International Civil Aviation Organization

FIFTH MEETING OF THE ASIA/PACIFIC METEOROLOGICAL REQUIREMENTS WORKING GROUP (MET/R WG/5) OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG)

Bangkok, Thailand, 19 – 21 April 2016

Agenda Item 5: Coordination between MET and ATM services

METEOROLOGICAL COLLABORATIVE DECISION MAKING

(Presented by Ashwin Naidu of Australia)

SUMMARY

This paper presents an update on MET Collaborative Decision Making (MET CDM) process in support of Air Traffic Flow Management (ATFM) at major capital city aerodromes in Australia.

1. INTRODUCTION

1.1 Airport arrival rates (AARs) at four major aerodromes in Australia (Sydney, Brisbane, Melbourne and Perth) through Ground Delay Program (GDP) are currently determined by referencing the Aerodrome Forecast (TAF) and a set of pre-determined business rules to determine future runway configurations and expected AAR. However, the TAF is not ideal for this application because some ATFM decisions require more tailored meteorological information.

1.2 MET CDM is now being introduced to support optimisation of planned AARs by taking into consideration more detailed and relevant forecast weather information.

1.3 MET CDM Phase 1 was trialed in Brisbane and Melbourne and has proved that the MET CDM capability would benefit Air Traffic Flow Management (ATFM) at these major airports. Brisbane and Melbourne have recently transitioned to as Business as Usual (BAU) MET CDM, with real time monitoring.

2. DISCUSSION

2.1 MET CDM PROCESS

2.1.1 The MET CDM process involves a collaboration of Airservices Australia (Airservices) operational staff, Australian Bureau of Meteorology (Bureau) meteorologists and major airline meteorological specialists to generate products suitable for better pre-tactical traffic management strategies and optimised use of available runway capacity.

2.1.2 MET CDM improves the process to meet the ATFM requirements for the major airports through the combination the Bureau's meteorologists embedded in Airservices National Operations Centre (NOC MET), Airline MET units, Qantas Mets and Virgin Australia Mets known as AVMETs and Airservices National Operations Centre (NOC).

2.1.3 The meteorologists use Reference Cards, mutually determined business rules and regular consultation with Airservices personnel to determine a proposed AAR taking into consideration all relevant ATFM factors and having collaborated between Bureau centres and AVMETs. The combination of meteorology and relevant ATFM factors combined with a formal collaborative process is a critical success factor for MET CDM. See **Appendix 1** for an example of Brisbane Airport Reference Card.

2.1.4 This new MET product has resulted in significant traffic flow efficiencies including better AARs in marginal forecast conditions, reduced AARs when more significant events occur and a combination of reduced holding and better recovery times after significant event.

2.2 DESCRIPTION OF MET CDM CAPABILITY

2.1.1 Capability

MET CDM provides additional capability for the GDP airports via:

- enhanced weather forecast products providing more detail of weather phenomena of importance to ATFM at the airport;
- more accurate prediction of AARs;
- automated and standardised interpretation of the TAF – based on agreed MET CDM business rules for AARs;
- incorporation of manually input forecast variances by the NOC MET team based on advice from the Regional Forecast Centres, Sydney Airport MET Unit (SAMU) and the MET CDM process;
- consideration of non-weather impacts on runway selection, e.g. runway works; and
- automated determination of anticipated runway configurations and AARs.

2.1.2 Process

MET CDM enhances existing ATFM procedures as seen by the:

- provision of additional meteorological information to enhance collaboration with CDM Participants;
- introduction of a MET CDM AAR Calculator, a tool developed in Microsoft Excel (the MET CDM "Calculator") that applied a set of agreed business rules to produce a matrix of AAR and associated forecast information (**see Appendix 2**);

- NOC MET provides better accountability on the calculator proforma for the rationale behind AAR decisions;

- Airservices managers gain a more comprehensive meteorological briefing relevant to GDP airports;

- Provision of a process to continuously improve, refine and document MET CDM.

2.1.3 Relationship and Communication

The communication and collaboration process is as follows:

- NOCMET monitors forecast products TAF, TTF, Aerodrome Briefing, Warnings etc.;

- NOCMET discusses any underlying issues with the forecasters for the major airports;

- NOCMET generates an acceptance rates matrix using MET CDM AAR Calculator based on the forecast and using the rates tables in the MET CDM Reference Cards. Matrix would be hour/weather phenomena of importance/acceptance rate to whatever the forecast timeline required;

- NOCMET convenes a MET CDM conference with AVMET units and modifies rates accordingly. Notes key points in discussion and the final decisions;

- MET CDM rates table passed to Airservices Traffic Management for discussion and final decision on acceptance rates by Airservices/ Traffic Manager; and

- NOCMET liaises with Airservices and AVMET units regarding changes to forecasts that might impact the MET CDM rates. Conducts further MET CDM discussions as appropriate.

Figure 1 and 2 summarises the MET CDM process and the review cycle.

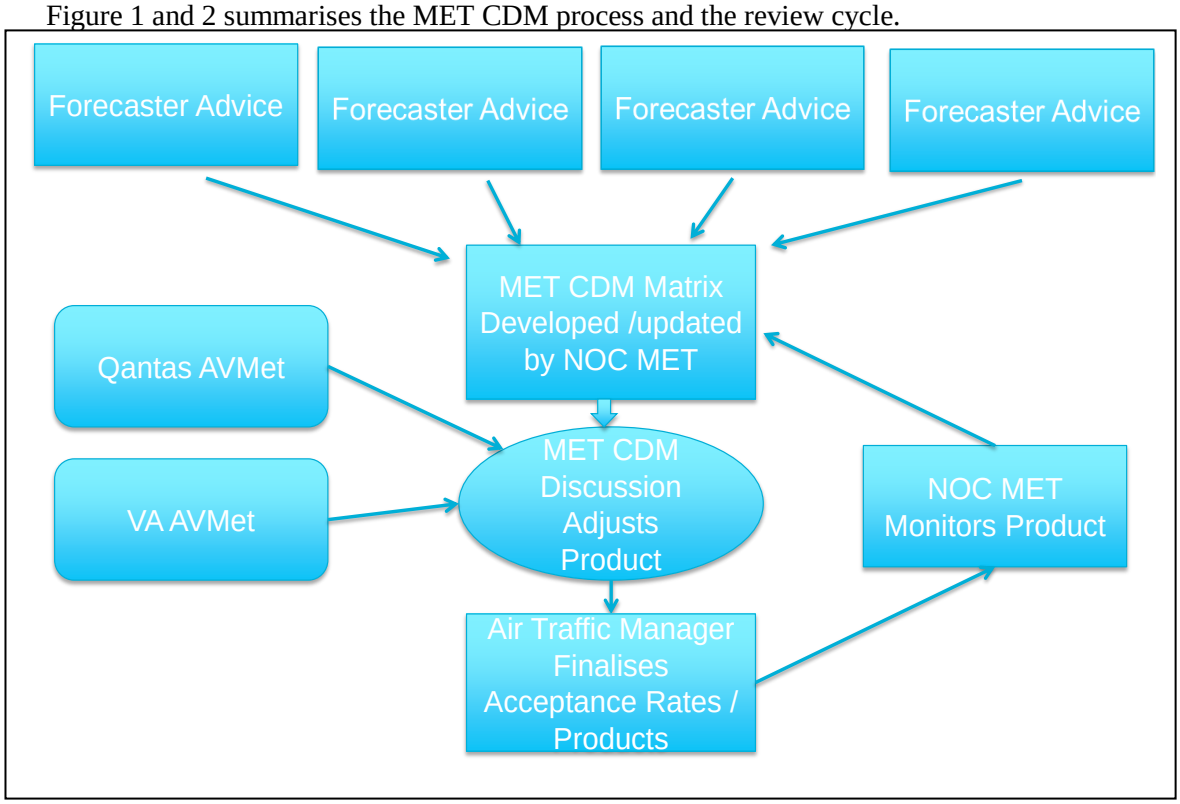

Figure 1: Met CDM Process

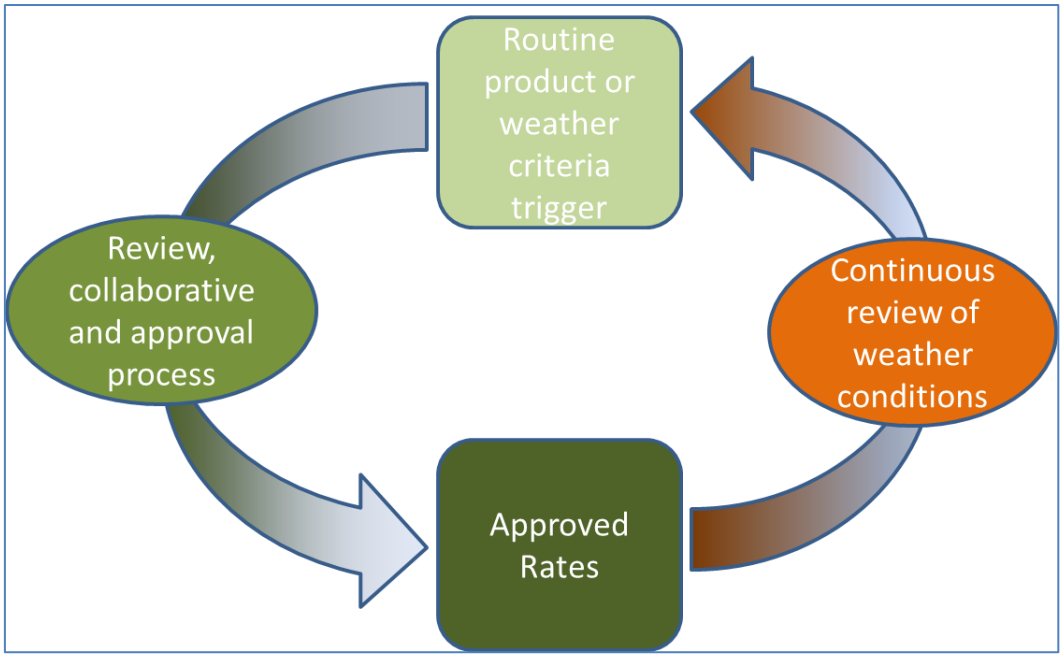

Figure 2: Continuous review cycle of the MET CDM workflow

2.4 MET CDM TRIAL AND OUTCOMES

2.4.1 Trial Process

The trials are broken into three stages:

- Ghosting
- Operational trial
- Business as Usual (BAU) transition

During the ghosting and operational trial stages the MET CDM process runs in parallel with "business as usual" activities.

Trial results are compared with the BAU results and evaluated to determine the level of confidence in the process. This stage lasts about six weeks.

When sufficient confidence is achieved, the parallel activities revert to the MET CDM process. The MET CDM calculator has been updated as process refinements are identified.

2.4.2 Outcomes

The outcomes of MET CDM include:

- Recovery of arrival slots in the shoulder periods of a weather phenomenon;
- Reduced ground delay using the Harmony GDP;
- Better balance of demand and capacity during periods of adverse weather phenomenon;
- Better predictability of the impact of weather events; and
- Better appreciation of airline expectations from TCU Managers.

3. ACTION REQUIRED BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this papers; and

b) discuss any relevant matters as appropriate.

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APPENDIX 1

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YBBN Air Traffic Operations

Brisbane is the third busiest international airport in Australia consisting of two converging runways in the direction 01/19 magnetic and 14/32 magnetic.

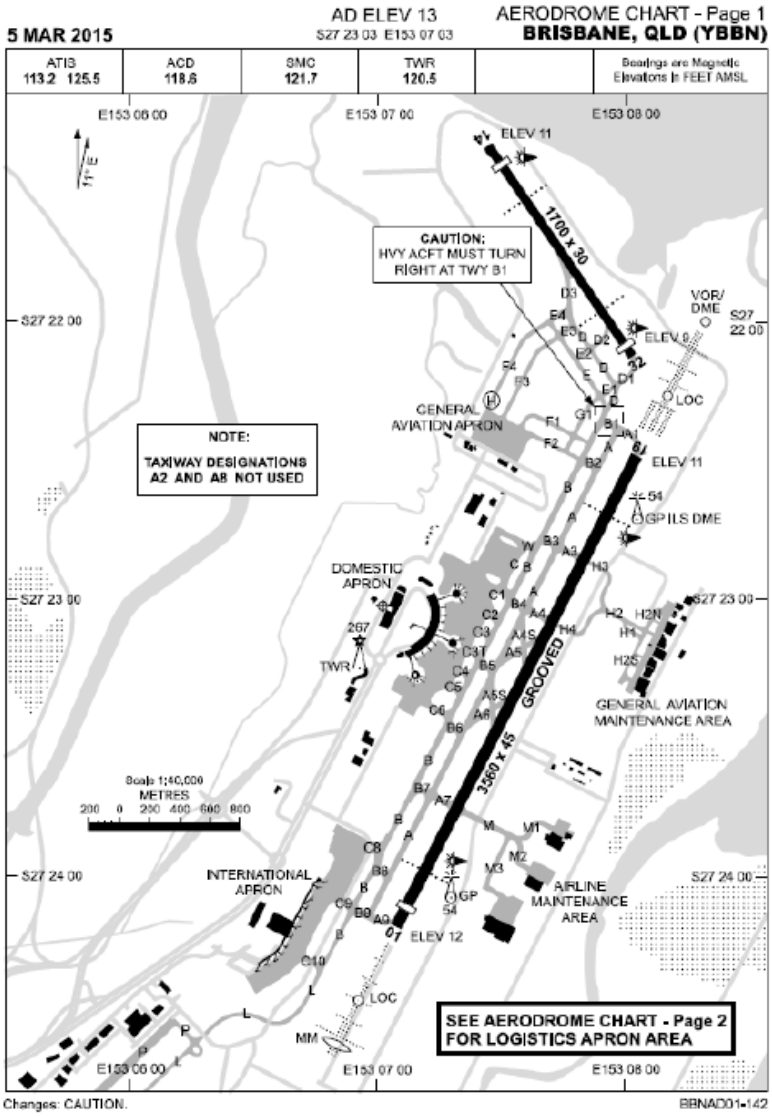

Figure 1: Brisbane Airport Aerodrome Chart (Source: Airservices Australia)

Noise Abatement

There is no curfew at Brisbane airport. However, noise abatement procedures apply.

From 10.00pm to 6.00am, providing wind and traffic management safety requirements permit, Reciprocal Runway Operations (RRO) are used to enable aircraft to depart and land over Moreton Bay. The preferred runway mode is Runway 19 for arrivals and Runway 01 for departures.

At other times, the preferred runways are, in order: Runway 01, Runways 14/32, and Runway 19.

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Terminal Area (TMA)

This term is used to describe the designated area of controlled airspace surrounding a major airport where there is a high volume of traffic. The Terminal Area (TMA) is a 30nm radial area surrounding Brisbane Airport.

The TMA is divided into segments called corridors for arriving and departing aircraft. For Brisbane Airport the main airport arrival corridors are to the N and S which are estimated to be used by approximately 45% of traffic each.

Airport Acceptance Rates (AAR)

Runway configurations allow up to 59 movements (arrivals plus departures) per hour at Brisbane Airport. A maximum planned airport acceptance rate (AAR) of 28 can only occur during the use of both runways for arrivals (refer to section below on CROPS).

METRON – Ground Delay Program

Airservices Australia run a Ground Delay Program (GDP) at Brisbane Airport. The new application called Harmony (produced by Metron Aviation) is an advanced Air Traffic Flow Management (ATFM) application capable of simultaneously managing traffic flows at multiple airports.

Essentially, when delays are foreseen to occur because of capacity and demand imbalances, these delays are assigned to the aircraft at their location of departure, rather than in the air in the vicinity of their destination.

An aircraft that departs significantly before their assigned Calculated Off-Blocks Time (COBT) will be given enroute delays to meet their programmed time of landing. Aircraft that complied with their assigned COBT will be given priority. The maximum benefit of the system will only occur if all users comply.

The Harmony application is run at the Airservices National Operations Centre (NOC) based on the 06Z TAF to plan rates for the subsequent day. The Bureau's NOCMET staff are co-located at the NOC and supply additional information critical to decisions surrounding the running of the Ground Delay Programs.

The ground delay program can be revised at any time.

Runway Direction

It is important to remember that although runway direction is annotated in magnetic co-ordinates, wind direction is reported in degrees true. The conversion for Brisbane Airport is as follows:

Table 1: Brisbane Runway Direction Conversion Table

Magnetic	True
010	027
190	207
140	146
320	326

*Please note that you refer to a runway direction as it is being travelled on. Using RWY19 means landing and departing towards the SSW. As opposed to how meteorologists report wind direction.

Nomination Of Runways

The nomination of runway is determined by Air Traffic Control (ATC) using a preferred landing or take-off direction. ATC shall not nominate a particular runway for use if an alternative runway is available, when:

Table 2: Runway Wind Thresholds

	Dry	Wet
Crosswind	>20kts	>20kts
Downwind	>5kts	>0kts

(*Please note that thresholds relate to sustained wind gusts as well as mean wind speeds.)

If possible, aircraft will take off and land with a head wind. A tail wind on landing is acceptable up to 5 knots, or not at all when the runway is wet. When departing with a tail wind, the Take-off Distance increases so the runway length is important. With a cross wind component exceeding 20 knots, an alternative landing runway will be planned. It is important to note that departures and arrivals do not have to occur on the same runway.

The MET CDM Calculator uses 0kt downwind as a filter for initial selection of RWY 01 or 19. For wind within the arc 286 - 106° nominate RWY 01. If wind is VRB or excessive crosswind, nominate RWY 19.

One other thing to keep in mind is the length of the runway. Landing and take-off distances differ per aircraft-type, weight, atmospheric pressure and temperature; the active runway will have to be able to accommodate the majority of traffic. This is a significant constraint on the use of the short runway (14/32) at Brisbane. Thus, RWY 01 or 19 must always be nominated as not all aircraft can land on 14/32

Forecasting for Brisbane Airport

Forecasters for Brisbane Airport have the ability to contact NOCMET for information on the operational effect caused by a TAF amendment. Alternatively, forecasters may contact Brisbane Centre directly if the need arises.

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It is expected that forecasters can provide meaningful information to Air Traffic Controllers regarding Brisbane Airport when requested.

Peak Times
Generally peak demand for traffic movements at Brisbane airport occur between Sunday to Friday 5-10pm, and Monday to Saturday 7-11am. Additional loading occurs on both a Monday morning and a Friday afternoon.

The forecasting of holding near or during these hours must be considered carefully. The removal or movement of holding that affects these periods should prompt a call to NOCMET prior to the TAF amendment.

Wind Forecasts
The TAF can be used by forecasters to routinely provide information about wind speed and directional changes that affect ATC decisions about runway changes.

Accurately forecasting a strong cross wind on a runway is important in planning. Instances can occur where a strong cross wind component is forecast on both runway directions. Air Traffic Control has a process of dealing with this issue.

Thunderstorms at YBBN
Thunderstorm cells within 5-10nm of Brisbane Airport affect the ability of aircraft to land and the provision of services to aircraft once on the ground. The movements of aircraft into and out of bays are affected due to ramp closures and the removal of ground staff from the tarmac.

Airline WHS regulations require the removal of ground staff from the tarmac when a thunderstorm is within 5nm, with an 'on-alert' status for a thunderstorm within 10nm. This decision is an important part of the duties of the Virgin and Qantas meteorologists.

In prolonged thunderstorm events this can lead to a backlog of aircraft waiting on the ground to be handled. By accurately forecasting thunderstorms on a TAF the planned acceptance rate at Brisbane is dropped thereby mitigating airport congestion.

Additionally the ability of forecasters to predict or recognise wind outflow from nearby thunderstorms is important in the management of tactical runway changes.

Thunderstorms in the TMA (30nm)
Thunderstorms within the Terminal Area (TMA - 30nm) also affect operations. Specifically thunderstorms in the entry corridors to the northwest and southeast of Brisbane airport have major impacts on traffic flow.

Thunderstorms to the south and southeast have a particular effect on Brisbane airport. The main departure corridor for Brisbane lies to the south and the main arrival corridor lies to the southeast. Organized thunderstorms that occur to the south and southeast and stalls near the ocean represent a major complication for air traffic both arriving and departing Brisbane.

When the weather falls below the minima at YBGC, aircraft will often divert to Brisbane. This potential for conditions to be observed below the minima at Gold Coast is important to capacity planning at Brisbane and needs to be highlighted in the METCDM process.

The ability to forecast organized thunderstorms in these areas can provide Airservices the capability to open additional corridors and re-route aircraft to minimise delays.

Within the TMA, any thunderstorms within 10nm present a specific problem for aircraft trying to join the initial approach for an ILS runway.

Fog
Fog can occur at Brisbane Airport at any time of the year but is more typical between April and October. There are around 7 events on average annually, lasting between 2-4hrs.

The inclusion of a PROB30 for fog onto the YBBN TAF does not trigger a revision of the arrival rates into Brisbane Airport. However a forecast on the TAF of PROB40 is treated as if the fog will occur and the planned arrival rates are dropped to 12 (or as negotiated).

The planning of arrival rates surrounding the cessation of fog at the airport is dependent on the timing on the TAF and TTF. It is critical that forecasters amend the fog period or remove fog from the TAF when appropriate.

Cloud/Visibility
Low cloud and/or reduced visibility on approach will necessitate the use of an instrument approach when a visual reference with the runway is not available. Any instrument approach has a specified decision height (landing minima) at which a 'missed approach' must be initiated if the required visual reference to continue the approach still has not been established.

This decision height (DH) will depend on the available equipment that is available for the runway and can vary widely, but is of the order of 250ft AGL for an Instrument Landing System (ILS) category 1, the most common instrument approach on runways at Australian major airports. Brisbane currently has ILS

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category 1 approaches available for runways 01 and 19 only.

Visibility and cloud are less critical during take-off, with most commercial jet aircraft allowed to depart with visibility over 550m.

Cloud and visibility have a large effect on airport acceptance rates at Brisbane Airport. Scattered or more cloud below 2500ft can effect operations, as seen in the Table 3 and 4 below.

CROPS

Converging Runway Operations (CROPS) procedures at Brisbane Airport were developed by Airservices Australia to enhance the capacity of the airport. This allowed for simultaneous approaches, or arrivals and departures, for certain runway configurations in visual conditions. This mode of operation is available between first and last light only with arrivals on RWY14 or RWY32 converging with the use of RWY01. When available, this mode permits the aircraft arrival rate to be increased by around three to five aircraft per hour.

Weather and air traffic permitting, RWY 32 can also be used for departing smaller aircraft, operating independently of arrivals and departures on RWY01. This mode is generally used during periods when there are more departures than arrivals and can reduce delays.

Figure 2 below illustrates the modes possible when CROPS are in operation.

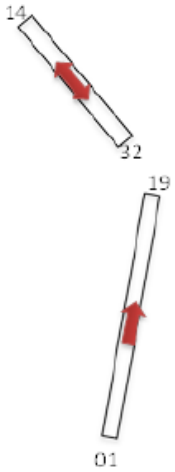

Figure 2: Depiction of Converging Runway Operations (CROPS) Modes

Forecast meteorological conditions that may prevent CROPS procedures include:

- cloud amounts of scattered or more below 2500ft;
- visibility below 8km;
- reported or forecast moderate/severe turbulence on final;
- reported windshear; and
- thunderstorms;

Aircraft are required to be clear of cloud and in sight of ground or water. These criteria are in addition to the wind thresholds for the runways.

Specifically a forecast wind from the NE quadrant producing <5kts downwind on the runway is optimal for CROPS. The CROPS mode is not available outside of Visual Meteorological Conditions (VMC) or outside daylight hours.

DROPS

Dependent Runway Operations (DROPS) procedures at Brisbane Airport were established on 15th December 2014. The procedure was developed by Airservices Australia to enable near simultaneous approaches on Runways 19 and 14 in visual

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meteorological conditions. DROPS is not currently in use at Brisbane and this section is for information only.

Separation of aircraft for wake turbulence is not required in this runway configuration. Additionally, the aircraft arriving RWY19 will always be broken off the procedure when there is a doubt that required spacing will not be achieved. (Aircraft break out procedures vectors aircraft off the approach path in response to aircraft penetrating minimum spatial separation standards).

This procedure will not be operated where its operation would reduce the Airport Acceptance Rate (AAR) below a single runway rate.

Figure 3 below illustrates the modes possible when DROPS are in operation.

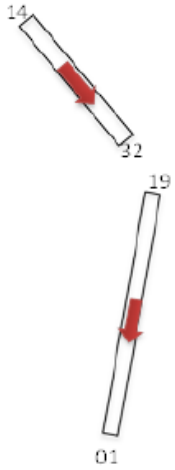

Figure 3: Depiction of Dependent Runway Operations (DROPS) Modes

Forecast meteorological conditions that may prevent DROPS procedures include:

- cloud amounts of scattered or more below 3000ft;
- visibility below 8km;
- reported or forecast moderate/severe turbulence on final;
- reported windshear; and
- thunderstorms;

Table 3: Summary of Decision Point Triggers

Phenomena	Criteria	Potential Effect
Cloud (>3octas)	<4000ft	Instrument approach on RWY01
	<3000ft	Instrument approach on RWY19, no DROPS
	<2500ft	Reduced rate, no CROPS
	<1500ft	Reduced rate, Instrument approach
Visibility	<8000m	Reduced rate, no CROPS/DROPS
	<5000m	Reduced rate, Instrument landing
	<1500m	Reduced rate, Fog
X-Wind	>20kts	Change of runway
Downwind	>5kts/0kts (dry/wet)	Change of runway

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Summary - Weather Effects on Runway Modes

The effect of weather on the availability of runway modes at Brisbane Airport is summarised in Table 4.

Table 4: Airport MET CDM Weather Criteria & Transitional Runway Rates at YBBN

ATFM Business Rules

RWY	Config	Cloud Ceiling (ft)	Cond	Visibility (m)	Exclusions	Rate	MET CDM: Application	Acceptance Rate Bracket	Rationale
01	VMC	>4000	VIS	>5000		24	Thunderstorms	18-22	Assessment of likely timing and impact on ATFM within a probabilistic event. Thunderstorm rates can be applied if the MET CDM process estimates a significant risk and there are no TS on the TAF.
01	IMC	>1500	VIS	>5000		24			
01	ILS	<1500	VIS	>1500		21	CROPS/DROPS from business rules but MET CDM estimates No CROPS /DROPS	Single runway rates from business rules.	Factors affecting CROPS / DROPS that may not be conveyed in the TAF. Ie. Wet runway and tail wind component, moderate turbulence, X-wind Gusts 20kts+, SCT cloud below 2500ft, any other factors.
19	VMC	>3000	VIS	>5000		24			
19	IMC	>1500	VIS	>5000		24			
19	ILS	<1500	VIS	>1500		21	No CROPS/DROPS from business rules but MET CDM estimates CROPS/DROPS possible	CROPS/ DROPS 25-28	TAF change groups may not reflect availability of CROPS/DROPS due to change group criteria. Ie. Wind direction changes, reduction in cloud. Late afternoon reduction in wind.
14	VMC		VIS	>5000		12			
14	IMC					12			
32	VMC		VIS	>5000		12			
*	FOG			<1500		12			
01/14	CROPS	>2500	VIS	>8000	HN,TS	28	MET CDM X factor	+2 to -2 Positive numbers cannot be applied to exceed the maximum rate (28).	1. There may be phenomena that affect traffic flow that are not conveyed in the TAF or are not part of the business rules. i.e. TMA thunderstorms, thunderstorms with probs below 30%, low level wind shear and other met factors. 2. Certainty in a severe event. 3. Transitions between closer acceptance rates. i.e. 26, 24, 22 instead of 26, 22, 22 for a 3 hour period.
01/32	CROPS	>2500	VIS	>8000	HN,TS	26			
19/14	DROPS	>3000	VIS	>8000	HN,TS	25			

RWY	Config	Cloud Ceiling	Cond	TAF info	Exclusions	Rate
*	TS1		TS	INT30		22
*	TS2		TS	INT40		21
*	TS3		TS	TEMP30		20
*	TS4		TS	TEMP40		19
*	TS		TS	*		18

Note 1: IMC refers to sig cloud to west below 4000FT and/or sig cloud to east below 3000FT. Vis 5km or more
Note 2 ILS refers to cloud below 1500FT and/or vis less than 5km.
Note 3: Specific meteorological conditions required for CROPs: visibility, cloud, etc

(Source: Airservices Australia)

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APPEDIX 2 - Example of Melbourne MET CDM Matrix

airservices

Airservices MET CDM Rate Calculator
Software Version 2.1.58

Autoload TAF
YPPH | EMAIL COPY TO SUPPORT
YSSY
LATEST TAF | RECALCULATE | CLEAR DATA

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TAF YMML 010524Z 0106/0212
34020G32KT CAVOK
FM010900 33013KT CAVOK
FM011900 25014KT 9999 -SHRA SCT015 BKN030
FM020200 22014KT 9999 -SHRA BKN045
FM021000 17012KT 9999 SCT045
INTER 0123/0202 4000 SHRA BKN015
RMK FM010600 MOD TURB BLW 5000FT TILL011200
FM011200 MOD/SEV TURB BLW 5000FT TILL012000
T 24 21 20 19 Q 1010 1011 1011 1011
```

YMML — Saturday, 02 Apr 2016 - Run 1 - Final

First Light: 2010
Last Light: 0838

BUSINESS RULES RATES FROM TAF — SHOW / HIDE CALCULATIONS

DATE/TIME	011900	012000	012100	012200	012300	020000	020100	020200	020300	020400	020500	020600	020700	020800	020900	021000	021100
BUSINESS RULES SUMMARY																	
BR RWY	16/27	16/27	16/27	16/27	16/27*	16/27*	16/27*	16/27	16/27	16/27	16/27	16/27	16/27	16/27	16/27	16/27	16/27
Downwind (Worst)	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	2.9	2.9
Crosswind (Worst)	13.7	13.7	13.7	13.7	13.7	13.7	13.7	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.6	11.6
BR Approach Mode	ILSA	ILSA	ILSA	ILSA	ILSA*	ILSA*	ILSA*	VMCA	VMCA	VMCA	VMCA	VMCA	VMCA	VMCB	VMCB	VMCB	VMCB
BR Rate	23	23	23	23	22	22	22	27	27	27	27	27	27	25	25	25	25
RESET BELOW	MET CDM RATE — EXPAND/COMPACT MET CDM																
Wind °True — LOAD WINDS	310	290	250	250	250	230	230	220	220	210	180	160	160	160	160	170	180
Significant Wind Speed	10	10	12	12	16	20	18	16	15	12	14	15	15	12	10	10	10
Anticipated RWY	27	27	16/27	16/27	16/27	16/27	16/27	16/27	16/27	16/27	16	16	16	16	16	16/27	16/27
Downwind (Main RWY)	-8.1	-9.6	-2.3	-2.3	-3.1	-10.3	-9.3	-10.5	-9.8	-9.3	-13.8	-14.7	-14.7	-11.8	-9.8	-10.0	-9.9
Crosswind (Main RWY)	5.9	2.8	11.8	11.8	15.7	17.1	15.4	12.1	11.3	7.6	2.2	2.9	2.9	2.3	1.9	0.2	1.6
Downwind (Cross RWY)			-11.0	-11.0	-14.6	-14.4	-12.9	-9.4	-8.8	-5.3						2.4	0.7
Crosswind (Cross RWY)			4.9	4.9	6.5	13.9	12.5	12.9	12.1	10.8						9.7	10.0
Anticipated Approach	ILSA	ILSA	ILSA	ILSA	ILSA	ILSA	VMCB	VMCA	VMCA	VMCA	VMC	VMC	VMC	VMC	VMC	VMCB	VMCB
MET CDM Initial Rate	22	22	23	23	23	23	25	27	27	27	24	24	24	24	24	25	25
MET CDM Notes	1	1	1	1	2	2	2				3	3	3	3	3	4	
MET CDM X-Factor — EXPORT PDF	1	1			1	1											
MET CDM Final Rate — NOTIFY SM/TM	23	23	23	23	24	24	25	27	27	27	24	24	24	24	24	25	25
TCU SM/TM FINAL ADJUSTMENT																	
SM/TM Notes																	
SM/TM X-Factor																	
Final Arrival Rates — NEXT	23	23	23	23	24	24	25	27	27	27	24	24	24	24	24	25	25
NON MET CDM NOTES — SHOW / HIDE CDM																	
Non MET CDM Notes																	
DATE/TIME	011900	012000	012100	012200	012300	020000	020100	020200	020300	020400	020500	020600	020700	020800	020900	021000	021100
Previous Arrival Rates																	
Programmed Rates ? ACCEPT RATES																	

MET CDM Notes	1	A weak cold front is expected to move through, though the consensus on the latest guidance is for winds to turn more WSW closer to 21Z. Showers and lower cloud expected with and following the front so have allowed for some uncertainty with the timing of the front in the 19-21Z period but most likely within 21 to 23Z. Have not lowered less than ILSA as most of the significant showers look to be to the south and east. Winds reaching up to around 25 knots aloft at first but unlikely to mix down as such until closer to 23Z by which time they ease to 20 knots. Higher winds gusts possible with any showers.
	2	Winds turn more SW which is a more favourable trajectory for showers, however the airmass also begins to dry significantly so have added 1 to the ILSA rate. Latest model guidance also less keen on too much low cloud and quite possibly even be VMCB during this period. Have elected the later from 01Z with the cloud ceiling already most likely reaching 4000ft or so. Winds up to around 20 knots aloft so an increase in surface cross wind on both RWYs until an easing around midday/early afternoon. Higher wind gusts possible with any showers.
	3	Latest guidance also suggests winds turn more SSE and also for a brief period freshen once again, with a reasonable risk of too much downwind on RWY 27 so have elected single RWY 16.
	4	Winds turn more S'ly or even SSW again.
	5	
	6	
SM/TM NOTES	1	
	2	
NON MET CDM NOTES	1	
	2	