Memo

To:	Aircraft Noise Community Consultative Group
From:	Kylie Higgs
Date:	11 December 2023
Subject:	Missed Approach Procedure Change at Auckland Airport

1.0 Purpose

The purpose of this memo is to

- inform the Aircraft Noise Community Consultative Group (ANCCG) of a planned redesign by Airways of the current Missed Approach Procedure (MAP) at Auckland Airport (AA), scheduled for November 2024; and

- to present the due diligence completed by AA to ensure the new procedure would not impact the overall community noise exposure or Auckland Unitary Plan compliance.

2.0 Background[1][2]

A missed approach, or go-around (also sometimes referred to as an aborted landing), is a standard, safe and well-practised manoeuvre, initiated by the pilot or an air traffic controller, that involves an aircraft discontinuing its approach to the runway when landing.

Missed approaches are not a common event. Adverse weather conditions, such as strong winds, experienced by the aircraft on final approach are the most common cause of a missed approach. Debris on the runway, an aircraft (or vehicle) that has not yet cleared the runway or another aircraft that has been slow to take-off may also prompt a missed approach. Pilots may also deliberately conduct a missed approach as part of training, although this is not usually done with passengers on board.

During a missed approach, a pilot will point the aircraft nose up, apply full take-off power to the engine(s), retract the landing gear and flaps and climb following the published MAP.

A MAP informs the pilot of the flight direction and altitude for the aircraft to climb to if a missed approach is conducted. This is to ensure that the aircraft conducting a missed approach remains separated from other aircraft and obstacles.

Currently at AA the MAP and the Jet Standard Instrument Departure (SID) follow the same flightpath from take-off up to 3000ft (231° for the Jet SID and MAP on runway 23L (23L), and 051° for the Jet SID and MAP on runway 05R (05R)) (see Figure 1).

[1] Air Services Australia *"Go-arounds and other 'unusual' activity"*, website link to text viewed 26 Nov 2023

[2] Air Services Australia *"Fact Sheet-Sydney Airport Change to Missed Approach Procedure", RWY34R* effective 2 Dec 2021, pdf located on website link here 26 Nov 2023

Auckland Airport

Figure 1

Having these two procedures share the same flightpath creates complexities because Air Traffic Control (ATC) have separation requirements (that are required to be met under Civil Aviation Rules[3]) between aircraft on the same flightpath. These requirements must be maintained in the event of an arriving aircraft being unable to land for any reason, including low cloud, fog or wind shear.[4] In practice, this requires ATC to plan the gaps between all arriving and departing aircraft assuming that a missed approach will eventuate, even though realistically a MAP at AA rarely occurs. Over the last 3 years AA had on average 0.08% per month of arrival aircraft undertake a MAP. (see Appendix A).

If ATC only used the MAP without any other intervention, then significant gaps would need to be left between departing and arriving aircraft and airborne/ground delays would significantly increase.

Currently, to overcome this issue ATC employ unpublished procedures to manoeuvre aircraft that are undertaking a MAP onto a different flightpath as soon as practicable after a missed appraoch has occurred.

These procedures include directing the aircraft to:

- use the visual circuit (subject to weather, approach type, aircraft approach category, and operator acceptance); or
- maintain radar separation (3 nautical miles).

Over time changes to the operational environment and enhancements in navigation technology have resulted in a reluctance from airlines to continue to use unpublished procedures. Unpublished procedures create safety concerns for airlines, especially in the modern digital automated environment, because they are unplanned and unpredictable procedures that don't involve the same 'safety by design' rigor of published procedures.

The MAP issue has not been isolated to AA. It was also an issue at Wellington and Christchurch Airport, therefore during 2018 Airways used Performance Based Navigation (see Appendix B) to design a new MAP, called Divergent Missed Approach Protection System (DMAPS).

DMAPS was introduced at Wellington Airport on 1 December 2022 and has been in place at Christchurch Airport since 2020. DMAPS for AA is planned to be introduced in November 2024.

[3] Civil Aviation Rules Part 172 Consolidation (2021, 8 Feb), s 172.259 Longitudinal separation by distance, link here
[4] Civil Aviation Rules Part 172 Consolidation (2021, 8 Feb), s 172.263 Separation between aircraft on an instrument approach, here

3.0 Divergent Missed Approach Protection System (DMAPS)

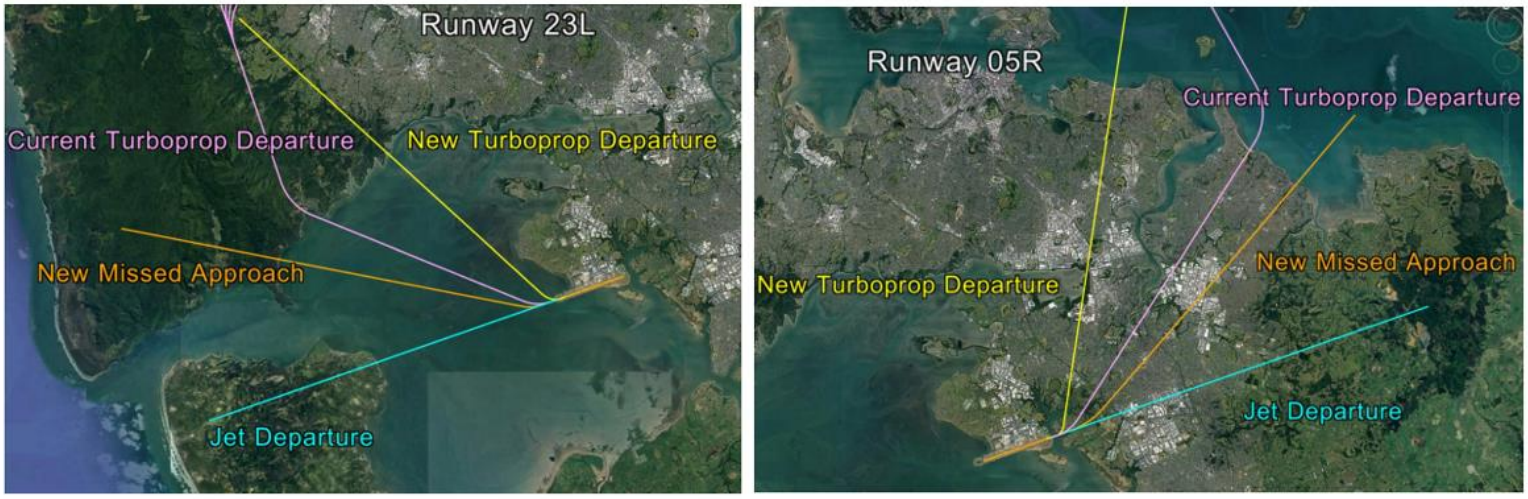

Figure 2

Under the new DMAPS system for AA the MAP and the Jet SID no longer fly the same path – they are now on separate flight paths that diverge 30 degrees from one another. Departing jet aircraft still climb on the centerline as per the current Jet SID, while aircraft that have missed their approach now track 30 degrees North of the centerline (see Figure 2)

The benefit of DMAPS for AA include:

- The DMAPS procedures are what is known as a safety-by-design system. They increase safety and efficiency by reducing complexity and uncertainty.

- Pilots can now fly a more consistent and predictable missed approach flight path that is clear of departing jet aircraft. They can use instrument flight procedures, rather than flying manually using visual cues to avoid terrain and uncontrolled airspace.

- This reduces potential risks and is in line with the global aviation industry's move towards instrument flight procedures that build greater safety into the design of aviation systems.

- The DMAPS procedures reduce delays because they allow ATC to safely reduce the size of the gaps required between approaching aircraft, particularly in poor weather.

- The new procedures reduce fuel burn and the associated CO_2 emissions, because they reduce both delays for all aircraft, and the overall number of kilometres flown by departing jet aircraft.

3.1 Do any other flightpaths need to change because of DMAPS?

Yes, the Turboprop North SID will also need to change.

Currently at AA the MAP and the Turboprop North SID are on separate flight paths that diverge 30 degrees from one another (see Figure 3).

This 30-degree separation needs to be maintained, therefore the Turboprop North SID will now need to move another 30 degrees North.

For Runway 05R the current Turboprop North SID tracks over Papatoetoe – Pakuranga. This will move to a proposed new track of Mangere East – Mt Wellington/Stonefield's (see Figure 4)

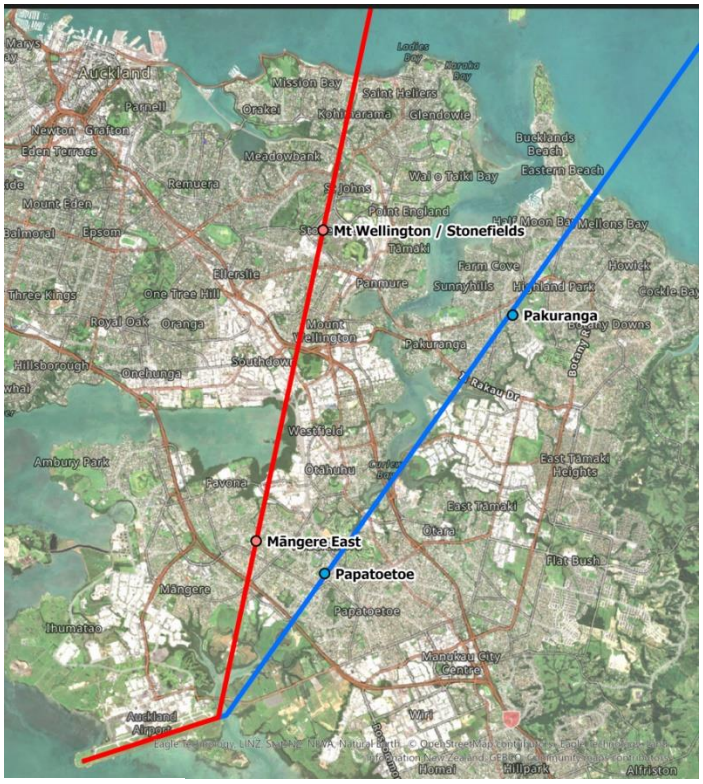

Figure 4

For Runway 23L the current Turboprop North SID tracks over the Manukau Harbour – Armour Bay. This will move to a new proposed track of Manukau Harbour – South Titirangi (see Figure 5)

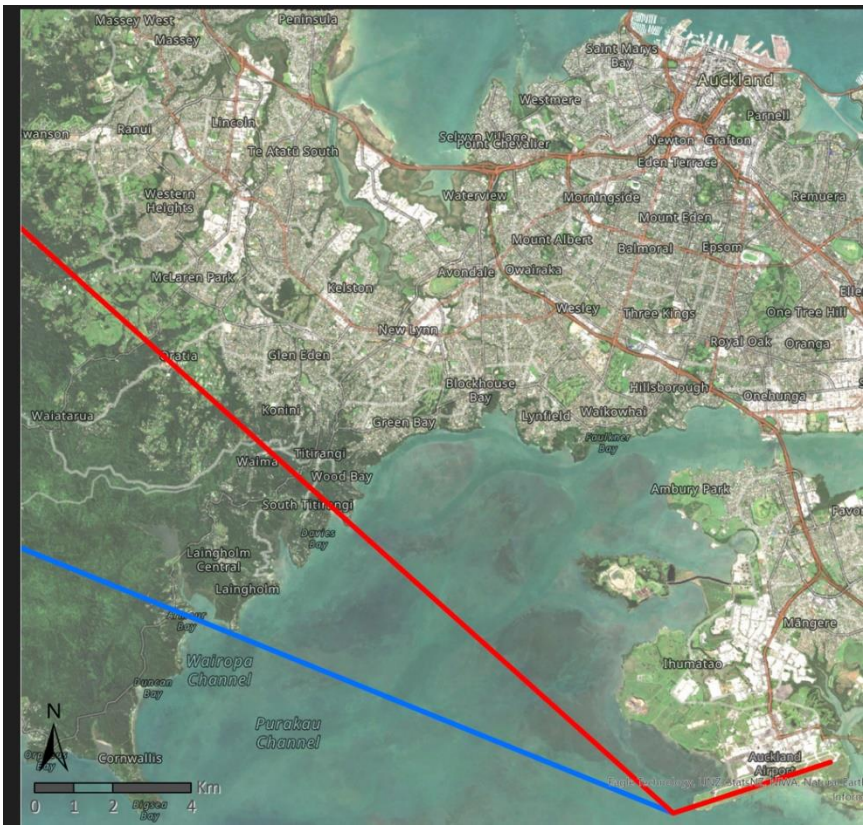

Figure 5

3.2 How many Turboprop North SIDs occur at AA?

Currently 12 turboprop aircraft depart daily to domestic northern airports and aerodromes (Great Barrier Island, Kaitāia, Kerikeri and Whangārei). This increases during summer with peak traffic increasing to 38 turboprop aircraft (see Table 1).

Destination	Aircraft type	Aircraft Category	Average daily flights	Daily summer flights (peak)
Great Barrier Island	Cessna 208b	Turboprop	6	27
Kaitāia	Cessna 208b	Turboprop	2	3
Kerikeri	Dash 8	Turboprop	2	4
Whangārei	Dash 8	Turboprop	2	4
TOTAL			12	38

Table 1: Current daily domestic northbound flights

4.0 What is the impact to overall community noise exposure?

AA appreciates that the change to flightpaths proposed by Airways under the DMAPS project may be noticed by some residents. While aircraft will not be present in areas that they have not been in before, some people will notice fewer flights, while others notice more. Therefore, AA commissioned Marshall

Day Acoustics (MDA) to complete a study to quantify the possible change in noise for the affected communities (For the full report see Appendix C).

MDA conducted this study using a two-stage approach, being acoustic analysis of actual noise measurements from current flightpaths, and modelling of proposed flightpaths. To provide AA with the required assurance MDA captured data from the turboprop North SID off 05R. No acoustic analysis was required for the turboprop North SID off 23L because MDA has determined that any noise impact from 23L will be equal to, but more likely less than that of 05R. The conclusion is based on the fact that aircraft are at a much higher altitude when they reach the affected communities when departing of 23L and Turboprop North departures are often turned early by Airways to track directly to Great Barrier Island.

Also, this study did not include acoustic analysis on the new missed approach tracks (which are also shifted 30°), as missed approach procedures are very rare at Auckland Airport. In the last 3 years, 0.08% of arrival aircraft per month have undertaken a missed approach. Also, the new missed approach track is currently in use for turboprop SIDs and jet departures that are turned early to the North.

Results

MDA concluded that affected communities would experience a change of ±10 dB when an aircraft flew directly overhead (see Table 2), however overall, this would not be disruptive.

	Distance from RW23L	Measured L_{AE} (dBA)	Calculated L_{AE}		Change in noise level (dB)
			Current track (dBA)	Proposed track (dBA)	
Under the current flightpath					
Papatoetoe	5.0km	80	78	71	-7
Pakuranga	13.6km	76	74	62	-12
Under the proposed flight path					
Mangere East	5.0km	72[1]	70	78	+8
Mt Wellington (Stonefields)	13.6km	64[1]	62	74	+12
				Log average:	**±10 dB**

[1] These noise levels were not measured but have been back calculated based on the calculated noise levels

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Table 2: Results for point locations for a single Cessna 208b flight

When on-site, MDA measured an LAFmax[6] noise level of up to 75 dB. This is equivalent to a truck driving past at 40m. As the affected neighbourhoods are urban and near industrial areas, truck passings are common. This means the flyovers of the small aircraft (Cessna 208 or Dash 8) would not make a significant change to the current noise environment.

Additionally, there is to be only a small number of aircraft flying along this proposed track (12 turboprops daily), and the track is only used when Runway 05R is in operation (when easterly winds prevail – an average of 30% of the year.

Finally, because the tracks are replacing existing turboprop departure tracks elsewhere, there is also an equivalent noise reduction benefit for those communities no longer under the overflight tracks.

[5] Please refer to full MDA report attached for glossary of terminology

[6] The maximum sound level recorded during the measurement period (A-weighted).

Overall, MDA considered that with the implementation of DMAPS, there would be no impact or effect of any significance on the overall community noise exposure.

5.0 What is the impact to Auckland Unitary Plan (AUP) compliance?

In terms of overall compliance with the AUP, there is no change to the annual noise contours (ANC) when the proposed track is modelled and therefore no issues with compliance. This is because DMAPS applies to only a few aircraft movements, and the aircraft are smaller (and quieter) than the other aircraft in use at the airport. Figure 6 below show the existing contours (solid lines) and the contours that use the proposed track (dotted lines) overlap entirely.

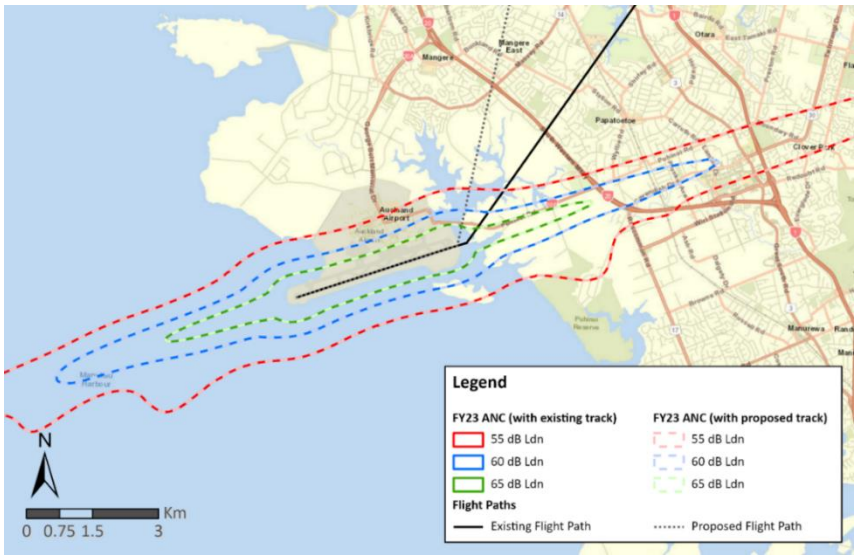


Figure 6

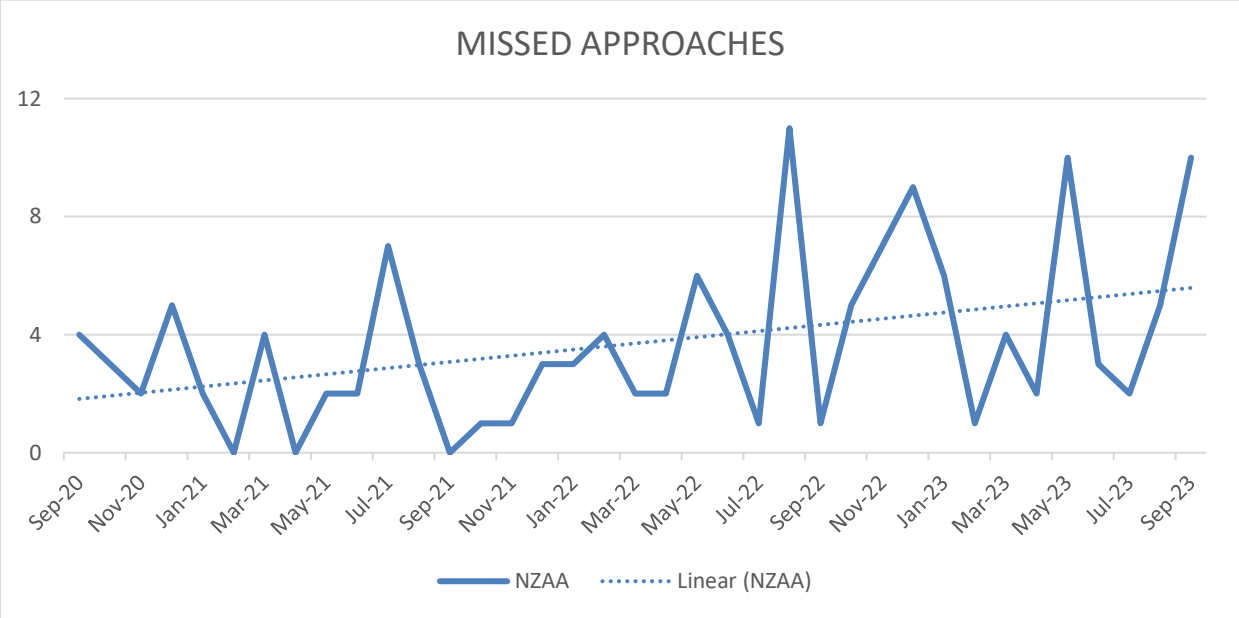
6.0 Next Steps

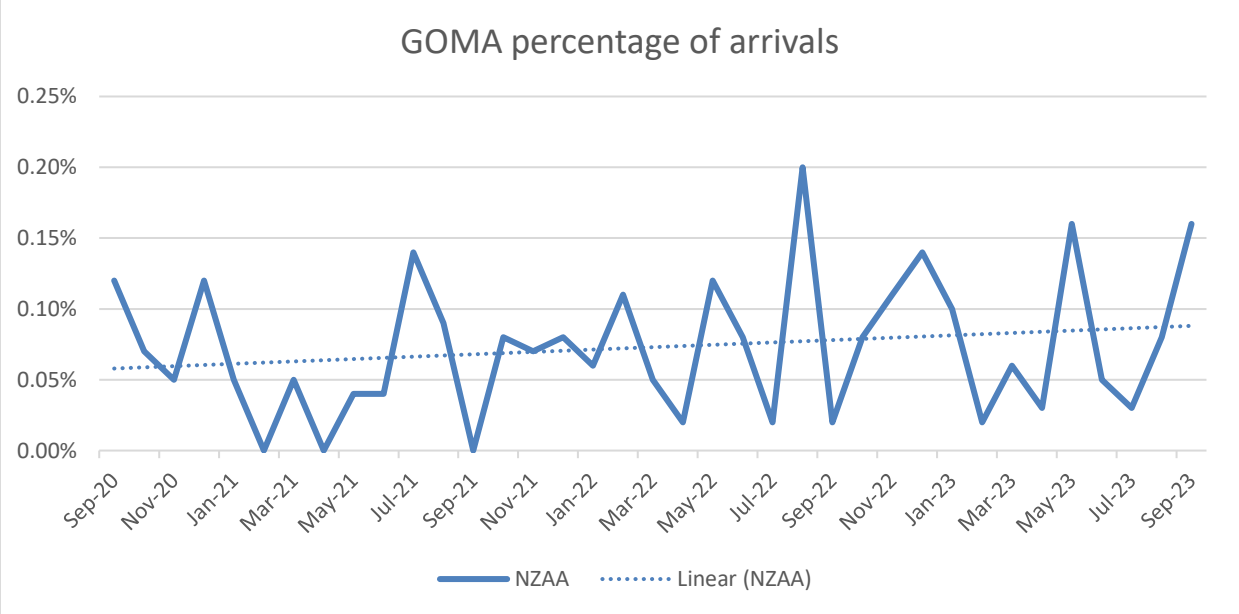
This is an Airways programme, however AA has approved the new system based on the results of the MDA DMAPS study and given the benefits for safety, efficiency/fuel use and sustainability. Airways is now working towards submitting these changes to the Civil Aviation Authority for approval by the 22nd December 2023.

To provide extra assurance regarding the impact of noise on the affected communities AA intends to commission a follow-up study with MDA to validate the 2023 modelling. This study will include the placement of temporary monitors to capture real time data under the new Turboprop North SIDs for both 23L & 05R. The results from this study will be presented to the ANCCG at the March 2025 meeting.

AA will work with the Local Boards to develop a communications plan to be disseminated to the communities that may be affected by this change. This draft communication plan will be presented at the June 2024 ANCCG to allow for feedback before the plan is finalised ahead of the implementation of DMAPS in November 2024.

Appendix A: Missed Approach Data for the last 3 years.





Appendix B: Performance Based Navigation (PBN) Overview

As air travel has evolved, methods of navigation have improved to increase safety and efficiency while reducing the environmental impact of aviation operations.

Historically aircraft navigation was based on looking outside the window at landmarks.

The next step in navigation saw beacons on land, which meant we could fly around without needing visual clues.

PBN is the newest evolution of navigation that is primarily reliant on satellite-based technologies. This enables aircraft to fly routes directly between virtual waypoints at set geographical coordinates, rather than between physical ground beacons. As the number of possible virtual waypoints is effectively infinite, routes using them can be much more direct than those using ground-based navigation aids (GBNA).

In 2007, the International Civil Aviation Organisation urged member countries to move to PBN. In response, the New Zealand government developed a National Airspace Policy, which recognises the step-change to PBN, allowing safer and more efficient airspace management. Since 2009, Airways has been in the process of implementing Performance Based Navigation (PBN) across the aviation system.

PBN delivers a range of benefits in New Zealand including,

- improved safety of departure, en-route, terminal, and approach operations brought about by improved navigational accuracy. Increased accuracy means that there is more reliable separation from terrain and other traffic.
- improved operational efficiency achieved by more direct routes with more flexibility (e.g. avoiding inclement weather). PBN enables shorter, more efficient approaches to landing and improving flight schedule reliability.
- reduced infrastructure costs as fewer GBNAs are needed to enable day-to-day operations by PBN equipped aircraft.
- increased airspace and airport capacity, due to more efficient design of routes in controlled airspace. More efficient approach and departure procedures means that more aircraft can take off and land per hour.
- reduced environmental impact and fuel costs due to reduced fuel burn from shorter routes and more efficient climb and descent paths.
- reduced community exposure to noise in some cases, where the design of routes can be tailored to minimise the frequency and proximity of aircraft flights over communities.

Auckland Airports SMART Approaches are a good example of Airways PBN enhancement programme. They use the accuracy of satellite-based navigation to create shorter, curved approaches to the runway, resulting in fuel and carbon emission savings and fewer kilometres being flown by aircraft over residential areas. This technology also allows for a more continuous descent, with the aircraft engines' power settings at or close to idle, meaning that aircraft on a SMART Approach generate less noise than when on other less efficient flight paths.

Appendix C: Marshall Day Acoustics Auckland Airport DMAPS Study – 15 November 2023

Please refer to separate attachment: Missed Approach Procedure MDA Report