WEATHER ADVICE FOR YOUR SAFETY

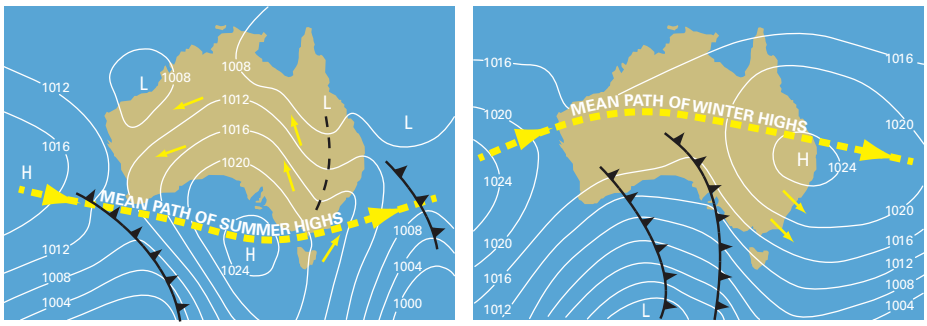
Flying the Southeast

This pamphlet provides an overview of the weather over southeastern Australia (defined as south of latitude 23.5˚S and east of longitude 135˚E), particularly as it affects aviation.

Weatherwise pilots keep in touch with the current and expected weather patterns by:

- **obtaining the latest aviation observations, forecasts, warnings and charts from the briefing system listed at the end of this pamphlet,**
- **telephoning the Bureau of Meteorology for elaborative briefing, when appropriate, and**
- **paying attention to media weather presentations and reports.**

Pilots also benefit from understanding the characteristics of particular weather situations and systems which affect the area in which they operate. This pamphlet discusses some of the hazardous weather elements and situations that may be experienced in southeastern Australia from an aviation perspective.



Average MSLP in summer (left) and winter (right).

General Climate

Southeastern Australia can broadly be described as having a temperate climate characterised by a marked seasonal variation in weather.

Summer

In summer, high pressure systems typically travel west to east across the region at the latitude of Victoria or Tasmania before moving northeast into the Tasman Sea. These high pressure systems are generally associated with benign conditions, however weather hazards may still be encountered in the transition between one high progressing eastwards and another high moving in to replace it. The most common aviation hazards in summer are thunderstorms and duststorms.

Winter

In winter, high pressure systems typically travel west to east across the region at the latitude of northern New South Wales or southern Queensland, with a generally westerly flow prevailing over southern Australia. Cold fronts with strengthening winds and widespread cloud typically cross the region every few days, separated by periods of more settled weather and lighter winds. The most common hazards to aviation in winter include fog and low cloud, turbulence about the ranges and on their lee side, and icing. Winter thunderstorms do occur, mostly along vigorous cold fronts. The typical winter patterns may be broken at times by intense East Coast Lows with deep cloud, very low cloud base and moderate to heavy rain occurring mainly on the eastern and southern side of the ranges.

Weather can vary significantly from year to year. In some years, very dry conditions can give rise to associated aviation hazards, e.g. dust and smoke. In other years this region may experience widespread cloud and rain.

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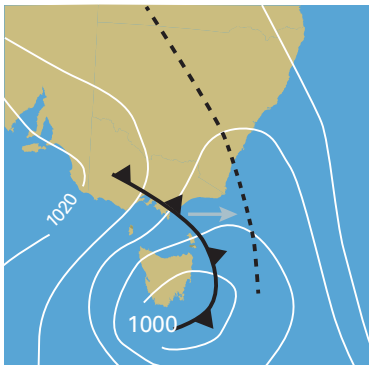
Topography has a major influence on flying conditions in southeastern Australia. The Great Dividing Range provides topographical obstruction that enhances low cloud and thunderstorm formation, and is the most common source of turbulence. Flying conditions often vary from one side of the mountain range to the other, for example, low cloud and precipitation may occur on the windward side with far better conditions on the lee side. Conversely, strong winds may not present a problem on the windward side of the ranges, but create hazardous turbulence on the lee side. Sudden variations such as these can occur and pilots must be ever vigilant for the first signs of deteriorating conditions when crossing the ranges, and act appropriately.

Significant Weather Systems

Cold Fronts



Cold Front.

A front is a major weather indicator and, by its very nature, separates air masses of different properties and thus may be associated with many kinds of weather. The most frequent frontal form experienced in southeastern Australia is a cold front. Cold fronts are associated with changes in wind, temperature and humidity which may occur rapidly. Because of the wind change, there is an impact on navigation, and in the case of strong winds there is the potential for cross-track errors and reduced range. A front may be preceded by a pre-frontal trough which can also produce inclement weather, low cloud and strong winds.

There may be many cloud and weather configurations associated with cold fronts, so the weather forecasts must be scrutinised thoroughly to form a mental picture of conditions prior to developing a flight strategy.

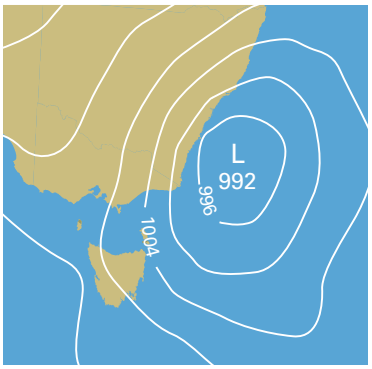
Southerly Buster


Southerly Buster roll cloud over North Avoca Beach, NSW. Photo, Andrew Hollis.

The southerly buster is a well-known phenomenon affecting parts of New South Wales. It is an especially strong warm-season southerly change, generally following a spell of hot weather. On average there are about 10 southerly busters per year that pass near Sydney, each characterised by a squally wind change with gusts to 30 knots or more and temperature falls of 10 to 15 degrees in a few minutes. There is usually very little cloud and no precipitation, although occasionally the change is marked by a spectacular roll cloud. The main aviation hazard is the abrupt wind change and the extreme low-level turbulence.

Southerly busters usually develop ahead of a cold front and often move erratically, which makes precise forecasting of their movement difficult. Pilots should exercise caution when a southerly buster is expected and listen for forecast updates. The TAFs for New South Wales coastal aerodromes provide a guide to when the change is expected to pass through particular locations.

East Coast Lows



East Coast Low.

East coast lows are intense low-pressure systems which generally occur several times each year off the coasts of southern Queensland, NSW and eastern Victoria. They can occur at any time of the year but are more common during autumn and winter with a maximum frequency in June.

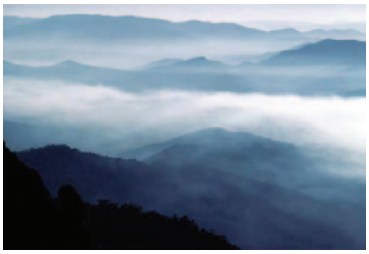
They often develop rapidly and can become quite intense bringing heavy widespread rainfall, deep cloud with low bases, and gale to storm force winds along the coast and adjacent waters.

Hazardous Phenomena

Low Cloud

Extensive low cloud may occur in association with various synoptic situations, e.g. steady precipitation, raised fog, ascent of moist airstreams, or by turbulent mixing of air at low levels. Low cloud may also form due to localised effects, and while it is not necessarily extensive in these circumstances, it may significantly affect operations at key aerodromes.

In the Adelaide area, in the cooler months of the year when a cold northeasterly surface wind undercuts warmer moist west to northwesterly air from the sea, low



Low cloud over Mount Buffalo, Victoria. Photo, Ian Forrest.

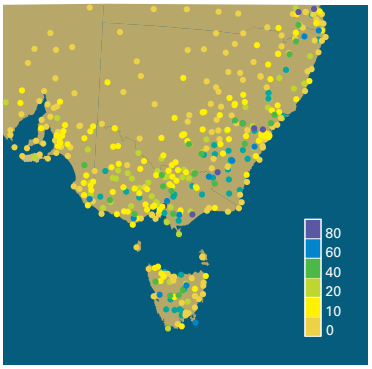
cloud with base around 800 feet (and sometimes lower) may affect Adelaide, Parafield and Edinburgh Airports.

Low cloud often forms along the north coast of Tasmania in the moist airstream ahead of a cold front, affecting aerodromes close to the coast.

Very extensive low cloud with base below 1000 feet above ground level can be expected over the ranges of southern New South Wales and central Victoria on at least one morning in four in winter. The incidence decreases inland, but is still quite high (approximately one morning in six) at locations such as Broken Hill where the nearby terrain is locally elevated.

In southeast Queensland and northeast New South Wales, low cloud can form at any time of year with moist onshore winds. In general, early morning is the favoured time for low cloud, however in strong on-shore stream flows the low cloud base combined with precipitation and reduced visibility may persist all day. Moist southwestly stream flows in winter associated with low pressure systems off the New South Wales coast may cause low cloud on the western side of the ranges. Lows which form further north along the Queensland coast (e.g. east of Fraser Is.) sometimes produce deep layered cloud with very low cloud bases and moderate to heavy rain over much of southeast Queensland.

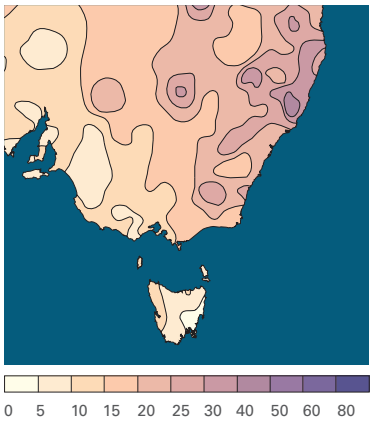
Low cloud in elevated or mountainous terrain is an especially dangerous hazard. It is imperative to compare lowest safe altitude and forecast cloud base whenever low cloud is forecast, and if flight is to commence, develop a pre-determined strategy which is reassessed as the flight progresses.



Average annual fog days.

Fog

Fog creates a major reduction in visibility. Its incidence is generally low at aerodromes close to the coast (e.g. Coffs Harbour in NSW and Hobart in Tasmania) but increases very rapidly only a short distance inland. Aerodromes such as Richmond in New South Wales, Launceston in Tasmania, Mt Gambier in South Australia and aerodromes along the Great Dividing Range generally experience in excess of 40 fogs per annum. On the western slopes of the Great Dividing Range, particularly in southern regions, locations experience in excess of 25 fogs per annum, while the incidence tapers off further inland. In the fog-prone parts of Australia, in late autumn or winter, fog may form in early evening and persist till midday or longer. On isolated occasions fog may persist unbroken for two days at aerodromes such as Canberra and Launceston.



Average annual thunder-days.

Thunderstorms

Thunderstorms may occur in all parts of southeastern Australia. The mountainous areas of New South Wales, southeast Queensland and eastern Victoria experience about 40 thunderstorms per year on average, grading to about 10 per year in the far northwest Victoria and eastern South Australia. Tasmania experiences between 5 and 15 thunderstorms per year on average.

A significant percentage of thunderstorms are severe particularly in northeast New South Wales and southeast Queensland. Severe thunderstorms over the mainland are characterised by large hail, flash flooding, strong surface winds and sometimes tornadoes, while those in Tasmania are characterised more by strong winds.

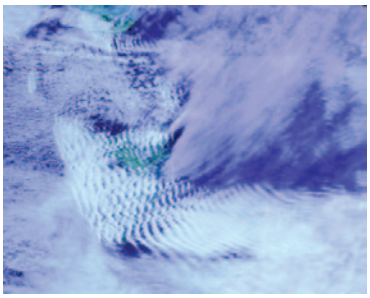
Late spring and summer tend to be the time of greatest thunderstorm activity in all areas except the west coast of Tasmania, where winter is the most likely time. Thunderstorms are more frequent in the afternoon, so as a general principle the best time to fly to avoid thunderstorms is in the morning. However always check the forecast for a particular day.

Keep in mind that the cumulonimbus cloud is only the visible dangerous area. Severe turbulence may be experienced for a considerable distance around the thunderstorm. Other particularly dangerous areas include:

- the area under the anvil, and
- low levels of the atmosphere ahead of the thunderstorm, which may experience a gust front and associated dangers of low-level turbulence and wind-shear.

Thunderstorms embedded in other cloud are especially dangerous as they are not easily identifiable. SIGMETs will be issued if embedded thunderstorms are expected or identified and pilots should avoid these areas.

Low-level Turbulence



Enhanced weather satellite image of mountain waves produced by strong westerly wind over Tasmania.

Low-level turbulence occurs mainly during late winter and early spring in west to northwesterly flows over the Great Diving Range in New South Wales and Queensland, the Flinders Ranges in South Australia and in northerly flows in Victoria. Mechanical turbulence occurs on and to the lee side of the ranges, with mountain waves a common occurrence.

Mountain waves, and associated turbulence, are a relatively frequent phenomenon over and on the lee side of elevated terrain. The most common dangers arising from mountain waves are:

- large sink rates on the lee side of the mountain waves, and
- localised severe turbulence.

These dangers are accentuated by sharp topographical features (e.g. escarpments). You should be aware of the orientation of the topography in assessing the risk of mountain waves and turbulence. For example, at airports such as Coolangatta (YBCG) which have ranges immediately to the west, significant wind shear (due to rotor effects) may occur in westerly flows.

The Adelaide 'gully wind' is a localised phenomenon, frequently associated with dangerous wind shears and low-level turbulence. It is normally experienced on occasions in the warmer months, and from late evening to mid-morning. The scale of any rotors and associated turbulence is not large, usually no more than a few kilometres. As no visual clues may be present, pilots should take note of any warnings, and check for reports of turbulence or wind shear.

Low level turbulence in the lee of Tasmania's mountains is very common. The prevailing westerlies regularly reach speeds in excess of 50 kts at mountain top level (4000 to 5000 ft) and there are often SIGMETs out for turbulence below 8000 to 10000 ft as the winds are perpendicular to the central highlands. Small aircraft regularly confirm these conditions. Aircraft in and out of Hobart and Launceston do report turbulence on approach/departure but it is rarely a problem. Occasionally a sea breeze develops at Hobart with strong overlying opposing northwesterly winds which leads to significant shear.

Dust Storms

Dust storm approaches Wagga Wagga. Photograph, John Darnley.

In southeastern Australia, dust storms occur mainly in western New South Wales, northwestern Victoria and South Australia north of about latitude 34°S. On average, five major dust storms occur annually within the Tibooburra-Mildura-Oodnadatta triangle, predominantly in the spring or summer months. The incidence in this area is greater in drought years, and in these conditions dust storms may also extend to southeastern South Australia and southern Victoria, and become much more frequent in western New South Wales and southern Queensland.

Dust storms can cause a marked reduction in visibility, and if you are contemplating flying into an area where dust storms are forecast, you should seek an elaborative briefing.

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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.