Aviation Safety Agency
ECAC	European Civil Aviation Conference
EFIS	Electronic flight instrument system
EUROCAE	European Organization for Civil Aviation Equipment
EUROCONTROL	European Organisation for the Safety of Air Navigation
FA	Fix to altitude
FAA	Federal Aviation Administration
FDE	Fault detection and exclusion

FMS	Flight management system
FRT	Fixed radius transition
FTE	Flight technical error
GNSS	Global navigation satellite system
GPS	Global positioning system
HSI	Horizontal situation indicator
IAF	Initial approach fix
INS	Inertial navigation system
IRS	Inertial reference system
IRU	Inertial reference unit
JAA	Joint aviation authorities
LRNS	Long-range navigation systems
MCDU	Multifunction control and display unit
MEL	Minimum equipment list
MNPS	Minimum navigation performance specification
Navaid	Navigation aid
NSE	Navigation system error
OEM	Original equipment manufacturer
PBN	Performance-based navigation
PDE	Path definition error
PEE	Positioning estimation error
PSR	Primary surveillance radar
RAIM	Receiver autonomous integrity monitoring
RF	Radius to fix
RNAV	Area navigation
RNP	Required navigation performance
RTCA	Radio Technical Commission on Aeronautics
SBAS	Satellite-based augmentation system
SID	Standard instrument departure

SSR	Secondary surveillance radar
STAR	Standard instrument arrival
TLS	Target level of safety
TOGA	Take-off/go-around
TSE	Total system error
TSO	Technical standard order
VNAV	Vertical navigation
VOR	Very high frequency (VHF) omnidirectional radio range

## EXPLANATION OF TERMS

**Aircraft-based augmentation system (ABAS).** An augmentation system that augments and/or integrates the information obtained from the other GNSS elements with information available on board the aircraft.

*Note.— The most common form of ABAS is receiver autonomous integrity monitoring (RAIM).*

**Airspace concept.** An airspace concept provides the outline and intended framework of operations within an airspace. Airspace concepts are developed to satisfy explicit strategic objectives such as improved safety, increased air traffic capacity and mitigation of environmental impact etc. airspace concepts can include details of the practical organization of the airspace and its users based on particular CNS/ATM assumptions, e.g. ATS route structure, separation minima, route spacing and obstacle clearance.

**Approach procedure with vertical guidance (APV).** An instrument procedure which utilizes lateral and vertical guidance but does not meet the requirements established for precision approach and landing operations.

**Area navigation (RNAV).** A method of navigation which permits aircraft operation on any desired flight path within the coverage of ground- or space-based navigation aids or within the limits of the capability of self-contained aids, or a combination of these.

*Note.— Area navigation includes performance-based navigation as well as other RNAV operations that do not meet the definition of performance-based navigation.*

**Area navigation route.** An ATS route established for the use of aircraft capable of employing area navigation.

**ATS surveillance service.** A term used to indicate a service provided directly by means of an ATS surveillance system.

**ATS surveillance system.** A generic term meaning variously, ADS-B, PSR, SSR or any comparable ground-based system that enables the identification of aircraft.

*Note.— A comparable ground-based system is one that has been demonstrated, by comparative assessment or other methodology, to have a level of safety and performance equal to or better than monopulse SSR.*

**Critical DME.** A DME facility that, when unavailable, results in a navigation service which is insufficient for DME/DME based or DME/DME/IRU-based operations along a specific route or procedure.

**Fault detection and exclusion (FDE).** Fault detection and exclusion (FDE) is a function performed by some GNSS receivers, which can detect the presence of a faulty satellite signal and exclude it from the position calculation.

**Navigation aid (navaid) infrastructure.** Navaid infrastructure refers to space-based and or ground-based navigation aids available to meet the requirements in the navigation specification.

**Navigation application.** The application of a navigation specification and the supporting navaid infrastructure, to routes, procedures, and/or defined airspace volume, in accordance with the intended airspace concept.

*Note.— The navigation application is one element, along with communication, surveillance and ATM procedures which meet the strategic objectives in a defined airspace concept.*

**Navigation function.** The detailed capability of the navigation system (such as the execution of leg transitions, parallel offset capabilities, holding patterns, navigation databases) required to meet the airspace concept.

*Note.— Navigational functional requirements are one of the drivers for the selection of a particular navigation specification. Navigation functionalities (functional requirements) for each navigation specification can be found in Parts B and C of this volume.*

**Navigation specification.** A set of aircraft and aircrew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specification:

**Required navigation performance (RNP) specification.** A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH.

**Area navigation (RNAV) specification.** A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.

*Note 1.— The Performance-Based Navigation (PBN) Manual (Doc 9613), Volume II, contains detailed guidance on navigation specifications.*

*Note 2.— The term RNP, previously defined as “a statement of the navigation performance necessary for operation within a defined airspace”, has been removed from this Annex as the concept of RNP has been overtaken by the concept of PBN. The term RNP in this Annex is now solely used in the context of navigation specifications that require performance monitoring and alerting, e.g. RNP 4 refers to the aircraft and operating requirements, including a 4 NM lateral performance with on-board performance monitoring and alerting that are detailed in Doc 9613.*

**Performance-based navigation (PBN).** Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

*Note.— Performance requirements are expressed in navigation specifications (RNAV specification, RNP specification) in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept.*

**Procedural control.** Air traffic control service provided by using information derived from sources other than an ATS surveillance system.

**Receiver autonomous integrity monitoring (RAIM).** A form of ABAS whereby a GNSS receiver processor determines the integrity of the GNSS navigation signals using only GPS signals or GPS signals augmented with altitude (baroaiding). This determination is achieved by a consistency check among redundant pseudo-range measurements. At least one additional

satellite needs to be available with the correct geometry over and above that needed for the position estimation for the receiver to perform the RAIM function.

***RNAV operations.*** Aircraft operations using area navigation for RNAV applications. RNAV operations include the use of area navigation for operations which are not developed in accordance with this manual.

***RNAV system.*** A navigation system which permits aircraft operation on any desired flight path within the coverage of station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these. An RNAV system may be included as part of a flight management system (FMS).

***RNP operations.*** Aircraft operations using an RNP system for RNP applications.

***RNP route.*** An ATS route established for the use of aircraft adhering to a prescribed RNP specification.

***RNP system.*** An area navigation system which supports on-board performance monitoring and alerting.

***Satellite-based augmentation system (SBAS).*** A wide coverage augmentation system in which the user receives augmentation information from a satellite-based transmitter.

***Standard instrument arrival (STAR).*** A designated instrument flight rule (IFR) arrival route linking a significant point, normally on an ATS route, with a point from which a published instrument approach procedure can be commenced.

***Standard instrument departure (SID).*** A designated instrument flight rule (IFR) departure route linking the aerodrome or a specified runway of the aerodrome with a specified significant point, normally on a designated ATS route, at which the en-route phase of a flight commences.