

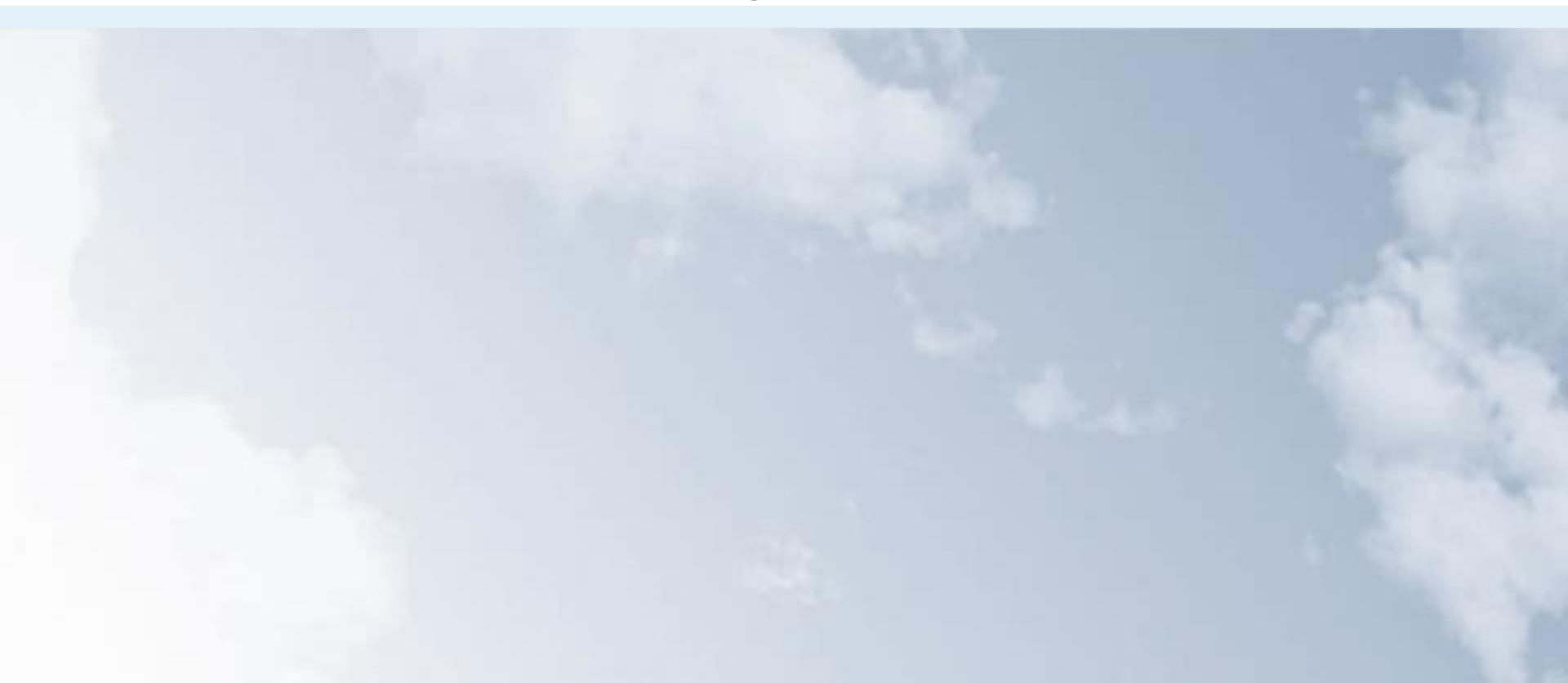


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Bureau of Meteorology

COLLABORATIVE DECISION MAKING (MET-CDM)

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Trial of MET-CDM

- The Bureau of Meteorology has participated in four (4) MET CDM trials at Brisbane and Sydney airports managed through Airservices National Operations Centre (NOC).
- The latest trial has proved that the MET CDM capability would benefit Air Traffic Flow Management (ATFM) around these major airports.
- It has been proposed that an expansion of the current mode could be extended to Melbourne YMML.



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Trial - Issues

Issues that were determined through the trials include:

- Competing priority to amend and update regulated products
- TAF is not a suitable product for ATFM
- Time management.
- Mismatch between ICAO products designed for safe flight planning and products designed to optimise ATFM.
- The trials revealed that meteorologists involved in this process needed detailed knowledge of the meteorological parameters affecting ATFM.



YSSY- Reference Card



YSSY Air Traffic Operations

Sydney is the busiest international airport in Australia consisting of twin moderately spaced parallel runways in the direction of 16/34 magnetic, and a single cross runway of 07/25 magnetic.

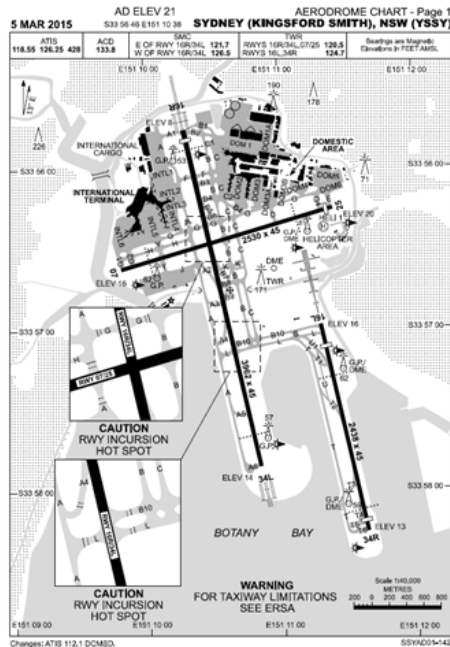


Figure 1 Sydney Airport Aerodrome Chart (Source: Airservices Australia)

Curfew

A curfew at Sydney airport prevents aircraft from taking off or landing between the hours of 11pm and 6am. A limited number of scheduled and approved take-offs and landings are permitted in the "shoulder periods" of 11pm to midnight and 5am to 6am, by Section 12 of the Sydney Airport Curfew Act 1995.

Terminal Area (TMA)

The TMA is a designated area of controlled airspace surrounding a major airport where there is a high volume of traffic. The TMA is a 45nm radial area surrounding Sydney Airport. The TMA is divided into segments called corridors for arriving and departing aircraft. For Sydney airport the main airport arrival corridors are to the N and SW.



Airport Acceptance Rates (AAR)

Sydney airport has a legislated capacity of 80 aircraft movements per hour which cannot be exceeded. For arrivals only, Sydney Airport has the capacity to take a rate of 46 or 50 on the parallel runways and 24 on the cross runway.

METRON – Ground Delay Program Airservices Australia run a Ground Delay Program (GDP) at Sydney 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, delays are assigned to the aircraft at their location of departure rather than in the air.

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) and is based on the 18Z 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 GDP.

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 Sydney Airport is as follows:

Table 1 Sydney Runway Direction Conversion Table

Magnetic	True
160	168
340	348
070	074
250	254

*Please note that you refer to a runway direction as it is being travelled on. Using RWY16 means landing and departing towards the SSE. 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.

An alternative landing runway will be planned when crosswinds exceed 20kts. It is important to note that departures and arrivals do not have to occur on the same runway.

One other thing to keep in mind is the length of the runway. Landing and take-off distances are dependent on aircraft-type, weight, atmospheric pressure and temperature; the active runway will have to be able to accommodate the majority of traffic.

Forecasting at Sydney Airport

Forecasters at Sydney Airport Meteorological Unit (SAMU) are co-located with Airservices Australia in Sydney. Forecasters are in direct contact with both the flow manager and Air Traffic Line Manager.

The flow manager is responsible for allocating an arrival slot and runway to aircraft inbound to Sydney Airport. The Air Traffic Line Manager is responsible for the arrivals, departures and flow of Air Traffic within the TMA.

It is essential that forecasters can provide meaningful information to air traffic controllers regarding Sydney Airport when requested.

Peak Times

Generally peak demand for traffic movements at Sydney airport occur between 7-9am and 5-7pm Monday to Friday. Additional loads occur 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.



YBBN- Reference Card



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.

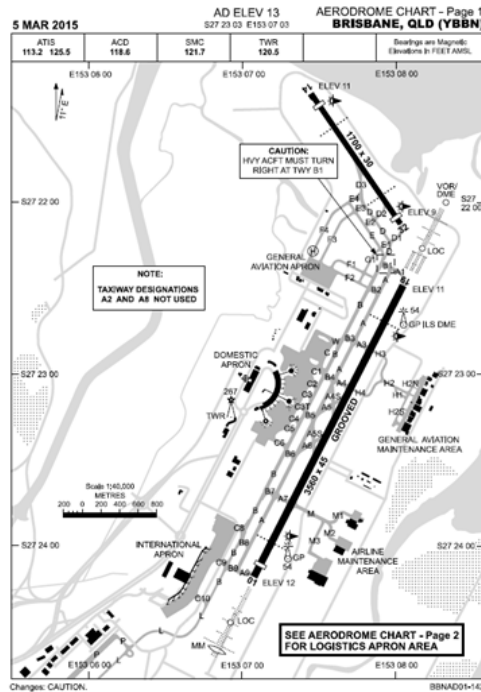


Figure 1: Brisbane Airport Aerodrome Chart (Source: Airservices Australia)

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.



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. Use Runway 19 towards the South, not towards the South West, 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

Crosswind	Dry	Wet
	>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.

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.

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.

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



YMML - Reference Card



YMML Air Traffic Operations

Melbourne is the second busiest international airport in Australia consisting of two intersecting runways in the direction 16/34 magnetic and 09/27 magnetic.

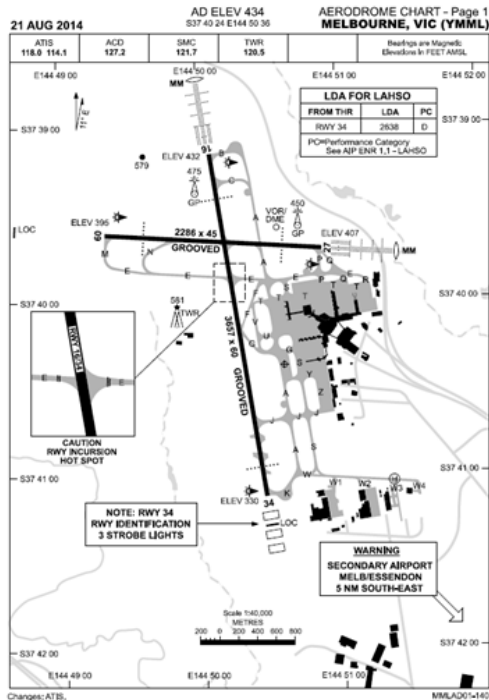


Figure 1: Melbourne Airport Aerodrome Chart (Source: Aircservices Australia)

Noise Abatement
There is no curfew at Melbourne airport. However, noise abatement procedures apply. These procedures include a preference to use runway 16 for noise abatement, particularly in the overnight period. Aircraft must normally be routed to

avoid over-flight of Bulls, Sunbury, Craigieburn, Kallor, Sydenham, St Albans, Greenvale, Meadow Heights and any other area notified by local instruction.



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 Melbourne Airport.

The TMA is divided into segments called corridors for arriving and departing aircraft. For Melbourne Airport it is the corridors to the N and NE which are estimated to be used by 30% and 60% of traffic respectively.

Aircraft Acceptance Rates (AAR)

Runway configurations allow up to 65 movements (arrivals plus departures) per hour at Melbourne Airport. A maximum planned aircraft acceptance rate (AAR) of 44 or 40 occur during the use of both runways for arrivals (refer to section below on LAHSO).

METRON – Ground Delay Program

Aircservices Australia run a Ground Delay Program (GDP) at Melbourne 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 Aircservices National Operations Centre (NOC) based on the 18Z TAF for planning rate for the next 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 reported in degrees true. The conversion for Brisbane Airport is as follows:

Table 1: Melbourne Runway Direction

Conversion Table	
Magnetic	True
090	094
270	274
160	172
340	352

*Please note that you refer to a runway direction as it is being travelled on. Using RWY16 means landing and departing towards the SSE. This as opposed to how meteorologists use wind directions.

Nomination Of Runways

The nomination of runway is determined by Air Traffic Control (ATC) using a preferred runway 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

Crosswind	Dry	Wet
>20kts	>20kts	>20kts
>5kts	>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 have to be planned.

Departures and arrivals do not have to occur on the same runway.

One other thing to keep in mind is the length of the runway in regards to landing and take-off distances that differ per aircraft-type, weight, atmospheric pressure and temperature; the active runway will have to be able to accommodate the majority of traffic.

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

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



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Proposed model for MET-CDM

The Bureau's National Operations Centre briefing officers would:

- would be integral and central to the development of all MET CDM ATFM products
- would manage four products for Sydney, Brisbane, Melbourne and Perth (YSSY, YBBN, YMML, and YPPH)
- be tasked with the ongoing development of these products and the future development of ATFM products for the terminal maneuvering area (TMA) and other areas of airspace deemed important
- work and discuss with Airservices Traffic Manager the MET CDM rates table before a final decision on acceptance rates are made by Airservices Traffic Manager



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Proposed model for MET-CDM

The roles and responsibilities for the AVMET Meteorologist (Qantas and Virgin Australia) would include:

- generate estimates of rates taking into consideration meteorological conditions, the forecast, information on airport reference cards and factors relating to airline commercial risk.
- contributes to the weather forecast and rates discussion through the MET CDM conference call.



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Proposed model for MET-CDM

The roles and responsibilities for Airservices would include:

- Develop rates tables within which the MET CDM process
- Together with the Bureau develop a process to monitor and incorporate lessons learned.
- Manage the rates tables and the mandatory processes that the meteorologists should be following.
- Manage rules surrounding changes to the tables, MET CDM Reference Cards and MET CDM process.



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What's in a TAF

- Generally hourly granularity.
- Under continuous review though TTF (Australia 3hr Trend Forecast) supersedes TAF
- FM groups can use minutes.
- Valid for 30 hours.
- TEMPO means deteriorations for up to an hour for less than half the time in total.
- INTER means deteriorations for up to 30 minutes for less than half the time in total.
- PROB 30 and 40 used with poor visibility and thunderstorms.



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Wind Speed and Direction

- Gusts included when expected to exceed mean wind by 10kts or more. Can be included for operational reasons.
- Change criteria – change of 30 degrees or more and speed 15kts or more before or after change.
- Change criteria – change of 10kt or more speed 15kt or more before/after change.
- Some significant changes for RWY selection may not be in TAF.
- MET CDM will have an hourly forecast wind so all changes will be visible.
- There is a requirement for transition rate rules.



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Visibility and cloud

- Visibility: There is a requirement to know these thresholds.
- Cloud: There is a requirement to understand these thresholds.
- The Bureau's manual and automated observations must be representative of aerodrome.
- Cloud in oktas and cloud base.
- A requirement to understand what is significant? i.e. 1-2 oktas = Few, 3-4 oktas SCT, 5-7oktas BKN, 8 =OVC.



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Weather Criteria

Phenomena	Criteria	Potential Effect
Cloud (>3octas)	<2000ft	Reduced rate, no LAHSO
	<1600ft	Reduced rate, Instrument approach
	<1200ft	Reduced rate, Instrument approach
	<200ft	Cat III Reduced rate,
Visibility	≤8000m	Reduced rate, Instrument approach
	≤550m	Cat III Reduced rate
X-Wind	>20kts	Change of runway
Downwind	>5kts/0kts (dry/wet)	Change of runway



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Advantages of proposed model

- The MET CDM process would develop into an organised discussion on forecast risk and commercial risk interpreted through a rates table.
- The process is managed through the Bureau's NOC MET unit together with Airservices Traffic Managers.
- The MWO forecaster (responsible for YMML, YSSY, YBBN, etc TAFs) would not be heavily involved in the MET CDM rates discussion.
- Airservices Traffic Managers would have the final say on rates and can apply an X factor if required.

MET CDM PRODUCT MOCK UP

TAF YMML

TAF YMML031711Z 0318/0424
35010KT 9999 BKN040
FM032300 02015G27KT 9999 FEW040
FM040300 02017G32KT 9999 -RA SCT020 BKN035
FM040900 02012KT 9999 -SHRA SCT020 BKN035
FM041500 36010KT 9999 SCT030
INTER 0404/0409 4000 RA BKN015 BKN020
RMK FM032300 MODTURB BLW 5000FT TILL041200
T 05 05 08 10 Q 1021 1020 1018 1015

Hour	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12
Wind	350/12	350/10			020/15G27	020/15G27	020/15G27			02018G32				360/10			
Wx1	nil	nil			WD	WD	WD	WD	WD	WD	WD	WD	WD				
Wx2								RA	RA	RA	RA	RA	RA	RA	RA	RA	RA
RWY	LAH	LAH	T	T	34V	34V	34V	T	T	34A	34A	34A	DA	DA	DA	DA	DA
A/R	44	44	35	30	24	24	24	23	21	20	20	20	22	22	22	22	22

Notes

- Onset of strong winds estimate 2330.
- Gradual onset of low cloud and rain 0300-0500
- Likely start of intermittent rain 0430
- Low Level Turbulence 06-09 1500ft wind >90 deg to surface.
- Estimated Nautical Twilight 0709
- Noise abatement rules applied.



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Any Questions?