



ATM Network Performance Report

March 2018



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Summary

Overview

The month of March saw the ATM network experience a range of unique and seasonal factors. A number of strategic traffic regulation measures were in place during March to manage one-off events. These events were the ASEAN summit in Sydney and the Commonwealth Games in the Gold Coast and the South East Queensland region.

Easter fell during March and the Thursday prior to Easter has traditionally been the busiest day of the year in terms of flight numbers. This year was no different with 4,346 arrivals at our four busiest airports on Easter Thursday (29 March), a figure that is 6% higher than a normal Thursday.

On 09 March, IT issues were experienced at Sydney airport and the impact of this disruption was felt across the network for the entire day.

In addition to these unique and seasonal factors, there were routine factors associated with weather and medical evacuation and other GDP-exempt flights during March. 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 **3.9** minutes, and the median was **0.8** minutes.

These monthly performance figures were a significant improvement on the same time last year (a decrease of 0.9 minutes delay for the 75th percentile and a decrease of 0.4 minutes delay for the median), but were slightly above the KPI targets of 3.5 minutes and 0.6 minutes for the 75th percentile and median, respectively.

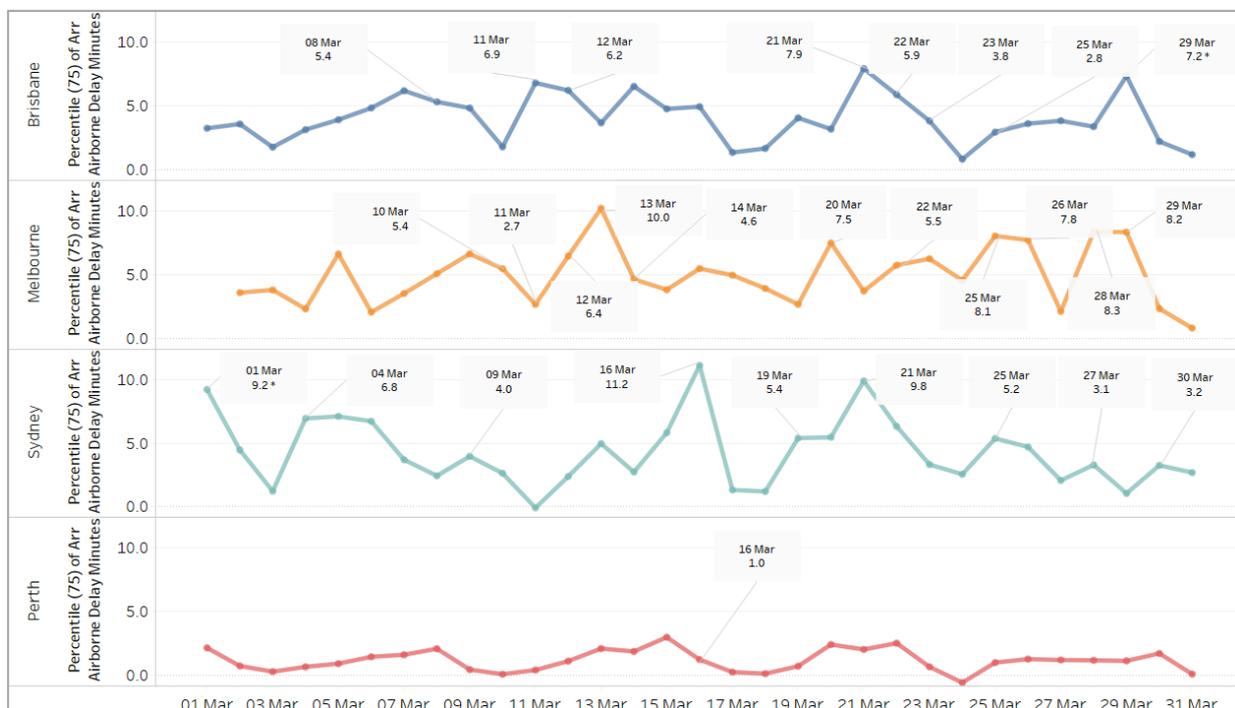


Figure 1: Notable delay impact events during March 2018.

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 airborne delay for each day of the month for the four major airports. A total of 29 notable events across the network have been highlighted. Eleven 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). Eighteen 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). An event in Perth where unforecast fog/mist required low visibility operations is also included due to the increased workload for both Airservices and the airlines operators; however the impact on delay was negligible. These events are summarised in **Table 1** below.

Location	Day	Local Time	Event Descriptions (Contributing causes to increased delays)
Sydney	1-Mar*	18-21	Departures out of Melbourne resulted in the late presentation of aircraft at Sydney immediately prior to a period with limited un-utilised capacity.
	4-Mar	18-19	Cloud lower than forecast led to increase airborne delays as arrival rates were tactically reduced.
	9-Mar	18-19	Airport terminal issues disrupted morning traffic. A number of late non-compliant aircraft presented in the evening period due to consequential delays from the morning issues.
	16-Mar	08-11	Delays were experienced in the morning period due to ASEAN summit and inbound state aircraft. Staff unavailability due to illness required a Level 1 GDP Revision in the evening.
	19-Mar	08-09	Late non-compliant and GDP-exempt flights with large arrival time variations.
	21-Mar	07-10	Precision Runway Monitor (PRM) was unavailable during morning period, resulting in a rate reduction of 6 arrivals per hour from planned values for 2 hours, and increased airborne delay.
	25-Mar	19-21	Weather conditions changed earlier than forecast. Thunderstorm activity in the circuit led to increased holding and multiple aircraft diversions to other airports A Level 2 GDP Revision was undertaken due to extensive airborne delays (50 minutes).
	28-Mar	08-09	Late non-compliant and exempt flights with large arrival time variations.
	30-Mar	17-18	Runway 16L was closed for 30 minutes due to disabled aircraft on runway during busy evening period.
Melbourne	10-Mar	11-12	Single operations were planned for the entire day due to excessive cross winds on Runway 27 for the morning and early afternoon, which led to airborne delays in the morning and early afternoon.
	11-Mar	18-19	Compliant and exempt flights with large arrival time variations resulted in elevated airborne delays.
	12-Mar	19-20	Runway 16 was closed for 20 minutes due to aircraft emergency, resulting in elevated airborne delays.
	13-Mar	07-10	Late non-compliant and exempt flights with large arrival time variations.
	14-Mar	18-20	A number of flights with large arrival time variations resulted additional demand at the beginning of the evening peak period.
	20-Mar	07-09	Elevated airborne delay during the morning period resulted from the late presentation of exempt aircraft immediately prior to a peak period.

	22-Mar	18-19	A number of flights with large arrival time variations resulted additional demand at the beginning of the evening peak period.
	25-Mar	18-20	Prioritised head-of-state aircraft added delays to subsequent evening arrivals.
	26-Mar	Day	LAHSO was planned for the morning period, however wind conditions changed and reduced the available arrival rate from 40 to 24 per hour for the morning period.
	28-Mar	08-12	Low arrival rates planned for the morning period due to weather conditions, and a number of late non-compliant and exempt flights with large arrival time variations.
	29-Mar	08-11	Low arrival rates planned for morning period, small variations in arrivals led to increased airborne delays.
Brisbane	8-Mar	19-20	Several late non-compliant aircraft during busy periods
	11-Mar	15-16	Exempt, early and late non-compliant aircraft shifting demand leading into a busy period.
	12-Mar	07-08 & 18-19	Unforecast showers in the morning reduced the available arrival rate by 4 per hour. The evening airborne delay was induced by several exempt, early and late non-compliant aircraft shifting demand during a busy period.
	21-Mar	17-20	Low arrival rates due to low cloud and showers, as well as 3 Medevac operations led to increased airborne delay.
	22-Mar	19-20	The evening delay was induced by several early and late non-compliant aircraft shifting demand during a busy period.
	23-Mar	19-20	The evening delay was induced by several early and late non-compliant aircraft shifting demand during a busy period.
	25-Mar	18-19	Diversions from Sydney increased delay for the evening arrivals into Brisbane.
	29-Mar*	08-09 & 16-17	Worse than forecast conditions resulted in morning arrival rate reductions of 3 per hour for 3 hours. The evening airborne delay was induced by several early and late non-compliant aircraft shifting demand during a busy period.
Perth	16-Mar	06-08	Unforecast fog/mist in early morning required Low Visibility Operations. Increased workload however, there was no noticeable impact on 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. The long-term trend is upwards. **Figure 2** indicates that the long-term trend is upwards.

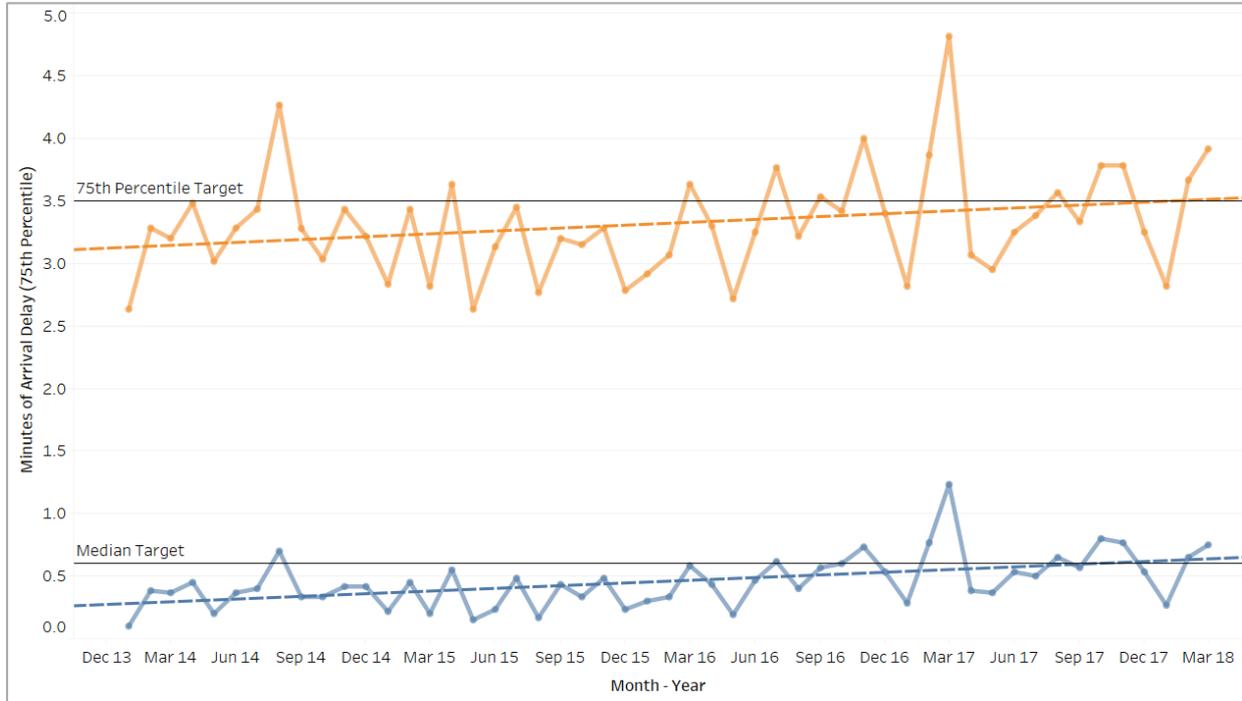


Figure 2: Long-term airborne delay (median and 75th percentile) for July 2014 to March 2018 with corresponding targets.

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.

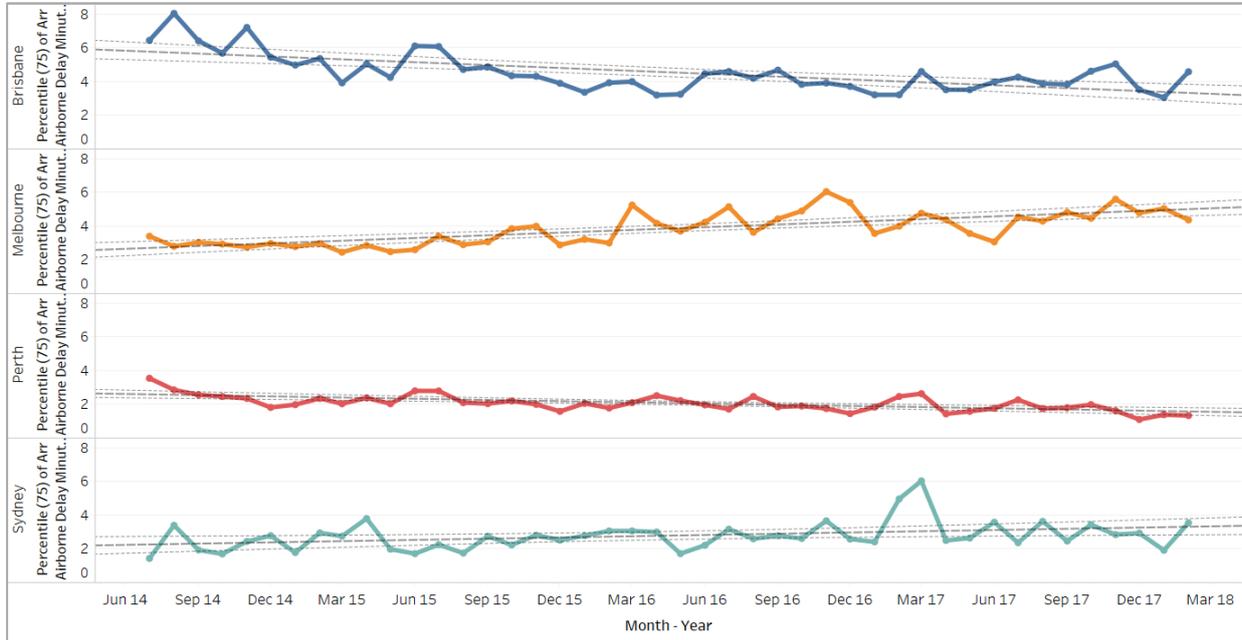


Figure 3: Long-term airborne delay 75th percentile by airport (July 2014 to March 2018)

Sydney

Airborne delay

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

Airborne delay during March (4.3 minutes) was above the target (3.5 minutes). However, delay was lower than during the same period last year (6.0 minutes). The long-term trend for airborne delay at Sydney is upwards.

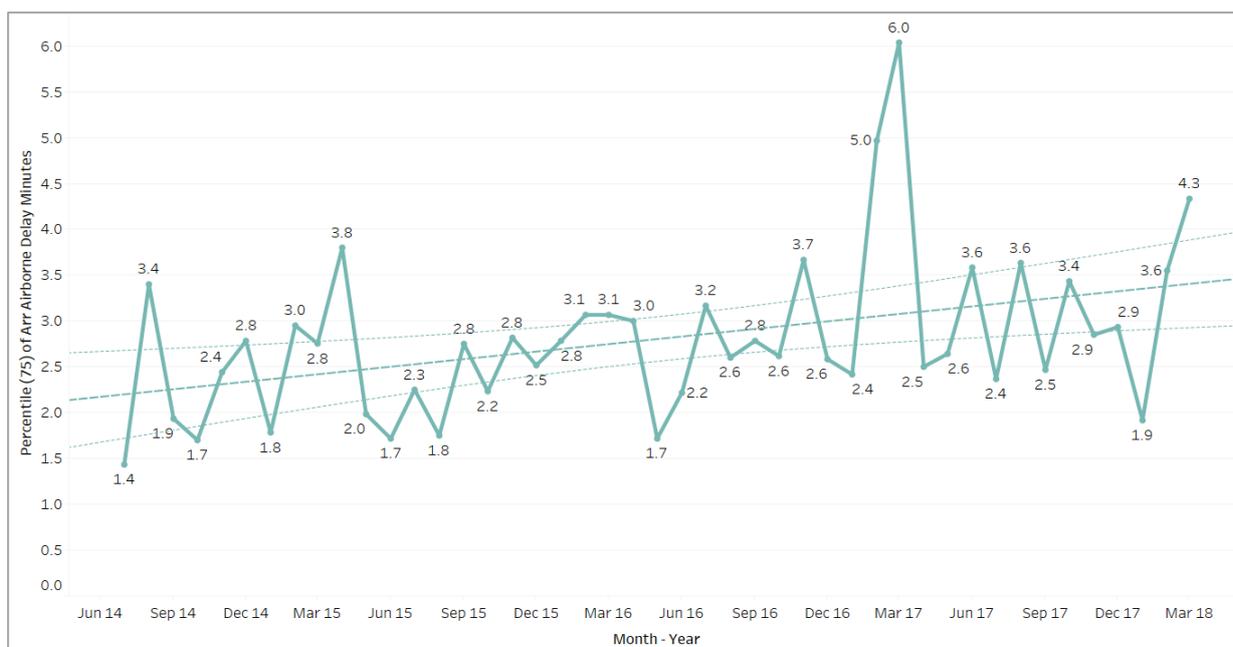


Figure 4: Sydney airborne delay 75th percentile

Notable events

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

- 01 March (1800-2100 Local)
 - Elevated airborne delay during the evening period resulted from the late presentation of aircraft immediately prior to a period with limited spare capacity.
 - The ability to accommodate late aircraft during this period was limited due to high demand, and lower arrival rates necessitated by decreased staffing availability.
 - The late presentation of aircraft appears to have resulted from late departures, in part caused by single runway operations in Melbourne.
 - A number of conclusions and recommendations can be found in the detailed Post Operational Performance Review of this event in Appendix A. In particular, exploring options to limit departure delays has the potential to limit network effects that result in elevated arrival airborne delay.
- 04 March (1800-1900 Local)
 - Cloud lower than forecast led to increased airborne delays as arrival rates were reduced.
 - Airborne delays required a traffic holding NOTAM (Notice to Airmen) for 35 minutes.

- 09 March (1800-1900 Local)
 - Sydney Airport terminal experienced IT outages, which disrupted morning traffic.
 - The ongoing impact of the morning disruption resulted in a number of late non-compliant aircraft in the evening.
 - These aircraft presented late in Sydney during the busy evening period increasing airborne delay.
- 16 March (0800-1100 Local)
 - Airborne delay was experienced during the morning period due to arrival of state aircraft for the ASEAN Summit.
 - See section on ASEAN Summit below for more discussion on the traffic management to accommodate this event.
- 19 March (0800-0900 Local)
 - Airborne delay was experienced during the morning peak period.
 - A number of late non-compliant and GDP-exempt flights shifted demand to the busy period and resulted in increased airborne delay.
- 21 March (0700-1000 Local)
 - Precision Runway Monitor was unavailable during morning period due to a short-notice staff reduction, necessitating a lower acceptance rate.
 - The arrival rate was lowered from 42 to 34 per hour for two hours. This decreased capacity resulted in an increased airborne delay in this period.
- 25 March (1900-2100 Local)
 - Wind and thunderstorm activity arrived earlier than anticipated and was stronger than forecast.
 - No approaches were made for a period of 20 minutes due to strong cross winds.
 - A traffic holding NOTAM (Notice to Airmen) for 35 minutes was issued and there were multiple diversions to other airports.
 - Level 2 GDP Revision was undertaken due to extensive airborne delays (up to 50 minutes)
- 28 March (0800-0900 Local)
 - Airborne delay was experienced during the morning peak period.
 - A number of late non-compliant and GDP-exempt flights shifted demand to the busy period and resulted in increased airborne delay.
- 30 March (1700-1800 Local)
 - Runway 16L was closed for 30 minutes due to a disabled aircraft.
 - The loss of capacity during the busy evening period resulted in increased airborne delay.

ASEAN Summit

The Association of Southeast Asian Nations (ASEAN) Summit 2018 was held in the Sydney on 16-18 March 2018. Airservices worked with the Department of the Prime Minister and Cabinet, the New South Wales Government and the Department of Defence to establish measures to ensure the appropriate level of airspace security for the event. The measures included establishment of Air Defence Identification Zones and a Temporary Restricted Area to ensure the security and safety of aircraft, the public and visiting dignitaries.

The overall impact of the event was low. However, there was an increase in airborne delay on the morning of 16 March, with the 75th percentile of airborne delay peaking at 26 minutes in the 0900 Local hour. This was due to the arrival of a number of state aircraft and the impact this had on the ability to provide PRM. Arrival rates were also impacted during this period due to NSW police helicopters escorting dignitaries from the airport. There was a significant impact on controller workload throughout the weekend, which had an impact on low-level operations but had minimal impact on airborne delay.

Melbourne

Airborne delay

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

March performance (4.8 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.

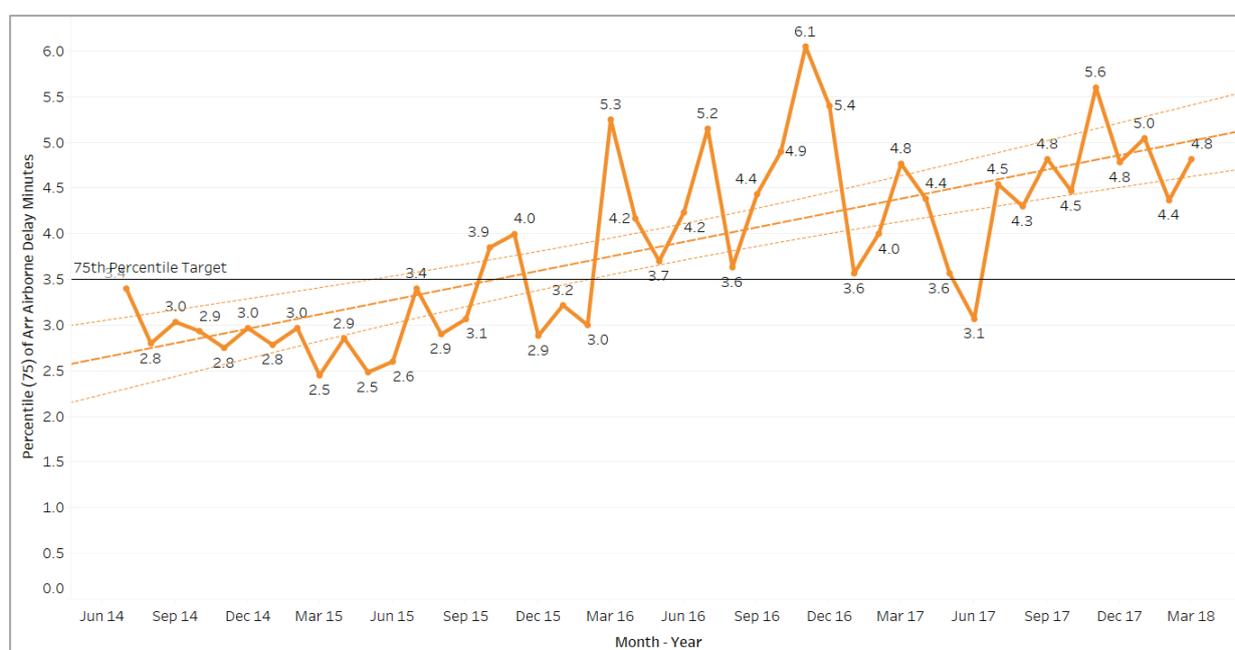


Figure 5: Melbourne airborne delay 75th percentile

Notable events

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

- 10 March (1100-1200 Local)
 - Single operations were planned for the entire day due to excessive cross winds on Runway 27.
 - Arrival acceptance rates were decreased to 24 per hour until the early evening. The decreased rates resulted in airborne delay during peak periods, particularly in the morning and early afternoon.
- 11 March (1800-1900 Local)

- Airborne delay was experienced during the evening peak period.
- A number of late non-compliant and exempt flights shifted demand to the busy period and resulted in delay.
- 12 March (1900-2000 Local)
 - Runway 16 was closed for 20 minutes due to an aircraft emergency.
 - The loss of capacity during that period resulted in increased airborne delay.
- 13 March (0700-1000 Local)
 - Airborne delay was experienced during the morning peak period.
 - A number of late non-compliant and exempt flights shifted demand to the busy period and resulted in increased airborne delay.
- 14 March (2000-2000 Local)
 - A number of flights at the beginning of the evening peak period arrived later than planned due to longer than estimated flight times.
 - This increased demand in the peak period resulted in increased airborne delay.
- 20 March (0700-0900 Local)
 - Elevated airborne delay during the morning period resulted from the late presentation of exempt aircraft immediately prior to a period with limited spare capacity.
 - The ability to accommodate late aircraft during this period was limited due to low arrival rates implemented as a result of low-cloud conditions.
- 22 March (1800-1900 Local)
 - Airborne delay was experienced during the evening peak period.
 - A number of late presenting aircraft shifted demand to the busy period and resulted in delay.
- 25 March (1800-2000 Local)
 - Prioritised head-of-state aircraft added airborne delays to subsequent evening arrivals.
- 26 March (entire day)
 - A change in wind conditions reduced the available arrival rate from 40 to 24 per hour for the morning and afternoon.
 - Reduced capacity resulted in airborne delay during both the morning and afternoon.
- 28 March (0800-1200 Local)
 - Elevated airborne delay during the morning period resulted from the late presentation of exempt aircraft immediately prior to a period with limited spare capacity.
 - The ability to accommodate late aircraft during this period was limited due to low arrival rates necessitated by gusty wind conditions.
- 29 March (0800-1100 Local)
 - Elevated airborne delay during the morning period resulted from the late presentation of exempt aircraft immediately prior to a period with limited spare capacity.
 - The ability to accommodate late aircraft during this period was limited due to low arrival rates necessitated by low-cloud conditions.

Brisbane

Airborne delay

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

March performance (4.2 minutes) did not meet the target (3.5 minutes). However, delay was lower than during the same period last year (4.6 minutes). The long-term trend for airborne delay at Brisbane is downwards.

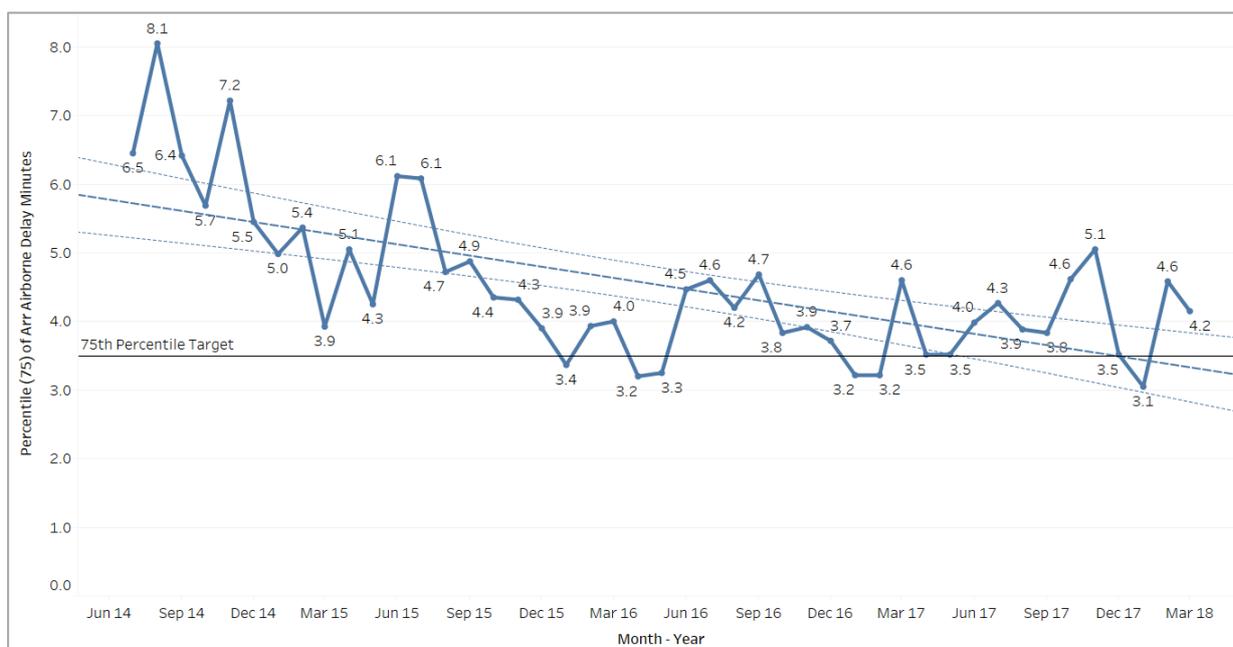


Figure 6: Brisbane airborne delay 75th percentile

Notable events

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

- 08 March (1900-2000 Local)
 - Airborne delay was experienced during the evening peak period.
 - A number of late non-compliant flights increased shifted demand to the busy period and resulted in increased airborne delay.
- 11 March (1500-1600 Local)
 - Airborne delay was experienced during the evening peak period.
 - A number of exempt, early and late non-compliant flights shifted demand to the busy period and resulted in increased airborne delay.
- 12 March (0700-0800 and 1800-1900 Local)
 - Unforecast showers in the morning reduced the arrival acceptance rates by 4 per hour. This decreased capacity resulted in an increase airborne delay in this period.
 - Airborne delay was also experienced during the evening peak period. A number of exempt, early and late non-compliant flights shifted demand to the busy period and resulted in increased airborne delay.

- 21 March (1700-2000 Local)
 - Low arrival rates due to low cloud and showers, and 3 Medevac operations impacting on airborne delay.
- 22 March (1900-2000 Local)
 - Airborne delay was experienced during the evening peak period.
 - A number of early and late non-compliant flights shifted demand to the busy period and resulted in increased airborne delay.
- 23 March (1900-2000 Local)
 - Airborne delay was experienced during the evening peak period.
 - A number of early and late non-compliant flights shifted demand to the busy period and resulted in increased airborne delay.
- 25 March (1800-1900 Local)
 - Multiple diversions to Brisbane as a result of the early arrival of wind and thunderstorm activity at Sydney Airport.
 - The additional demand during a period with limited spare capacity resulted in increased airborne delay.
- 29 March (0800-0900 and 1600-1700 Local)
 - Worse than forecast weather conditions in the morning resulted in acceptance rate reductions of 3 per hour for 3 hours.
 - This decreased capacity resulted in an increase airborne delay during this period.
 - Airborne delay was also experienced in the evening due to a number of early and late non-compliant which shifted demand to the busy period.
 - Level 2 GDP Revision was undertaken to realign the program and create a firebreak to ensure that airborne holding remained under control.
 - A detailed review of the evening event can be found in Appendix A.

Perth

Airborne delay

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

March performance (1.3 minutes) met the target (3.5 minutes) and airborne delay was also lower than the same period last year (2.6 minutes). The long-term trend for airborne delay at Perth is downwards.

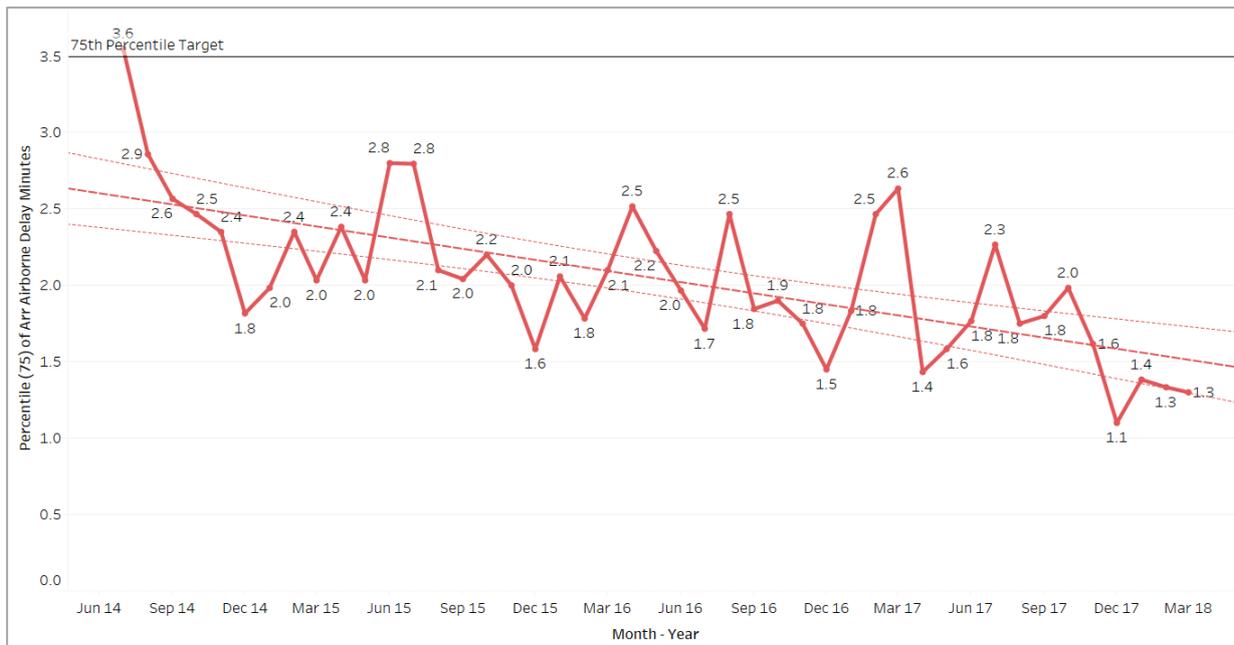


Figure 7: Perth airborne delay 75th percentile

Notable events

The following commentary describes the most significant event during March in Perth:

- 16 March (0600-0800 Local)
 - Unforecast fog/mist in early morning required Low Visibility Operations.
 - There was low demand in this period so there was limited impact on airborne delay.

Appendix A

Post Operational Performance Review

Sydney Airport – 1st March 2018

Event Description

Elevated arrival delay was observed in the evening peak period from 0700-1100z (1800-2200 local) at Sydney on 1 March 2018 (see Figure 8). The airborne arrival delay (75th percentile) in this period was above 9 minutes for four consecutive hours and peaked at 11 minutes. The maximum airborne arrival delay in this period was 24 minutes.

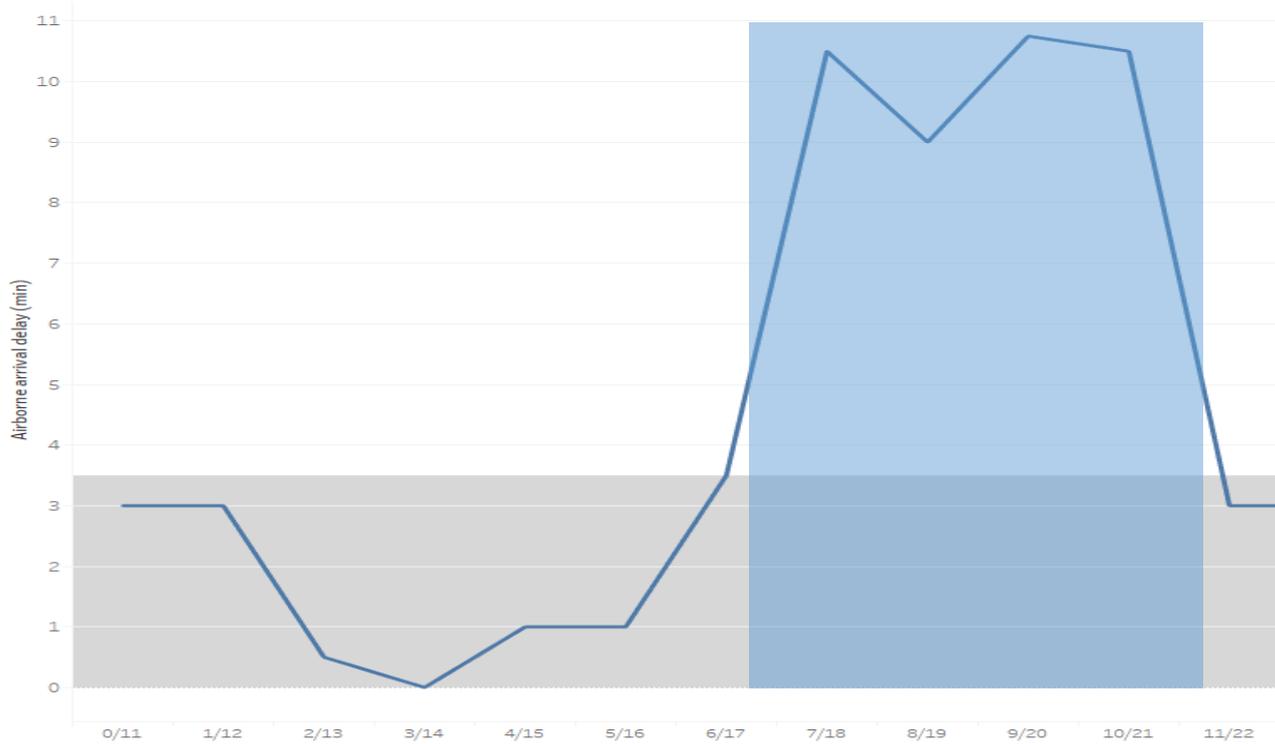


Figure 8: Arrival delay (75th percentile) by hour (local/UTC) at Sydney on the afternoon of 1 March 2018. Period of elevated delay is highlighted in blue.

A Level 1 revision was undertaken after a CDM teleconference at 0430z to reduce capacity due to a short notice staffing constraint issue at Sydney TCU. The revision decreased arrival rates from 42 to 38 starting at 0600z and continuing until 1100z.

Analysis

Figure 2 shows how aircraft which ran late at the beginning of the high-delay period put pressure on throughput for the subsequent hours. Beginning in the 0600z hour, a number of flights began to land in the hour after their CLDT (indicated by the red boxes). Figure 3 shows that there was little spare capacity to accommodate late presenting aircraft due to high demand and reduced arrival rates particularly from 0700z (blue oval). This coincided with the observed increase in airborne arrival delay.

Hour of ALDT	Hour of CLDT							
	05	06	07	08	09	10	11	12
05	25	1						
06	5	29						
07		8	28					
08			10	24	2			
09				9	22			
10					6	23		
11						4	12	
12								4

Figure 2: Arrival accuracy in hourly windows for 0500-1200z at Sydney on 1 March 2018. Red boxes show flights that landed in the hour after their calculated landing time (CLDT).

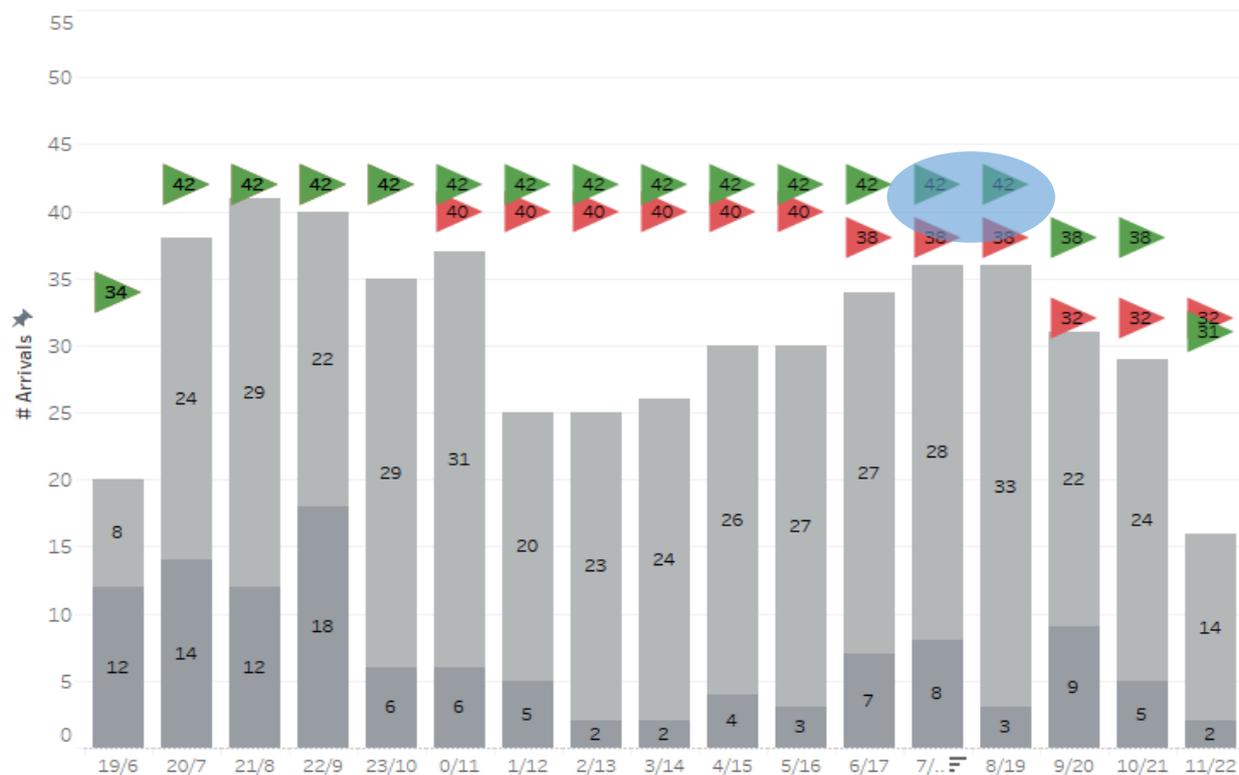


Figure 3: Arrivals compared to METCDM (green triangles) and tactical (red triangles) rates by hour for Sydney on 1 March 2018.

Note: METCDM rates between 0600z and 0800z incorrectly show the pre-revision rate of 42. Should read 38 for each hour.

Furthermore, Figure 4 shows that late presenting flights led to an imbalance of arrivals within the 0600z hour. There was slack demand in the 0615z block (blue) where only six aircraft landed instead of nine calculated. Then in the 0630z block (orange) there were six arrivals that had been due earlier in the hour. This cascade continued for the remainder of the program.

		Hour of CLDT / CLDT_15											
		05				06				07			
Hour of ALDT	Min..	0	15	30	45	0	15	30	45	0	15	30	45
05	0	5	1										
	15		5										
	30		1	5	1								
	45			3	4	1							
06	0			1	4	4							
	15					3	3						
	30					1	5	3	1				
	45						1	5	3				
07	0							2	4	3			
	15					1			1	5	3		
	30									2	6	1	
	45											7	1

Figure 4: Arrival accuracy in 15 minute blocks for 0500-0800z at Sydney on 1 March 2018. The blue box shows that only six flights landed in the 0615z block. The orange box shows flights arriving in the 0630z block which a CLDT earlier in the hour.

Figure 5 shows the runway utilisation in the 0700z hour as the arrival airborne delay began to build up. Both runways in operation were heavily occupied which further illustrates the limited capacity to accommodate late presenting aircraft without adding to delay.

Runway utilisation - arrivals



Runway utilisation - departures

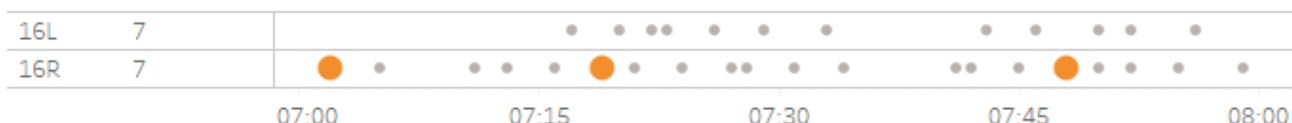


Figure 5: Runway utilisation at Sydney on 1 March 2018 in the 0700z hour. Blue dots – light aircraft; grey dots – medium aircraft; orange dots – heavy aircraft. *Note:* runway times contain some variance/inaccuracy so aircraft may appear closer than reality.

Table 1 lists the domestic flights that arrived in Sydney in the 0600-0730z period which took off 10 minutes or more after their CTOT. There are 14 of these flights out of a total of 53 flights in this period. Single runway operations were in place in Melbourne in the afternoon until 0902z and this contributed to a number of the late take-offs. Half of the late take-offs (7 out of 14) were from compliant aircraft departing Melbourne.

ACID	ADEP	ALDT (UTC)	CTOT (UTC)	ATOT (UTC)	ATOT-CTOT (min)	COBT	AOBT	AOBT-COBT (min)	Off-blocks compliant
VOZ657	YSCB	06:01	05:09	05:22	13	05:04	05:09	5	Yes
QFA470	YMML	06:07	04:48	05:06	18	04:42	04:42	0	Yes
VOZ859	YMML	06:14	04:54	05:13	19	04:48	04:55	7	Yes

QFA446	YMML	06:23	05:02	05:23	21	04:56	04:58	2	Yes
VOZ427	YPAD	06:26	04:40	04:59	19	04:33	04:45	12	Yes
VOZ958	YBBN	06:31	05:03	05:22	19	04:56	05:13	17	No
VOZ556	YPPH	06:32	02:43	02:53	10	02:34	02:38	4	Yes
QFA468	YMML	06:38	05:20	05:30	10	05:14	05:15	1	Yes
JST61	YMML	06:44	05:08	05:34	26	05:02	05:19	17	No
QJE1520	YSCB	07:00	06:12	06:23	11	NA	NA	NA	NA
QFA450	YMML	07:04	05:37	05:49	12	05:31	05:37	6	Yes
TGG254	YMML	07:07	05:40	05:54	14	05:32	05:35	3	Yes
QLK47D	YSDU	07:11	05:48	06:11	23	NA	NA	NA	NA
QFA448	YMML	07:22	05:52	06:10	18	05:46	05:58	12	Yes

Table 1: Summary of flights arriving Sydney from 0600-0730z on 1 March 2018 where ATOT was 10 minutes or more after CTOT.

The late departures likely had a substantial impact on the timely presentation of aircraft. As the late presentation occurred during a capacity constrained period this ultimately lead to increased arrival airborne delay.

At 0642Z NCC and Sydney Traffic Manager reviewed the performance of the Sydney GDP and there were concerns about high level of over subscription. During the review a Level 2 revision was considered due to excess demand in the 0700z hour (see Figure 6). However, no revision was conducted as airborne holding was observed at around 10 minutes and not expected to increase beyond 20 minutes. The actual arrival rate was also above the predicted demand for the rest of the evening.

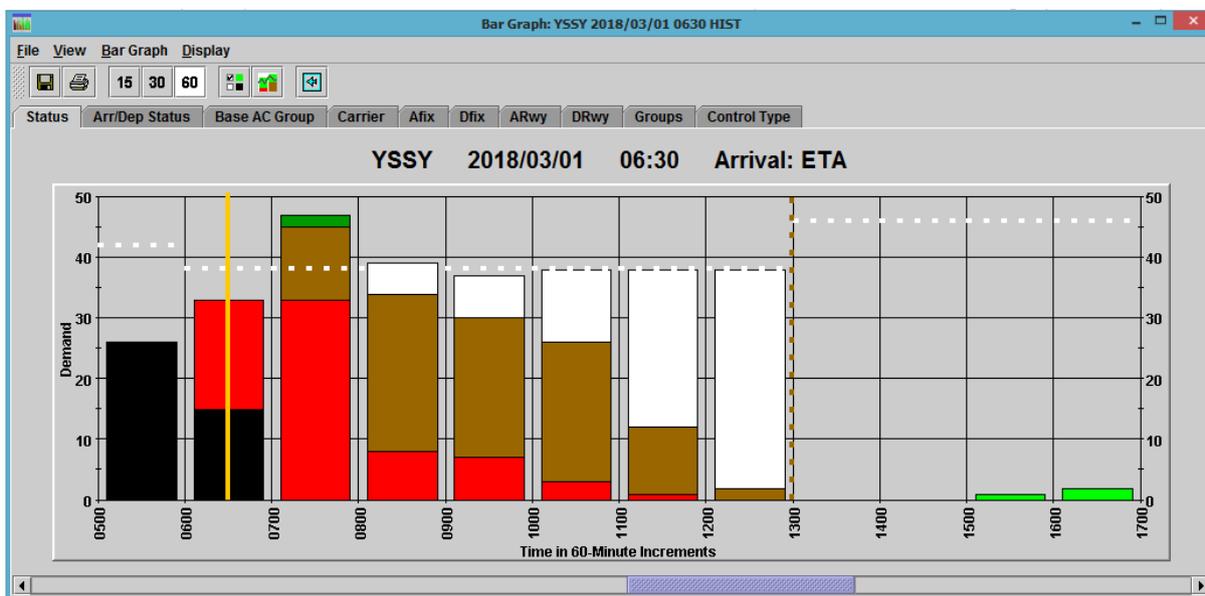


Figure 6: Harmony demand by hour at 0630z at Sydney on 1 March 2017. Demand in the 0700z hour was 47 (33 airborne, 12 yet to depart and two late) which exceeded the revised rate of 38 for that hour.

Summary

Elevated arrival delay during the evening period (0600-1100z) at Sydney on 1 March 2018 resulted from the late presentation of aircraft immediately prior to a capacity constrained period. The ability to accommodate late aircraft during this period was limited due to (a) high demand and (b) lower arrival rates necessitated by decreased staffing availability. The impact of these late arrivals at a time with limited spare capacity cascaded into delays for the rest of the evening.

The late presentation of aircraft appears to have resulted from late departures in part caused by single runway operations in Melbourne. There were 14 aircraft which arrived in the 0600-0730z period that departed 10 minutes or more after their CTOT. Seven of these flights involved compliant aircraft departing Melbourne. Exploring options to limit departure delays has the potential to limit network effects that result in elevated arrival airborne delay.

**For further information please contact Network Performance and Analysis @
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Post Operational Performance Review

Brisbane Airport – 29 March 2018

Event Description

An oversubscription of planned arrivals was observed in the 0600z hour at Brisbane on 29 March 2018 (see Figure 1). The chart shows that at 0600z there was an oversubscription of eight flights in the 0600z hour followed by two fully subscribed hours. A Level 2 Revision was run at 0603z with rates of 22 for the remainder of the program.

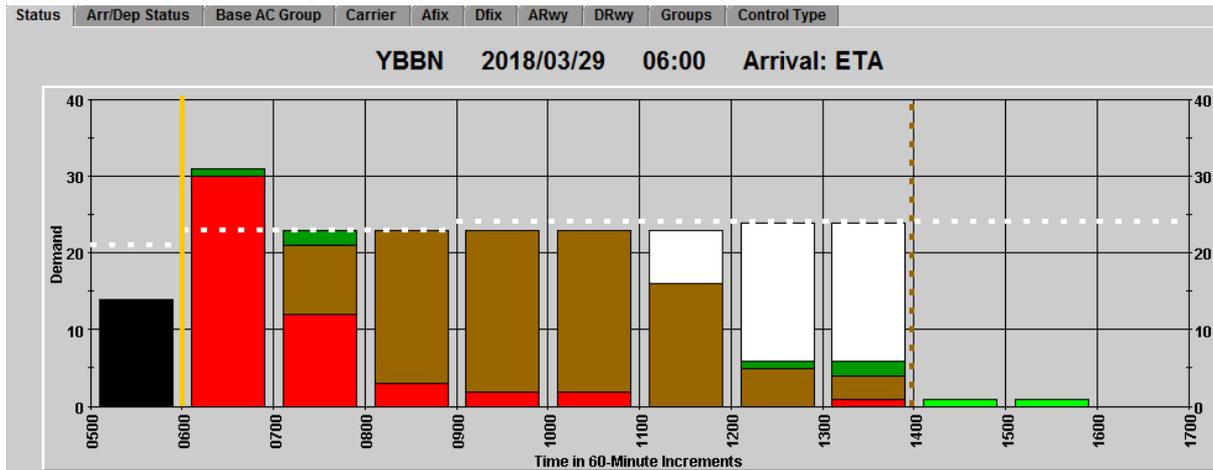


Figure 9: Harmony demand by hour at 0600z at Brisbane on 29 March 2017. Demand in the 08z hour was 31 compared to a rate of 23.

Figure 2 shows the airborne arrival delay and ground delay for the evening of 29 March 2018 at Brisbane. A moderate increase in arrival delay was observed in the 06z and 07z hours (75th percentile of arrival airborne delay was 9 minutes in 06z). Ground delay increased following the revision. Aircraft that arrived Brisbane in the 10z hour experienced substantial ground delay (75th percentile of ground delay taken was 42 minutes).

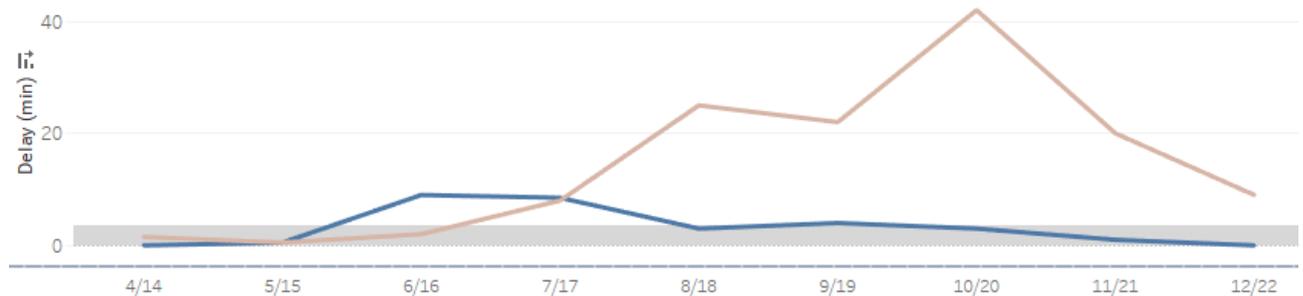


Figure 2: Arrival delay (75th percentile - blue) and ground delay (75th percentile - beige) by hour (local/UTC) at Brisbane on the evening of 29 March 2018.

Analysis

Table 1 lists flights that arrived in the 06z hour that prior to the revision had been planned for the 05z hour. These four flights all departed late (ATOT-CTOT between 17 and 32 minutes) and their ETAs had all moved to the 06z hour putting pressure on the program in that period. Two RFDS flights with ETAs in the 06z hour also added to the oversubscription.

ACID	ADEP	ADES	ATOT	ATOT-CTOT	ETA	CLDT (prior to revision)
JST564	YMML	YBBN	0419	17	0602	0548
ANZ805	NZCH	YBBN	0301	32	0616	0551
VOZ333	YMML	YBBN	0428	20	0619	0554
VOZ705	YMHB	YBBN	0355	30	0621	0545

Table 1: Summary of flights that prior to the revision had a CLDT in the 05z hour but an ETA in the 06z hour.

The revision realigned the program, and the revised rates created a firebreak to ensure delay would not rise again. This was particularly in light of terminal area diversions which had the potential to affect actual landing rates. Figure 2 shows that this was achieved with arrival airborne delay only moderate in the 06z and 07z hours, and dropping substantially in 08z. An earlier revision was not a realistic option as the delay would not have been reflected in the Maestro ladder at that time. Harmony estimates of oversubscription would also have been too uncertain to suggest an early revision. Early Harmony estimates contain a large proportion of flights which have not departed. These flights may not take off close to their CTOT which can cause actual demand to shift away from early estimates.

Figure 3 shows the number of arrivals by hour compared to the revised rate of 22 following the revision at 0603z. Demand remained high in the 06z and 07z hours and throughput was achieved above the revised rate. In the 08z hour demand reduced substantially below capacity with only 17 arrivals. This corresponded with the drop in airborne arrival delay seen in Figure 2.

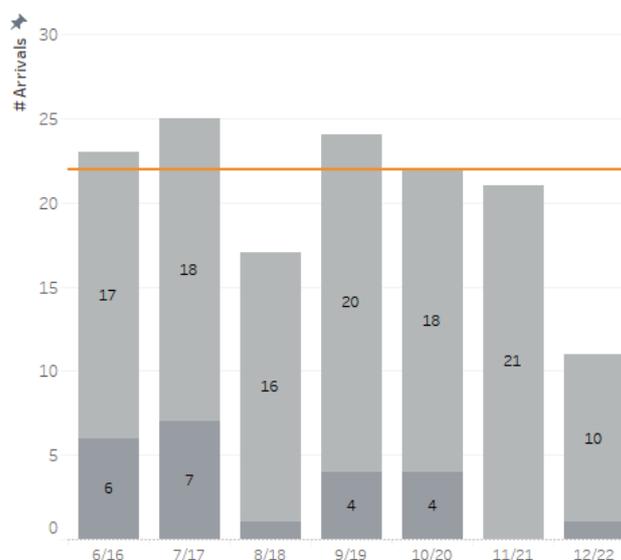


Figure 3: Arrivals compared to revised rates (orange line) by hour (UTC/local) for Brisbane on 29 March 2018. Rates were lowered to 22 in a Level 2 Revision at 0603z. Dark grey blocks represent international flights; light grey blocks represent domestic flights.

Figure 4 shows arrivals following the revision were impacted by early presenting flights (represented by the blue boxes). There were three flights that landed in the 06z hour that had a CLDT in the 07z hour. Likewise there were four flights that landed in the 07z hour that had a CLDT in the 08z hour. This contributed to the weak demand in the 08z hour and indicates that the overdelivery in 06z and 07z

allowed the excess demand to clear. During the 07z hour 25 arrivals landed against a tactical rate of 24 and a planned rate of 22. In the absence of the overdelivery it is likely that demand would have increased again as aircraft presented early with respect to their allocated slots.

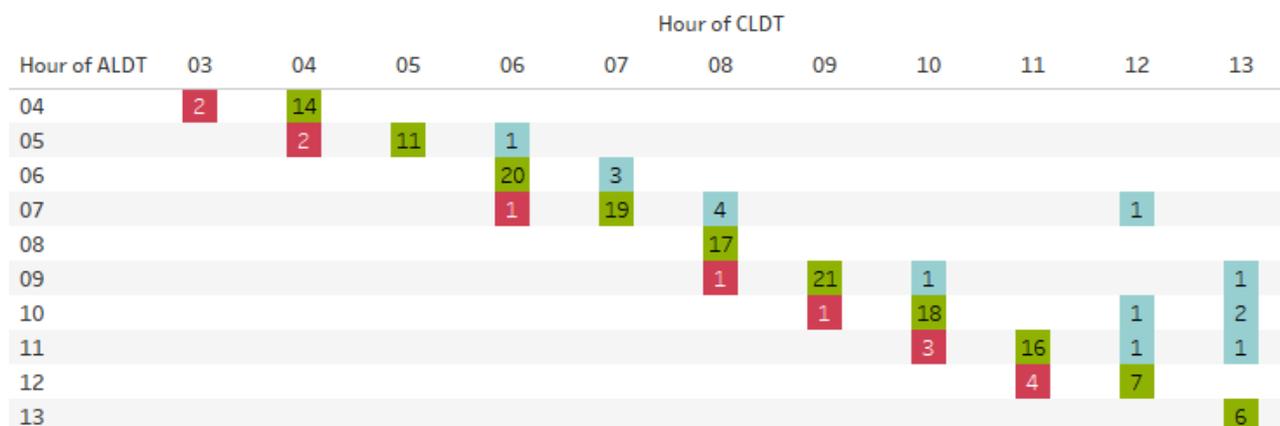


Figure 4: Arrival accuracy in hourly windows for 0300-1300z at Brisbane on 29 March 2018. Red boxes show flights that landed in the hour after their calculated landing time (CLDT); blue boxes show flights that landed in the hour before their CLDT.

The overdelivery in 06z and 07z, as well as the early presenting flights, were not predictable at the time of the revision. A smaller or shorter reduction in the rates for the revision would have risked the delay increasing or reappearing later in the program. These risks were more acute on the day before Easter which has the highest volume of traffic for the year.

Summary

An oversubscription of planned arrivals was observed in the 0600z hour at Brisbane on 29 March 2018. A Level 2 Revision was run at 0603z with rates of 22 for the remainder of the program. The revision realigned the program, and the revised rates created a firebreak to ensure delay would not rise again. This was particularly in light of terminal area diversions which had the potential to affect actual landing rates. The revision was observed to successfully constrain arrival airborne delay (75th percentile of arrival airborne delay peaked at nine minutes in 06z and dropped to three minutes in 08z).

An earlier revision was not a realistic option as the delay would not have been reflected in the Maestro ladder at that time and Harmony demand estimates are uncertain when there are many flights which have not departed. A smaller or shorter reduction in the rates for the revision would have risked the delay increasing or reappearing later in the program. These risks were more acute on the day before Easter which has the highest volume of traffic for the year.

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

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.