Your Guide to PBN and ADS-B

If you would like further information please contact the following:

**PBN Information** - pbn@caa.govt.nz

**ADS-B Information** - adsb@caa.govt.nz

**General enquiries** - nss@caa.govt.nz
# Your Guide to Aviation Acronyms

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<th>Description</th>
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<tr>
<td>ADS-B</td>
<td>Automatic Dependant Surveillance - Broadcast</td>
<td>MON</td>
<td>Minimum Operating Network</td>
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<tr>
<td>ANSP</td>
<td>Air Navigation Service Provider</td>
<td>MLAT</td>
<td>Multilateration</td>
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<td>ATC</td>
<td>Air Traffic Control</td>
<td>NAVAID</td>
<td>Navigation Aid</td>
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<td>ATD</td>
<td>Acceptable Technical Data</td>
<td>NSS</td>
<td>New Southern Sky</td>
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<td>ATM</td>
<td>Air Traffic Management</td>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
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<td>ATS</td>
<td>Air Traffic Service</td>
<td>NDB</td>
<td>Non-Direction Beacon</td>
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<td>Baro-VNAV</td>
<td>Barometric Vertical Navigation</td>
<td>PBCS</td>
<td>Performance Based Communication and Surveillance</td>
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<td>CNS</td>
<td>Communication/Navigation/Surveillance</td>
<td>PBN</td>
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<td>CPDLC</td>
<td>Controller Pilot Datalink Communications</td>
<td>PBNIWG</td>
<td>PBN Implementation Working Group</td>
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<td>CONOPs</td>
<td>Concept of Operations</td>
<td>PSR</td>
<td>Primary Surveillance Radar</td>
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<tr>
<td>DME</td>
<td>Distance Measuring Equipment</td>
<td>RAIM</td>
<td>Receiver Autonomous Integrity Monitoring</td>
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<tr>
<td>FMS</td>
<td>Flight Management System</td>
<td>RCP</td>
<td>Required Communication Performance</td>
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<tr>
<td>FIR</td>
<td>Flight Information Region</td>
<td>RSP</td>
<td>Required Surveillance Performance</td>
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<td>FIS</td>
<td>Flight Information Service</td>
<td>RNAV</td>
<td>Area Navigation</td>
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<td>FSIWG</td>
<td>Future Surveillance Implementation Working Group</td>
<td>RNP</td>
<td>Required Navigation Performance</td>
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<td>GA</td>
<td>General Aviation</td>
<td>SBAS</td>
<td>Satellite Based Augmentation System</td>
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<td>GBNAs</td>
<td>Ground Based Navigation Aid</td>
<td>SSR</td>
<td>Secondary Surveillance Radar</td>
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<tr>
<td>GNSS</td>
<td>Global Navigation Satellite System</td>
<td>SWIM</td>
<td>System Wide Information Management</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
<td>TSO</td>
<td>Technical Standard Order</td>
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<td>HF</td>
<td>High Frequency</td>
<td>VFR</td>
<td>Visual Flight Rules</td>
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<td>ICAO</td>
<td>International Civil Aviation Organisation</td>
<td>VHF</td>
<td>Very High Frequency</td>
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<td>IFR</td>
<td>Instrument Flight Rules</td>
<td>VMC</td>
<td>Visual Meteorological Conditions</td>
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<td>ILS</td>
<td>Instrument Landing System</td>
<td>VOR</td>
<td>VHF Omni-directional Radio-Range</td>
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<td>Instrument Meteorological Conditions</td>
<td>VNAV</td>
<td>Vertical Navigation Guidance</td>
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<td>IR</td>
<td>Instrument Rating</td>
<td>UAT</td>
<td>Universal Access Transceiver</td>
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<td>LNAV</td>
<td>Lateral Navigation Guidance</td>
<td>WAAS</td>
<td>Wide Area Augmentation System</td>
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# Your Guide to PBN and ADS-B workshop and Open Forum

## Workshops 1.30pm – 2.30pm

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## Open Forum 2.30pm – 3.00pm

### Open Forum

**ADS-B / PBN High Level Advice**

Regulator and operator discussions on the concept of operation, including operational and system aspects.

**Policy / Rules**

Information about the process for policy and rules for PBN and ADS-B: What, When and How to have your say.

**Stage**

**Design Data**

Providing operators, design organisations and maintenance organisations the opportunity to discuss acceptable technical data with the regulator.

**Auditorium**

**Ops Approvals**

Providing clarification and advice on the requirement, data and process for obtaining an operational approval.

**Industry Support**

Talk to a Part 146 design organisation and Part 145 Maintenance organisation on and design and installation of your equipment.

**Training Room 1**

PBN Workshop

**Training Room 2**

ADS-B Workshop
Introduction

New Zealand is implementing Performance Based Navigation (PBN), with the objective of achieving a full PBN operating environment by 2023. Implementation commenced with deployment of enroute, terminal and approach procedures within controlled airspace and will conclude with uncontrolled airspace by 2023. Deployment of PBN provides safety, operator, environment and societal benefits. The NZ PBN Implementation plan was revised in 2017, a copy of the plan is available at www.nss.govt.nz, resources page.

Concept of Operations

Primary means IFR navigation in New Zealand will be based upon PBN. The navigation route and procedure infrastructure will be optimised to deliver the benefits outlined in the PBN Implementation Plan—Revised 2017.

PBN in New Zealand is predominantly based upon Global Navigation Satellite System (GNSS) (using GPS constellation), adopting the ICAO navigation specifications appropriate for a phase of flight. This enables operations to be conducted outside of Ground Based Navigation Aid (GBNA) service. In the event of loss of PBN capability (aircraft failure or loss of GNSS signal) operators will be required to extract from the PBN operation and recover the aircraft based upon conventional navigation with reference to GBNAs.

The GBNA infrastructure will be described collectively as a Minimum Operational Network (MON). Its purpose is to enable safe recovery of IFR aircraft in the event of loss of PBN capability. The recommendation for the MON is a set of strategically collocated VOR/DME stations in the North and South islands.

Noting that PBN and the surveillance system (ADS-B) is dependent on the GPS constellation, there is a risk of a common mode failure affecting navigation and surveillance. However, this is addressed by means of a non GNSS cooperative surveillance system and the rationalised GBNA navigation infrastructure. Defined as a contingency network, this allows IFR navigation to continue for transport operations. The infrastructure will support contingency operations between Auckland, Wellington and Christchurch. It is expected it will also support regional airports.

Pilot and air traffic control (ATC) training will focus on navigation based upon PBN, however training will need to be retained for conventional navigation as well as responses to loss of PBN or GNSS capability. This is to ensure pilots and ATC are adequately trained for extraction and safe recovery of aircraft and contingency operations.

For more information see www.nss.govt.nz, or email pbn@caa.govt.nz. You can also subscribe to the CAA notification alerting service to receive the latest information and updates on PBN. Tick the ‘Performance Based Navigation’ box here: https://notifications.caa.govt.nz/
Your Guide to
PBN Navigation Specifications and
Aircraft Equipment Standards

Navigation Specifications

Each PBN route or procedure is identified by an ICAO navigation specification which sets and requires a specific accuracy for the phase of flight.

For oceanic operations RNP10 and RNP4 are in use. In the domestic FIR, enroute is based upon RNAV2, terminal areas use RNAV1 or RNP1, approach is RNP APCH – identified as RNAV (GNSS) RWY x. For specific operators RNP AR has been authorized.

The following PBN specifications are being added to support a full PBN environment: RNP2 supporting enroute for oceanic and the domestic FIR, RNP0.3 (H) for helicopters (all phases of flight), Advanced-RNP (A-RNP) providing approvals for multiple specifications including enhanced functionality (i.e. RF turns).

Aircraft Equipment Standards

To operate within the PBN environment and recognizing that New Zealand will be operating in a full PBN environment by 2023, the following equipment standards are required.

PBN operations are based upon GPS: TSO-C129, TSO-C145, TSO-C146, and TSO-C196

The following points should be considered when determining your equipage solution:

- New Zealand’s surveillance solution requires aircraft to have a GPS with Fault Detection and Exclusion (FDE), TSO-C129 does not have FDE as a standard function. However TSO-C129 with a Letter of Approval for FDE functionality is acceptable.
- New Zealand is considering a business case for Satellite Based Augmentation System (SBAS) capability. TSO-C129 and TSO-C196 do not have SBAS capability; this should be considered from an operator’s investment perspective, particularly for safety in relation to vertical guidance.

Systems for recovery and contingency operations are based upon VOR and DME. VOR equipment standard is TSO-C40, DME equipment standard is TSO-C66.

Note, the CAA is currently undergoing a safety assessment which will determine the minimum navigation equipage requirements for Air Transport and Part 91 operators, whilst ensuring an adequate level of safety is provided. The results of this work will support regulatory decision making for PBN.

Operators are to be aware that New Zealand are already in a mature PBN environment, with full PBN deployment concluding in 2023. Adoption of PBN from an operator perspective is dependent on routes and airports operating to and from. The system works on a “best equipped, best served” basis.
Your Guide to Installing ADS-B and PBN equipment

The installation of ADS-B and/or PBN equipment is considered a Design Change. Therefore, the installation of this equipment will require Acceptable Technical Data and an approved installer.

Acceptable Technical Data (ATD) is defined at Civil Aviation Rule Part 21, Appendix D. ATD for the installation of ADS-B and/or PBN equipment includes:

- **Service Bulletin (SB):**
  A Service Bulletin is the document used by manufacturers of aircraft, their engines or their components to communicate details of modifications which can be embodied in aircraft. In some cases, these may be issued as a Mandatory SB (or MSB) in which case a corresponding Airworthiness Directive will be issued by the appropriate National Airworthiness Authority.

- **Supplemental Type Certificate (STC):**
  A STC is an approval of a major modification covering those areas or aspects of an aeronautical product that were modified, including updates to the Flight Manual, user guides/manuals and Instructions for Continuing Airworthiness.

- **AML-STC:**
  An AML-STC is intended for installations that are identical or similar and that share baseline data between the models. This streamlines the certification effort by avoiding unnecessary testing and resubmittal of data that is common to more than one model aircraft. Note that the your specific aircraft type and model must be listed in the AML-STC for it to be considered ATD.

If an SB, STC, or AML-STC is available for your aircraft type, an approved installer can use this ATD to install ADS-B or PBN equipment into your aircraft as a modification. Depending on the complexity of the associated equipment installation and/or test requirements this modification may be classified as Major, this requires conformity on a 337 by an IA or 145 equivalent.

If a SB, STC or AML-STC is not available for your aircraft type, CAR 146 Design Organisation or OEM support will be required to develop and certify ATD in accordance with the guidance set out in Civil Aviation Rule Part 21.

The process for the use and/or development of ATD is depicted in the diagram on the next page.
Process for use of ATD for ADS-B or PBN equipment installation

Not applicable for ADS-B and PBN installations

Do I have acceptable technical data

Go to Part 146 Design Organisation

Develop design change (STC)

Go to OEM

Develop design change (337 Form 337: Conformity Certificate if Major Modification)

Go to Part 145 Installation

FORM 145/66

Work being carried out is a change to the type design

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DESIGNER/TYPE CERTIFICATE HOLDER

INSTALLER/MAINTENANCE

INSTALLER/MAINTENANCE

OPERATOR/OWNER

DESIGNER/TYPE CERTIFICATE HOLDER

INSTALLER/MAINTENANCE

OPERATOR/OWNER

NOTICE TO

Process for use of ATD for ADS-B or PBN equipment installation

ATD EMBODIMENT/INSTALLATION

May 2018
Your Guide to the Performance Based Navigation Regulatory Framework Project

What is the PBN Regulatory Framework Project delivering?

The Performance Based Navigation (PBN) Regulatory Framework project will support and enable the implementation of PBN into the New Zealand aviation system.

Between now and 2023, you are likely to see a number of minor and significant changes to Civil Aviation Authority (CAA) regulation to support safe and harmonised PBN operations in the New Zealand Flight Instrument Region (FIR). These changes may be reflected in an Advisory Circular (AC), rule, and/or introduction of a notice, promotional material, or through education campaigns.

How is regulatory change being delivered?

In recognition of the size and complexity of the regulatory change required, the project is being delivered in a staggered approach. This means you will not see regulatory change delivered in one package, but over a series of stages based on a ‘priority and approach’ model.

What do you mean by “a priority and approach”

The New Southern Sky Working Group (NSSWG) is assisting the CAA to identify which regulatory issues (e.g. equipage, alternate requirements, training and qualifications) should be addressed first, and which should be addressed later. This is based on a number of factors including: operational impact, dependencies, safety risk, and what is logical. This work will help determine the priority and approach—what issues should be addressed, when.

What rule parts might we see regulatory changes to?

- Equipage requirements
- Training and qualifications
- GNSS monitoring
- PBN specifications
- Part 19 Subpart D — IFR Operations: GNSS
- Alternate requirements
- PBN reporting
- Definitions and abbreviations
- Maintenance requirements
- Pre-flight action

How can I get involved or find further information?

You can provide feedback and/or get involved in this project:

- Via your NSSWG representative - a list of NSSWG reps can be found on the NSS website www.nss.govt.nz
- Through the project email service, pbn@caa.govt.nz
- By adding ‘Performance Based Navigation’ to your CAA subscription list
- Via future workshops, roadshows and engagement sessions (more information to come!)
- Through the standard policy consultation process
About ADS-B equipment: Proposed standards for New Zealand

This information is guidance only. Please check with the CAA and your avionics supplier before committing to purchasing and installing an ADS-B system.

For more information see www.nss.govt.nz/surveillance, or email adsb@caa.govt.nz

May 2018

Already got an ADS-B transponder and/or a GNSS source installed?

There’s no need to replace your equipment so long as:

- the transponder is TSO-C166, TSO-C166a or TSO-C166b certified;
- the GNSS position source is certified to TSO-C145 or TSO-C146, or a TSO-C129 with fault detection and exclusion
- The system (the transponder and GNSS position source) produces data that meets the requirements in the rule

If you fly below 24,500 feet, the new rule won’t require you to fit ADS-B now. However, if you do have ADS-B, you’ll need to make sure it meets the rule requirements

Fitting new ADS-B equipment?

We propose that from the date the rule comes into force, the new system will need to include:

- a TSO-C166B transponder (or a transponder that demonstrates the same level of performance)
- a GNSS position source is certified to TSO-C145 or TSO-C146, or a TSO-C129 with fault detection and exclusion

OR

- an all-in-one ADS-B system including an integrated GNSS aviation certified position source (not used for navigation)

What to be aware of....

- Make sure you do not buy Universal ADS-B transceiver (UAT) equipment. Check the frequency: UAT operates on 978MHz. It is not compatible with the New Zealand ADS-B system that operates on 1090 MHz.
- Get your equipment fitted by a Licensed Aircraft Maintenance Engineer (LAME) with a Group 3 rating
- If you have separate GNSS and ADS-B units, make sure they are compatible.
- The rule will require testing before you fly in controlled airspace. Make sure the installed system works.