ATM Network Performance Report

April 2018

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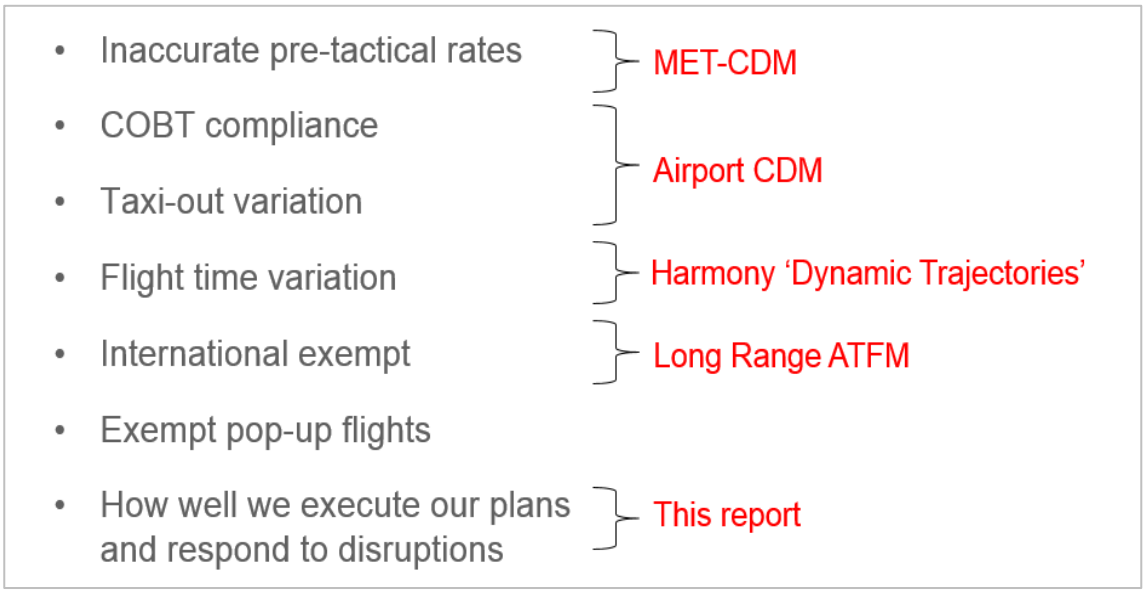
Foreword

This monthly report format is now in its sixth month and it is timely to highlight how this work fits with the various initiatives underway to improve Network Performance.

What we have seen through the analysis are factors which are consistently common from month-to-month. And this leads to the question of what we are doing about these factors – how does our work in A-CDM, Long Range ATFM and the various other initiatives all relate to each other.

This is summarised below. On the left are the known limitations of the current ATFM system and on the right are the initiatives underway to tackle these known limitations.



The data collection and analysis that enables this report plays a pivotal part in understanding the influences on the network. As we build a more substantial body of data, we will be better positioned to more precisely attribute causal factors of Airborne Delay and to understand the quantum of improvement that we can expect to see through each of these initiatives.

The work that goes into this report is also pivotal in driving continuous improvement. There are daily and weekly network reviews so that the outcomes and desired improvements can be identified close to the actual event rather than at the end of the month. The detailed Post Operational Performance Reviews (see Appendix A) represent a deep dive into certain events.

As you can see, our reporting is still in its infancy but we are already getting clarity on the types of events that are effecting Network Performance. Overtime, the body of data that we are building and the initiatives we are undertaking with have a positive impact.

Regards,

Paddy Goodall,
ATM Network Servcies Manager.

Summary

Overview

The month of April saw a substantial decrease in the number of notable events impacting the ATM network. There were a total 18 notable events during April, in comparison with 29 experienced during March. The events experienced this month were primarily the result of routine factors associated with weather and early and late presenting aircraft concentrating demand in busy periods. Details of these are contained in the report and are depicted in **Figure 1**.

The combined 75th percentile performance for airborne delay across the four major airports (Sydney, Melbourne, Brisbane & Perth) was **3.2** minutes, and the median was **0.5** minutes.

These monthly performance figures were a slight increase compared to the same period last year (i.e. an increase of 0.1 minutes delay for both the 75th percentile and the median), and were below the KPI targets of 3.5 minutes and 0.6 minutes for the 75th percentile and median, respectively.

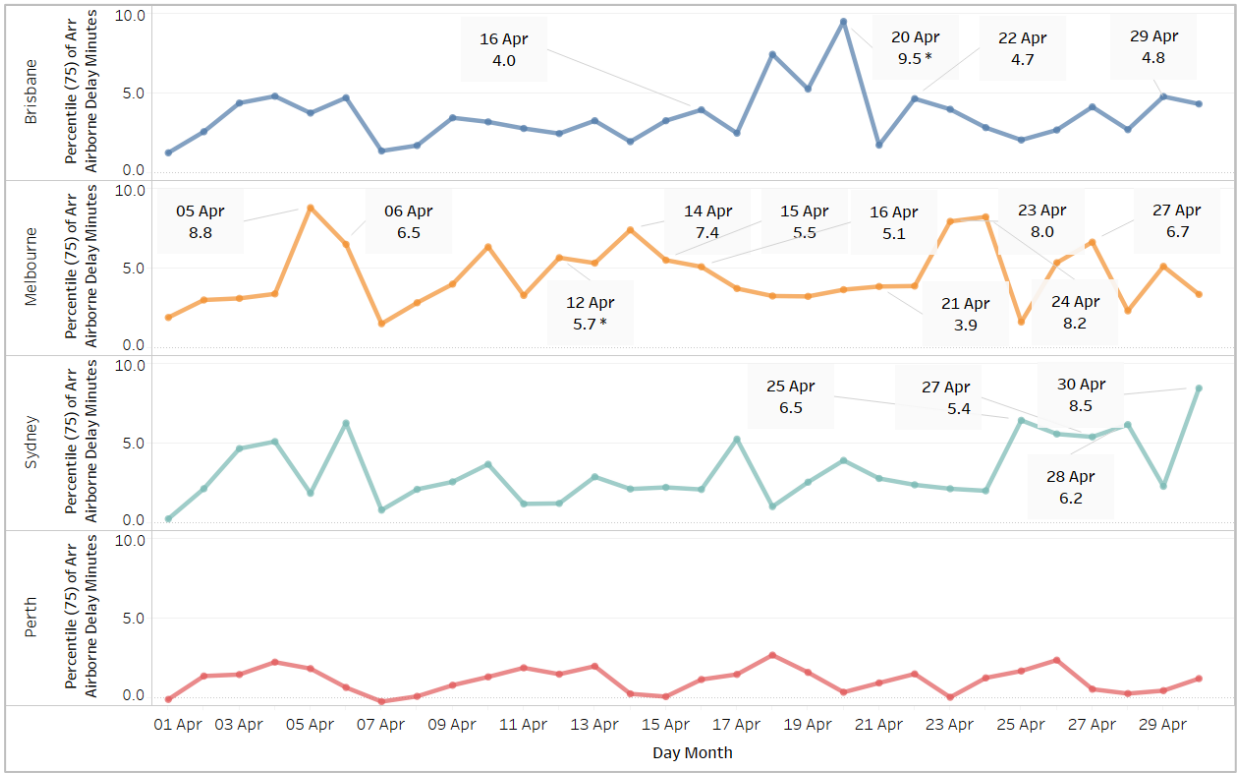


Figure 1: Notable delay impact events during April 2018.

Numbers underneath the dates indicate the extent of the 75th percentile of airborne delay in minutes. Asterisk symbols in the labels (*) indicate that a Post Operational Performance Review (POPR) is available for that event.
The reviews are included in Appendix A.

Figure 1 shows the 75th percentile of airborne delay for each day of the month for the four major airports. A total of 18 notable events across the network have been highlighted. Seven of these notable events resulted in a prolonged and moderately elevated airborne delay for the entire day (i.e. 75th percentile greater than 7 minutes across the entire day).

Eleven events resulted in a shorter and more intense period of elevated airborne delay (i.e. 2 or more consecutive hours where the 75th percentile was over 10 minutes). These events are summarised in **Table 1** (over the page).

Location	Day	Local Time	Event Descriptions (*Contributing causes to increased delays*)
Sydney	25-Apr	18-19	Worse than forecast weather conditions led to increase airborne delays as arrival rates were tactically reduced.
	27-Apr	06-08	A Level 2 GDP Revision lowered arrival rates for the morning period due to weather conditions, and there were a number of late non-compliant and exempt flights with large arrival time variations from allocated slot time.
	28-Apr	06-08	Exempt, early and late non-compliant aircraft concentrated demand leading into a peak period.
	30-Apr	06-09	Precision Runway Monitor (PRM) was unavailable due to staff unavailability. Exempt, early and late non-compliant aircraft concentrated demand leading into a busy period.
Melbourne	5-Apr	07-09	Exempt international aircraft concentrated demand during a period where rates were low to account for low cloud. A Level 3 GDP Revision was undertaken.
	6-Apr	18-20	Exempt, early and late non-compliant aircraft concentrated demand leading into a busy period.
	12-Apr*	07-09	Late notice runway changes within a short period required due to variable wind conditions.
	14-Apr	08-09	Exempt, early and late non-compliant aircraft concentrated demand leading into a busy period.
	15-Apr	18-19	Concentrated demand during peak period resulted in airborne delay. A Level 2 GDP Revision was undertaken due to extensive airborne delays.
	16-Apr	09-10	Exempt, early and late non-compliant aircraft concentrated demand leading into a busy period.
	21-Apr	08-10	Morning fog worse than forecast compounded by multiple missed approaches and diversions. A Level 2 GDP Revision was undertaken.
	23-Apr	10-12	Morning fog worse than forecast led to increase airborne delays. A Level 1 GDP Revision was undertaken.
	24-Apr	07-09	A small number of late-presenting flights concentrated demand to the busy period.
	27-Apr	08-09	A small number of late-presenting flights concentrated demand to the busy period.
Brisbane	16-Apr	19-20	Exempt, early and late non-compliant aircraft concentrated demand leading into a busy period.
	20-Apr*	16-19	Airborne delay was experienced during the evening period due to a weather event that did not clear as quickly as initially forecast. A Level 2 GDP Revision was undertaken.
	22-Apr	16-17	Exempt, early and late non-compliant aircraft concentrated demand leading into a busy period.
	29-Apr	18-19	Late non-compliant flights concentrated demand to the busy period and resulted in increased airborne delay.

Table 1: Notable event descriptions.

Asterisk symbols in the labels (*) indicate that a Post Operational Performance Review (POPR) is available for that event. The reviews are included in Appendix A.

Network Wide Performance

Airborne delay

The combined median and 75th percentile airborne delay at the four major airports is indicated below. **Figure 2** indicates that the long-term trend is upwards.

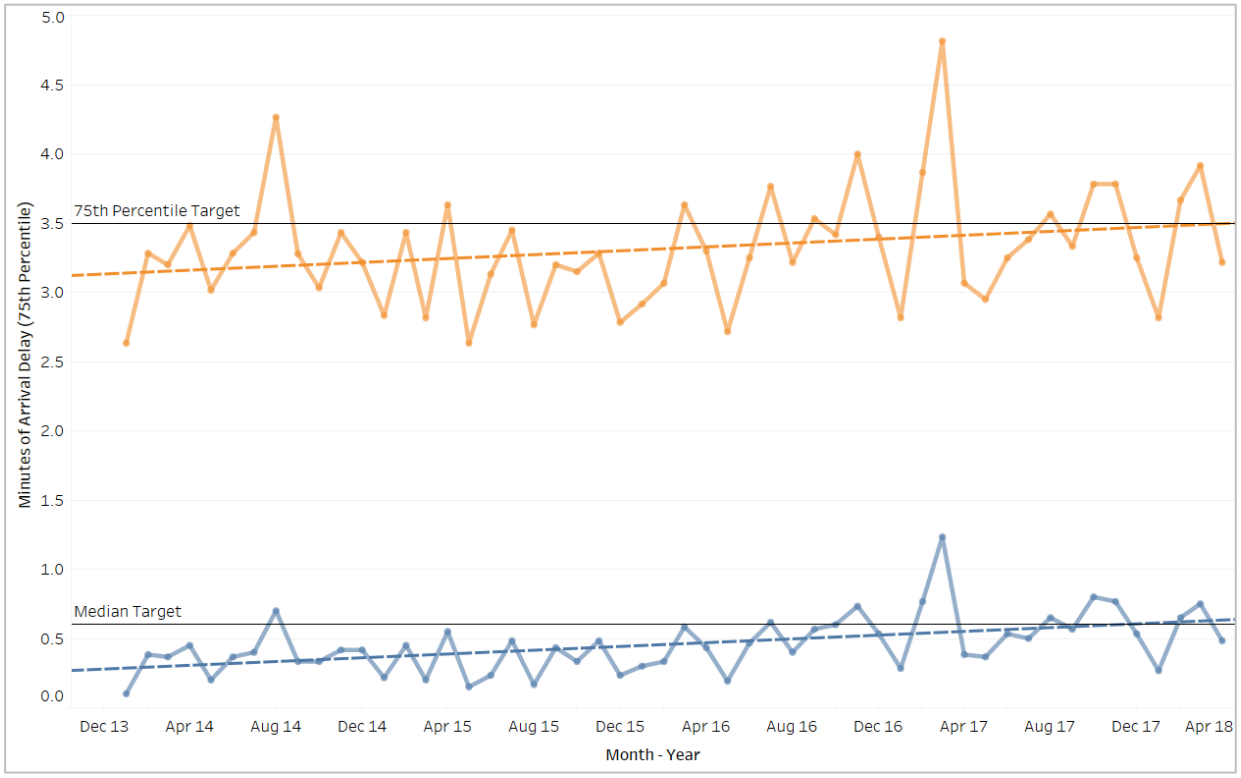


Figure 2: Long-term airborne delay (median and 75th percentile) for January 2014 to April 2018 with corresponding targets.

The individual long-term trends of the 75th percentile airborne delay for each of the four major airports are depicted in **Figure 3**. For each curve, the long-term trend is represented by the thick dashed line; the thin dashed lines provides an indication of the confidence of the trend.

The trends for Sydney and Melbourne are upwards. More detailed analysis for each airport is presented later in this report.

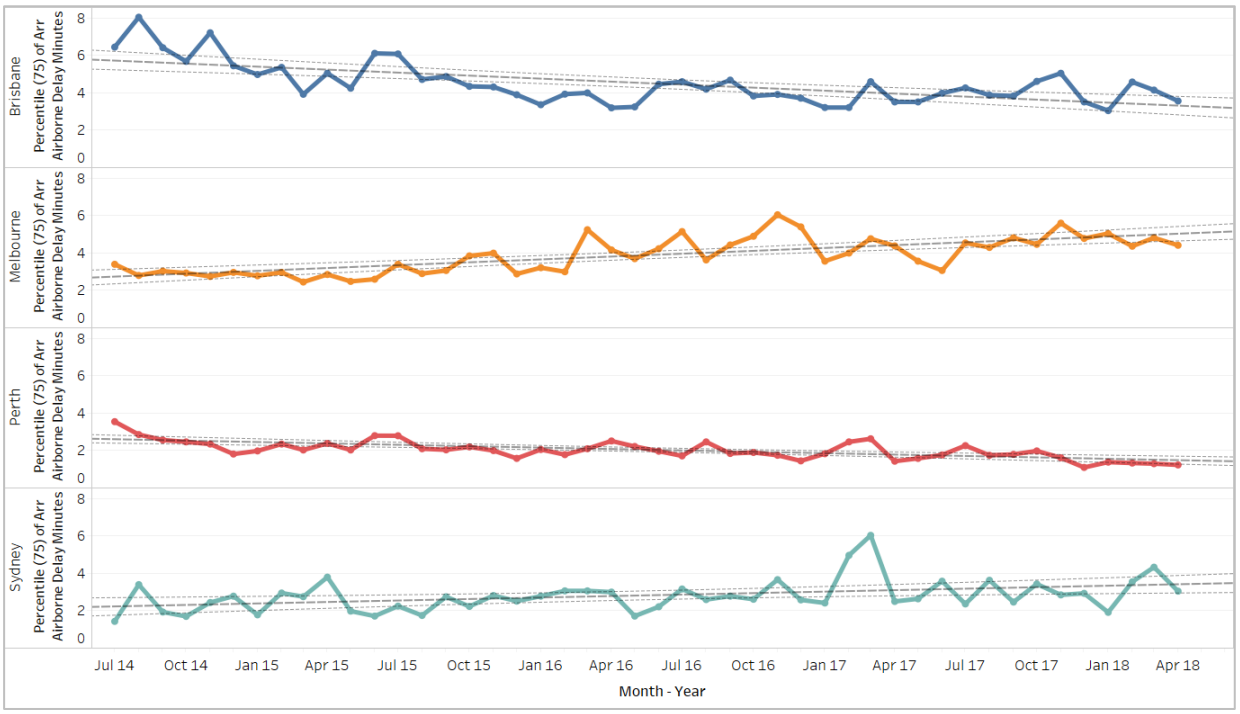


Figure 3: Long-term airborne delay 75th percentile by airport (July 2014 to April 2018)

Sydney

Airborne delay

The 75th percentile performance figures for airborne delay at Sydney are indicated in **Figure 4.**

April performance (3.1 minutes) met the target (3.5 minutes). However, delay was higher than during the same period last year (2.5 minutes). The long-term trend for airborne delay at Sydney is upwards.

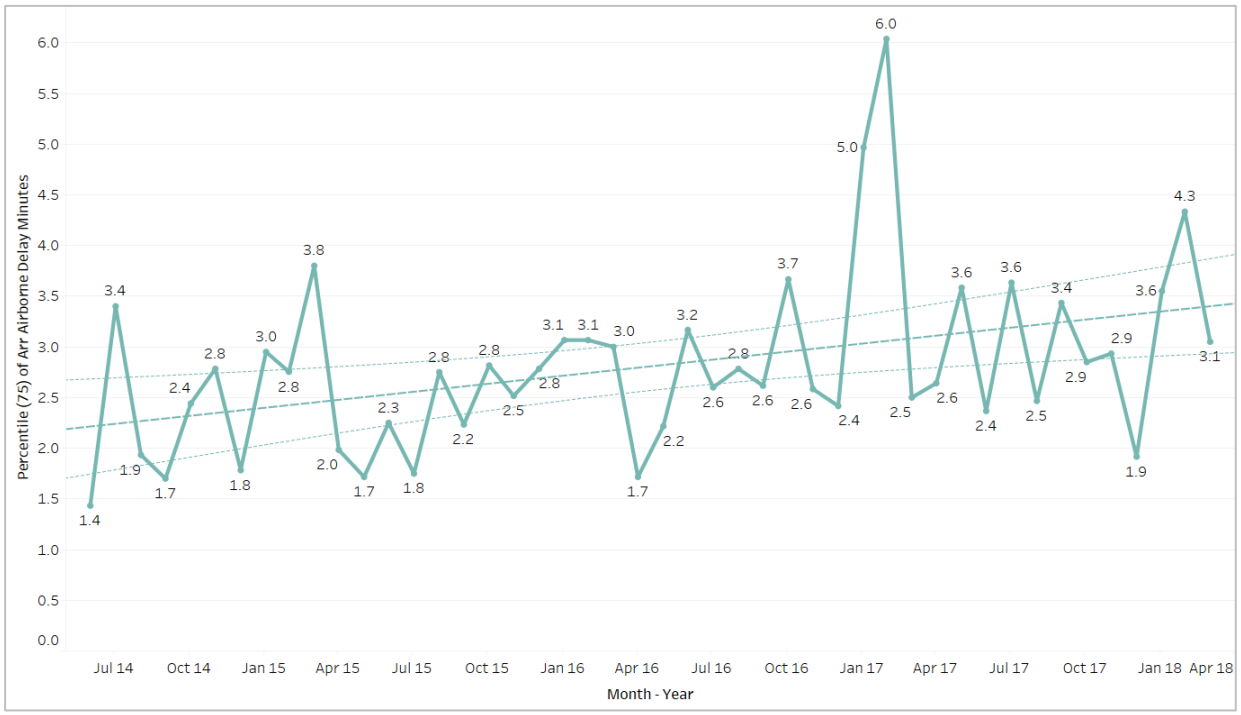


Figure 4: Sydney airborne delay 75th percentile

Notable events

The following commentary describes the notable airborne delay events during April in Sydney:

- 25 April (1800-1900 Local)
  - Worse than forecast weather conditions resulted in acceptance rate reductions of four aircraft an hour during the afternoon and early evening.
  - This decreased capacity resulted in an increase airborne delay during the peak evening period.
- 27 April (0600-0800 Local)
  - Worse than forecast weather conditions in the morning resulted in a Level 2 GDP Revision. Acceptance rates were reduced by between six and 10 aircraft for the first three hours of the morning.
  - A number of GDP-exempt, early and late non-compliant flights also concentrated demand into this period.
  - The combination of lowered rates and off-schedule flights resulted in increased airborne delay during the morning peak period.

- 28 April (0600-0800 Local)
    - Increased airborne delay was experienced in the morning peak period.
    - A number of GDP-exempt, early and late non-compliant flights concentrated demand into the busy period resulting in increased airborne delay.
    - Delays were further compounded by two medical emergency flights in this period.
- 30 April (0600-0900 Local)
    - Precision Runway Monitor (PRM) was unavailable during the morning period due to staff unavailability. This reduced capacity and resulted in increased airborne delay during the morning peak period.
    - A number of GDP-exempt, early and late non-compliant flights also concentrated demand into this period which exacerbated the delay.

Melbourne

Airborne delay

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

April performance (4.4 minutes) did not meet the target (3.5 minutes), and was steady with respect to the same period last year. The long-term trend for airborne delay at Melbourne is upwards.

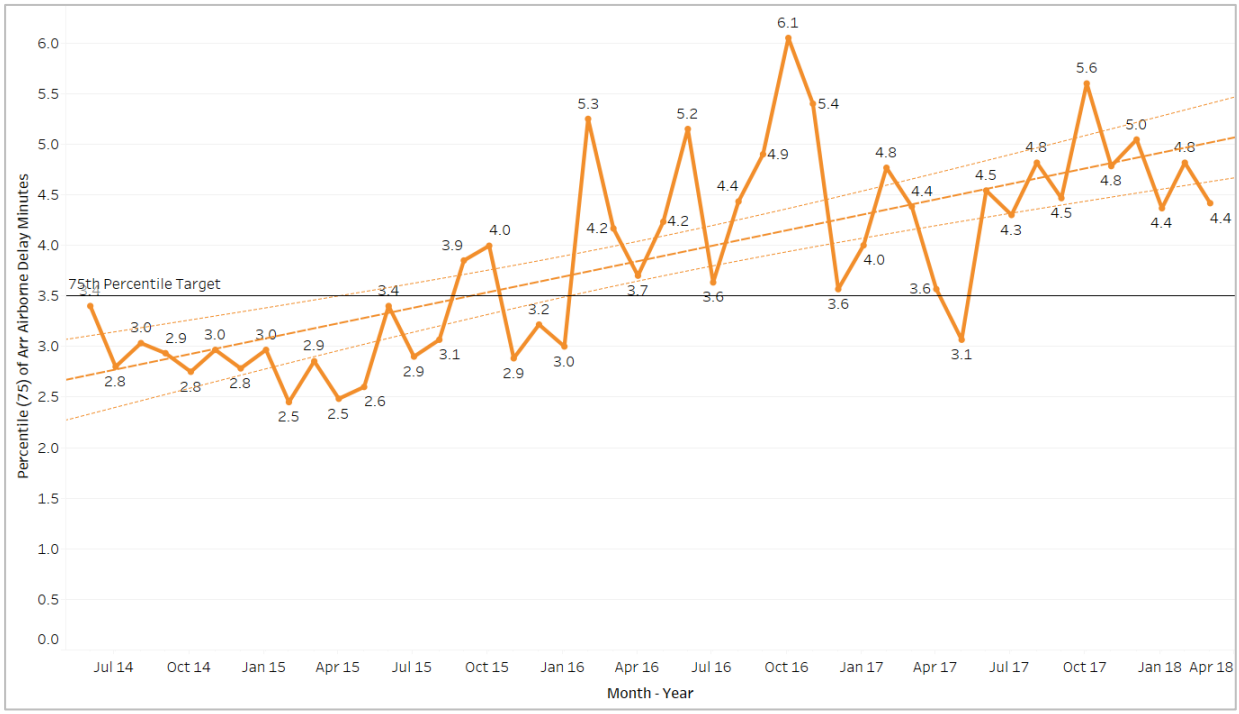


Figure 5: Melbourne airborne delay 75th percentile

Notable events

The following commentary describes the most significant airborne delay events during April in Melbourne:

- 5 April (0700-0900 Local)
  - Increased airborne delay was experienced during the morning peak period.
  - A number of late-presenting international flights concentrated demand during a busy period where rates were low to account for low cloud. A Level 3 GDP Revision was undertaken to ease demand and alleviate the built up delay.
- 6 April (1800-2000 Local)
  - Increased airborne delay was experienced during the evening peak period.
  - A number of late non-compliant and GDP-exempt flights concentrated demand into the busy period and resulted in increased airborne delay.
-

- 12 April (0700-0900 Local)
    - Increased airborne delay was experienced during the morning peak period.
    - The delay was caused by a series of late-notice runway changes within a 40-minute period. These changes were required due to variable wind conditions experienced throughout the day.
    - A number of conclusions can be found in the detailed Post Operational Performance Review of this event in Appendix A. In particular, the level of delay was reduced by a Level 2 GDP Revision to account for winds aloft and the cancellation of runway works to accommodate arrivals.
- 14 April (0800-0900 Local)
    - Increased airborne delay was experienced during the morning peak period.
    - A number of late non-compliant and GDP-exempt flights concentrated demand into the busy period and resulted in increased airborne delay.
- 15 April (1800-1900 Local)
    - Increased airborne delay was experienced during the evening peak period.
    - A Level 2 GDP Revision was undertaken due to a concentration of demand observed for this period. The revision limited the extent and duration of airborne delay experienced.
- 16 April (0900-1000 Local)
    - Increased airborne delay was experienced during the morning peak period.
    - A number of late non-compliant and GDP-exempt flights shifted demand and resulted in delay. A missed approach also occurred in this period. These factors both contributed to the increased airborne delay.
- 21 April (0800-1000 Local)
    - Increased airborne delay was experienced during the morning peak period.
    - Worse than forecast fog in the early morning was compounded by six missed approaches and three diversions.
    - A Level 2 GDP Revision was undertaken due to the missed approaches and increasing delay.
- 23 April (1000-1200 Local)
    - Increased airborne delay was experienced during the late morning.
    - Morning fog was worse than forecast. A Level 1 GDP Revision was undertaken to lower rates and realign demand.
    - The fog persisted longer than anticipated, requiring rates to remain lowered until mid-morning. This concentrated demand into the late morning resulting in airborne delay.
- 24 April (0700-0900)
    - Increased airborne delay was experienced during the morning peak period.
    - A small number of late-presenting flights concentrated demand to the busy period and resulted in increased airborne delay.
- 27 April (0800-0900)
    - Increased airborne delay was experienced during the morning peak period.
    - A small number of late-presenting flights concentrated demand into the busy period and resulted in increased airborne delay.

Brisbane

Airborne delay

The 75th percentile performance figures for airborne delay at Brisbane are indicated in **Figure 6**.

April performance (3.6 minutes) did not meet the target (3.5 minutes) and delay was higher than during the same period last year (3.5 minutes). The long-term trend for airborne delay at Brisbane is downwards.

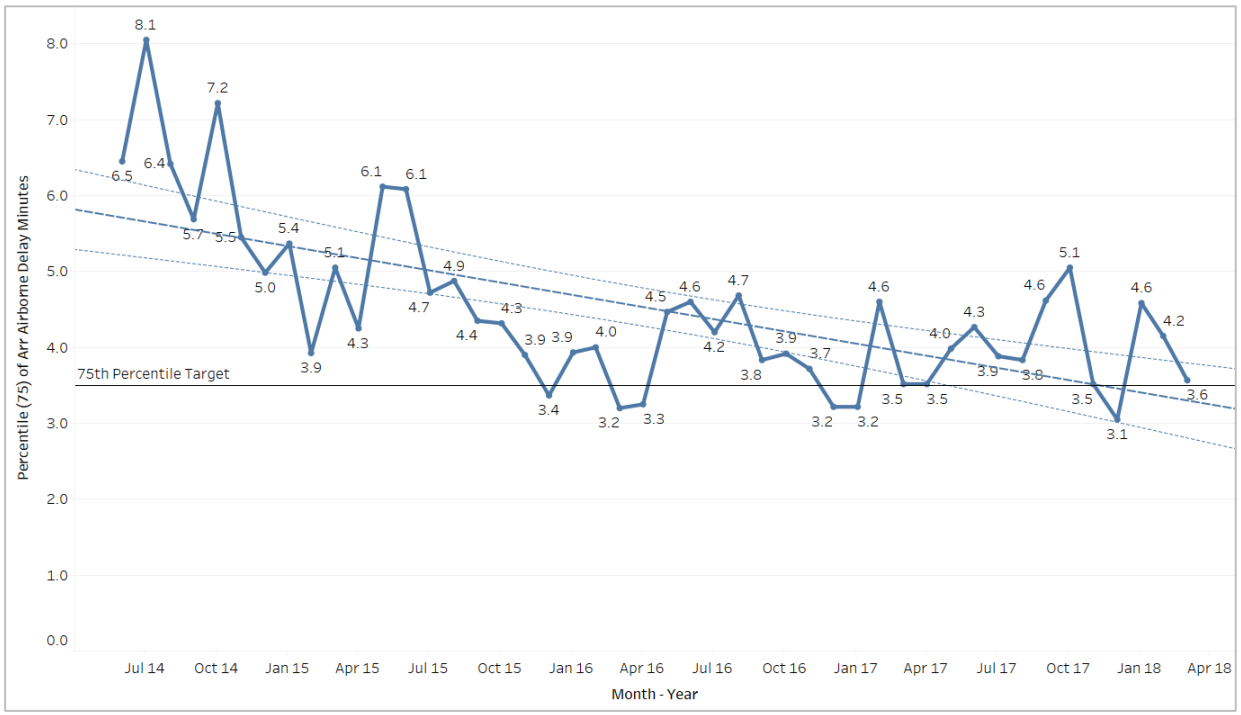


Figure 6: Brisbane airborne delay 75th percentile

Notable events

The following commentary describes the most significant airborne delay events during April in Brisbane:

- 16 April (1900-2000 Local)
  - Increased airborne delay was experienced during the evening peak period.
  - A number of late non-compliant flights concentrated demand into the busy period and resulted in increased airborne delay.
- 20 April (1600-2100 Local)
  - Increased airborne delay was experienced during the evening period due to a weather event that did not clear as quickly as initially forecast.
  - A Level 2 GDP Revision was undertaken to lower acceptance rates and realign demand.
  - The increased delay was also exacerbated by non-compliance and other off-schedule departures which altered the expected sequence into Brisbane.
  - A number of conclusions can be found in the detailed Post Operational Performance Review of this event in Appendix A. In particular, the time elapsed during the consultation and approval of the revision did not allow enough time for aircraft to absorb the delay while still on the ground.

- 22 April (1600-1700 Local)
    - Increased airborne delay was experienced during the evening peak period.
    - A number of late non-compliant and GDP-exempt flights concentrated demand into the busy period resulted in increased airborne delay.
- 29 April (1800-1900 Local)
    - Increased airborne delay was experienced during the evening peak period.
    - A number of late non-compliant flights concentrated demand into the busy period and resulted in increased airborne delay.

Perth

Airborne delay

The 75th percentile performance figures for airborne delay at Perth are indicated in **Figure 7**.

April performance (1.2 minutes) met the target (3.5 minutes) and airborne delay was also lower than the same period last year (1.4 minutes). The long-term trend for airborne delay at Perth is downwards.

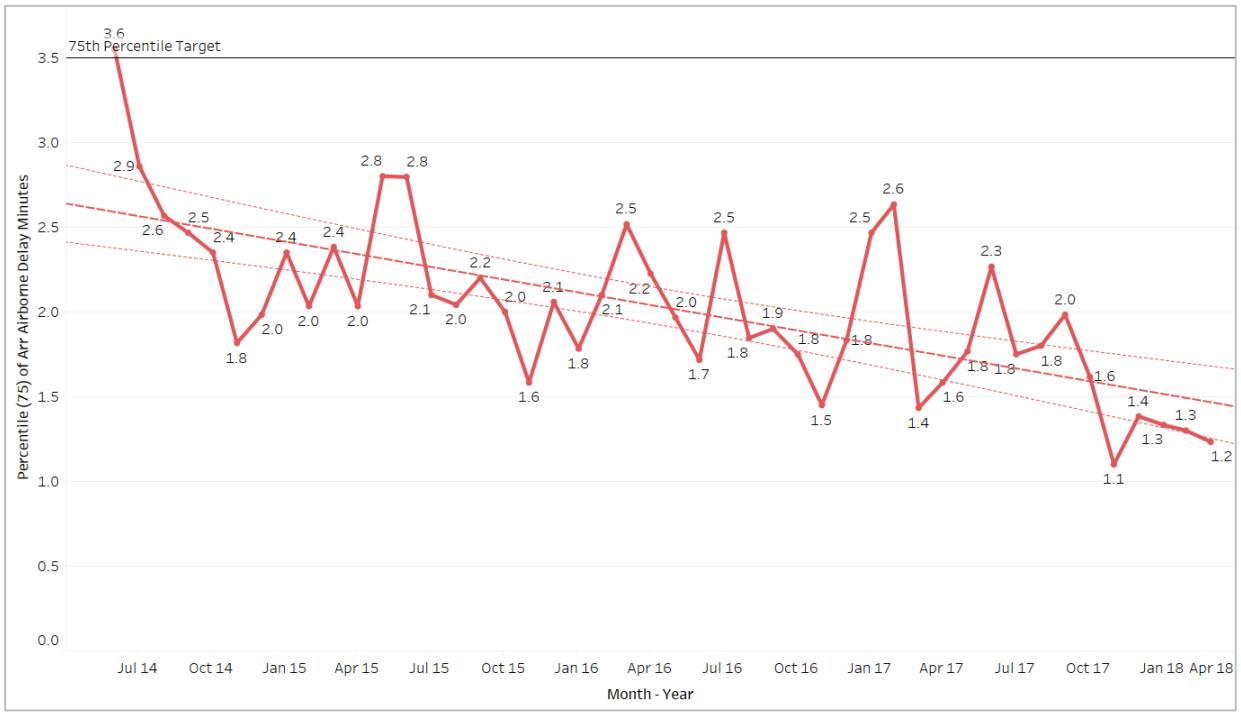


Figure 7: Perth airborne delay 75th percentile

Notable events

There were no notable events during April in Perth.

Appendix A

Post Operational Performance Reviews

Post Operational Performance Review

Melbourne Airport – 12 April 2018

Event Description

On April 12th 2018 starting 2100Z, airborne delay of arrivals at Melbourne Airport (YMML) was elevated for a period of two hours; in particular during the 2200Z hour when the 75th percentile airborne delay increased to 18 minutes. At 2055Z ML TM called the NCC to advise holding up to 30 mins for the next couple of hours due to strong winds aloft causing increasing airborne holding and workload for enroute ATC. A level 2 revision was executed at 2119Z due to strong winds aloft and increasing airborne holding. For this revision, the ATFM rate was reduced from 24 to 22 for 2 hours from 2100 to 2300Z. The plan for the day was to operate on runway 34 from 2000Z to 0600Z, then runway 27 until 0800Z and then runway 16/27 until 1300Z.

During 2100Z the delay started to build up (75th percentile of 7 min), mainly because of too much demand towards the middle of the hour in combination with reduced slots due to increased spacing requirements from super-heavy A388 arrivals. The primary contributors to the elevated delay during 22Z (75th percentile of 18 min) were internationals that experienced high delays as a result of an unforecast runway change from 34 to 16 commencing at 2215 with the first landing at 2240Z on runway 16. The domestic arrivals were not affected as much, as they were resequenced to land on runway 27 for a 25 minute period, before switching to 16 A/D. Runway 27 was initially closed due to planned maintenance, but a decision was made to allow this runway for arrivals.

Analysis

During 2200Z airborne delays were observed, with the 75th percentile reaching up to 18 minutes delay as shown as blue line in the top panel of Figure 1. It is noted that only aircraft with heavy or super heavy wtc (wake turbulence category) contributed to this elevation in delay and all other arrivals showed no more than 8 min delay (see Table 3b).

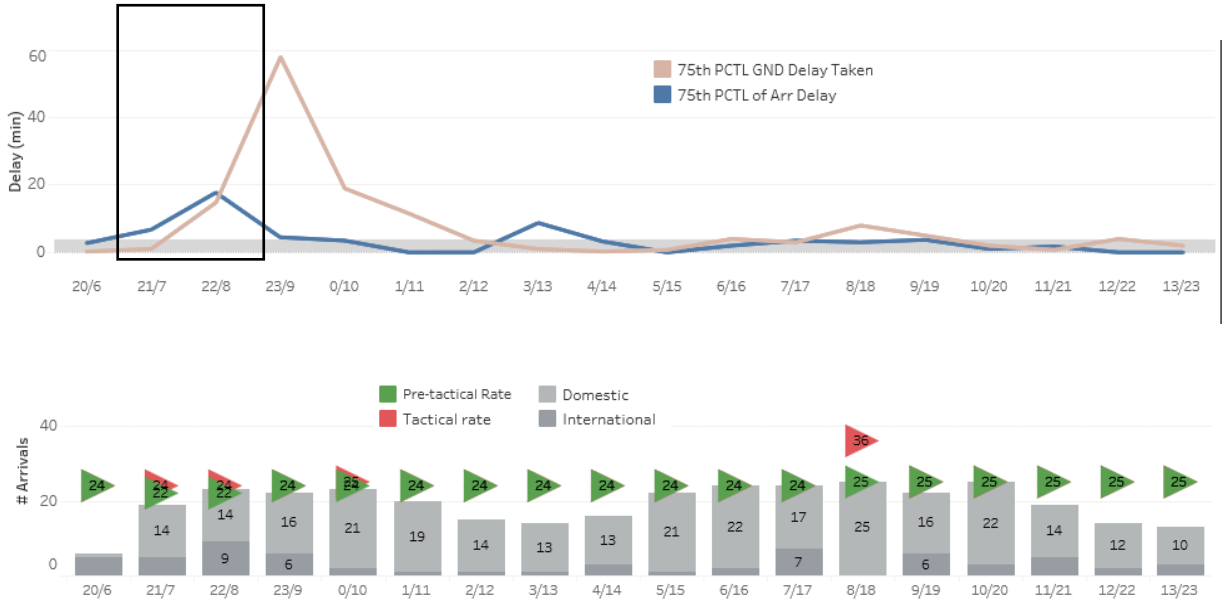


Figure 1: [top]: Arrival delay (blue) and ground delay (beige) for 2018-04-12. [bottom]: pre-tactical rate (green), tactical rate (red) and achieved throughput rate (grey).

Figure 1 (bottom panel) shows the pre-tactical rates (green), tactical rates (red) and throughput rates (grey). Four flights with ETA (maestro estimated time of arrival) during 2100Z landed during 2200Z instead. This is a consequence of unevenly distributed demand, with only 9 arrivals with ETA between 2100 and 2130Z but 14 during 2130 and 2200Z (see Figure 2). Hence, the tactical rate of 24 was not achieved during the2100Z hour. On the other hand, during 2200Z the tactical rate of 24 was almost achieved, with 23 arrivals despite the runway change from 34 to 16 at 2215Z.

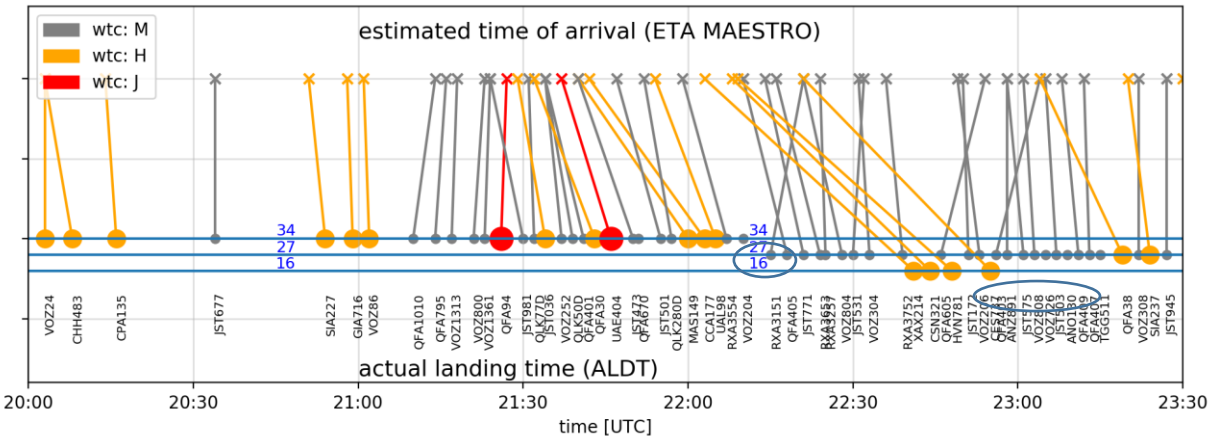


Figure 2: Estimated time of arrival according to Maestro (top) *vs. actual landing time (bottom) during 2000-2330Z. The runway utilisation for arrivals is shown by the position of the ALDT. The circles indicate the two clusters with delayed heavy-WTC arrivals. Arrival times are subject to uncertainties up to a few minutes.*

Figure 2 shows the runway utilisation for arrivals during the lead-in period to the delay build up (2000Z to 2330Z). The figure shows the shifting demand due to differences between the estimated time of arrival (ETA) shown in the upper section of the figure (crosses) and the actual landing times (ALDT) on the bottom (circles). The ETA is calculated through Maestro, i.e. set several hours before landing time. Medium WTC are shown in grey, heavy and super-heavy WTC in orange and red, respectively. The runway for each arrival is indicated by the position of the ALDT marker on the blue lines (top line: 34, centre line: 27, bottom line: 16). See Tables 3a & 3b in the appendix for detailed data on each arrival.

Figure 2 shows that during the **2100Z hour** the majority of flights from 2139Z arrived with 5 minutes or more delay (QLK50D, QFA401, QFA30, UAE404, JST473, JST501, QLK280D). These flights are responsible for the build-up in delay of 7 min during 2100Z (75th percentile). Table 3a (Appendix) lists the ETA CLDT (calculated landing time) and ETA, which shows that these flights presented early by 15 to 30 min. This can be attributed as the cause of their delay as this led to increased demand during the 2130-2200Z period. The two super-heavy A388 arrivals also led to reduced number of slots, as their WTC requires larger spacing to the next arrival.

For the **2200Z hour**, Figure 2 shows that runway 34 was used for arrivals until 2210Z after which landings were accommodated by runway 27 instead. During that period a cluster of heavy-WTC (left circle in Figure 2) shows moderate elevated delays (11-21 minutes) partially contributing to the 18 min delay (75th percentile).

From 2215Z all medium category aircraft were landed on runway 27. Initially, this runway was not available due to maintenance work (See NOTAM C196/18), but a decision was made to cancel this work and allow this runway for arrivals. However, the heavy-WTC with CLDTs from 2220Z onward were not landed on runway 27 but had to wait until the runway change 16 -> 34 was completed. Thus a second cluster of four aircrafts with significant delays (34-39 min) occurred. It remains unclear why these aircraft were not accommodated on runway 27 like the medium-WTC aircrafts. No aircrafts had been deprioritised during both hours.

The arrival sequence was further impacted by the following two groups of flights:

- Several flights pushed their off block time forward to receive an earlier take off slot but then departed late to obtain a take-off time closer to their originally scheduled take-off time. Those with IOBT – COBT above 5 minutes and ATOT – CTOT > 5 minutes are VOZ1313 (ALDT: 2117Z), QLK50D (ALDT: 2139Z), VOZ204 (ALDT: 2210Z).
- Early non-compliant flights: QLK77D (ALDT: 2132Z), RXA3653 (ALDT: 2224Z), RXA3752 (ALDT: 2239Z), and VOZ206 (ALDT: 2253Z).
- Late non-compliant flights: VOZ1313 (ALDT: 2117Z) and JST981 (ALDT: 2130Z).

The MetCDM forecast for the wind direction (Table 1) shows the runway change 34 -> 16 during 2200Z was not predicted, although it was mentioned in the comments that a sudden change of wind direction was a possibility.

UTC	21	22	23	00	01	02	03	04	05	06	07	08	09	10
Wind Direction [MetCDM]	360	360	300	280	280	280	290	300	300	300	290	260	240	240
RWY [METCDM]	34	34	34*	34*	34*	34*	34*	34	27	27	27	16/ 27	16/ 27	16/ 27
Wind Direction [actual]	360	220	190	090	180	200	330	300	300	310	290	210	200	220
RWY [actual]	34	16/ 27/ 34	16/ 27	16	16/ 27	16/ 27	16/ 27	27/ 34	27/ 34	27/ 34	27/ 34	27/ 34	16	16

*Table 1: Wind direction and runway for the METCDM forecast (top two rows) and actual (bottom two rows). Main runway 34 is shown in red, main runway 16 in green. *initially rwy 27 would have been used but had to be replaced by 34 due to the planned maintenance work.*

Table 2 shows the wind speed and arrival capacity values for the period on April 12th 2018. During Run 1, finalised at 11-04-2018 0651 (UTC), the wind speed was set significantly higher to take the high gusts from the TAF. The final rates were similar as when calculated by using business rules (BR).

UTC	2000	2100	2200	2300	0000	0100	0200
Local time	0600	0700	0800	0900	1000	1100	1200
RUN 1							
Speed [TAF]	18	18	18	18	18	18	18
Gusts [TAF]	34	34	34	34	34	34	34
Speed [MetCDM]	28	28	28	25	25	25	28
Rate [BR]	24	24	24	24	24	24	24
Rate [MetCDM]	24	24	24	24	24	24	24
RUN 2							
Speed [TAF]	-	20	20	10	10	10	10
Gusts [TAF]	40	40	40	-	-	-	-
Speed [MetCDM]	-	30	30	20	18	15	15
Rate [BR]	-	24	24	40	40	40	40
Rate [MetCDM]	-	22	22	24	24	24	24
Actual							
Speed [METAR]	14*	15*	16*	07*	03*	07*	07*
Direction [METAR]	360	360	220	190	90	180	200
Rate [Tactical]	24	24	24	24	25	24	24
Throughput Arrivals	5	19	23	22	23	11	18

* The METAR further reported MOD/SEV TURB BLW 5000 ft (moderate/severe turbulences) for the entire period

Table 2: MetCDM wind speed and capacity rate values for the morning period.

During METCDM Run 2, finalised at 11-04-2018 2139 (UTC), the TAF prediction did not report any gusts (more than 10 knots above the average wind speed) from 2300Z. Although the BR would have allowed LAHSO operation on 27/34 (rate 40), the MetCDM decision was to increase the average wind speed thus that only runway 34 is used (rate 24 as previously). In addition, for the two hours 2100-2200 (UTC), the arrival rate was reduced by 2 due to uncertainty of the wind direction forecast and moderate turbulence.

In summary, the business rules alone would not have been sufficient to predict the correct rate due to insufficient information, but the MetCDM process with access to additional wind information predicted the correct rate during run 1 as well as run 2.

Summary

An elevation in delay was caused by a series of late notice runway changes 16 ->27-> 34 within a 40 minute period and a number of non-compliant flights. In total, four flights were early non-compliant (take off more than 5 min early) and two were late compliant (take off more than 15 min late). A number of international flights that experienced 30+ minutes airborne delay as a result. Although the domestic arrivals were resequenced to runway 27, the internationals remained on the main runway. The late notice runway changes were required due to variable wind conditions experienced throughout the day.

The level of delay during the morning period was significantly reduced by the METCDM process and subsequent level 2 revision that considered winds aloft and also the cancellation of the runway works on 27 to accommodate arrivals.

For further information please contact Network Performance and Analysis @
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Appendix

A/C id	WTC	CLDT	ETA	ALDT	Delay (maestro) [min]
VOZ86	H	11/04/2018 20:37	11/04/2018 21:01	4/11/2018 21:02	1
QFA1010	M	11/04/2018 21:02	11/04/2018 21:14	4/11/2018 21:10	0
QFA795	M	11/04/2018 21:05	11/04/2018 21:16	4/11/2018 21:14	0
VOZ1313	M	11/04/2018 20:55	11/04/2018 21:18	4/11/2018 21:17	0
VOZ800	M	11/04/2018 21:20	11/04/2018 21:23	4/11/2018 21:21	0
VOZ1361	M	11/04/2018 21:00	11/04/2018 21:24	4/11/2018 21:23	0
QFA94	J	11/04/2018 21:15	11/04/2018 21:27	4/11/2018 21:26	0
JST981	M	11/04/2018 21:30	11/04/2018 21:24	4/11/2018 21:30	6
QLK77D	M	11/04/2018 2:32	11/04/2018 21:31	4/11/2018 21:32	1
JST036	H	11/04/2018 21:37	11/04/2018 21:29	4/11/2018 21:34	5
VOZ252	M	11/04/2018 21:40	11/04/2018 21:34	4/11/2018 21:37	3
QLK50D	M	11/04/2018 21:42	11/04/2018 21:34	4/11/2018 21:39	5
QFA401	M	11/04/2018 21:48	11/04/2018 21:34	4/11/2018 21:41	7
QFA30	H	11/04/2018 21:57	11/04/2018 21:32	4/11/2018 21:43	11
UAE404	J	11/04/2018 22:00	11/04/2018 21:37	4/11/2018 21:46	9
JST473	M	11/04/2018 22:07	11/04/2018 21:40	4/11/2018 21:50	10
QFA670	M	11/04/2018 22:02		4/11/2018 21:51	
JST501	M	11/04/2018 22:15	11/04/2018 21:47	4/11/2018 21:55	8
QLK280D	M	11/04/2018 22:24	11/04/2018 21:52	4/11/2018 21:57	5

*Table 3a: Arriving aircraft during 2100Z. Arrivals with **delays ≥ 5 min** are marked orange.*

A/C id	WTC	CLDT	ETA	ALDT	Delay (maestro) [min]
MAS149	H	11/04/2018 21:54	11/04/2018 21:40	4/11/2018 22:00	20
CCA177	H	11/04/2018 21:35	11/04/2018 21:42	4/11/2018 22:03	21
UAL98	H	11/04/2018 21:45	11/04/2018 21:54	4/11/2018 22:05	11
RXA3554	M	11/04/2018 21:51	11/04/2018 21:59	4/11/2018 22:07	8
VOZ204	M	11/04/2018 22:42		4/11/2018 22:10	
RXA3151	M	11/04/2018 22:10	11/04/2018 22:21	4/11/2018 22:15	0
QFA405	M	11/04/2018 22:12	11/04/2018 22:10	4/11/2018 22:18	8
JST771	M	11/04/2018 22:05	11/04/2018 22:14	4/11/2018 22:21	7
RXA3653	M	11/04/2018 22:45	11/04/2018 22:16	4/11/2018 22:24	8
RXA3257	M	11/04/2018 22:21	11/04/2018 22:24	4/11/2018 22:25	1
VOZ804	M	11/04/2018 22:27	11/04/2018 22:21	4/11/2018 22:28	7
JST531	M	11/04/2018 22:35	11/04/2018 22:32	4/11/2018 22:30	0
VOZ304	M	11/04/2018 22:30	11/04/2018 22:31	4/11/2018 22:33	2
RXA3752	M	11/04/2018 23:32	11/04/2018 22:36	4/11/2018 22:39	3
XAX214	H	11/04/2018 22:18	11/04/2018 22:03	4/11/2018 22:41	38
CSN321	H	11/04/2018 22:32	11/04/2018 22:08	4/11/2018 22:44	36
QFA605	M	11/04/2018 22:40	11/04/2018 22:54	4/11/2018 22:46	0
HVN781	H	11/04/2018 22:37	11/04/2018 22:09	4/11/2018 22:48	39
JST172	M	11/04/2018 22:51	11/04/2018 22:50	4/11/2018 22:51	1
VOZ206	M	11/04/2018 22:54	11/04/2018 22:49	4/11/2018 22:53	4
CES737	H	11/04/2018 22:48	11/04/2018 22:21	4/11/2018 22:55	34
QFA403	M	11/04/2018 23:00	11/04/2018 23:04	4/11/2018 22:56	0
ANZ891	M	11/04/2018 22:57	11/04/2018 22:58	4/11/2018 22:58	0

*Table 3b: Arriving aircraft during 2200Z. Arrivals with **delays ≥ 10 min** are marked light orange.*

Table 3 lists all arrivals during 2200Z (see black frame in Figure 1) with late aircraft (>5 min during 2100Z and > 10min during 2200Z) marked as orange. It is noted that all delayed arrivals during 2200Z are *heavy* WTC aircraft (A332/A333 and B789) and thus internationals other than from New Zealand.

Post Operational Performance Review

Brisbane Airport – 20 April 2018

Event Description

Elevated airborne arrival delay was observed at Brisbane Airport (YBBN) on the evening of 20 April 2018. Figure 1 (bottom panel) shows the airborne arrival and ground delay at YBBN for this period. The 75th percentile of airborne arrival delay exceeded 20 minutes during the 06z and 07z hours. A level 2 revision was conducted at 0545z to reduce airborne arrival delays. As a result, aircraft arriving at YBBN during the 08z hour experienced elevated ground delay (75th percentile of 25 minutes).

This POPR was initiated to detail the timeline of events, look at the compliance leading into the delay period and identify instances of operators taking early slots and not operating to them.

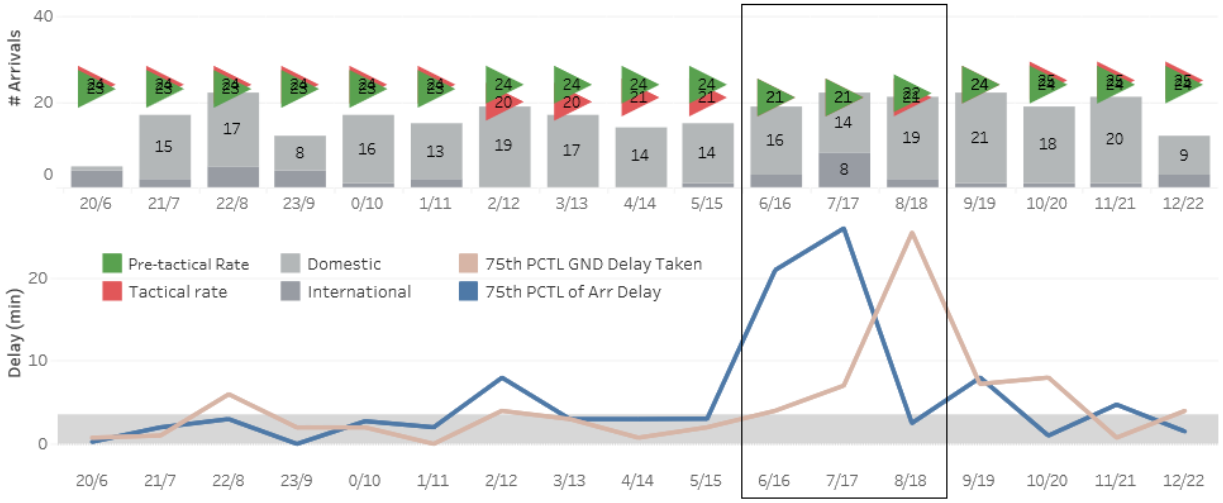

Figure 8. [top panel]: pre-tactical rate (green), tactical rate (red) and achieved throughput rate (grey). [bottom panel]: Airborne arrival delay (blue) and ground delay (beige) for 20 April 2018 at YBBN.

NCCMET submitted a MET CDM review at 0418z after observing developing oversubscription for the evening peak period, with the likelihood of lower rates required for the oversubscribed hours due to weather not clearing as quickly as initially forecast. This submission to the aviation meteorologists was followed by a MET CDM teleconference.

- At 0439z NCCMET submitted the MET CDM updated to the Brisbane TCU shift manager for review.
- At 0515z after discussion between the Brisbane TCU shift manager and NCCMET, the revision was approved, followed by the Brisbane TCU shift manager contacting the NCC to discuss a level 2 revision.
- A notification about the intent for a revision was sent out to industry at 0527z.
- A teleconference with airlines was conducted at 0530z prior to running the revision at 0545z.

Figure 1 (top panel) shows the pre-tactical and tactical rates, and actual arrivals at YBBN on 20 April 2018. The revision lowered the ATFM rate from 24 (which was the rate for the entire afternoon/evening period) to:

- 20 during 05z
- 22 during 06-08z
- 23 during 09z

Note that 24 is shown as the rate during 05z and 09z, MET CDM – green triangles, as the revision was implemented at 0545z it was too late to change the rate during 05z, and the rate during 09z appears to be a transcription error).

The revision did not affect the planned arrival runway which was 01 all afternoon until 08z, and then 19 from 09z onwards. However, at 0617z the tactical runway configuration switched from runway 01 to 19.

Run 1 of the MET CDM rate calculator included a prediction for wet conditions for most of the day, with potential isolated thunderstorms during 03-09z (however rates were not reduced during this period).

Run 2 of the MET CDM rate calculator predicted storm activity at the airport during 05z, with lingering poor conditions in the vicinity during 06-09z. In the end Run 2 was implemented (as the level 2 revision) within 15-30 minutes of the elevated airborne delay period, which was too late to prevent the majority of flights from taking-off (and absorbing delay on the ground). The revision was executed 55 minutes after the build-up of delay was identified by the BN TAC.

Analysis

Figure 9 shows the runway utilisation for arrivals during the lead in to the elevated airborne arrival delay period (during 05z) and the elevated delay period itself (06-07z). The level 2 revision (at 0545z – marked as vertical dashed line) occurs only 15 to 30 minutes before aircraft begin to experience large airborne delays (which may have been amplified by the runway change at 0617z). The GDP rerun was too late to stop the large airborne delays experienced by aircraft during 06-07z (21 flights exceeding 10 minutes, 15 exceeding 20 minutes, and a maximum delay of 54 minutes), as the majority would have been airborne and could not absorb delay on the ground prior to departure. However, the revision likely prevented the elevation of airborne delay extending into the 08z period.

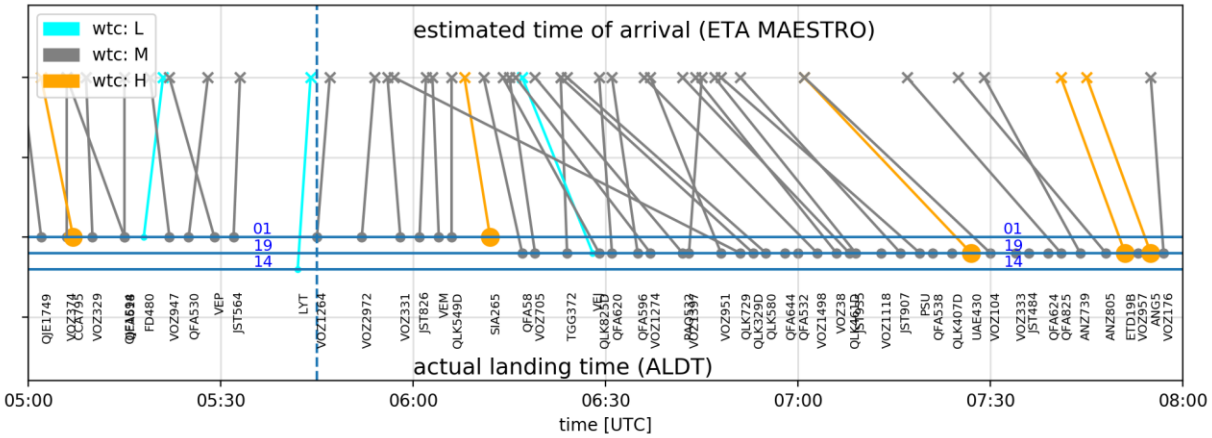

Figure 9. Estimated time of arrival according to Maestro (top) *vs. actual landing time (bottom) during 05-07z.* The *runway utilisation for arrivals is shown by the position of the ALDT. The dashed vertical line shows the time of the level 2 revision at 0545z. Arrival runways are shown at the bottom of the image as horizontal blue lines (runway names labelled in blue text). Arrival times are subject to uncertainties up to a few minutes.*

Table 2 Shows a list of four flights landing during 05-07z which took a slot at least 4 minutes earlier than their IOBT, and which also take-off at least 4 minutes after their CTOT. Table 3 Shows a list of flights landing during 05-07z where the flight was either: early non-compliant (1 flight), late non-compliant (2 flights), exempt (13 flights) or compliant with ATOT at least 10 minutes after CTOT (6 flights). Note that QJE1749 and QFA620 appear in both tables. There are 24 flights across these two tables which may have contributed to the elevation of airborne delay during 06-07z.

A Whispir message was sent at 0527z advising of the teleconference to discuss the level 2 revision (which was then executed at 0545z). One of the identified early non-compliant flights appear to have pushed back during the period 0527-0545z: QLK729 (FDR state switched to COOR at 0532z, ATOT 0536z, pre-revision COBT 0539z, pre-revision CTOT 0543z). Note: previous work has shown the switching of the

state to COOR within the FDR is a good approximation for the AOBT (when the AOBT data is not available). An additional flight, QLK759D, was deemed early non-compliant (39 minutes) and switched to FDR COOR state at 0558z, with an ATOT at 0602z. This flight landed at 0823z, and so was not listed with the flights landing during the 06-07z period.

Two additional flights, JST484 (ATOT 0616z) and VOZ957 (ATOT 0630z) departed after the revision and landed during 07z.

Finally, nine domestic flights departed between the approval of the revision at 0515z and its implementation at 0545z (with QLK407 and QFA538 pushing back in this period).

Table 2. Flights arriving YBBN during 05-07z which take an early slot (by at least 4 minutes) and pushback at least 4 minutes later than the assigned slot.

ACID	ADEP	ADES_RWY	ALDT	COBT-IOBT	ATOT-CTOT
QJE1749	YBCS	01	20/04/2018 5:02	-6	10
QLK549D	YROM	01	20/04/2018 6:06	-4	7
QFA620	YMML	19	20/04/2018 6:31	-4	15
VOZ1498	YBHM	19	20/04/2018 7:03	-6	6

Table 3. Flights arriving YBBN during 05-07z which are either late non-compliant, early non-compliant, exempt or compliant (but with an ATOT at least 10 minutes after CTOT).

ACID	ADEP	ADES_RWY	ALDT	ATOT-CTOT	Compliance
QJE1749	YBCS	01	20/04/2018 5:02	10	Compliant
CCA795	ZBAA	01	20/04/2018 5:07	3	Exempt
VOZ329	YMML	01	20/04/2018 5:10	12	Compliant
QJE1594	YPAD	01	20/04/2018 5:15	21	Late Non Compliant
FD480	YHBA	01	20/04/2018 5:18	-12	Exempt
SIA265	WSSS	01	20/04/2018 6:12	9	Exempt
QFA58	AYPY	19	20/04/2018 6:17	-9	Exempt
VOZ705	YMHB	19	20/04/2018 6:19	14	Compliant
QFA620	YMML	19	20/04/2018 6:31	15	Compliant
QFA596	YPPH	19	20/04/2018 6:35	12	Compliant
PAQ532	AYPY	19	20/04/2018 6:42		Exempt
QLK729	YMLS	19	20/04/2018 6:51	-7	Early Non Compliant
QLK329D	YBUD	19	20/04/2018 6:53	33	Late Non Compliant
VOZ38	AYPY	19	20/04/2018 7:06	-1	Exempt
UAE430	OMDB	19	20/04/2018 7:27	16	Exempt
VOZ104	NZWN	19	20/04/2018 7:30	16	Exempt
JST484	YWLM	19	20/04/2018 7:36	10	Compliant
ANZ739	NZAA	19	20/04/2018 7:44	2	Exempt
ANZ805	NZCH	19	20/04/2018 7:48	23	Exempt
ETD19B	OMAA	19	20/04/2018 7:51	33	Exempt
ANG5	AYPY	19	20/04/2018 7:55	-2	Exempt
VOZ176	NFFN	19	20/04/2018 7:57	14	Exempt

Summary

An elevation in delay was caused by a predicted weather event lasting the entire afternoon period, with uncertain intensity and proximity to Brisbane Airport – as indicated from the METCDM calculations. A revised METCDM calculation was sent to BN TAC with revised lower rates during 05z-09z, just over an hour before being implemented, due to the process of approving (including consultation with airlines) the level 2 revision. This did not allow enough time for aircraft landing during 06-07z to absorb delay on the ground rather than while airborne, with eleven domestic flights taking-off or pushing back between the approval and implementation of the revision. Due to the early communications providing situational awareness to all stakeholders, the delay created by the process was counterproductive in this event.

An additional cause of the delay spike during the period 06-07z were 24 flights with pushback behaviour altering the expected sequence into Brisbane (non-compliant and exempt flights, flights where ATOT at least 10 minutes after CTOT, and flights taking early slots and pushing back late).

For further information please contact Network Performance and Analysis @
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Appendix B

Corporate Plan Key Performance Indicator 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.