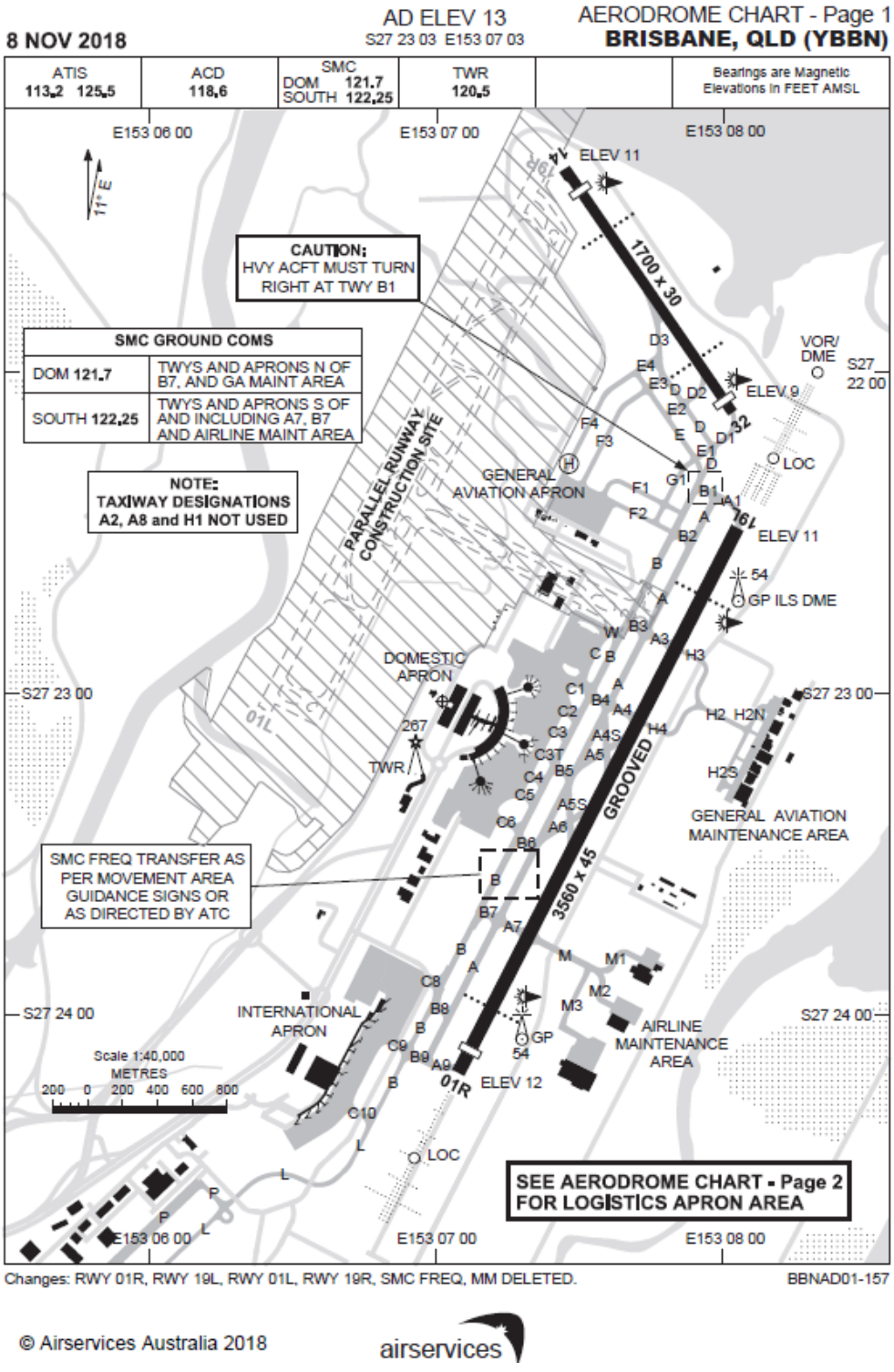
Australian Government
Bureau of Meteorology

YBBN Air Traffic Operations

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



airservices

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 19L for arrivals and Runway 01R for departures.

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

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).

Ground Delay Program

Airservices Australia run a Ground Delay Program (GDP) for Brisbane Airport. A special software 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 demand exceeding the expected capacity, these delays are assigned to the aircraft at their location of departure, rather than in the air in the vicinity of their destination (i.e. Brisbane).

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 Network Coordination Centre (NCC) based on the 06Z TAF for planning rates for the next day.

The Bureau's NCCMET staff are co-located at the NCC 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, yet will only impact flights that have not departed yet.

MET CDM

Based on the 06Z TAF, NCCMET makes a tailored runway configuration and AAR forecast for ATC. This forecast is discussed with the airline meteorologists and presented to ATC for modification and sign-off, a process which is known as 'Meteorological Collaborative Decision Making' (MET CDM).

The MET CDM forecast is a monitored forecast and currently forms the main input for the Brisbane GDP.

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 Brisbane Airport is as follows:

Table 1: Brisbane Runway Direction Conversion Table.

Runway	Magnetic	True
01R	016	027
19L	196	207
14	135	146
32	315	326

* Please note that you refer to a runway direction as it is being travelled on. Using RWY19L means landing and departing towards the SSW. 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.

Airservices advises that RWY selection preferences for VRB or excessive crosswind are RWY19L. Initial selection of either RWY01R or 19L is based on a forecast of zero tailwind (i.e. Nominate RWY01R for wind within the arc 297º – 117º resulting in zero tailwind).

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. Thus, RWY 01R or 19L 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 NCCMET 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.

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 NCCMET 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 may be 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 landing minima at YBCG, 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 with 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.

Thunderstorms outside the TMA (30-100NM)

Thunderstorms outside the Terminal Area (30-100NM) can also affect operations. If significant weather such as thunderstorms are located in the band 30nm -100nm from YBBN, then a three-minute sequence may be required to allow for random deviations. This may also result in spacing required between departures ex YBBN and YBCG.

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 or PROB40 for fog onto the YBBN TAF does not affect the planned AAR into Brisbane Airport, although the MET CDM process is very likely to suggest a reduced AAR. However, fog on the main body of the TAF is treated as if the fog will occur and the tactical AAR may be 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 category 1 approaches available for runways 01R and 19L 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 affect 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 RWY01R. When available, this mode permits the aircraft arrival rate to be increased by around two to four 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 RWY01R. 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.

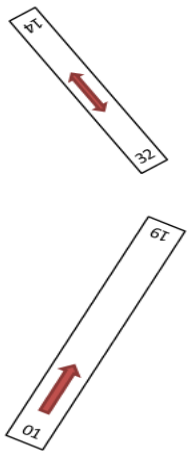


Figure 2: Depiction of Converging Runway Operations (CROPS) Modes

Forecast meteorological conditions that may prevent CROPS procedures include:

- cloud amounts of scattered or more below 2500ft;
- visibility at or below 8km;

- crosswind on runway 14/32 in excess of 20 knots.
- 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. There should be no reported wind shear conditions and/or no reported or forecast turbulence on final. These criteria are in addition to the wind thresholds for the runways.

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

In some instances Traffic Managers may not utilise 01R/32 CROPS when cloud less than 4000ft is evident due to the added complexity to air traffic approaching from the north of the aerodrome.

Archerfield

Archerfield aerodrome is located approximately 13 NM to the SSW of Brisbane Aerodrome. Archerfield runway configuration consists of two parallel runways in the magnetic direction of 04/22 and 10/28. Archerfield is located within the TMA of Brisbane Airport and is within Brisbane controlled airspace.

The effect of Archerfield on air traffic flow can be alluded to in the following situations:

- Poor weather conditions at Archerfield may increase the complexity and workload within the TCU handling sequences into YBAF and processing IMC departures out of YBAF.
- Aircraft unable to land as scheduled at YBAF may divert to either YBBN or YBCG.

Coolangatta

Coolangatta aerodrome is located approximately 50 NM to the SSE of Brisbane Aerodrome. Coolangatta Airport consists of two intersecting runways in the magnetic direction of 14/32 and 17/35. The responsibility for arrivals and departures is held by a dedicated controller in Brisbane Terminal Control Unit (TCU). Please see the reference card for Coolangatta for further information.

Monitoring of Alternate Aerodromes

The presence of very poor conditions at Brisbane that prohibit scheduled landings may result in the use of alternate aerodromes. Brisbane Centre may request for additional information in regards to expected conditions at surrounding aerodromes such as YBSU (Sunshine Coast) and YBCG, (Coolangatta)

Table 3: Summary of Decision Point Triggers

Phenomena	Criteria	Potential Effect
Cloud (SCT or more)	≤4000ft	Instrument approach on RWY01R
	≤3000ft	Instrument approach on RWY19L
	<2500ft	Reduced rate, no CROPS
	<1500ft	Reduced rate, Instrument approach
Visibility	<8000m	Reduced rate, no CROPS
	<5000m	Reduced rate, Instrument approach
	<1500m	Reduced rate, Fog
Crosswind	>20kts	On RWY14/32, no CROPS. Gradually decreasing rate as negotiated
Tailwind	>5/0kts (dry/wet)	Change of runway

Summary - Weather Effects on Runway Modes

The effect of weather on the availability of runway modes at Brisbane Airport is summarised in Table 4a and with acceptance Rates listed in table 4b.

It is important to note, particularly for forecast crosswinds, that RWY01R/19L must always be nominated in the pre-tactical timeframe as not all aircraft can land on RWY14/32.

Table 4a: Rationale and Application of Weather Criteria to METCDM AAR

MET CDM: Application	AAR	Rationale
CROPS	26-28	In addition to the criteria listed in table 4b, ability to nominate CROPS may be inhibited by reported wind shear and reported or forecast turbulence on finals. In some instances Traffic Managers may not utilise 01R/32 CROPS when cloud less than 4000ft is evident due to the added complexity to air traffic approaching from the north of the aerodrome.
Thunderstorms	18-22	Assessment of likely timing and impact on ATFM within a probabilistic event. Thunderstorm rates can be applied if the METCDM process estimates a significant risk and there are no thunderstorms on the TAF.
MET CDM X Factor	'+2 to -2 Positive numbers cannot be applied to exceed the maximum CROPS rate An X Factor down to -10 can be applied for extreme weather events.	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 TS, TS, TS with PROB below 30%, low-level wind shear, gusts 20-24kts and other meteorological factors. 2. Certainty in a severe event (i.e. +TSRA could reduce by -2) 3. Transition creating closer acceptance rates, i.e. 18, 17, 16 instead of 18, 16, 16 over a 3 hour period. 4. Overcomes hourly granularity and other TAF limitations 5. MET CDM X Factors can be applied to end up between two configurations when forecasting confidence is moderate or low. 6. When cloud ceiling is forecast to near 1500ft consider use of x-factor to convey risk of periods falling below 1500ft and moving to an ILS configuration. Impact of lengthy periods of time at 1500ft may also require x-factor consideration

Table 4b: Brisbane Acceptance Rates as defined in Airservices Australia LOA_461 Appendix A – updated 08 Nov 2018

Definitions

a Maestro Rate is the agreed Airport Arrival Rate between Brisbane Tower and Brisbane TMA;

b ATFM ARR Rate is the Air Traffic Flow Management Airport Acceptance Rate agreed to between industry and Airservices and recorded in the ATFM Business Rules; and

c RDMS rate is the Strategic Airport Rate for slot allocation purposes agreed between Brisbane Airport Corporation and its customers. Refer to Airport documentation for more detail.

Mode ID	Runway	Metron condition	Cloud and Vis	Maestro rate	ATFM ARR rate	ATFM Dep rate
1	01R	VMC	Significant cloud to west above 4000 FT or Significant cloud to east above 3000 FT + Vis 5 km or more	25	24	21
2	01R	IMC	Significant cloud to west below 4000 FT or Significant cloud to east below 3000 FT + Vis 5 km or more	25	24	21
3	01R	ILS	Cloud < 1500 FT +/or Vis < 5 km	20	21	20
4	01R	FOG	Vis < 1500 m	12 or as negotiated	12	0
5	01R/14 CROPS	VMC	Cloud 2500 FT and above + Vis 8 km or more	RWY 01R = 24 RWY 14 = 12	28	20
6	01R/32 CROPS	VMC	Cloud 2500 FT and above + Vis 8 km or more	RWY 01R = 24 RWY 32 = 12	26	20
7	19L	VMC	Significant cloud above 3000 FT +Vis 5 km or more	25	24	21
8	19L	IMC	Significant cloud below 3000 FT +Vis 5 km or more	25	24	21
9	19L	ILS	Vis < 5 km	20	21	20
10	19L	FOG	Vis < 1500 m	12 or as negotiated	12	0
12	14	VMC	Vis 5 km or more	As negotiated	12	12
13	14	IMC	Vis < 5 km	As negotiated	12	12
14	32	VMC	Vis 5 km or more	12	12	12
15	01R Dep/19L Arr 1200 – 2000 UTC	ALL	All conditions	As negotiated	10	10
16	01R or 19L	TS	PROB30 INTER TS	As negotiated	22	20
17	01R or 19L	TS	PROB40 INTER TS	As negotiated	21	20
18	01R or 19L	TS	PROB30 TEMPO TS	As negotiated	20	20
19	01R or 19L	TS	PROB40 TEMPO TS	As negotiated	19	19
20	01R or 19L	TS	INTER/TEMPO TS W/O PROB30 or PROB40	As negotiated	18	18

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 on 26/11/2018 – Version 9.3, but 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 particular 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.