Network Performance Report
November 2017

Foreword

Welcome to the first edition of the monthly Network Performance Report.

Network Performance, measured through the lens of the Airborne Delay metric, is one of the Key Performance Indicators of how Airservices is performing.

It has been recognised that there is a need to make more information available about how the Network is performing, and more specifically, how Airservices is performing in managing the Network.

This first edition provides a report on Airborne Delay and ATFM Compliance data from November 2017. Whilst it is accurate, *it is not exhaustive*. Over time, the report will evolve as we receive your feedback and as we develop our reporting capabilities.

Our focus in this first edition is to provide detail on the "outlier" or notable events and to utilise the information we have received from ANS Operations to provide insights into these notable events.

The long-term trend for Airborne Delay is up. We are currently above target and trending upwards. So what are we doing about it?

The answer is twofold. As each monthly report is likely to highlight performance issues and limitations of the current suite of Network Management tools, we will use future editions of the report to demonstrate how key strategic initiatives such as A-CDM, Long Range ATFM and the development of the ATM Services Plan will improve our performance.

The second part is to increase our tempo in post-operational analysis. Our aim is to broaden the analysis to more normal events and to improve the quantity and quality of detail we are receiving about operations from those in the operational environment. This is vital. It will help us understand the gap between what we planned to do and what we actually did, and which factors of Network Performance we have control of. You will see some example of this through this report and a detailed example towards the end of the report.

Improvements in Airborne Delay require this dual focus; - on the strategic initiatives and also a better understanding and improvement of our day-to-day performance.

Regards,

Paddy Goodall,
ATM Network Services Manager.

Table of contents

1 Summary

1.1 Scope

This report focusses on Network Performance at the four major airports that are subject to the Air Traffic Flow Management (ATFM) program. These are Sydney, Melbourne, Brisbane and Perth.

Airborne Delay is the prime indicator of Network Performance and is one of Airservices Corporate Plan Key Performance Indicators (KPI). Detail on the KPI measurement is included in **Appendix A**.

1.2 Overview

The combined 75th Percentile performance for Airborne Delay across the four major airports was 3.8 minutes, and the median was 0.8 minutes.

These monthly performance figures were an improvement on the November 2016 performance but did not meet the KPI targets of 3.5 minutes and 0.6 minutes respectively.

Airborne Delay during November was primarily impacted by eight significant airborne delay events. These were:

- 4 weather events that were unforecast and/or the impact was underestimated in the pre-tactical processes (1 at Sydney, 3 at Melbourne);
- 3 days of reduced capacity at Brisbane associated with change initiatives (new SIDS/STARS & INTAS commissioning);
- 1 event with an abnormally high number of international, exempt and non-compliant flights at Melbourne.

Why measure Median rather than Average/Mean?

In some cases, for example; where ATC has had a positive impact by providing track shortening without increasing operational risk, a 'negative' value for Airborne Delay is registered for that particular flight.

The Median shows the mid-point of the data set and allows us to demonstrate our impact on all flights, not just the ones that were delayed. Additionally, over short timeframes and small datasets, Median measurement is more resilient to data errors and small groups of outliers which may skew the average.

Why measure the 75th percentile?

This supplements the Median and is valuable to demonstrate how effectively we have managed the arrival of most of the fleet.

The last 25th percentile can typically contain arrival data from flights that were impacted by non-routine events, such as Medical priority traffic or aircraft in an emergency or diversion.

2 Network Wide Performance

2.1 Airborne Delay

The combined median and 75th percentile Airborne Delay at the four major airports is indicated below.

Figure 1 indicates that the long-term trend is upwards. Figure 2 indicates that the upward trend has somewhat stabilised in the recent near-term .

Figure 3 shows the long-term trends for each of the four major airports. More detailed analysis is presented for each of the airports later in this report.

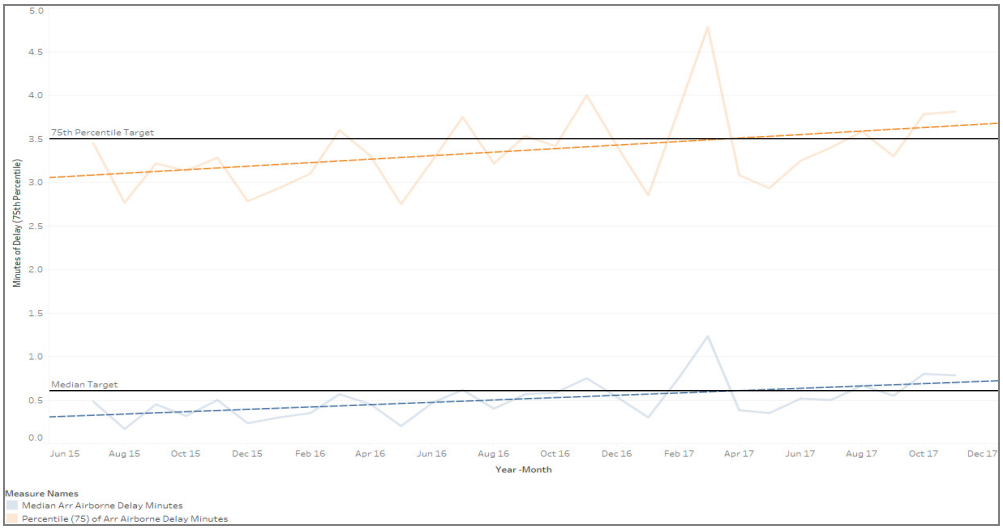

Figure 1: Long-term combined Airborne Delay median and 75th percentile (June 2015 to November 2017)

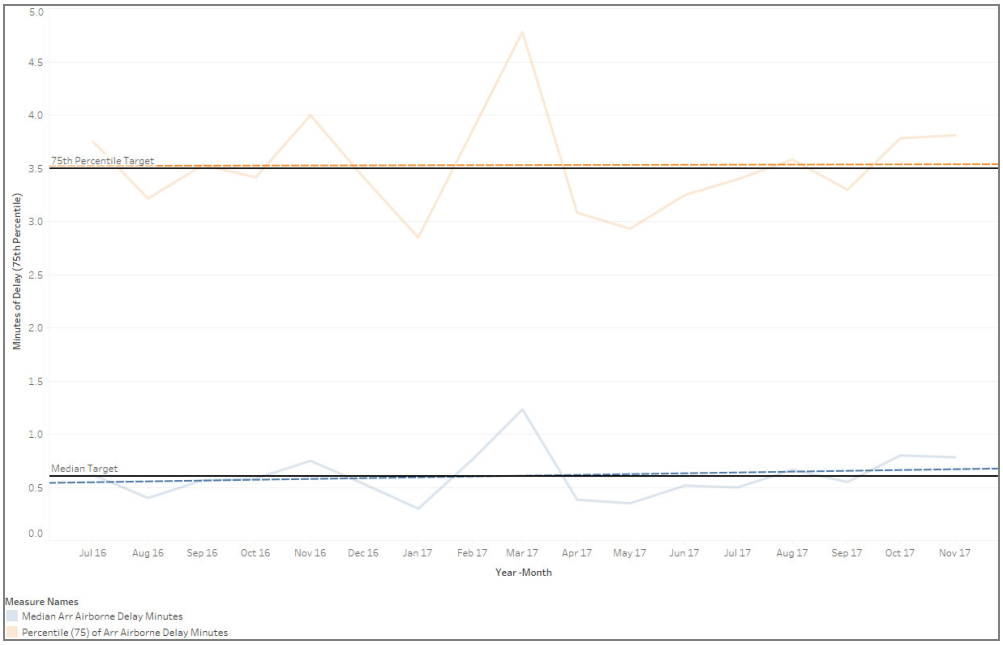

Figure 2: Near-term combined Airborne Delay median and 75th percentile (July 2016 to November 2017)

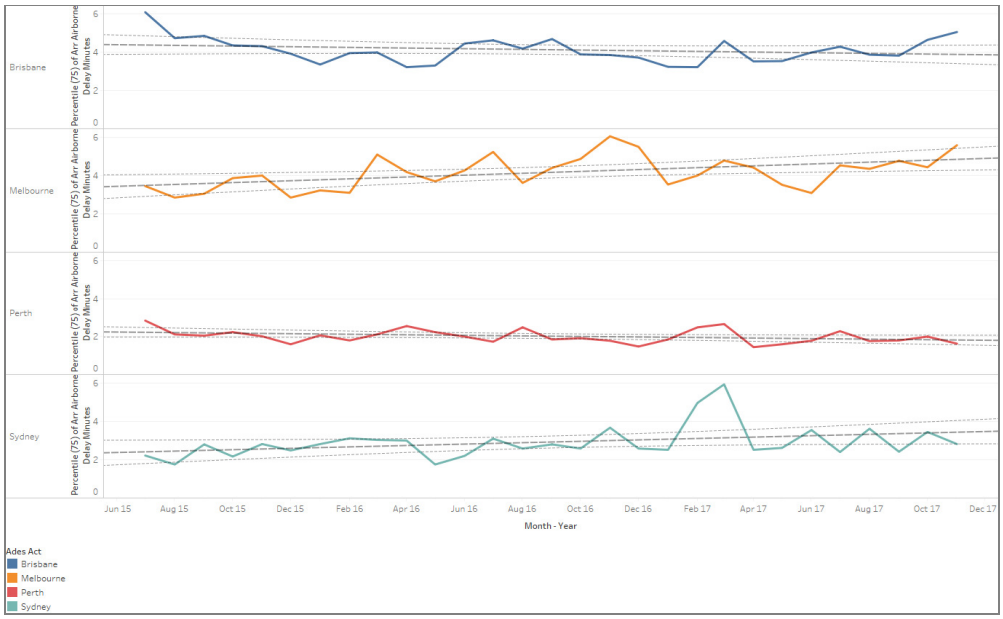

Figure 3: Long-term individual Airborne Delay 75th percentile[1]
(June 2015 to November 2017)

[1] Dotted lines above and below trend line indicate 95% confidence bounds and can be considered as a measure of the reliability of the trend. That is; larger bounds indicate a less reliable trend.

2.2 Actual Take-off Time Performance

The effectiveness of the ATFM/Ground Delay system is predicated on allocating a push-back time (Calculated Off Blocks Time - COBT) to each aircraft at the departure aerodrome in order to achieve a target time for significant milestones later in that flight, right through to the landing time at the destination.

There is a degree of variability associated with each stage of the flight and as the flight progresses, these variable factors increase and compound. Therefore, the effectiveness of the allocated COBT in achieving subsequent target times is gradually eroded as the flight progresses.

The first significant milestone following COBT is the take-off time that the ATFM program is aiming for (Calculated Take-off Time - CTOT). This is the subsequent milestone that is subject to the least variability.

By looking at the take-off time and comparing what was achieved against what was aimed for, an indication can be provided to how effective the COBT has been. This is done here by comparing Actual Take-off Time (ATOT) with CTOT. The CTOT–ATOT performance for each destination airport is listed in Figure 4.

		Nov 16	Dec 16	Jan 17	Feb 17	Mar 17	Apr 17	May 17	Jun 17	Jul 17	Aug 17	Sep 17	Oct 17	Nov 17
Early Non Compliant	YBBN	0.6%	0.6%	0.6%	0.5%	0.5%	0.6%	0.5%	0.6%	0.6%	0.6%	0.4%	0.6%	0.4%
	YMML	0.7%	0.7%	0.5%	0.4%	0.7%	0.6%	0.4%	0.5%	0.3%	0.4%	0.5%	0.5%	0.6%
	YPPH	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%	0.2%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%
	YSSY	0.7%	0.5%	0.4%	0.5%	0.8%	0.4%	0.5%	0.7%	0.5%	0.7%	0.8%	0.5%	0.5%
Late Non Compliant	YBBN	2.1%	2.1%	1.5%	1.7%	2.2%	1.7%	1.7%	1.6%	2.6%	1.9%	2.3%	2.4%	2.4%
	YMML	3.6%	3.3%	2.4%	3.1%	3.8%	2.9%	2.4%	2.5%	3.2%	2.7%	3.0%	3.5%	3.5%
	YPPH	0.9%	0.9%	0.7%	0.8%	0.9%	0.8%	0.7%	0.8%	0.9%	0.9%	1.0%	1.0%	1.0%
	YSSY	3.5%	3.2%	2.5%	3.0%	3.7%	3.0%	2.5%	2.5%	3.3%	2.9%	3.4%	3.7%	4.2%

% of Total SUM(Number of Flights)

0.1% 4.2%

Figure 4: CTOT–ATOT Performance

In addition to indicating how effective the allocated COBT in achieving the next major milestone, CTOT–ATOT performance is also the best available indicator to measure likely COBT compliance. Absolute COBT compliance is difficult to measure and requires further development in monitoring and reporting capability.

3 Sydney

3.1 Airborne Delay

The 75th percentile performance figures for airborne delay at Sydney are indicated in Figure 5.

November performance met target and was better than same time last year. However, the long-term trend for Airborne Delay at Sydney is upwards.

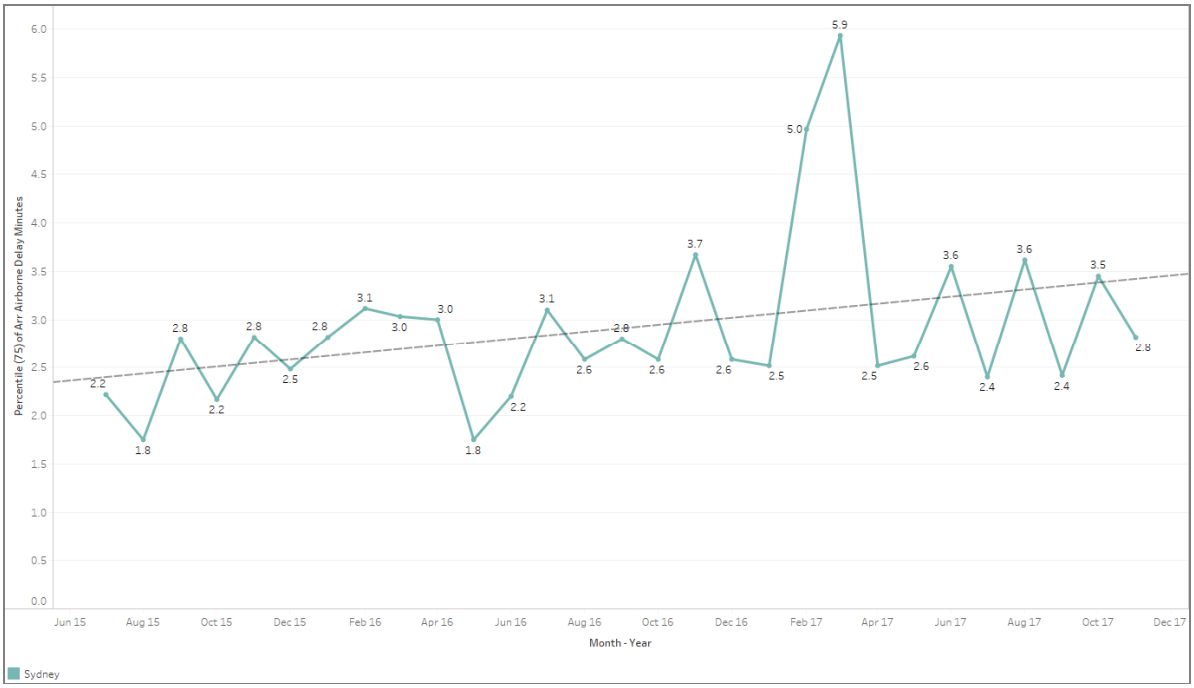

Figure 5: Sydney Airborne Delay 75th Percentile

3.2 Notable Events

The following commentary describes the most significant Airborne Delay events during November in Sydney:

- 06 November:
  - Significant Airborne Delay associated with unforecast thunderstorm activity;
  - PRM operations were planned but were unable to be implemented.
- 22 November:
  - A medical evacuation helicopter arriving and departing at Royal Prince Alfred hospital impacted operations at Sydney Airport;
  - Airborne Delays of up to 24 minutes were experienced during this time.
- 23 November:
  - Re-sheeting runway 16L/34R reduced arrival acceptance rates during the morning period;
  - Moderate Airborne Delays experienced.

4 Melbourne

4.1 Airborne Delay

The 75th Percentile performance figures for Airborne Delay at Melbourne are indicated in Figure 6.

November performance did not meet target but was better than same time last year. The long-term trend for Airborne Delay at Melbourne is upwards.

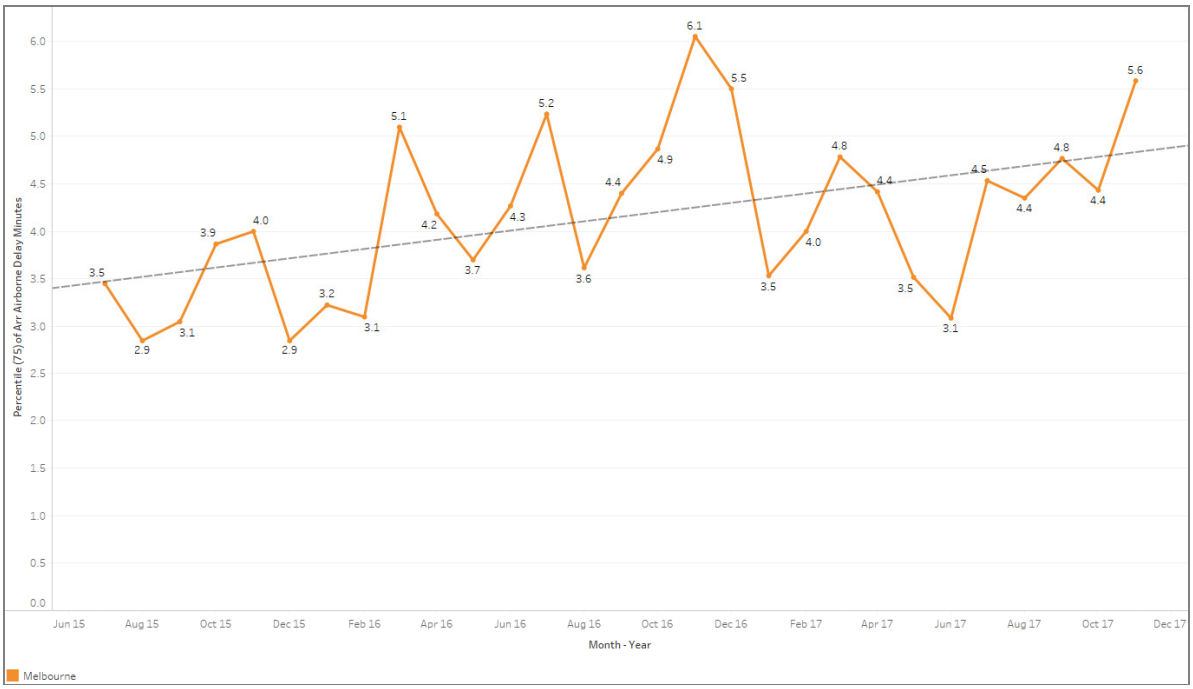

Figure 6: Melbourne Airborne Delay 75th Percentile

4.2 Notable Events

The following commentary describes the most significant Airborne Delay events during November in Melbourne:

- 13 November:
  - Significant Airborne Delay associated with unforecast fog during the morning period;
  - The impact of thunderstorms during the afternoon period was larger than forecast.
- 16 November:
  - The forecast indicated a low probability of thunderstorms. The pre-tactical arrival acceptance rates set during the METCDM process factored this low probability;
  - The thunderstorms eventuated and caused a lower tactical arrival acceptance rate and an increase to Airborne Delay.

- 24 November:
  - Earlier than anticipated onset of thunderstorms lead to a lower than planned arrival acceptance rate and consequential elevated Airborne Delays.
- 27 November:
  - A higher than normal concentration of international flights, other exempt flights and late non-compliant flights during the morning period reduced the effectiveness of the ATFM program and increased Airborne Delay.

5 Brisbane

5.1 Airborne Delay

The 75th Percentile performance figures for Airborne Delay at Brisbane are indicated in Figure 7.

November performance did not meet target and Airborne Delays were higher than same time last year. The long-term trend for Airborne Delay at Brisbane is downwards.

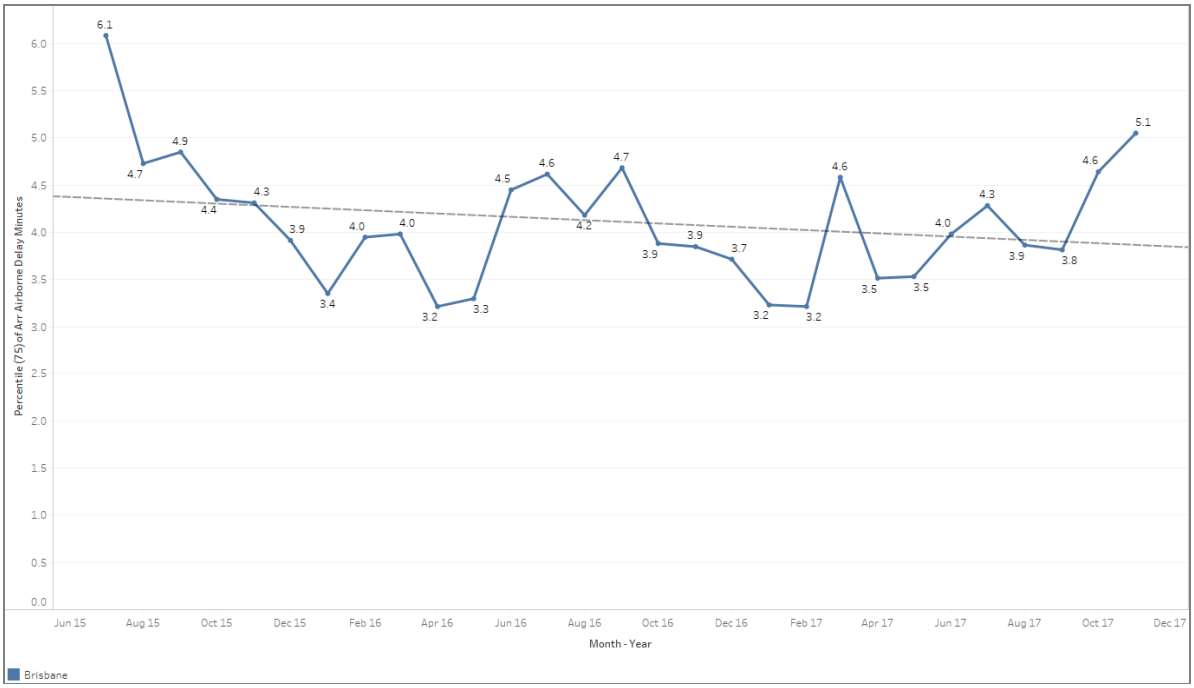

Figure 7: Brisbane Airborne Delay 75th Percentile

5.2 Notable Events

The following commentary describes the most significant Airborne Delay events during November in Brisbane:

- 09 November:
  - The arrival acceptance rate was set at 21 per hour to manage the risk associated with the implementation of new ICAO SID/STAR procedures;
- 26 & 27 November:
  - The arrival acceptance rate was set at 21 per hour to manage the risk associated with the commissioning of INTAS.
- On each of these instances;
  - The arrival demand and actual arrival rates matched capacity for most of the day;
  - ATFM slot compliance was high, however, the variability of the 20 minute compliance window lead to a concentration/dispersal effect and over-subscription to tactical landing slots.
  - There was no latent capacity to absorb over-subscription in consecutive until later in the days.

The 26 November event has been used to develop a deep-dive analysis and reporting format which will be replicated for all notable events. This analysis is available in **Appendix B**.

6 Perth

6.1 Airborne Delay

The 75th Percentile performance figures for Airborne Delay at Perth are indicated in Figure 8.

November performance met target and Airborne Delay was lower than same time last year. The long-term trend for Airborne Delay at Perth is downwards.

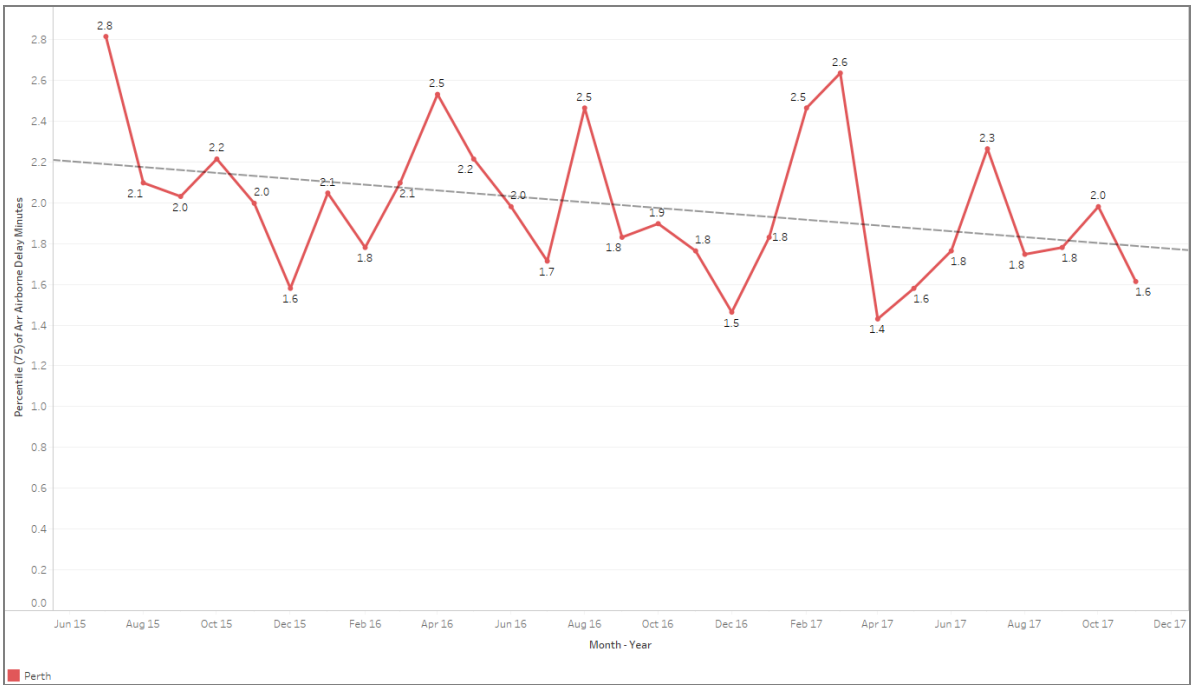

Figure 8: Perth Airborne Delay 75th Percentile

6.2 Notable Events

There were no notable events for Perth in November 2017.

7 Appendix A

Corporate Plan Key Performance Indictor Profile: Arrival airborne delay

Corporate Plan Description:
The median (and 75th percentile) excess time incurred during the arrival airborne phase of flight in reference to the estimated time of arrival for high-volume operations. (High volume operating environments defined as Brisbane, Melbourne, Perth and Sydney).

Corporate Plan Targets:

Year	17/18	18/19	19/20	20/21	21/22
75%	3.5	3.4	3.3	3.2	3.1
Median	0.6	0.6	0.6	0.6	0.6

What is it: Excess time incurred during the arrival phase of flight.

What is measured: It is measured by comparing the estimated flight time and actual flight time for the portion of the flight within 250 NM of the destination aerodrome.

Why 250NM: The 250NM threshold has been identified as the distance from the aerodrome at which arrival demand/capacity balancing measures and arrival flight paths start taking effect. It is a true reflection of the tactical arrival management of the flight, and is not skewed by other non-related issues such as congestion at the departure aerodrome.

Why measure Median rather than Average/Mean: In some cases, the actual flight time within 250NM of the destination aerodrome will be less than the estimated flight time (e.g.: ATC has provide track shortening). In the dataset, this translates into a 'negative' value for that particular flight.

The Median shows the mid-point of the data set and allows us to demonstrate our impact on all flights, not just the ones that were delayed. Additionally, over short timeframes and small datasets (such as a daily report), Median measurement is more resilient to data errors and small groups of outliers which may skew the average.

Why measure the 75th percentile: This supplements the Median and is valuable to demonstrate how effectively we have managed the arrival of most of the fleet.

The last 25th percentile can typically contain arrival data from flights that were impacted by non-routine events, such as Medical priority traffic or aircraft in an emergency or diversion.

How do we measure:
Uses the high-fidelity Dalí trajectory-based model. For Sydney, some assumptions are built in to calculations as the actual flight path is unique for each flight.

8 Appendix B

Post Operational Performance Analysis

- *Brisbane Airport - 26th November 2017*

• Event Description

On Sunday November 26th, an arrival delay elevation was observed in the PM period between 1600-2000 local at Brisbane, see figure 1. An amended Traffic Holding Advisory NOTAM was issued for arriving flights to carry 30 minutes of holding fuel until 2030 local time.

Low arrival rates were being run, as seen in figure 2, where the demand and capacity were almost identical. Tactical arrival rates were equal to or greater than the planned rates. Ref METCDM. Rates were set lower than business rules rates by the TM due to the introduction of INTAS - NOTAM B13/17.

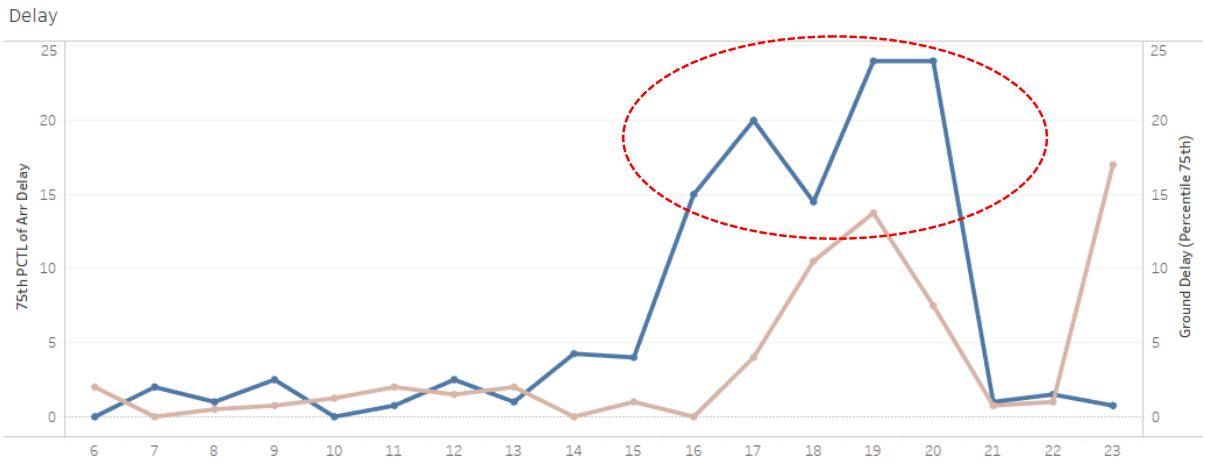

Figure 4: Flight delay chart, airborne delay in blue, ground delay in brown.

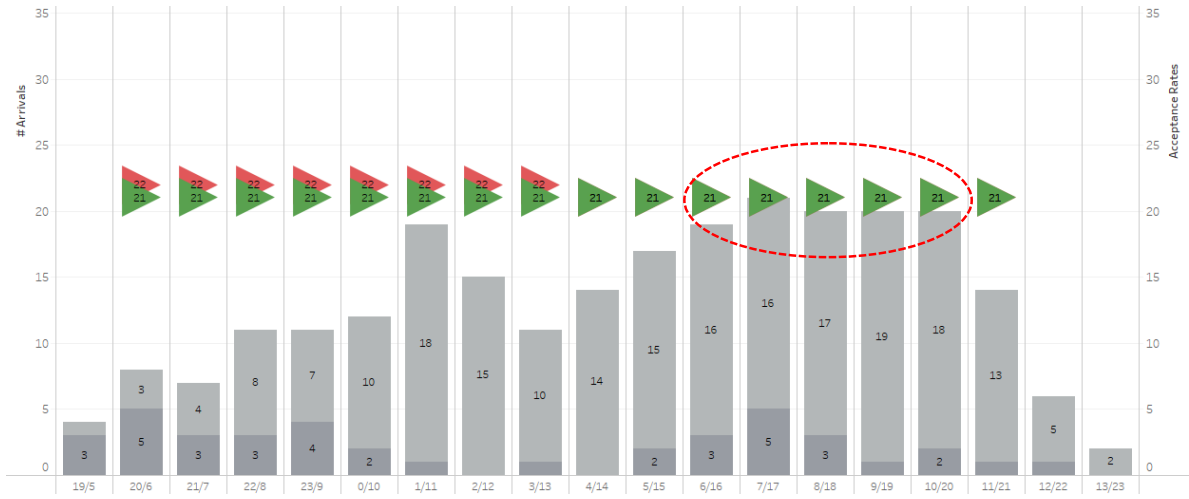

Figure 5: Pre tactical rates in green, tactical rates in red. Bars show actual arrivals by hour. Dark grey are internationals, light grey are domestic.

• Analysis

A known limitation of the system is that when demand equals capacity, elevated holding occurs due to inaccuracies in executing the Ground Delay Program (GDP).

Figure 3 provides a scatter of actual landing time (ALDT) against GDP-planned arrival time (CLDT). Of interest are the numbers in red; these represent the number of flights that arrive in a later hourly bin than planned. As can be seen from figure 3, during the period at which elevated holding occurred, there were a large number of late arrivals. These arrivals compound the demand planned for that period, and hence holding occurs. In a full program, holding will not reduce until there is latent capacity. The 5 aircraft that landed in the 1600 hour from the calculated 1500 hour showed that one aircraft (VOZ467) had a departure COBT 4 minutes prior to its IOBT. One aircraft (VEJ) was early non-compliant but was late arriving due to airborne delay.

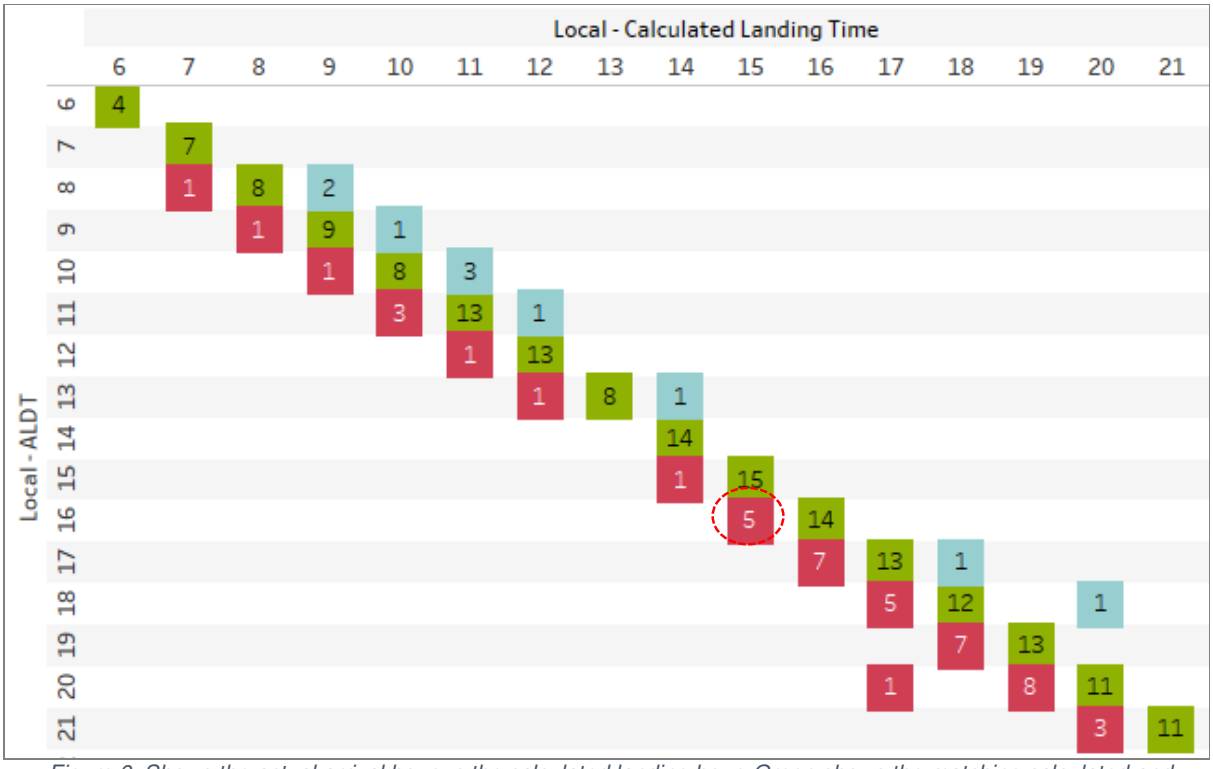

Figure 6: Shows the actual arrival hour vs the calculated landing hour. Green shows the matching calculated and actual landing hour, red shows late aircraft, blue shows early aircraft. This figure includes all flights.

There are a number of common causal factors why aircraft arrive at a time different to planned by the GDP:

- Non-compliance with COBT. Figure 5 provides a scatter plot of CTOT compliance (proxy for COBT compliance). As can be seen from this figure, there were 6 early and 6 late non-compliant flights that landed in the evening peak period.
- There were 15 Internationals and/or exempt GDP flights over the period as seen in Figure 5.

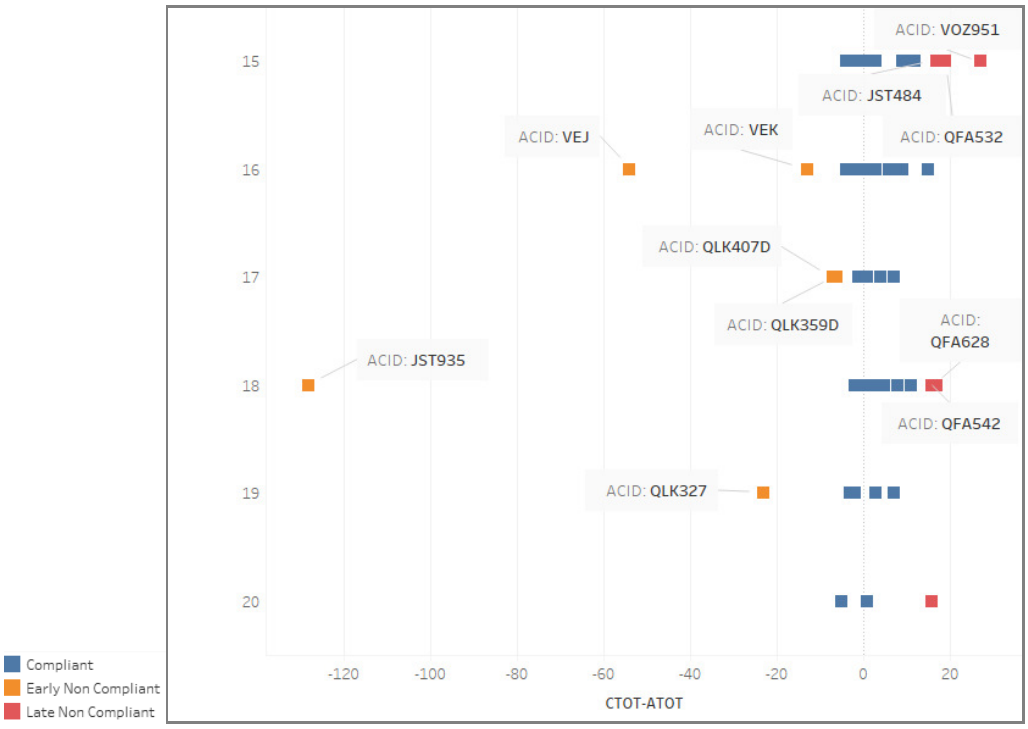

Figure 4 – CTOT-ATOT Compliance –There were 6 early non-compliant aircraft that landed in the peak period. This figure does not include exempt flights.

• Summary

The elevated holding experienced in the evening peak at Brisbane on Sunday November 26th was mainly the result of demand presenting itself later than planned due to GDP non-compliance (early and late), which subsequently cascaded throughout the evening peak period. Figure 7 shows the 2d tracks for arrivals into Brisbane for the evening.

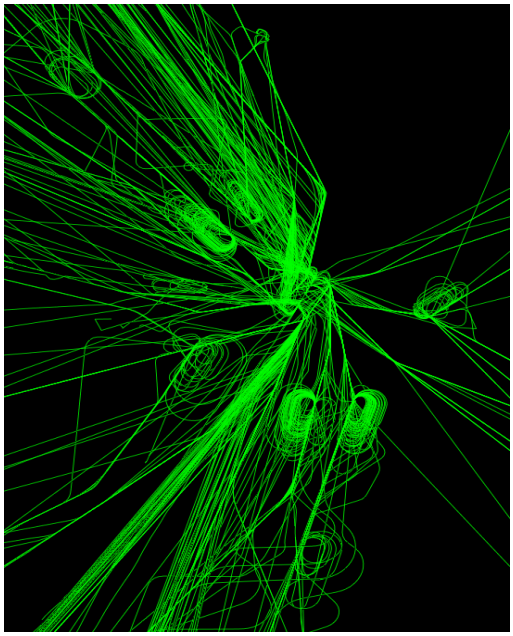

Figure 7 - Track snapshot of arrivals into Brisbane on the 26th November 2017.

For further information please contact Network Performance and Analysis @
OPS_ANALYSIS_ADMIN@AirservicesAustralia.com