Australian Government
Bureau of Meteorology

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.

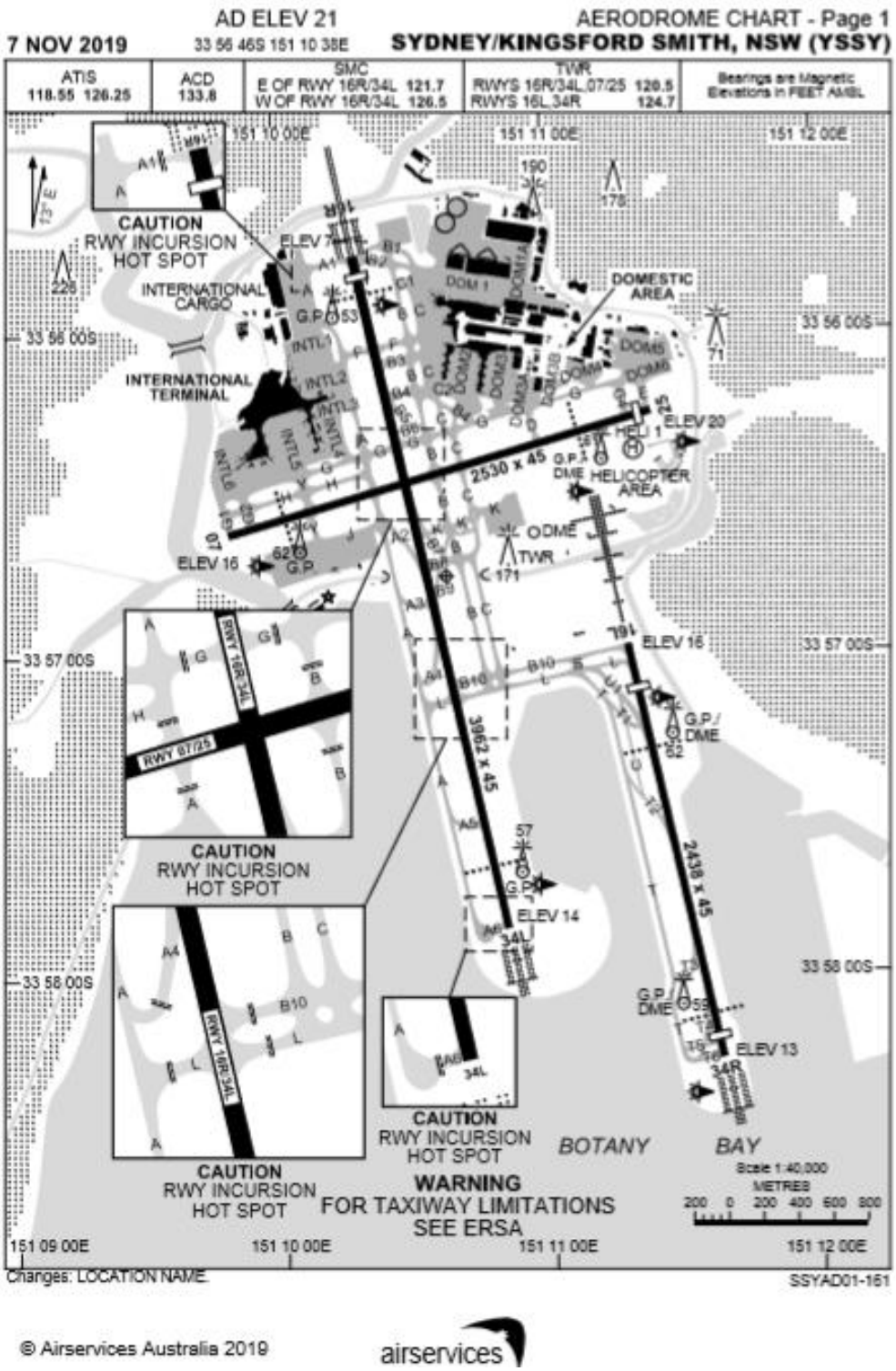

Figure 1. Sydney Airport Aerodrome Chart. Source, AirServices Australia. Valid December 2020.

Curfew

A curfew at Sydney airport regulates movements at Sydney aerodrome 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 Sydney TMA is approximately a 45NM radial area surrounding Sydney Airport.

The TMA is divided into lateral and vertical sectors 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 in benign weather conditions to land 46 or 50 on the parallel runways and 25 on the cross runway.

Ground Delay Program

AirServices Australia run a Ground Delay Program (GDP) at Sydney airport. A special software application called Harmony (produced by Metron Aviation) is an Air Traffic Flow Management (ATFM) application, capable of simultaneously managing traffic flows at multiple airports.

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

Flights that are compliant with their ATFM requirements are afforded priority over flights that are non-compliant.

The Harmony application is run at the AirServices Network Coordination Centre (NCC) and is based on MET CDM for planning rates for the next day.

The ground delay program can be revised at any time but will only impact flights that have not departed.

MET CDM

SAMU provide advice to NCCMET on weather for Sydney airport. NCCMET then make a tailored runway configuration and AAR forecast for ATC based on all weather factors and uncertainties affecting the GDP. This forecast is discussed with the airline meteorologists and then presented to ATC for assessment of other pertinent factors and finalisation. This Meteorological Collaborative Decision Making (MET CDM) forecast is then monitored for significant changes.

Runway Direction

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

Table 1: Sydney Runway Direction Conversion Table.

Runway	Magnetic	True
16	155	168
34	335	348
07	062	074
25	242	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. This 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	>20 knots	>20 knots
Tailwind	>5 knots	>0 knots

*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 crosswind 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 that the length of the runway in regards to landing and take-off distances differs per aircraft-type, weight, atmospheric pressure and temperature; the active

runway will have to be able to accommodate the majority of traffic.

Forecasting for Sydney Airport

Forecasters at Sydney Airport Meteorological Unit (SAMU) are co-located with AirServices Australia at the Terminal Control Unit (TCU). The flow manager and Sydney Traffic Manager have direct access to advice from forecasters.
The flow manager is responsible for establishing an arrival sequence for aircraft inbound to Sydney. The Sydney Traffic Manager holds Operational Command Authority for the TMA and is responsible for the arrivals, departures and flow of Air Traffic within the TMA.

Peak Times

Generally, peak demand for arriving traffic at Sydney airport occurs between 7-9am and 5-7pm Monday to Friday. There is also an afternoon peak on Sundays around 5-7pm.
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 NCCMET prior to the TAF amendment.

Wind Forecasts

SAMU forecasters routinely provide additional information about wind speed and direction changes to ATC for informed runway decision making.
Accurately forecasting a strong cross wind on the parallel runways is critical because of the reduction in AAR caused by the change to single runway operations. A forecast sustained crosswind gust of 20kts or more should be applied for forecasting 07/25 operations.
Instances can occur where a strong cross wind is forecast for both crossing runway and parallel runway directions. Parallel runways would normally be selected in this instance.

Strong Wind Change

The forecast of an expected strong wind change, resulting in an immediate 180-degree runway change, may see an AAR reduced of up to 6 applied to the lower runway rate for the hours either side of the change.

Thunderstorms at YSSY

Thunderstorm cells can affect the ability of aircraft to land and the ability of ground crew to provide services to aircraft once on the ground.
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.
Prolonged thunderstorm events can lead to an excess of aircraft waiting for ground handling. Accurate thunderstorms forecasts are crucial in predicting AAR and potential airborne holding. 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 (45NM)

Thunderstorms within the TMA also affect operations. Specifically, thunderstorms in the entry corridors to the north and southwest of Sydney airport have major impacts on traffic flow.
A reduced AAR can be applied in these circumstances where it is anticipated that the thunderstorm activity will adversely affect the following sectors

330—020 degrees	45NM to 20NM
210—260 degrees	45NM to 20NM

Figure 2: 20NM and 45NM range rings (red) around Sydney Airport with 330-020° and 210-260° sectors (blue) indicated.

Thunderstorms inside 20NM

A reduced AAR may be applied for any thunderstorm activity, but a much lower rate may need to be applied when the thunderstorms occur inside 20NM. There are many factors to consider including the following:

- Positioning of the activity and whether thunderstorms will be weakening as they approach.
- Airspace in the vicinity of SY aerodrome that will be directly affected by thunderstorm activity.

- MET CDM discussion relating to likelihood, severity, timings, anticipated triggers for formation e.g. frontal, convective lifting, speed of travel, steering winds and duration.

Fog

Fog can occur at any time of the year at Sydney airport but is most prevalent during winter. SAMU have developed the Sydney Airport Fog Aid (SAFA) which provides forecasters with a systematic approach to forecasting fog at Sydney Airport. During the Fog Season (25 March through to the 14 September inclusive) this systematic approach is followed every day. The SAFA routinely allows the forecaster to evaluate the development of fog in post-rain and no rain environments.
The inclusion of a PROB for fog onto the Sydney TAF does not result in the application of a reduced AAR at Sydney Airport.
The imminent arrival of fog at Sydney Airport will result in a revised AAR of 15 and clearance rates in accordance with Table 3.

Table 3: Planned AAR for fog cessation

Time commence	Time End	Rate
0600 or fog formation	From first light till +2 hours, rounded to the nearest Harmony 15 min block	15
2 hours after first light	+1 hour or until the fog is forecast to clear	24
Previous end time	+1 hour	34
Then		Normal rates

Instrument approaches

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 (DH) 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) is primarily dependent upon the navigational equipment available on the runway.

Cloud/Visibility

Cloud and visibility have a large effect on AAR at Sydney Airport. Cloud below 4000ft can affect operations.
Cloud at and below 3000ft/2500ft (runway dependent) ensure the use of the ILS and may trigger the PRM system described below.
Similarly, visibility below 5000m also may trigger the use of the ILS and PRM system.
Furthermore, even forecast FEW cloud below 3000ft will require a reduced AAR, as mitigation for those occasions when the few oktas are affecting the approach path.

PRM

The Precision Runway Monitor (PRM) is a highly accurate air traffic surveillance system designed to maximise air traffic flow to parallel runways during periods of inclement weather. PRM permits ATC to utilise reductions in lateral separation standards during ILS approaches to parallel runways separated by less than 1310m but not less than 1035m. PRM is typically only available on weekdays between 0700 – 1100 local.
The specialised controller interfaces alert ATC when an aircraft is deviating towards the adjacent centerline. A 'No Transgression Zone' (NTZ) with a width of 610m is established between the parallel approach paths to provide for a suitable safety buffer between aircraft on adjacent ILS approaches.
Forecast conditions at Sydney which may result in the practice of PRM the following morning result in additional endorsed staff being rostered at the TCU. Meteorological conditions that affect the PRM decision include cloud amounts of scattered or more at or below 2500ft or visibility below 5000m.
In case of Melbourne, RWY34 is the runway where aircraft are cleared to land and hold short before the RWY09/27 intersection, with RWY27 used in its full length.

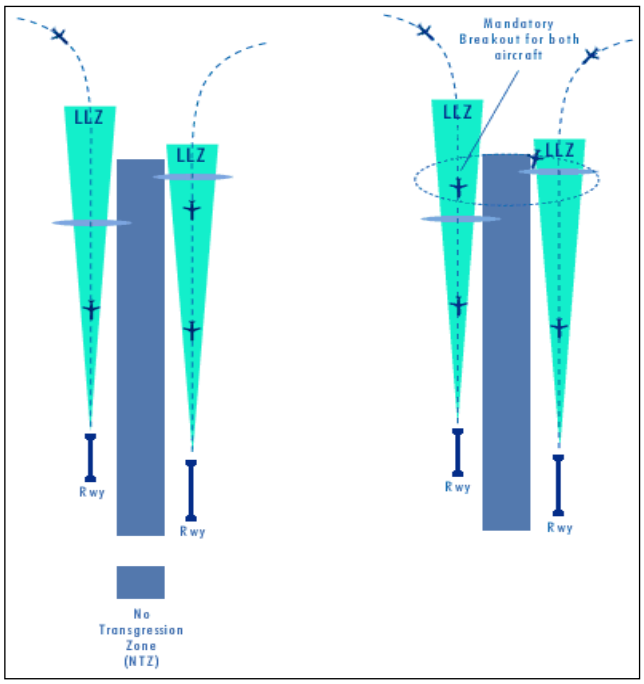

Figure 3: Illustration of Sydney Airport PRM

SODPROPS

It is always a requirement of air traffic management to undertake noise abatement procedures at Sydney. During times of low traffic demand and under certain meteorological conditions simultaneous opposite direction parallel runway operations or (SODPROPS) is one method at their disposal. SODPROPS involves the arrival of aircraft on one runway 34L with the departure of aircraft on runway 16L.

Summary

The meteorological conditions which affect AAR are summarised in Table 4.

Table 4: Summary of Decision Trigger Points

Phenomena	Criteria	Potential Effect
Cloud (SCT or more)	≤ 4000ft	Reduced AAR
	≤ 3000ft / 2500ft	Reduced AAR / PRM
Cloud (FEW)	< 3000ft	Reduced AAR
Visibility	≤ 5000m	Reduced AAR, PRM
Crosswind	> 20kts	Change of runway
Tailwind	> 5kts/0kts (dry/wet)	Change of runway
Headwind	> 25kts	Reduced AAR
Thunderstorms	Range and impact dependent	Reduced AAR
Strong Wind Change	During 2-hour bracket of ETA	Reduced AAR
Fog	High certainty at airport	Reduced AAR

The effect of weather on the availability of runway modes at Sydney Airport is summarised in Table 5a and 5b.

Table 5a: Weather effects on Airport Acceptance Rates at YSSY

Sydney ATFM Business Rules Sydney			
RWY	**Configuration**	**Cloud (ft) and Visibility (m)**	**AAR**
16//	IVA	CLD>4000 & VIS>8000	46
16//	PRM		42
16//	FEW030	FEW CLD<3000	42
16//	DVA A	CLD>3000 & VIS>8000	42
16//	DVA B	CLD>2000 & VIS>5000	38
16//	ILS A	CLD>1500 & VIS>5000	36
16//	ILS B	CLD>1000 & VIS>3000	34
16//	ILS C	CLD≤1000 OR VIS≤3000	32
34//	IVA	CLD>3500 & VIS>8000	50
34//	PRM		46
34//	FEW030	FEW CLD<3000	46
34//	DVA A	CLD>2500 & VIS>8000	44
34//	DVA B	CLD>2000 & VIS>5000	40
34//	ILS A	CLD>1500 & VIS>5000	36
34//	ILS B	CLD>1000 & VIS>3000	34
34//	ILS C	CLD≤1000 OR VIS≤3000	32
07/25	VSA	CLD>3000 & VIS>5000	23
07/25	IMC	CLD≤3000 OR VIS≤5000	20
07/25	TURB	Severe turbulence forecast or observed	20
*	TSRA		20-34
//	XW>25	Forecast XW 20-25 knots or forecast XW > 25 knots on both parallel and crossing RWY	34

Table 5b: Weather effects on Airport Acceptance Rates at YSSY

METCDM Considerations Sydney		
Phenomenon	**AAR**	**Rationale**
Thunderstorms	20-34	MET CDM process to estimate anticipated event severity, position, duration and set rates accordingly within a range of 20-34. - The matrix will show a standard initial selection of AAR 26 for TSRA <20nm and AAR 34 for TSRA >20nm. - Note these are starting points only to convey the greater potential impact of TSRA on rates when within 20nm. - The assessment of rates between 20-34 is based on likelihood, timing and impact on ATFM within a forecast event and the initial starting AAR of 26 or 34 may be used at any distance from the aerodrome and changed with a combination of x-factors and text explanations. PRM is unlikely to be achieved during thunderstorms within 25nm and may be disregarded from the ATFM plan when there is high likelihood of thunderstorms eventuating
Single RWY 25/07 Operations	20,23,34	Sustained crosswind in excess of 25 knots forecast. - AAR of 34 from commencement of forecast period, - AAR of 23 or 20 for the core period when a high likelihood of single RWY operations is agreed between METCDM participants. A forecast crosswind of 20-25 knots results in a parallel runway nomination with the nominal AAR 34 to be run. Should single RWY operations be triggered by actual crosswinds > 20 kts an immediate GDP revision is likely. "Sustained crosswind gusts occur when more than 50% of the one-minute gust components of wind data exceeds a crosswind threshold over a period of 10 minutes or more."
Strong Headwinds on parallels	X Factor -2	While on parallel runways with a headwind greater than 30 knots at 3000ft: - Reduce AAR by 2.
Heavy Showers	30	Shower activity heavy enough to result in aircraft deviations in the circuit typically requires a tactical AAR around 30. This may be considered only when forecast confidence is very high.
Strong Southerly Change	Up to -6 from lowest AAR	A strong wind change is expected which would necessitate an immediate runway change. Subtract up to 6 from the applicable post event runway AAR for the hours either side of the forecast wind change.
METCDM X Factor	-2 to +2	Applied for other impacts; not to exceed the maximum AAR
-10 to -1		The METCDM Process may propose other changes to business rules rates based on forecast meteorological conditions but shall not exceed the maximum AAR for the anticipated runway.

This is a reference card intended to educate users on the phenomena that affect Air Traffic Flow Management (ATFM) and is based on information obtained from AirServices Australia. The card was accurate in December 2020 and will be updated by December 2021. The information contained within may be subject to short term changes that are not reflected in this document. There may also be other factors beyond the meteorological conditions affecting ATFM on any day. AirServices Australia, NCC should be contacted for all day of operations information related to arrival/departure rates and runway configurations. Please email any feedback, corrections or comments to NCCMET_TL@bom.gov.au

Note: Changes to the previous version have been highlighted in yellow.