AVIATION WEATHER HAZARDS

Jandakot Airport (YPJT)

Bureau of Meteorology › Aviation Weather Services

Latitude: S32 05 51

Longitude: E115 52 52

Height above MSL:
99 ft (30 m)

This pamphlet describes hazardous weather conditions for Jandakot Airport. It is one of a series of pamphlets focussing on hazardous weather conditions at a number of busier General Aviation Aerodromes in Australia and its external territories. Pilots should regard this publication as information provided in support of official forecasts.

Aerial view of Jandakot Airport, 2010. Image courtesy, Matthew Thompson.

Introduction

Jandakot Airport is situated approximately 15 km to the south of Perth CBD, lying on the coastal plain between the west coast and the north-south oriented Darling Escarpment to the east. Although Jandakot Airport is located within the metropolitan area it can experience different meteorological conditions to Perth Airport which is located to the northeast. This is due to Jandakot's closer proximity to the coast and greater distance from the Escarpment.

An automatic weather station (AWS) with sensors for surface wind speed and direction, QNH (pressure), temperature, dew point temperature, precipitation, visibility, cloud amount and base is located at the airport.

Fog and low cloud

Due to Jandakot Airport's location on the low lying coastal plain the aerodrome is susceptible to fog, mainly during the night in winter when the sub-tropical ridge lies north of Jandakot, generating a moist onshore (westerly) flow over the coastal plain.

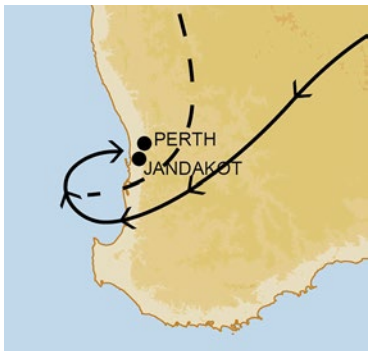
Fog is most likely to form in light westerly through to south-southwesterly flow with onshore winds maintaining high surface moisture. Fog formation is less likely in an easterly synoptic flow as the air is usually drier when sourced from further inland. During the situations when moisture has travelled up from the south coast to saturate the low levels of the atmosphere east of the Darling Escarpment, an easterly flow will result in a katabatic (downslope) wind which warms and dries the air as it descends the Darling Escarpment. Hence, even if air is saturated at the top of the Escarpment, fog will generally dissipate in this regime well before reaching Jandakot Airport.

The balance between the strengths of the westerly synoptic airstream and the easterly katabatic wind at night is critical to fog formation at Perth and Jandakot. If the westerly synoptic airstream is too light, the katabatic wind can prevent the occurrence of fog. If the westerly synoptic airstream is too strong it will result in the mixing of the lower layers of the atmosphere making it unlikely for fog to occur. Generally when the westerly airstream is balanced with the katabatic wind, fog can develop and extend all the way from the coast to the Darling Escarpment.

Australian Government
Bureau of Meteorology

Fog can also occur overnight following a rain event in most synoptic airflows, particularly when skies are clear and winds weaken after the event.

During the warmer months, the risk of fog and low cloud at Jandakot depends heavily on the position of the 'West Coast trough', a surface trough which is normally oriented north-south along the coast, but can lie anywhere from well offshore to well inland. When the trough is located offshore winds at Jandakot are generally easterly, bringing dry and cloud-free continental air over the airport. As the trough moves inland, the moisture laden maritime air mass to the west of the trough extends over land. Areas of low cloud can develop and fog may form if sufficient cooling occurs overnight.



West coast trough and air flow trajectory favourable for low cloud and fog at Jandakot and Perth airports.

An ideal setup for low cloud at Perth and Jandakot airports during the warmer months occurs when the surface trough lies just inland from the west coast, with the southern tail of the trough extending offshore to the south of Perth (see diagram at left). Warm east-southeasterly flow to the south of Perth re-circulates around the trough over the ocean to the southwest of Perth and increases moisture in the lower levels of the atmosphere. When this happens overnight an inversion develops over land helping to limit the vertical extent of the cloud, resulting in a thin layer of very low cloud in a northwest through southwesterly airstream at Jandakot.

During the warmer months, if the atmosphere is unstable and the west coast trough lies to the west of Jandakot Airport, showers and thunderstorms may develop along the trough and move southeast to affect the airport. This precipitation can bring periods of low cloud which usually clear up rapidly after the event.

For the remainder of the year Jandakot is susceptible to low cloud overnight and early morning in moist southerly through westerly airstreams, with low-level moisture building up against the Darling Escarpment until saturation occurs. This low cloud can often descend into fog as the saturated airmass deepens.

The cooler months are dominated by the passage of frontal systems. Periods of low cloud can occur in association with rain, showers or thunderstorms. Low cloud can persist for longer periods if winds are light, moisture levels are high and precipitation continues for an extended period, especially in drizzle.

Northwesterly flow is normally associated with good conditions. However, low cloud can form at Jandakot if there is persistent precipitation, such as in rain falling from a northwest cloud band[1]. These cloud bands can form during any time of the year but are more common ahead of frontal systems during the cooler months.

Thunderstorms

Jandakot has a very similar climatology to Perth Airport for thunderstorms. However, thunderstorms that are triggered off the surface trough over land during the warmer months tend to move in a south or south-southeasterly direction and are more likely to affect inland locations than Jandakot. Thunderstorms in frontal passage regimes can weaken as they travel further inland due to the cooler and drier surface conditions. It is therefore likely that Jandakot has a slightly lower occurrence of warm season thunderstorms and a slightly higher occurrence of cool season thunderstorms relative to Perth Airport.

During the warmer months, the potential for thunderstorms at Jandakot is mostly dependent on the position of the surface trough. Thunderstorms are triggered on the surface trough when hot and dry continental air to the east converges with the warm moist air to the west. The usual movement of these thunderstorms is to the southeast, however they can track to the east through south, and very occasionally

[1] More information on northwest cloud bands can be found in the brochure *Flying the southwest* www.bom.gov.au/aviation/data/education/flying-sw.pdf

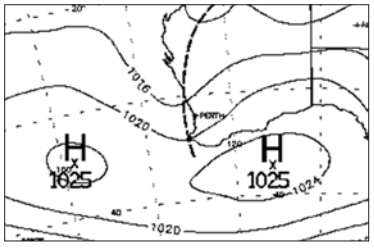
Air Traffic Control, Jandakot Airport. Image courtesy, Sean Mack.

to the southwest. If atmospheric conditions are favourable these thunderstorms can become severe, producing large hail, heavy rainfall and/or damaging wind gusts.

Another mechanism for thunderstorms that can occur anytime of the year acts without any influence from the surface trough. Mid-level thunderstorms, with bases generally above 8000 ft, develop in an area of instability in the upper levels of the atmosphere (generally a mid-level trough that moves from west to east across the state). These thunderstorms usually produce less precipitation but can produce significant gusts (due to dry microbursts[2]). Mid-level thunderstorms that form over the ocean can have slightly lower bases which, due to the resultant increase in cloud depth, can lead to greater lightning activity in these storms.

During the cooler months, showers and thunderstorms associated with frontal features or deep low pressure systems moving south of the state can produce significant wind gusts and even occasional tornadoes. Heavy rainfall and small hail are possible with these systems.

Wind, turbulence and low-level wind shear

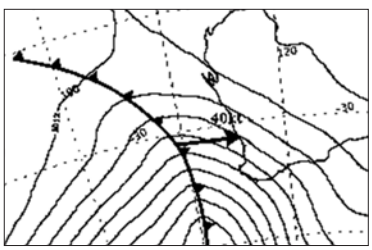


A summer synoptic pattern showing the sub-tropical ridge to the south of the continent and a trough near the west coast.

During the warmer months the sub-tropical ridge often lies south of the state with a trough near the west coast (see diagram at left). This synoptic pattern generates stable atmospheric conditions and easterly winds over Jandakot. If a strong pressure gradient exists between the high pressure to the south and the trough to the north, easterly winds will strengthen. With the formation of a low level temperature inversion overnight, moderate or even severe, low-level turbulence can develop west of the Escarpment. Jandakot Airport can experience strong gusts overnight, abating during the day once solar heating mixes through the surface inversion. Wind shear in this regime is possible overnight and early morning with relatively light winds at the surface grading to strong easterly winds in the low-level jet stream located just below the temperature inversion, generally about two thousand feet above the ground.

With the ocean to the west, moderate to fresh southwesterly sea breezes can develop over the airstrip anytime from late morning, but more commonly during the afternoon when the temperature difference between the ocean and the land is at its highest. The wind change can initially be west-southwesterly, but generally backs around to be south-southwesterly as the sea-breeze develops into the afternoon. Wind shear is possible if the sea breeze forms in a tight easterly pressure gradient with a surface southwesterly grading to an easterly airstream only a few thousand feet above the ground. As Jandakot is the closest airport to the coast the sea breeze can arrive here up to an hour or two earlier than Perth airport. Jandakot is also more likely to experience a sea breeze than these locations as a moderate easterly gradient can prevent the sea breeze extending as far inland as the Escarpment. If the easterly gradient is of sufficient strength and the trough remains offshore, the sea breeze will not extend to Jandakot, leaving the airport in fresh, gusty and hot easterly winds.

Thermals are likely on warm, clear days with high surface temperatures heating surface air parcels which then rise rapidly to heights sometimes exceeding 12000 ft. Light to moderate turbulence can be experienced in thermals and if sufficiently developed, a rotating updraft can pick up loose topsoil to reduce visibility in the vicinity. These are referred to as ‘dust devils’.



A winter synoptic pattern showing the sub-tropical ridge to the north and a cold front approaching the west coast.

During the cooler months the sub-tropical ridge is positioned north of Jandakot generating light to moderate westerly flow over the airport. It is common for frontal systems to move over the airport with northwest flow ahead of the front and southwest flow behind (see diagram at left). Strong fronts and/or deep low pressure systems can generate very tight pressure gradients. Strong or even gale force winds can occur ahead of and behind these systems, along with abrupt changes in wind

[2] More information on dry microbursts can be found in the *Thunderstorms* brochure www.bom.gov.au/aviation/data/education/thunderstorms.pdf

Aircraft and hangars at Jandakot Airport. Image courtesy, Sean Mack.

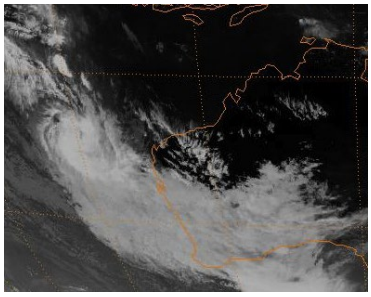
direction on the frontal boundary. Moderate turbulence in the low levels accompanies these strong and unstable systems. Significant gusts may reach the surface with showers and thunderstorms that accompany these systems. In rare cases tornadoes can develop from cumulonimbus or towering cumulus clouds.

Smoke haze and dust

Smoke haze can occur at Jandakot during any time of the year. Wildfires generally occur during the hottest and driest period of the year between December and March, but can begin as early as November and occur as late as April. Controlled burning around Perth occurs mainly in autumn and spring, but can occur in winter. Generally the lowest visibility occurs overnight and early morning as smoke is trapped below a temperature inversion and becomes concentrated.

Dust storms very rarely affect Jandakot, but are generally associated with the infrequent occurrence of tropical cyclones tracking down the west coast toward Perth (refer to the section below). However, there have been occasions when strong and gusty easterly winds generated by a high pressure system south of the state have raised topsoil from agricultural areas inland following an extended period of hot, dry days. These winds carry dust over the aerodrome and can cause visibility reductions over a large area.

Haze generated by the ocean (sea salt particles) and pollution can affect the Jandakot aerodrome. It is usually most significant overnight and in light flow when the temperature inversion forms and light winds inhibit mixing of the atmosphere.



Satellite image of tropical cyclone *Herbie* approaching Western Australia on 20 May 1988. Image courtesy, NOAA.

Tropical cyclones

Tropical cyclones, or ex-tropical cyclones, very rarely affect the Perth area however when they do they pose a significant risk to aviation. Extreme weather ranging from heavy rain, gale force winds and significant gusts, to dust storms and rapidly spreading wildfires. Most cases of tropical cyclones affecting Perth have occurred towards the end of the tropical cyclone season between February and April.

Australian Government
Bureau of Meteorology

Airservices Australia is the official distributor of aviation forecasts, warnings and observations issued by the Bureau of Meteorology. Airservices' flight briefing services are available at www.airservicesaustralia.com. Telephone contact details for elaborative briefings are contained in Airservices' Aeronautical Information Publication Australia (AIP), which is available online through their website.

Other brochures produced by the Bureau of Meteorology's aviation weather services program can be found at www.bom.gov.au/aviation/knowledge-centre.