ATM Network Performance Report
December 2017

Foreword

Welcome to this edition of the monthly ATM Network Performance Report for December 2017.

Airborne Delay during the month of December was lower (better) than KPI targets. Over recent years, performance in the month of December has been consistently better than KPI targets. We have not identified a clear driver for this seasonal improvement performance except to say that it is not associated with a reduction in traffic volumes. There were 80,000 movements at Sydney, Melbourne, Brisbane and Perth airports during the month of December. This is consistent with the previous month and consistent with the same time last year.

In the previous edition, we analysed the relationship between Calculated Take-Off Time (CTOT) and Actual Take-Off Time (ATOT). This month there is a brief analysis of tactical revisions to the Ground Delay Program.

We have increased our tempo in post-operational analysis. This edition includes four deep-dive reviews of challenging network conditions experienced through December. These reviews are initiated following a daily triage of the previous day.

Over time, these insights will be captured and be used to improve the body of knowledge of Network Operations through the industry.

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 E**.

1.2 Overview

The combined 75th Percentile performance for Airborne Delay across the four major airports was **3.3** minutes, and the median was **0.5** minutes.

These monthly performance figures were an improvement of 0.5 minutes delay (75th percentile) from the previous month and met the KPI targets of 3.5 minutes and 0.6 minutes, respectively.

When compared to the same time last year, the December performance was a marginal improvement of 0.1 minutes in the 75th percentile.

Airborne Delay during December was impacted by ten notable events. Each of these events was weather related. These events and the extent of the Airborne Delay are depicted in **Figure 1** and can be summarised as:

- 5 at Melbourne, 3 at Brisbane and 2 at Sydney.
- The impact of these weather events on airborne delay was less than that experienced during November.
- The Ground Delay Program (GDP) was subject to 14 revisions during December. This included eleven Level 1 revisions, a single Level 2 revision and two Level 3 revisions.

GDP revisions are discussed in more detail in Section 3.

Of the ten notable events experienced in December, four were subject to a detailed Post Operational Performance Reviews. These Reviews are available in **Appendix A-D.**

The key learnings from the Reviews highlight what are already known factors in a dynamic network management system where the impacts of weather and traffic subtly change each day. The learnings were:

- Low GDP compliance and slot accuracy in an environment where demand is closely aligned with capacity can result in unutilised capacity and cascading delays. This is particularly relevant during morning arrival peak periods where a number of arriving international aircraft can compound the issue.
- Accurate predictions on the duration of severe weather events and expected recovery time leads to improved industry outcomes.

Knowledge about the frequency of these factors will be captured over time to inform tactical decision making and strategic planning.

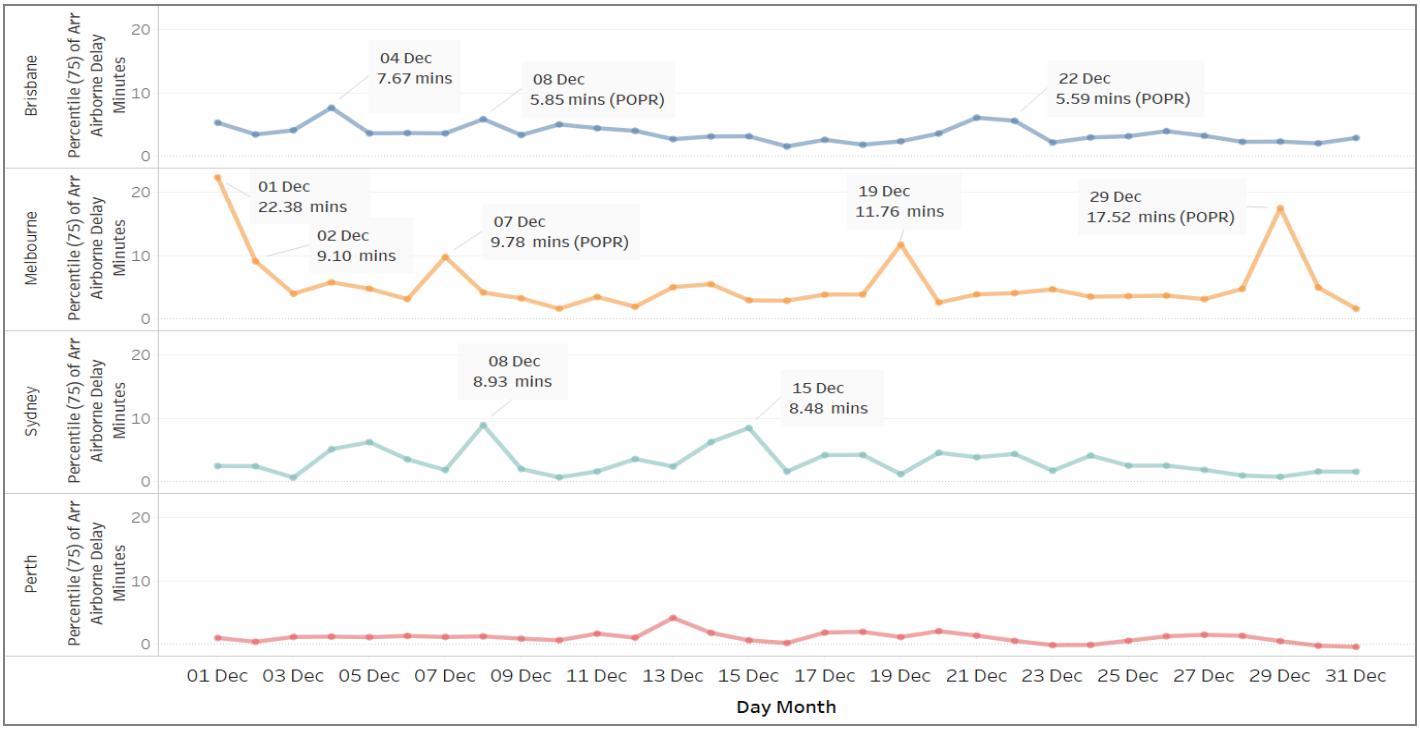

Figure 1: Notable delay impact events during December 2017

(POPR indicates that a Post Operational Performance Review of this event is available in Appendix A-D)

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 2 indicates that the long-term trend is upwards.

Figure 3 shows the long-term trends for each of the four major airports. The long terms trends for Sydney and Melbourne are upwards, and downwards for Brisbane and Perth. More detailed analysis is presented for each of the airports later in this report.

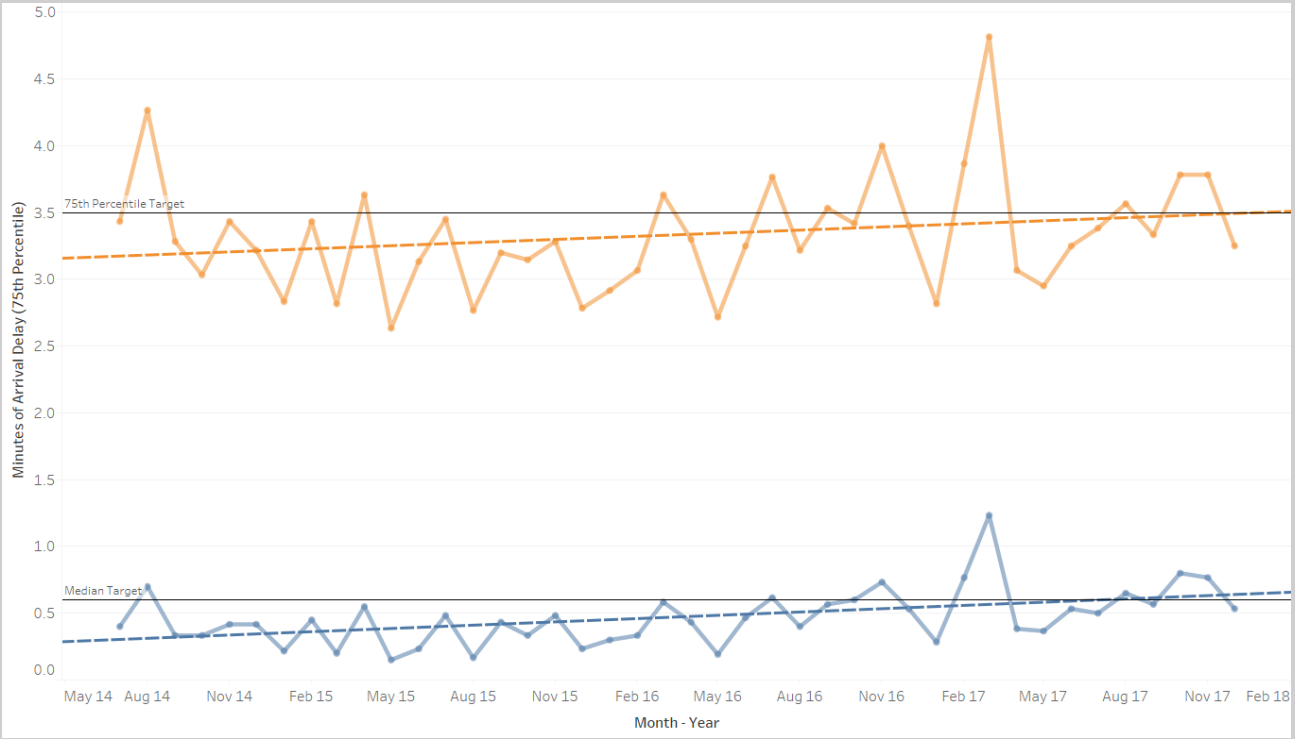

Figure 2: Long-term combined Airborne Delay median and 75th percentile (July 2014 to December 2017), and corresponding targets.

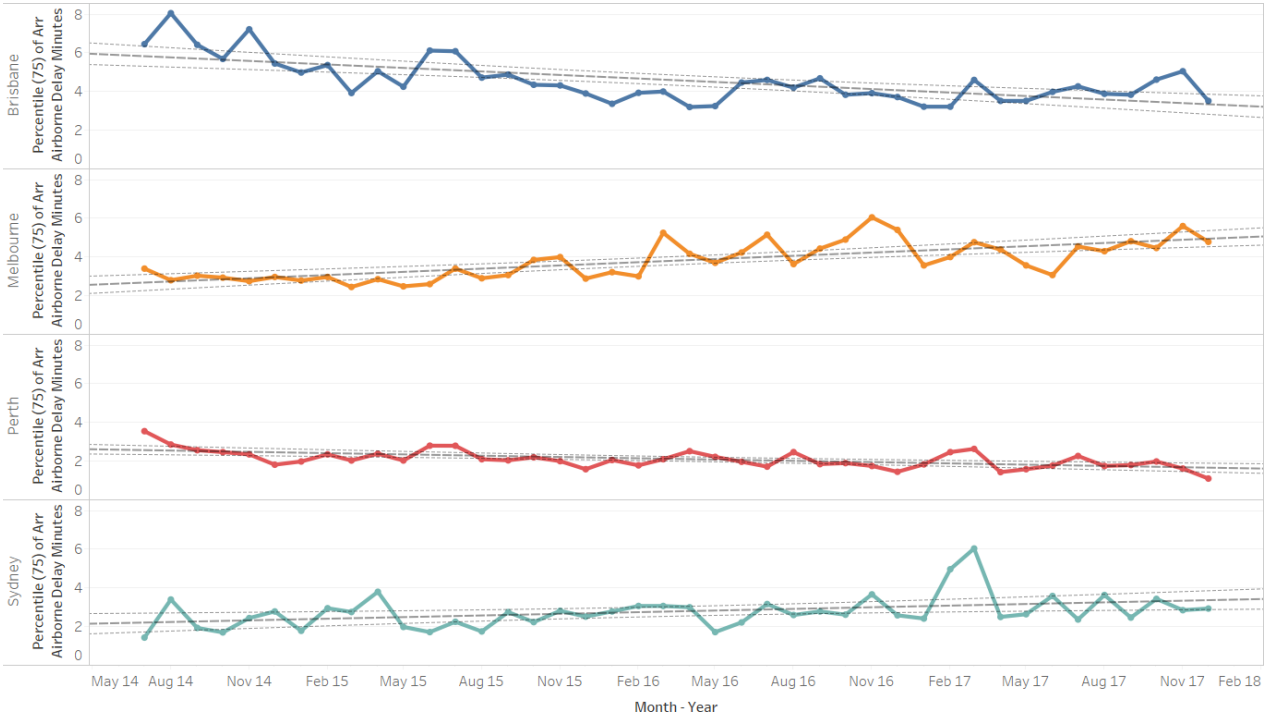

Figure 3: Long-term Airborne Delay 75th percentile[1] by airport (July 2014 to December 2017)

[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.

3 GDP Revisions

3.1 Background

For flights landing at Sydney, Melbourne, Brisbane and Perth, a prediction of the airport capacity during each hour of the day is undertaken based on forecast weather and other operating constraints. This is compared to predicted demand for slots at the airport using flight schedule information. Where it is predicted that the demand at the airport will be greater than the capacity, a ground delay is allocated to flights so that a delay can be absorbed prior to take-off rather than airborne.

The allocated ground delay is specified to the pilot as a “push-back time”, that is the time at which the pilot is required to push back from the gate in order to meet their allocated slot at the destination. The pilot has a 20 minute compliance window to meet this time.

During operations, the GDP may require revision due to a variety of reasons. Typical reasons include a variation to the capacity of the airport due to a change in weather conditions or the widespread inability to meet allocated slot times.

3.2 Levels of Revision

- **Level 1** Revisions are a standard revision where circumstances change and the rate needs to be amended. There is a 30 minute grace period following a Level 1 Revision where a flight can continue utilise its previously allocated push back time.
- **Level 2** Revisions apply where the demand-capacity situation is starting to deteriorate and the destination airport is no longer able to maintain the predicted capacity. Flights that have already pushed-back can depart during in a Level 2 revision but all other flights must obtain a new push-back time.
- **Level 3** Revisions apply when an airport cannot accept any flights for a certain period. Flights must not depart for that airport until the GDP is revised and immediate compliance with the new push back time is required.

Ideally, the network performs and is being managed in a way that precludes the need for GDP Revisions. However, revisions are a necessary tool to maintain GDP effectiveness where conditions require.

3.3 Analysis

The number of GDP Revisions undertaken is the past thirteen months is presented in **Figure 4.**

From the data that has been collected to date and the analysis that has historically been conducted, trends and causal factors for GDP Revisions have not been identified. Future reporting and analysis will focus on identifying causes and obtaining more information from tactical decision makers.

This will support an assessment of the effectiveness of the tactical decision and ultimately the development of lead indicators which may provide an early intervention and potentially shift away from more disruptive revisions.

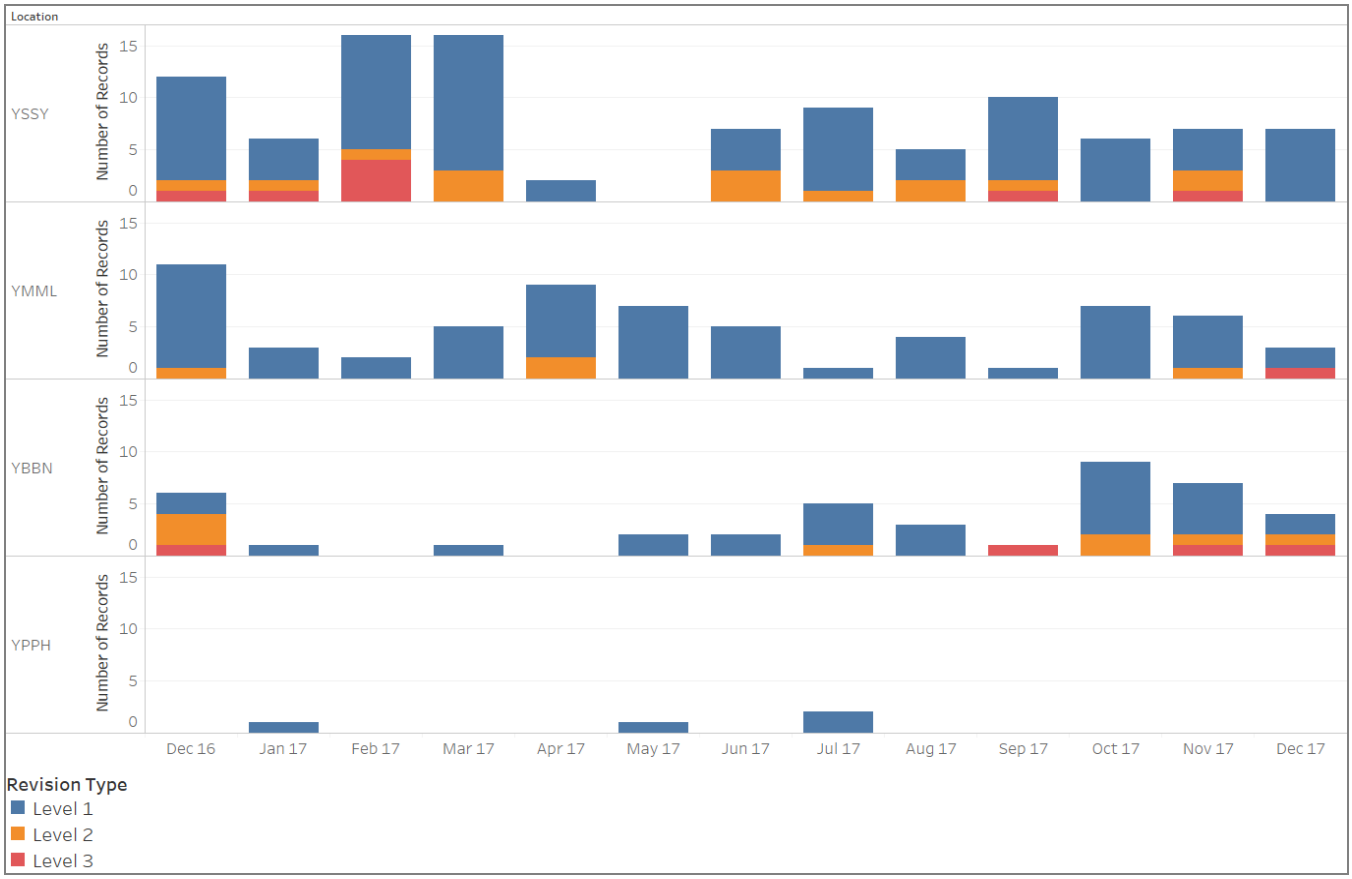

Figure 4: GDP Revisions by airport

(December 2016 to December 2017)

4 Sydney

4.1 Airborne Delay

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

Airborne Delay experienced during December (2.9 minutes) met target but was slightly higher than the same period last year. The long-term trend for Airborne Delay at Sydney is upwards.

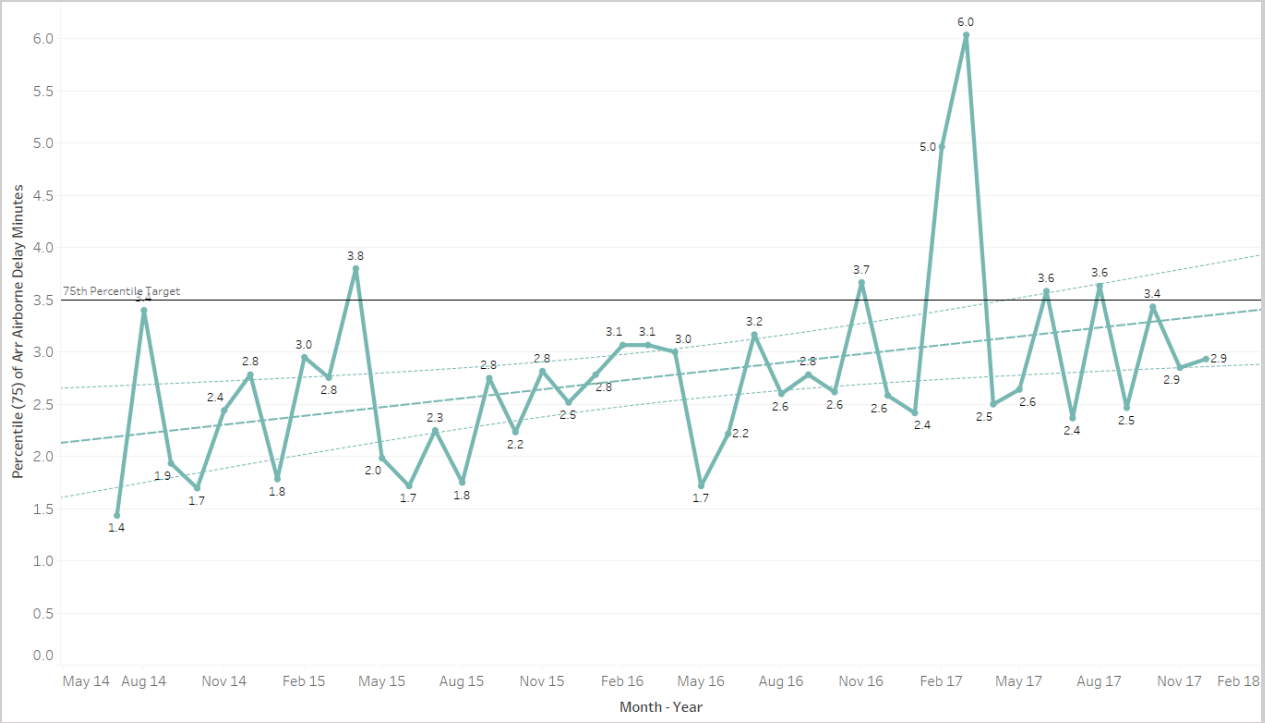

Figure 5: Sydney Airborne Delay 75th Percentile

4.2 Notable Events

The following commentary describes the notable Airborne Delay events during December in Sydney:

- 08 & 15 December:
  - The impact of thunderstorms during the afternoon period was larger than forecast.

5 Melbourne

5.1 Airborne Delay

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

December performance (4.8 minutes) did not meet target, however performance was better than same period last year. The long-term trend for Airborne Delay at Melbourne is upwards.

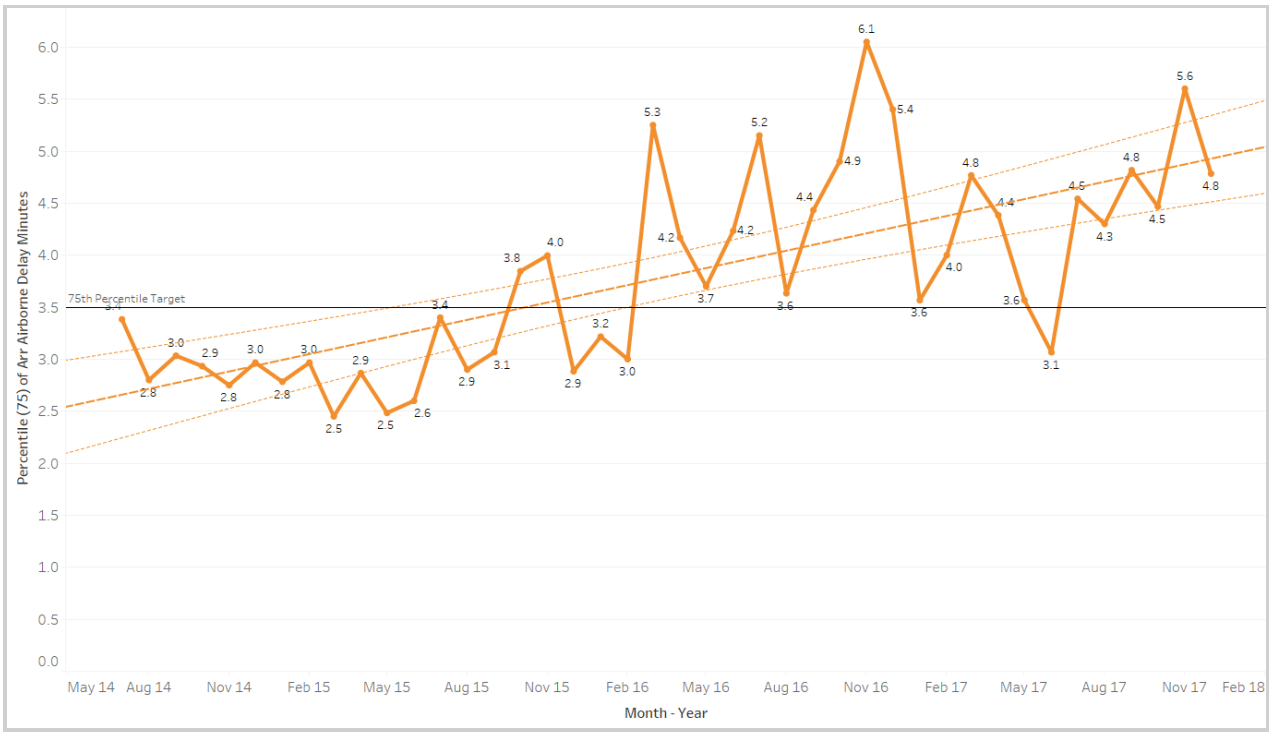

Figure 6: Melbourne Airborne Delay 75th Percentile

5.2 Notable Events

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

- 01 December;
  - Thunderstorms experienced during the morning period.
- 02 December:
  - Low visibility procedures and extended periods of low cloud.
- 07 December:
  - Thunderstorm activity during the evening resulted in reduced capacity;
  - Higher levels of non-compliance noticed on the Sydney-Melbourne city pair possibly arising from increased taxi times in Sydney;
  - Adjustments to the tactical arrival rates and proactive compliant monitoring minimised the impact of thunderstorms to a 75th Percentile result of 9.78 minutes of Airborne Delay.

- A detailed Post Operations Performance Review can be found in **Appendix A.**

- 19 December:
  - Active thunderstorm front passed through the Melbourne area;
  - Numerous missed approaches required to be re-sequenced and led and increase in Airborne Delays.
- 29 December:
  - Thunderstorms and low cloud persisted longer than originally forecast;
  - Application of a Level 1 GDP Revision was not consistent with standard procedures and caused confusion and an increase in communications;
  - This was compounded by slot accuracy and GDP compliance issue and resulted in a 75th Percentile result of 17.52 minutes of Airborne Delay;
  - A detailed Post Operations Performance Review can be found in **Appendix D**.

6 Brisbane

6.1 Airborne Delay

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

December performance (3.5 minutes) met the target and Airborne Delays were lower than same period last year. The long-term trend for Airborne Delay at Brisbane is downwards.

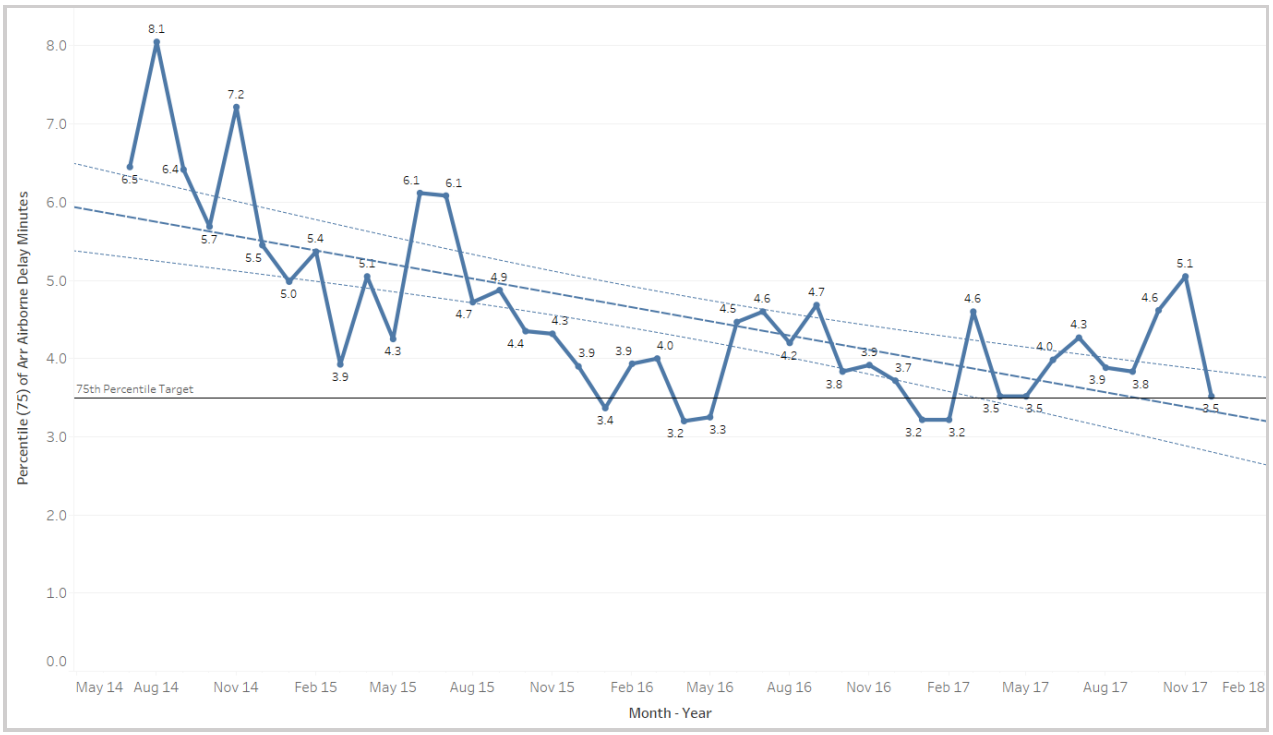

Figure 7: Brisbane Airborne Delay 75th Percentile

6.2 Notable Events

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

- 04 December:
  - Forecast thunderstorms resulted in low capacity;
  - Demand was very closely matched to capacity for the entire day meaning that Airborne Delay was acutely linked to GDP compliance and slot accuracy.
- 08 December:
  - Thunderstorm directly over the airport led to a period with no arrivals;
  - Level 3 Revision was implemented including a one hour period with zero arrivals;
  - Airborne Delay 75th Percentile was 5.85 minutes.
  - A detailed Post Operations Performance Review can be found in **Appendix B.**
- 22 December:
  - It was identified that the late afternoon period was going to experience a higher number of late non-compliant arrivals from the early afternoon, along with a number of early non-compliant arrivals from the early evening. This would lead to high levels of Airborne Delay.
  - A Level 2 GDP Revision was initiated and the Airborne Delay 75^{th} Percentile was limited to 5.59 minutes;
  - A detailed Post Operations Performance Review can be found in **Appendix C.**

7 Perth

7.1 Airborne Delay

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

December performance (1.1 minutes) met the target and Airborne Delay was also lower than same period last year. The long-term trend for Airborne Delay at Perth is downwards.

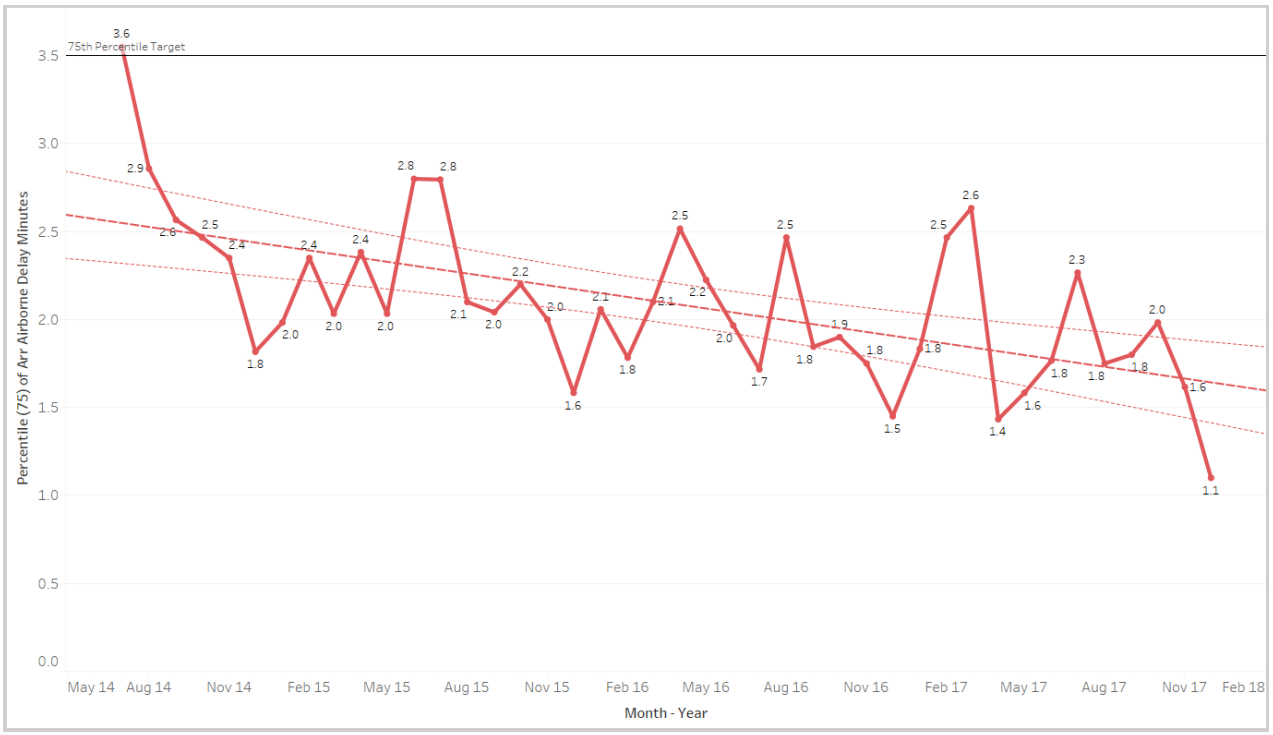

Figure 8: Perth Airborne Delay 75th Percentile

7.2 Notable Events

There were no notable events for Perth in December.

8 Appendix A

Post Operational Performance Review

Melbourne Airport – 7th December 2017

Event Description

A review was initiated into an elevated delay period from 0400z to 1000z at Melbourne Airport on the evening of the 7th December 2017 as a result of thunderstorm activity. Specific interest was around Ground Delay Program (GDP) compliance leading into the event and the recovery after the event.

Thunderstorms were predicted to affect the airport from 0700z. The thunderstorms stopped arrivals between 0711z and 0735z. Six aircraft were re-sequenced to runway 09. Conditions required the Melbourne and Essendon sequences to be dependant. The extra delay this caused in the Melbourne sequence was partly offset by operating at a higher tactical acceptance rate than planned for in the GDP by the MET-CDM process. The MET-CDM plan also included a reduced rate to account for the anticipated thunderstorms.

Analysis

Figure 1 below shows arrivals by hour (grey bars), tactical (red triangles) and pre-tactical rates (green triangles). Figure 1 indicates the tactical rate was 22 for the 0700z hour when the thunderstorms most severely impacted operations. As a result, no arrivals could be landed for 24 minutes, which is the equivalent of around 8 slots (assuming 3 minute spacing). A total of14 aircraft were landed prior to and after the storm had passed, which sums up to 22, demonstrating good delivery prior to, and following the disruptive event.

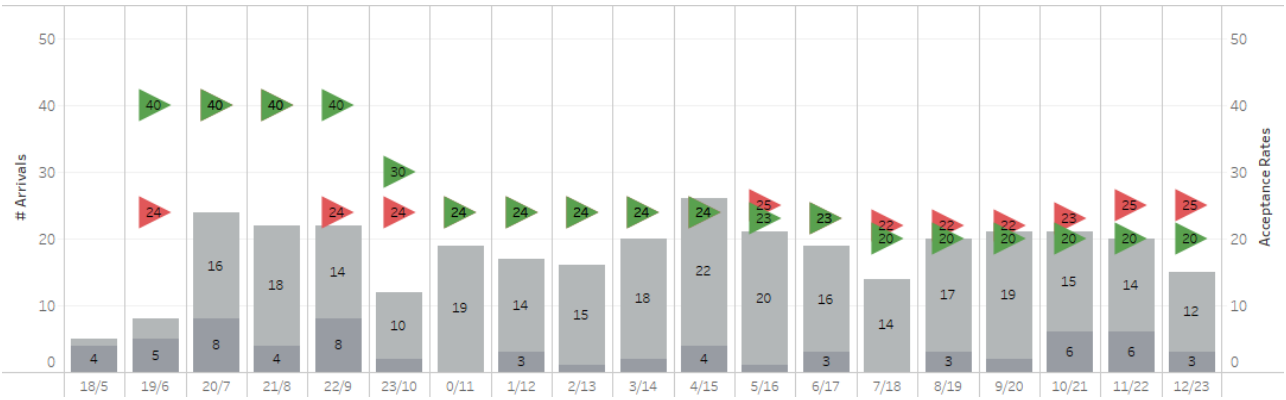

Figure 1- Arrivals by hour, tactical and pre-tactical rates for 7th December 2017 by hour (UTC/local) @ ML. Domestic arrivals in light grey, internationals in dark grey. Pre-tactical rates shown in green, tactical rates shown in red.

Figure 2 on the next page shows compliance with the GDP. Flights are scattered by arrival hour (local time) on the vertical axis, and by GDP compliance on the horizontal axis. Early non-compliance is indicated by an orange marker, and late non-compliance by a red marker. Most significant non-compliant flights are addressed with an identification label. The NCC ALM raised that airlines were contacted about non-compliance. Most of the outliers that were late non-compliant were departing from Sydney and may have incurred increased taxi out times which on occasion, incorrectly infers that they were non-compliant with their off blocks times. The number of non-compliant Sydney flights indicates that there may have been increased taxi times during this period.

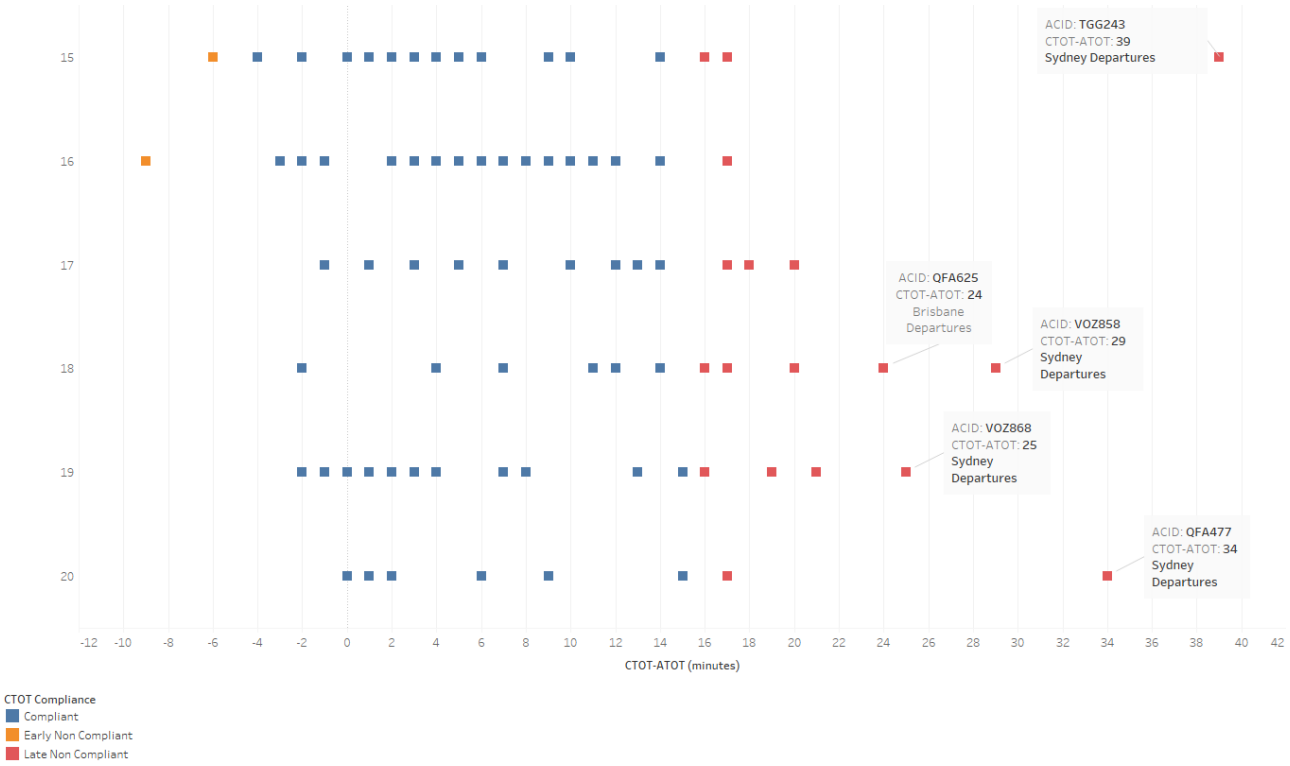

Figure 2 – Calculated take off time accuracy/compliance

Figure 3 below shows the difference between the calculated landing hour (CLDT) and the actual landing hour (ALDT). Take for example the 1700l hour; reading vertically for the calculated landing times, a total of 1 + 16 + 5 = 22 flights were allocated a landing slot within that hour. This division means that one flight arrived in the 1600l hour, 16 flights arrived in the 1700l hour and 5 flights arrived in the 1800l hour. For the same 1700l hour, reading horizontally for the actual landing times, a total of 3 + 16 = 19 flights arrived in that hour. Of these 19 flights, the first 3 actually had a landing time in the 1600l hour. Figure 3 therefore illustrates whether the pre-tactical plan was achieved and what the delivery accuracy of that plan was (in terms of meeting the allocated landing slot). In the case of increasing delays this graphic will generally show a cascading effect of late aircraft shown in red, as aircraft arrive late due to airborne delays.

Closer investigation shows that 5 flights, which were supposed to land in the 1700l hour, arrived later and landed in the 1800L hour (indicated by red 5 on 1800l ALDT horizontal and 1700l CLDT vertical). These five flights displaced several flights that were anticipated to land before the storm. At 3 minute spacing, this consequently equalled 15 minutes of additional delay for all flights arriving after the storm during the high demand period.

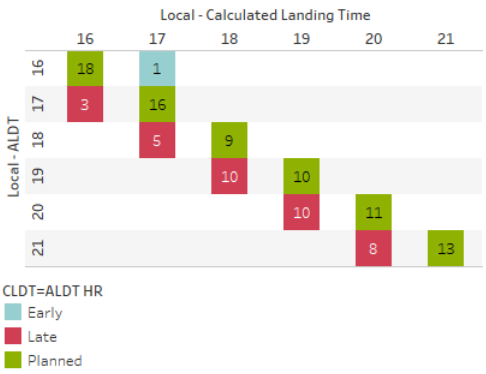

Figure 3 – Calculated landing hour vs actual landing hour.

Summary

Based on the sequence of events, and noting the uncertainty of thunderstorm activity, the Traffic Managers and NCC achieved good outcomes, through their management of the event through MET CDM, adjusting the tactical rates, and the required runway changes. Proactive measures taken by the NCC to ensure aircraft were compliant with their off block times, indicates this is an important part in managing delays.

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

9 Appendix B

Post Operational Performance Review

Brisbane Airport - 8th December 2017

Scope & Event Description

This review focuses on the recovery from a thunderstorm event at Brisbane on December 8th 2017. The following reports were used as a source of information: ATFM Post Operational Report, MET CDM Report Run 1 and MET CDM Report Run 2 and Daily Post Operational Performance Report.

A revision of the MET CDM process was initiated at 0100Z predicting thunderstorms to impact the airport 0300Z vice 0500Z (early afternoon local time). This lead to a Level 1 GDP rerun, with arrival rates during the predicted thunderstorm period revised down from 22 to 18.

At 0300Z the BN ORM advised the NCC that they were not landing aircraft due to the storm being overhead the airport. Subsequently, a Level 3 ground stop revision was implemented. The GDP was revised at 0315Z, with a rate of zero for the next hour, then as planned (from Level 1 revision at 0100Z).

The last aircraft to land before the storm was at 0240Z. The first aircraft to land after some of the storm had passed was at 0326Z, which was a gap of 46 minutes between landings.

Figure 1 shows the landed throughput that was maintained with reference to the planned rate.

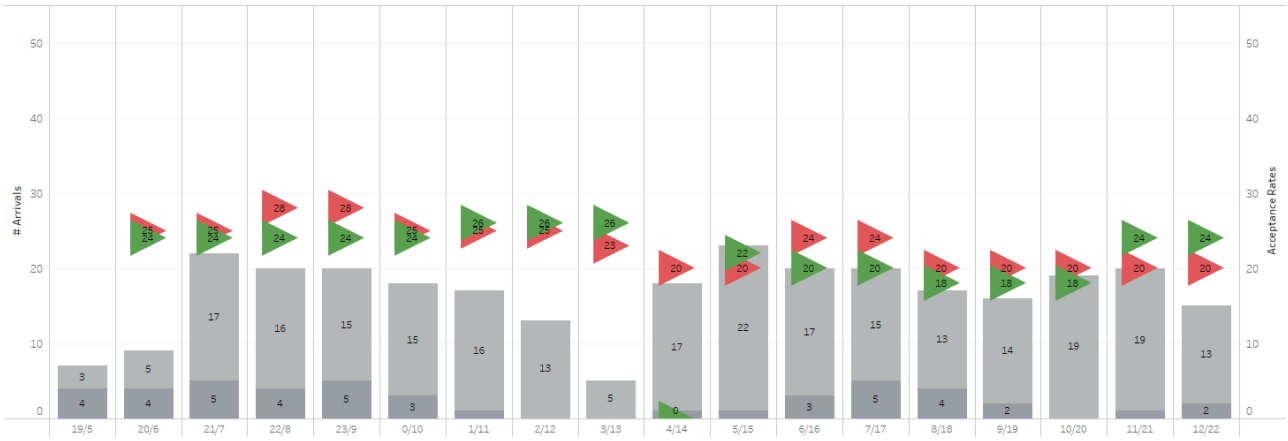

Figure 1: Arrivals by hour, tactical and pre-tactical rates for 8th December 2017 by hour (UTC/local) @ BN. Domestic arrivals in light grey, internationals in dark grey. Pre-tactical rates shown in green, tactical rates shown in red.

Figure 2 shows the impact of the GDP revisions and the resulting airborne delay.

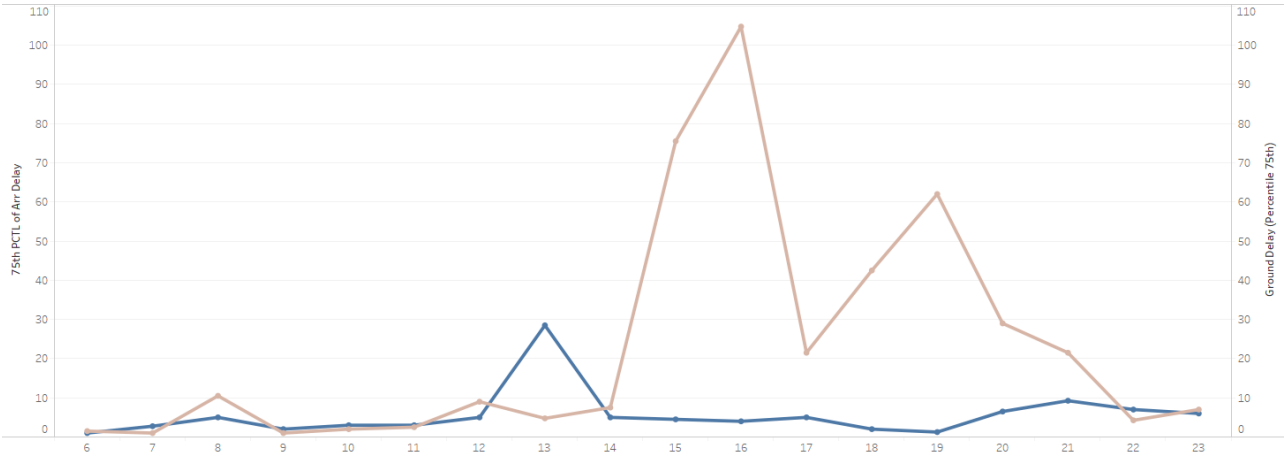

Figure 2: Airborne delay (75th Percentile) in blue, and ground delay taken (75th Percentile) in beige by hour (local) for 8th December 2017 @ BN

Analysis

The analysis presented below focussed on the landing sequence after the thunderstorms had passed, to validate the implemented ground stop.

Table 1 presents the landing sequence from 0226Z to 0457Z. The storm passed approximately between 0240Z and 0355Z with a few aircraft capable of making a successful approach within that period. Once the storm had passed, there were two slightly longer gaps in the sequence which amounted to around 2-3 slots based on a 3 minute spacing (see Table 1). The larger gap coincided with a decrease in observed airborne delay indicating a reduction in pressure. A playback also confirms this. However, two aircraft landed within the hour blocked out due to storm activity, which otherwise would have provided increased pressure upon passing of the storm. Given the uncertainty of the event, the outcome was favourable for industry as delays did not become excessive and only a small number of slots may have gone un-utilised. A shorter ground stop period would likely have resulted in elevated airborne delays, arguable for a similar outcome in terms of delivery to the runway.

Summary

Based on the sequence of events, and noting the uncertainty of thunderstorm activity, the NCC and TMs achieved good outcomes through their management of the event through MET CDM and the tactical ground stop with accordingly adjusted rates.

It is unclear what information the TM in BN had to make the determination to do a ground stop for one hour. An action is to close the loop on this and source the information.

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

Appendix

Table 1 - Aircraft landing order and spacing analysis

ACID	Actual Landing Times	DELAY MAESTRO (Minutes)	Spacing Between Landings(minutes)	Comments
JST758	8/12/2017 2:26	2	-	
VOZ939	8/12/2017 2:28	0	02:00	
TGG522	8/12/2017 2:32	0	04:00	
JST887	8/12/2017 2:40	16	08:00	
QLK422D	8/12/2017 3:26	17	46:00	thunderstorms hit
QFA616	8/12/2017 3:40	23	14:00	
VOZ327	8/12/2017 3:44	45	04:00	
JGO54	8/12/2017 3:53	-	09:00	
QFA650	8/12/2017 3:57	17	04:00	
VOZ372	8/12/2017 4:01	43	04:00	
VOZ943	8/12/2017 4:03	30	02:00	
QLK531D	8/12/2017 4:06	41	03:00	
TGG524	8/12/2017 4:07	47	01:00	
VOZ610	8/12/2017 4:13	4	06:00	Potential under utilisation
TGG368	8/12/2017 4:22	0	09:00	Potential under utilisation
QFA618	8/12/2017 4:25	0	03:00	
QFA534	8/12/2017 4:28	2	03:00	
QJE1546	8/12/2017 4:31	4	03:00	
QLK541D	8/12/2017 4:34	2	03:00	
QLK455D	8/12/2017 4:37	5	03:00	
QFA514	8/12/2017 4:40	2	03:00	
SGY	8/12/2017 4:43	1	03:00	
VOZ117	8/12/2017 4:47	0	04:00	
QFA644	8/12/2017 4:49	0	02:00	
QFA662	8/12/2017 4:51	0	02:00	
QJE1779	8/12/2017 4:53	-	02:00	
QFA524	8/12/2017 4:57	0	04:00	

10 Appendix C

Post Operational Performance Review

Event date: Brisbane 22nd December 2017

Event Description

An elevated arrival delay was observed in the afternoon period around 0800-1000z at Brisbane on December 22nd 2017 (see Figure 1). The peak of the airborne arrival delay (75th percentile) was close to 25 minutes and was sustained over a 3 hour period. The level of delay and feedback from airline customers triggered an investigative look to see what happened on the day and how we can improve Network Performance next time these conditions present.

As result of updated MET-CDM advice at 0210z, airlines agreed to a rate reduction from 24 to 20 from 0600z for a level 1 revision (see Figure 2 for illustration in rate revisions) to mitigate the risk of afternoon thunderstorms. At 0820z NCC supervisor and BN ORM decided that a level 2 revision was required due to the high non-compliance and weather impacts. At 0839z NOTAMed holding increased from 20 minutes to 30 minutes due to presence of thunderstorms (TSRA) between 09z to 11z. From 1030z, conditions improved and 2 tactical releases per half hour were approved.

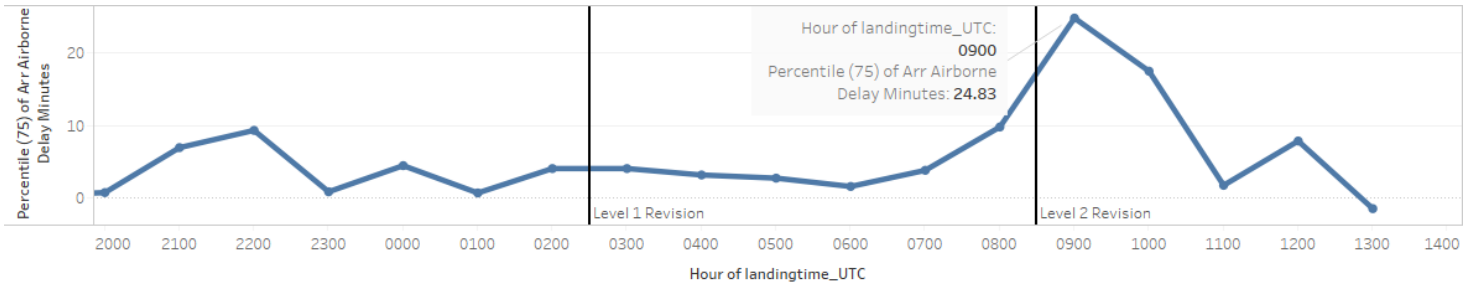

Figure 1: An analysis of arrival airborne delay using ODAS data. Delay is calculated as the flight time within 250NM of the arrival airport from the actual track minus the same value from the trajectory created from the flight plan. The 75th-percentile has been calculated for each hour block from 2000 to 1300 UTC.

Figure 2: Arrivals by hour, tactical and pre-tactical rates for 22nd December 2017 by hour (UTC/local) @ BN. Domestic arrivals in light grey, internationals in dark grey. Pre-tactical (METCDM) rates shown by green triangles, tactical rates shown by red triangles.

Analysis

A level 1 revision was run at 0230z, and subsequently a level 2 revision was run at 0830z stemming from numerous and large non-compliances. Operational commentary from both the TCU and NCC cited wide spread non-compliance. A list of non-compliant aircraft have been compiled in 2 tables by the NCC and non-compliances confirmed with the operators (see appendix). Table 1 lists 17 non-compliant aircraft including 3 GAM, 5 VOZ, 6 QFA, 1 JST, and 1 JGO. Table 2 lists 7 aircraft that were tactically released or had extenuating circumstances.

Figure 3 below shows compliance with the GDP. Flights are scattered by arrival hour (local time) on the vertical axis, and by GDP compliance on the horizontal axis. Early non-compliance is indicated by an orange marker, and late non-compliance by a red marker. Most significant non-compliant flights are addressed with an identification label. It illustrates that there are many late non-compliant aircraft leading up to 0900 when the airborne and ground delay begins to elevate (see Figure 1).

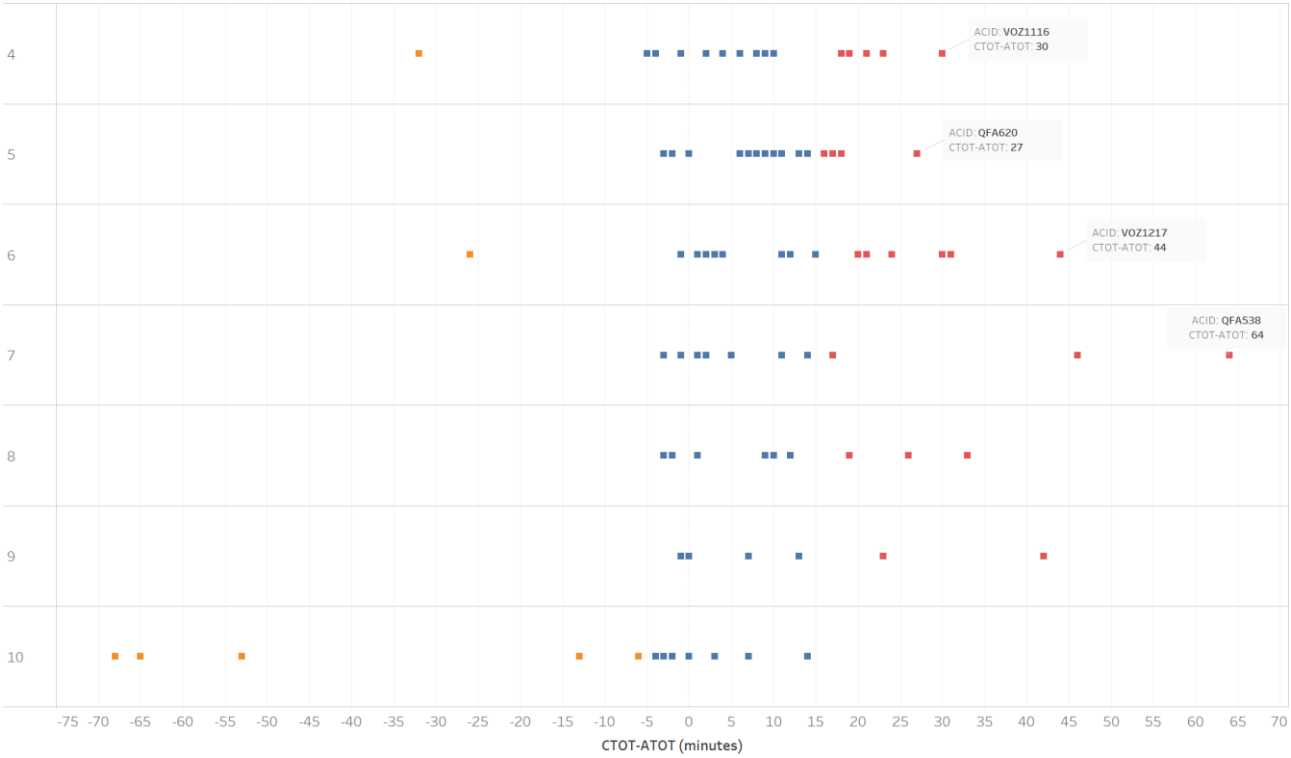

Figure 3: The compliance of flights landing at Brisbane Airport. The y-axis shows hour blocks from 04z to 10z representing the actual landing time of the flight. The x-axis shows (in minutes) the difference between the CTOT and ATOT (CTOT minus ATOT) – early non-complaint flights are marked in orange and late non-compliant flights are marked in red. Several aircraft with large non-compliances have been marked with call signs.

The impact of non-compliance is further illustrated by Figure 4 to Figure 7. Figure 4 to Figure 7 show the arrival demand for Brisbane as presented by Harmony at different moments in time. Figure 4 shows the arrival demand at 0231z, just after the level 1 revision in anticipation of the forecast afternoon thunderstorms. The declared capacity between 0600z and 1200z was set to 20 to mitigate for the thunderstorm risk (white dotted line). Up to 0500z, there is spare capacity in the system (partially white bars), but during the period of thunderstorm risk, the program is full.

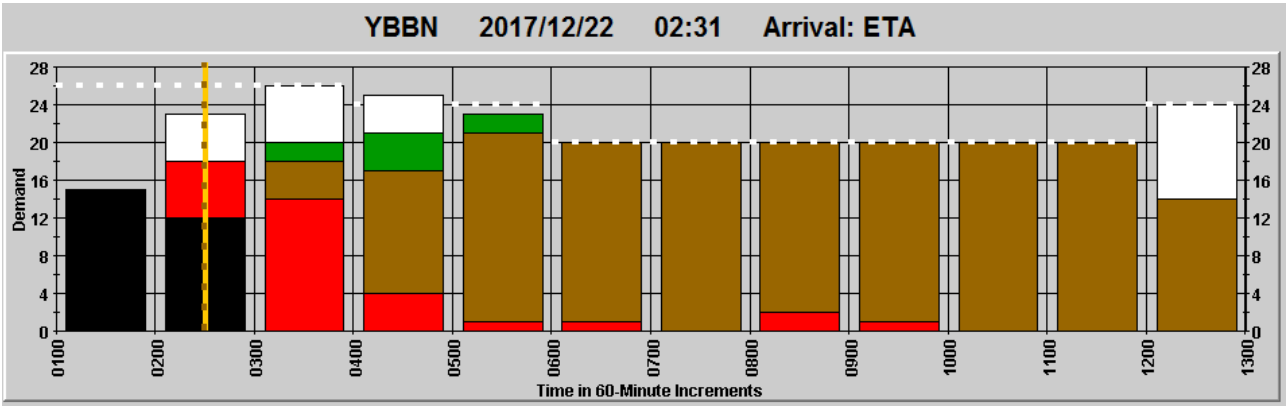

Figure 4: Demand for YBBN in Harmony at 0231z, just after the level 1 revision.

Figure 5 shows the demand in Harmony approximately 2.5 hours later at 0500z. At 0231z, the expected demand for the 03z hour was 20 (Figure 4), but only 18 aircraft actually landed in that hour. In addition, 2 aircraft planned for the 04z hour had not yet departed at 05z (indicated by green bar). Demand for the 05z hour was 23 as planned, but there was an over-subscription of 4 aircraft for the 06z hour.

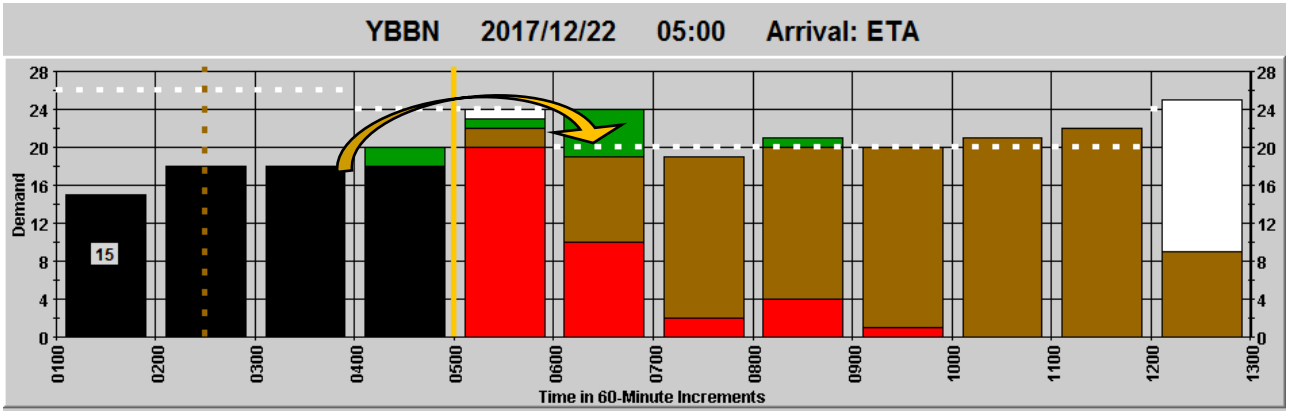

Figure 5: Demand for YBBN in Harmony at 0500z.

Figure 6 shows the demand in Harmony at 0700z. Due to a higher tactical arrival rate, the over-subscription for the 06z hour could be landed, but now also an over-subscription of 4 aircraft for the 08z hour appears. This over-subscription appears to be partly caused by demand for later hours shifting early (e.g. compare the brown bars for the 11z and 12z hour between Figure 5 and Figure 6).

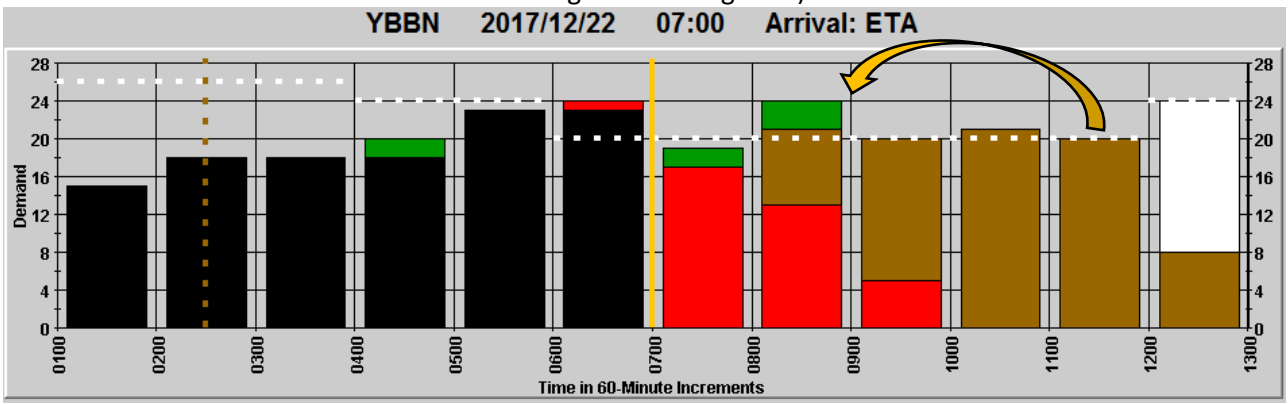

Figure 6: Demand for YBBN in Harmony at 0700z.

Figure 7 shows the demand in Harmony at 0830z, just prior to the level 2 revision. At this stage, thunderstorms are impacting operations with only 5 aircraft that landed between 0800z and 0830z. The demand is subsequently pushed into later hours, compounded by the over-subscription already noted at 0700z (Figure 6 and further demand that shifted early from later hours (demand for 11z hour now 18 instead of planned 20).

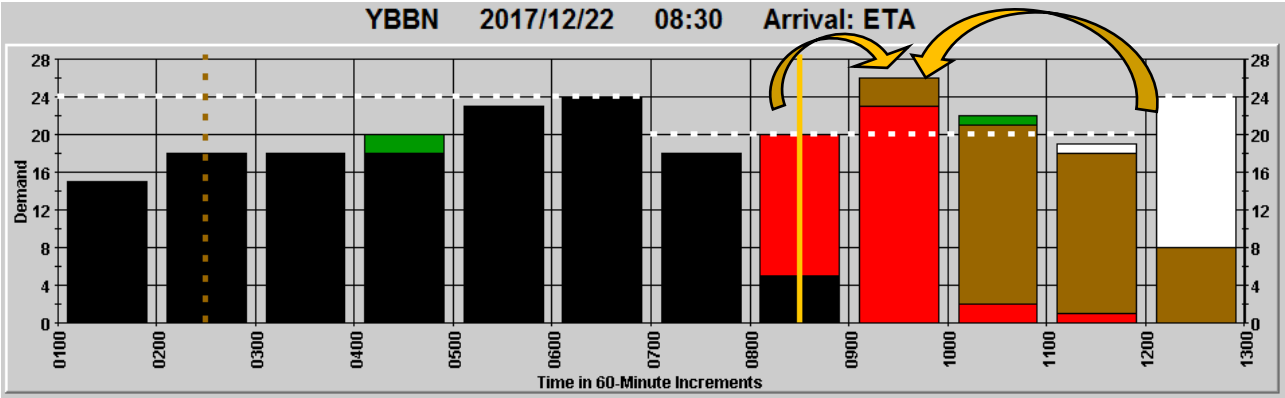

Figure 7: Demand for YBBN in Harmony at 0830z, just prior to the level 2 revision.

In summary, a combination of both early and late non-compliance after the 0231z level 1 revision shifted demand into the thunderstorm risk period, causing significant over-subscription at the time thunderstorms actually hit the airport. A level 2 revision was subsequently required to mitigate the situation and re-align demand with declared capacity.

Causal Factors

- Many non-compliant flights
- Storms impacted both TMA and airport

Outcome

An increased workload across all involved parties including NCC, TMA and Airlines due to high levels of non-compliance compounded by thunderstorm activity. This also resulted in an elevated delay for 3 hours and an increased level of tactical intervention.

References

ATFM Post Operational Report

METCDM Report

Appendix

Table 1: Actual non-compliant aircraft (source: NCC)

1	22/12/2017	YBBN	VOZ1116	Virgin australia	**Late non compliant 30 mins**
2	22/12/2017	YBBN	QFA620	QANTAS	**Late non compliant 27 mins**
3	22/12/2017	YBBN	VOZ333	Virgin australia	**Late non compliant 31 mins**
4	22/12/2017	YBBN	VOZ1217	Virgin australia	**Late non compliant 43 mins**
5	22/12/2017	YBBN	QFA624	QANTAS	**Late non compliant 46 mins**
6	22/12/2017	YBBN	JGO31	JETGO	**Late non compliant 29 mins**
7	22/12/2017	YBBN	QFA538	QANTAS	**Late non compliant 64 mins**
8	22/12/2017	YBBN	QFA664	QANTAS	**Late non compliant 32 mins**
9	22/12/2017	YBBN	VOZ1248	Virgin australia	**Late non compliant 33 mins**
10	22/12/2017	YBBN	VOZ1225	Virgin australia	**Late non compliant 42 mins**
11	22/12/2017	YBBN	QFA542	QANTAS	**Late non compliant 26 mins**
12	22/12/2017	YBBN	VEM	CORPORATE AIR	**Early non compliant 65 mins**
13	22/12/2017	YBBN	UJX	GAM	**Early non compliant 53 mins**
14	22/12/2017	YBBN	VJN	GAM	**Early non compliant 32 mins**
15	22/12/2017	YBBN	QFA656	QANTAS	**Early non compliant 34 mins**
16	22/12/2017	YBBN	JST833	Jetstar	**Early non compliant 16 mins**
17	22/12/2017	YBBN	UJS	GAM	**Early non compliant 68 mins**

Table 2: Tactical and extenuating circumstances (source: NCC)

1	22/12/2017	YBBN	QLK327D	QANTAS	Departed IAW COBT before Level 1 revision.
2	22/12/2017	YBBN	VOZ2972	Virgin australia	Tactical release
3	22/12/2017	YBBN	RXA5661	rex Regional Express	Tactical release
4	22/12/2017	YBBN	VOZ981	Virgin australia	On take off roll during revision
5	22/12/2017	YBBN	VOZ351	Virgin australia	On take off roll during revision
6	22/12/2017	YBBN	VOZ997	Virgin australia	Tactical release
7	22/12/2017	YBBN	VOZ999	Virgin australia	Tactical release

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11 Appendix D

Post Operational Performance Review

Melbourne Airport – 29th December 2017

Event Description

A review was initiated for operations at Melbourne Airport on the 29th December 2017 for 2 reasons; the first was a query by Virgin Australia Operations regarding the non-standard nature of an early morning revision, and the second was an observation regarding an elevated delay period from 07z to 10z at as a result of forecast thunderstorm activity.

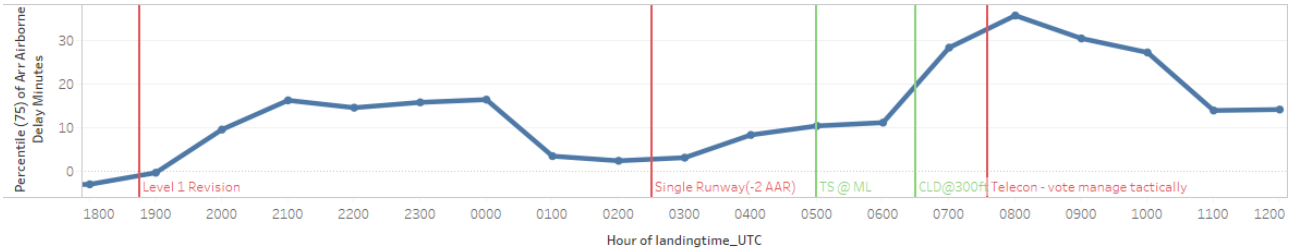

Figure 1: Airborne arrival delay (75th Percentile) into Melbourne for the 29th December 2017 by UTC hour. Red vertical lines represent events or actions, green vertical lines represent significant changes to weather.

Analysis

The post operational log indicated that a Level 1 GDP Revision with no grace period was communicated directly to the airlines. This is inconsistent with the requirements of a Level 1 GDP Revision which includes a 30 minute grace period. The non-standard nature of the Revision caused confusion and increased communication. Action has been undertaken to ensure that the requirements associated with each level of GDP Revision are appropriately applied.

The second part of this review focuses on the evening performance and sequence of events. Figure shows the sequence of events during the day. The timeline shows a series of events (indicated by the vertical lines) that adversely impacted arrival and departure throughput, with resultant increases in airborne delay. Of particular interest is the timing of the 0730z tele-conference, given that two capacity constraining events were already causing significant delays. Through discussions with the NCC, it has been identified that often teleconferences are initiated based on tactical information provided by the traffic managers. Therefore, if the traffic managers do not timely alert the NCC of evolving situations, no action is taken by the NCC as it does not have full situational awareness of tactical operations at each of the major airports. An initiative to examine the provision of real time information to the NCC is underway to improve the situational awareness and reduce the reliance on voice communications and notifications from ANS Operations.

Figure 2 below shows arrivals by hour (grey bars), tactical rates (red triangles) and pre-tactical rates (green triangles). Figure 29 indicates the 23z to 02z had periods where the tactical rate was higher than the pre-tactical rate, however due to the morning weather delays incurred, the demand shifted and the higher arrival acceptance rates were able to be capitalised on(see 00z where the delivery was 24 arrivals and the pre-tactical rate was 22). However, during the 09z to 11z time period the tactical rate was lower than the pre-tactical rate as the Thunder Storms and low cloud persisted longer than originally forecast.

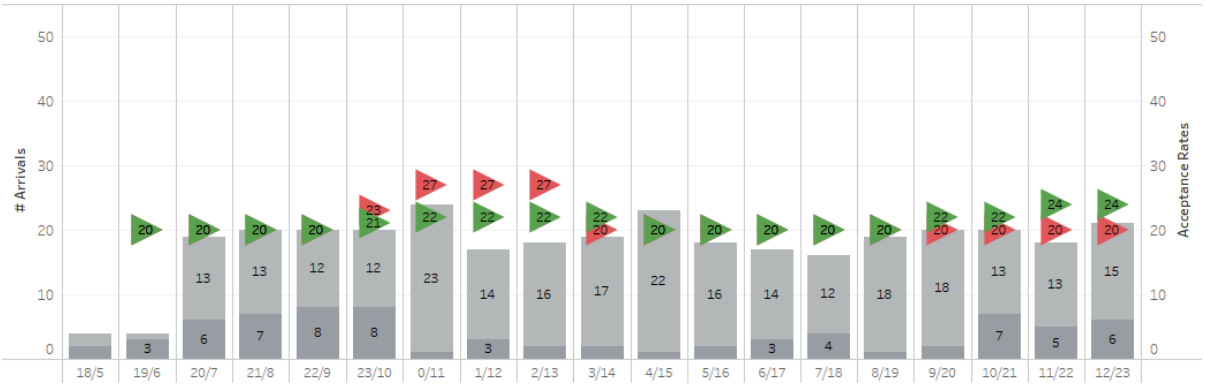

Figure 29- Arrivals by hour, tactical and pre-tactical rates for 29th December 2017 by hour (UTC/local) @ ML. Domestic arrivals in light grey, internationals in dark grey. Pre-tactical rates shown in green, tactical rates shown in red.

Figure 3 below shows the difference between the calculated landing hour (CLDT) and the actual landing hour (ALDT). This figure illustrates whether the pre-tactical plan was achieved and what the delivery accuracy of that plan was (in terms of meeting the allocated landing slot). In the case of increasing delays this graphic will generally show a cascading effect of late aircraft shown in red, as aircraft arrive later than planned due to airborne delays. From the 05 hour CLDT hour we can see an increasing number of 'late' aircraft accumulating due to the TS and low cloud impacts.

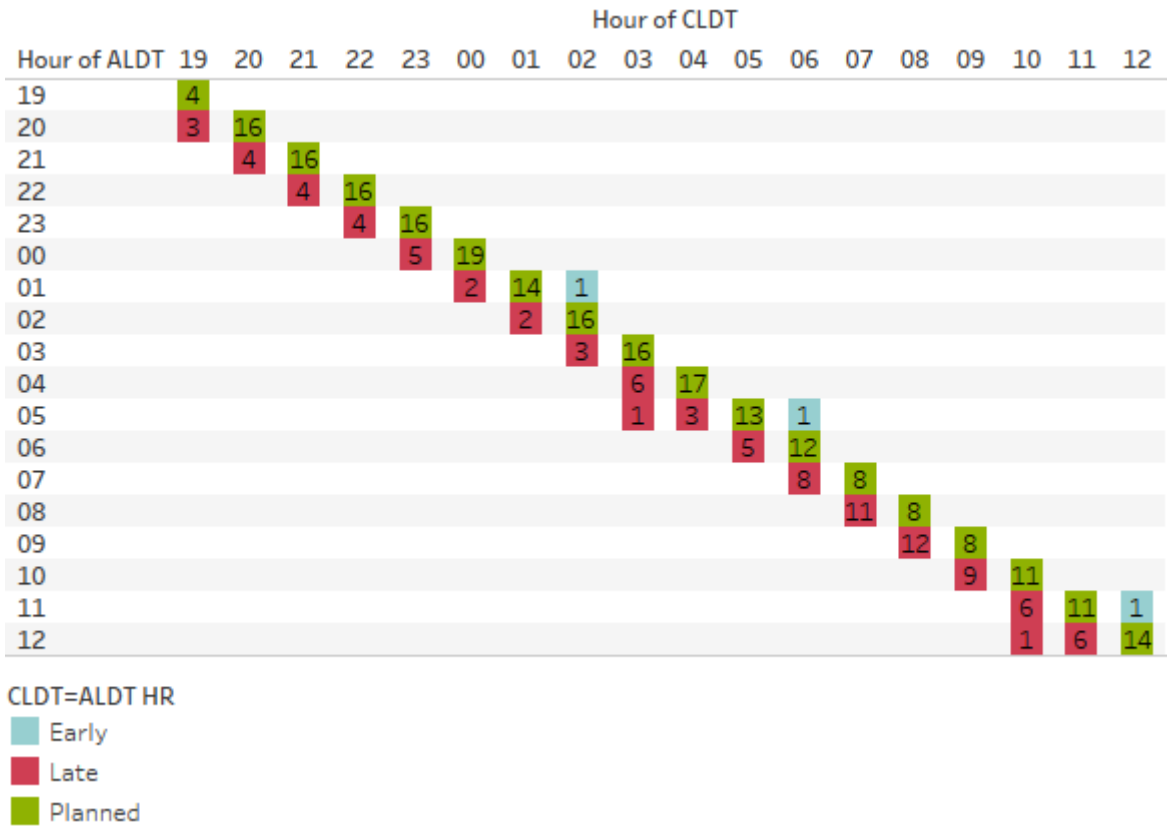

Figure 3: Calculated landing hour vs actual landing hour

Figure 4 shows landing hour by local/UTC, against the difference between calculated take off time and actual take off time, to illustrate take-off compliance. There were 14 late aircraft in the 04z to 09z period and also 4 early aircraft in the same period. The early and late aircraft shift demand into already fully subscribed periods creating delay due to the large differences of up to 134 minutes.

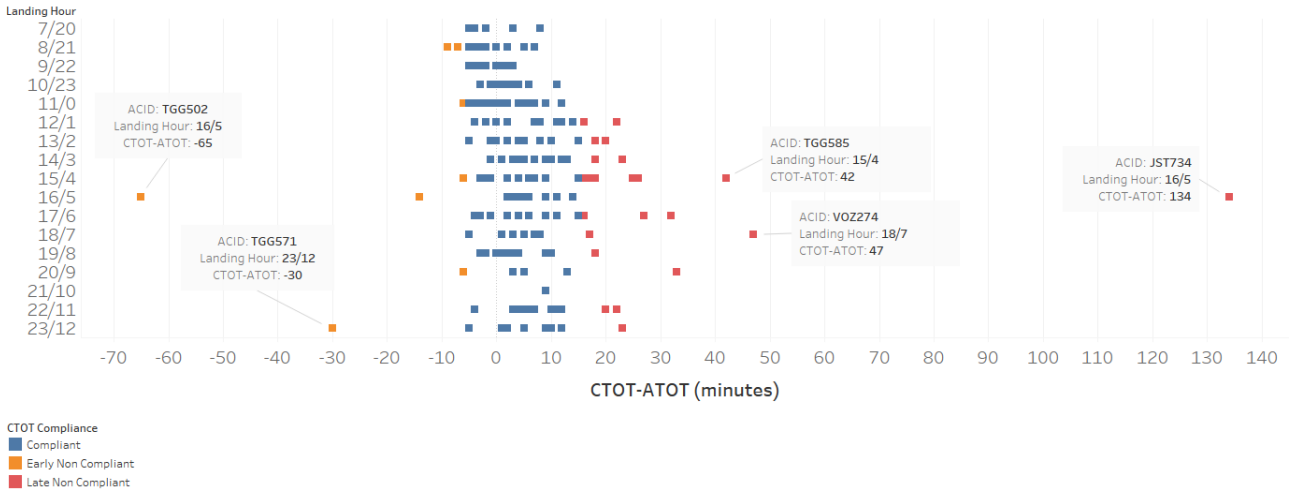

Figure 4: Take off compliance - Landing hour by local/UTC, against the difference between calculated take off time and actual take off time

Figure 1 shows that for eight hours of the day, demand matched or exceed the tactical capacity. The subsequent figures show the performance impact of both landing accuracy and take off compliance particularly when non-compliant and/or late aircraft present during periods of increasing delay.

Summary

The key learnings from this review include:

- A reminder on the importance of standard phraseology and the use of standard operating procedures to minimise ambiguity
- The impact of late and early flights on fully subscribed programs when low rates are in effect.
- Access to timely information to initiate action.

Some of these learnings are already well known, however it is always a good reminder to provide real examples of the impact to ATM operations and airline operations.

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12 Appendix E

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.