International Civil Aviation Organization

Fourteenth Meeting of the Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/14)

Bangkok, Thailand, 22 – 26 April 2024

Agenda Item 4: Review of Current ATFM Operations and Problem Areas

COLLABORATIVE DECISION MAKING BETWEEN AUSTRALIAN BUREAU OF METEOROLOGY, AIRSERVICES AUSTRALIA AND OTHER ATM STAKEHOLDERS

(Presented by Australia)

SUMMARY

This paper presents Meteorological Collaborative Decision Making (MET CDM), used in Australia, to formulate aircraft arrival rates for Air Traffic Flow Management (ATFM) and technology developments to enhance network management decisions.

1. INTRODUCTION

1.1 MET CDM entails collaboration between Airservices operational and support staff, Australian Bureau of Meteorology, and airline Aviation Meteorologists (AVMET) to generate forecast products used to inform pre-tactical traffic management strategies. ATFM measures are used to reduce airborne delays via a Ground Delay Program (GDP) at Melbourne, Sydney, Brisbane, and Perth airports. The aim is to provide predictability and minimise alterations to published GDP. The planning process aims to optimise runway capacity by closing the gap between planned and actual arrival rates.

1.2 Airservices National Operations Management Centre (NOMC) provides ATFM and the embedded NOMC Bureau of Meteorology Unit (NOMC MET) enhances this capability.

1.3 CDM involves sharing of information to improve Air Traffic Management (ATM). CDM is applied from long-range planning of schedules to the pre-tactical decisions taken on day of operations. Each user may participate to a level that suits their operations and information requirements. However, to maximise ATM benefits, it is important that all affected users participate in information sharing.

2. DISCUSSION

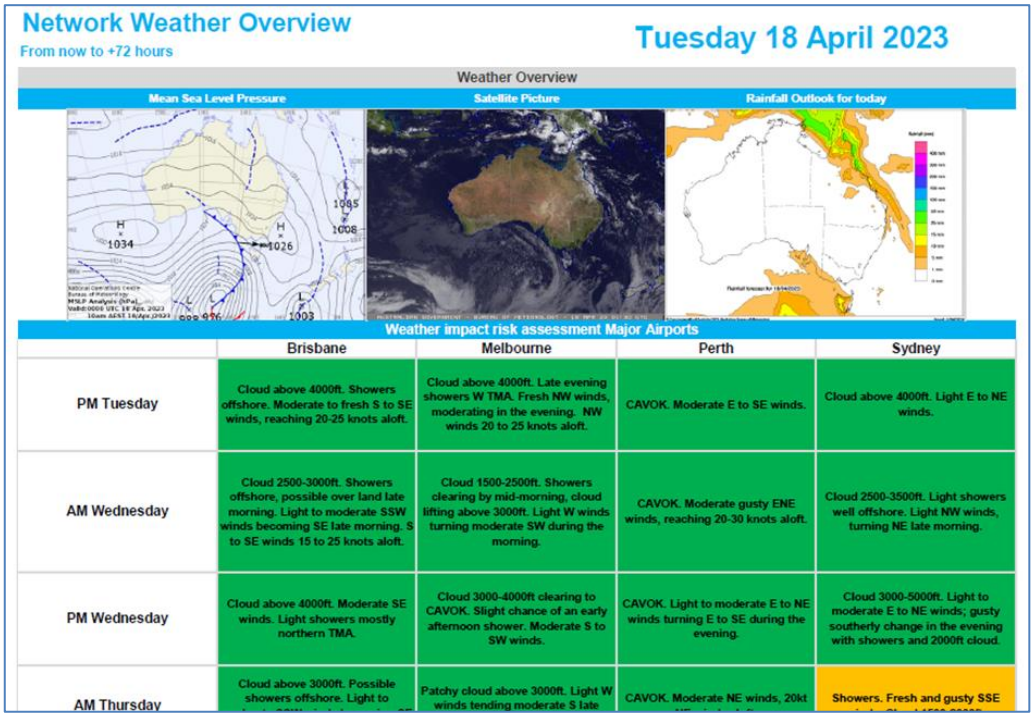
2.1 GDP - Arrivals (GDP-A) are utilised in Sydney, Brisbane, Perth, and Melbourne. The purpose of GDP-A is to reduce the airborne holding for airlines. For example, when weather conditions change (for better or worse) GDP-A revisions are made to provide new arrival rates.

2.2 GDP - Departures (GDP-D) is used at Perth, between 2130 to 0030 UTC on weekdays. for efficient management of departing traffic. At 0815 UTC the day before, the program is run and managed in the same way as GDP-A to meet the capacity based on meteorological and airport conditions.

2.3 NOMC MET aids pre-tactical planning with:

- MET CDM products and services.

- Provision of a 72-hour rolling forecast (today, tomorrow and the following day), in consultation with other BoM forecasting centres; for GDP airports with a focus on prediction of major weather event(s) likely to cause traffic flow disruptions or reductions to airport capacity.



Network Weather Overview

From now to +72 hours

Tuesday 18 April 2023

Weather Overview

Mean Sea Level Pressure	Satellite Picture	Rainfall Outlook for today

Weather impact risk assessment Major Airports

	Brisbane	Melbourne	Perth	Sydney
PM Tuesday	Cloud above 4000ft. Showers offshore. Moderate to fresh S to SE winds, reaching 20-25 knots aloft.	Cloud above 4000ft. Late evening showers W TMA. Fresh NW winds, moderating in the evening. NW winds 20 to 25 knots aloft.	CAVOK. Moderate E to SE winds.	Cloud above 4000ft. Light E to NE winds.
AM Wednesday	Cloud 2500-3000ft. Showers offshore, possible over land late morning. Light to moderate SSW winds becoming SE late morning. S to SE winds 15 to 25 knots aloft.	Cloud 1500-2500ft. Showers clearing by mid-morning, cloud lifting above 3000ft. Light W winds turning moderate SW during the morning.	CAVOK. Moderate gusty ENE winds, reaching 20-30 knots aloft.	Cloud 2500-3500ft. Light showers well offshore. Light NW winds, turning NE late morning.
PM Wednesday	Cloud above 4000ft. Moderate SE winds. Light showers mostly northern TMA.	Cloud 3000-4000ft clearing to CAVOK. Slight chance of an early afternoon shower. Moderate S to SW winds.	CAVOK. Light to moderate E to NE winds turning E to SE during the evening.	Cloud 3000-5000ft. Light to moderate E to NE winds; gusty southerly change in the evening with showers and 2000ft cloud.
AM Thursday	Cloud above 3000ft. Possible showers offshore. Light to	Patchy cloud above 3000ft. Light W winds tending moderate S late	CAVOK. Moderate NE winds, 20kt	Showers. Fresh and gusty SSE

- Three-day forecast as part of the ATFM Daily Plan (ADP) are issued three times a day each morning, midday, and evening, or as otherwise amended.
- Seven-day network impact outlook for the Network Operations Weekly Debrief and teleconference which includes meteorological outlook, expected operating mode with AAR range and runway configuration.

		THURSDAY		FRIDAY		SATURDAY
		AM	PM	AM	PM	
Sydney	MET CONDITIONS			Low cloud, -SH	-SH	SH
	RWY CONFIG	16	16	16	16 -> 34	16
	Capacity impact(s)					
	AAR RANGE	42-46	42-46	34-38	38-42	34-38
Melbourne	MET CONDITIONS	SH	-SH	Chance SH	Chance SH	
	Runway configuration	16/27	16	27	16/27	27/34 -> 09/16
	Capacity impact(s)					
	AAR RANGE	20-22	22-24	24	25-27	25-40
Brisbane	MET CONDITIONS			-SH	-SH	SH
	Runway configuration	19	01 -> 19	19	19	19 -> 01
	Capacity impact(s)					
	AAR RANGE	34	34	34	34	30-34
Perth	MET CONDITIONS	XW/TURB			Late SH	SH
	Runway configuration	06 -> 03	03 -> 21	06	06 -> 03/06	03/06 -> 21/24
	Capacity impact(s)					
	AAR RANGE	22-24	24	22	22-24	22-26

		SUNDAY	MONDAY	TUESDAY	WEDNESDAY
Sydney	MET CONDITIONS	-SH	Early/late cloud		SH
	RWY CONFIG	16 -> 34	34	34 -> 16	16
	Capacity impact(s)				
	AAR RANGE	36-40	34-50	40-46	32-34
Melbourne	MET CONDITIONS			PM SH	SH
	Runway configuration	34, 09/16	27/34, 0916	27/34 -> 16/27	16
	Capacity impact(s)				
	AAR RANGE	24-25	25-40	22-40	22-24
Brisbane	MET CONDITIONS	SH	-SH	SH	SH, chance TS
	Runway configuration	19 -> 01	19 -> 01	19 -> 01	19
	Capacity impact(s)				
	AAR RANGE	30-34	34	30-34	24-34
Perth	MET CONDITIONS				
	Runway configuration	21 -> 21/24	03/06 -> 21/24	03/06	03/06
	Capacity impact(s)				
	AAR RANGE	24-26	24-26	24	24

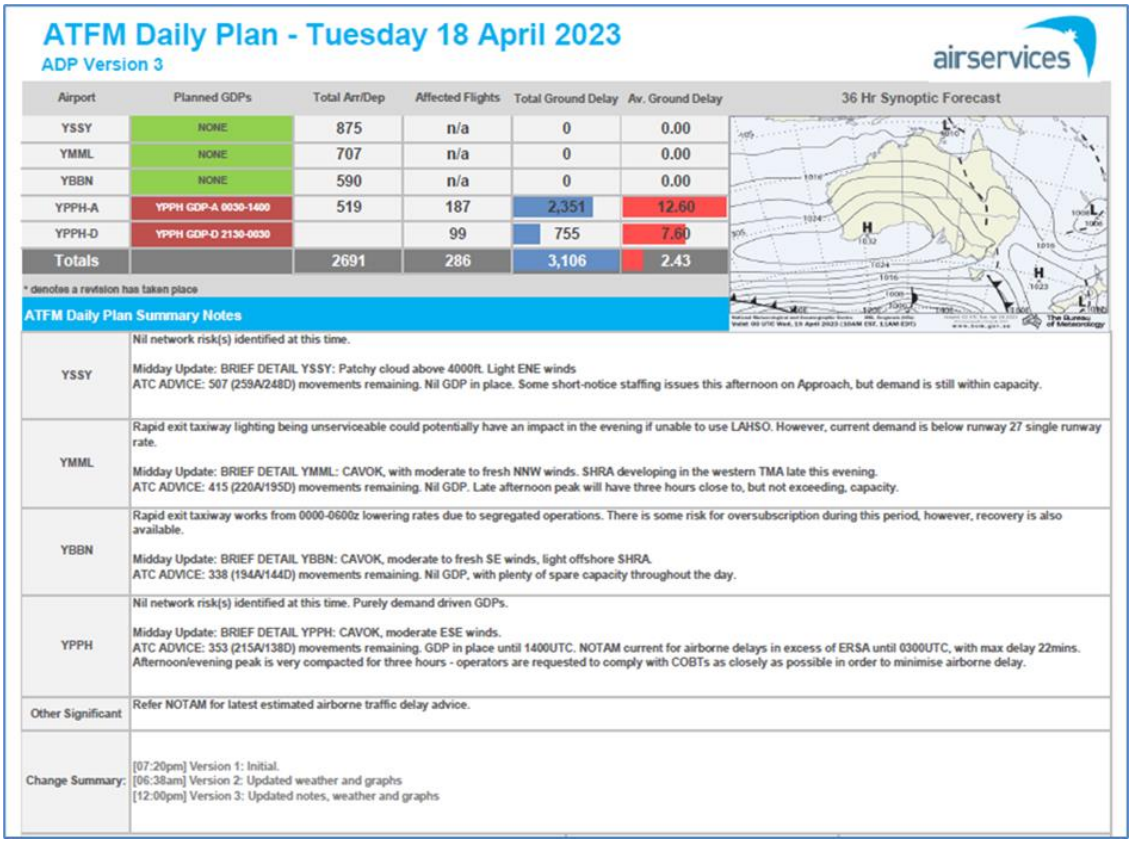
2.4 MET CDM includes:

- Assessing capacity through the MET CDM process looking at proposed rates and runway configurations for GDP airports to identify factors (for example, weather and facilities) that may affect capacity.
- Review demand against declared arrival rates and determine the requirement for a

GDP based on established parameters.

- Modelling whole of network for the next day assessing promulgated delay and network behaviour through the Digital Twin

- Provide a recommendation whether a GDP is required or not and determine the appropriate timings for the GDP.
- GDP recommendations are discussed with the relevant operational ATC units. GDP 'X-Factors' may be applied with reference to local operational knowledge.
- GDP have programmed run times to allow airlines time to manage any changes.



ATFM Daily Plan - Tuesday 18 April 2023

ADP Version 3

airservices

Airport	Planned GDPs	Total Arr/Dep	Affected Flights	Total Ground Delay	Av. Ground Delay	36 Hr Synoptic Forecast
YSSY	NONE	875	n/a	0	0.00	
YMML	NONE	707	n/a	0	0.00	
YBBN	NONE	590	n/a	0	0.00	
YPPH-A	YPPH GDP-A 0030-1400	519	187	2,351	12.60	
YPPH-D	YPPH GDP-D 2130-0030		99	755	7.60	
Totals		2691	286	3,106	2.43	

* denotes a revision has taken place

ATFM Daily Plan Summary Notes

YSSY	Nil network risk(s) identified at this time. Midday Update: BRIEF DETAIL YSSY: Patchy cloud above 4000ft. Light ENE winds ATC ADVICE: 507 (259A/248D) movements remaining. Nil GDP in place. Some short-notice staffing issues this afternoon on Approach, but demand is still within capacity.
YMML	Rapid exit taxiway lighting being unserviceable could potentially have an impact in the evening if unable to use LAHSO. However, current demand is below runway 27 single runway rate. Midday Update: BRIEF DETAIL YMML: CAVOK, with moderate to fresh NNW winds. SHRA developing in the western TMA late this evening. ATC ADVICE: 415 (220A/195D) movements remaining. Nil GDP. Late afternoon peak will have three hours close to, but not exceeding, capacity.
YBBN	Rapid exit taxiway works from 0000-0600z lowering rates due to segregated operations. There is some risk for oversubscription during this period, however, recovery is also available. Midday Update: BRIEF DETAIL YBBN: CAVOK, moderate to fresh SE winds, light offshore SHRA. ATC ADVICE: 338 (194A/144D) movements remaining. Nil GDP, with plenty of spare capacity throughout the day.
YPPH	Nil network risk(s) identified at this time. Purely demand driven GDPs. Midday Update: BRIEF DETAIL YPPH: CAVOK, moderate ESE winds. ATC ADVICE: 353 (215A/138D) movements remaining. GDP in place until 1400UTC. NOTAM current for airborne delays in excess of ERSA until 0300UTC, with max delay 22mins. Afternoon/evening peak is very compacted for three hours - operators are requested to comply with COBTs as closely as possible in order to minimise airborne delay.
Other Significant	Refer NOTAM for latest estimated airborne traffic delay advice.
Change Summary:	[07:20pm] Version 1: Initial. [06:38am] Version 2: Updated weather and graphs [12:00pm] Version 3: Updated notes, weather and graphs

2.5 The benefits of MET CDM include:

- Using enhanced weather forecast information to determine pre-tactical arrival rates that better suit weather conditions on the day.
- Greater predictability between planned arrival rates the day before operations and the actual arrival rates on the day, which provides enhanced planning.
- Collaboration between meteorological experts across stakeholders builds understanding and consensus on the aviation implications.
- The process and business rules allow flexibility and responsiveness when setting arrival rates with consideration of weather constraints.
- Reduction in airborne delay (holding) saving fuel and money for airlines.

2.6 Airservices uses a software-based tool called ‘Harmony’ to manage GDP. Harmony accepts real-time updates to schedule data, either via flight plan submission, airline day of operations changes to scheduled departure times, or ATC live data. In accepting real-time updates, Harmony can display the most up-to-date demand/capacity information for any monitored airport, which in turn provides airlines, airports, and ATC with an enhanced capability to predict traffic management issues.

3. Network Management enhancements:

3.1 A-CDM

- A proven operating concept to improve airport operational efficiency, optimisation of resources and predictability based on accurate, real-time data & insights.
- A-CDM will enhance airline, airport and passenger experience by making

departure management more predictable, improving use of runway and gate capacity, and reducing the time aircraft are waiting on taxiways prior to take-off.

- A-CDM provides a common picture that optimises gate allocations, allows ground handling resources to be ready when needed, gives airlines more certainty about when a flight will take-off, reduces gate changes and improves the passenger experience.

- Australia's A-CDM is an integrated system across the 4 ATFM ports of Melbourne, Perth, Sydney and Brisbane managed by Airservices Australia.

- A-CDM will share common information with the Digital Twin to allow for more accurate pre-tactical planning of the network and predictability for all stakeholders.

3.2 Digital Twin

- Enterprise Digital Twin using data, AI and Digital to process large data sets and run millions of 'what if' scenarios to optimise network decision outcomes.

- Core simulation models the Australian FIR to model whole of network effects caused by capacity and demand at individual airports.

- Pre-tactical delay management applications are then able to predict Network behaviour by modelling the impact of Network decisions to manage disruptive events including changes to airport capacity or Ground Delay Program (GDP) parameter changes.

- Applications under development include, Day-of-Operations delay management, What-if scenario modelling and Taskload management to assist in both pre-tactical network management and strategic planning for known network events (runway maintenance etc), resource modelling and planned events.

3.3 Future concept – Collaborative Convective Forecast-CDM

- Impacts/disruptions to ATFM at a distance from the point of departure/arrival are mostly attributed to thunderstorms, severe thunderstorms and tropical cyclones in the Australian region.

- CCF-CDM aims to improve readiness for disruptive events in a manner that meteorologists, ATC and operators understand.

- There are ATFM technology dependencies required to gain benefits and predictability from CCF-CDM outside of the current scope of operations.

4. ACTION BY THE MEETING

4.1 Note the information contained in this paper.

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