AVIATION WEATHER HAZARDS

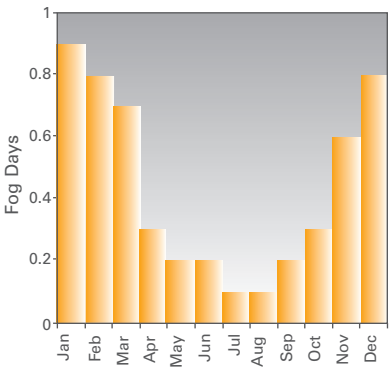
Norfolk Island (YSNF)

Latitude: S29 02.5

Longitude: E167 59.6

Height above MSL: 364 ft

This pamphlet describes hazardous weather conditions for Norfolk Island airport. It is one of a series of pamphlets focussing on hazardous weather conditions at a number of the busier general aviation aerodromes. Pilots should regard this publication as information provided in support of official forecasts.



Mean number of days with fog for Norfolk Island airport from 1939–2013.

Australian Government
Bureau of Meteorology

Norfolk Island, image courtesy bertknot, creative commons.

Introduction

Norfolk Island is located in subtropical waters to the northwest of New Zealand and south of Fiji and Noumea. It is a table top island bounded by cliffs or steep slopes on most sides and has no high mountains. The average elevation is about 700 feet, with the highest point being Mount Bates at 1047 feet. Low cloud is a frequent occurrence in humid airflows (northeast to east in particular) due to, or enhanced by, orographic uplift.

Fog

Fog at Norfolk Island is a rare phenomenon, occurring only about five days a year on average. Higher surface humidity during the summer and early autumn months make the aerodrome slightly more susceptible to fog during these times of the year, occurring less than once per month on average.

A highly favourable set of atmospheric and synoptic conditions must be in place for fog to affect the aerodrome. Being on an exposed island, the wind strength at the airport is often too high for fog to develop. For fog formation, calm or very light winds are necessary, as this allows a temperature inversion to form and trap moisture near the ground level. This usually occurs when Norfolk Island is under the influence of a high pressure system, with conditions becoming even more favourable near the centre of a high where the winds are lightest.

The presence of high surface moisture increases the chances for fog development. Light south easterly trade winds during the summer months usually don't carry enough moisture for fog to be an issue; however air masses that originate from the tropics are much more of a concern, meaning winds from the northern quadrants are more favourable for fog. Southerly winds are a much less favourable wind direction, as the air tends to be too dry. Consequently, southerly winds usually bring good flying weather, especially when the flow is anti-cyclonic. Recent precipitation from frontal systems or lows will often increase the available surface moisture, and under the right conditions this may cause a post-frontal fog.

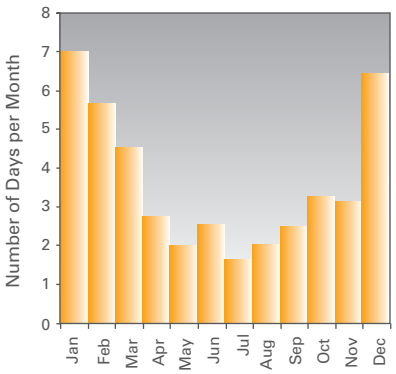
Low stratus cloud looming over Norfolk Island (view from Mt Pitt).

On very rare occasions, when the air is particularly moist, low cloud may continue to lower into fog as the temperature drops overnight. For the majority of fog events, visibility will improve above alternate conditions shortly after sunrise as the surface temperature rises, typically clearing by about 20 UTC.

Low Cloud

Low cloud is one of the most common weather phenomena to affect Norfolk Island. Low cloud is most common during summer and early autumn when moist easterly trade winds are most prevalent, bringing relatively high maritime moisture. The slight orographic lift provided by the island combined with a consistent supply of advected moisture can often result in prolonged periods of low cloud.

Advected moisture in the easterly winds combined with the island's topography provide the most common mechanism for the formation of low cloud; however precipitation in the vicinity often causes intermittent periods of low cloud. This is relatively common with anti-cyclonic southeasterly winds producing passing showers.



Mean number of days with low cloud ceiling below 1500 ft for Norfolk Island airport from 1939–2013.

Low cloud with heavy continuous precipitation is often seen during the passage of a front particularly during the winter months. Low cloud ceiling in the southwesterly airstream following a frontal passage is rarely seen below 1500 ft; however, there are some occasions when low cloud has been detected with relatively low bases, especially when there is continuous precipitation in the area. Low cloud events associated with frontal passages are often shorter in duration due to the entrainment of drier post-frontal air masses. The onset and cessation times of low cloud associated with the passage of a front are often hard to forecast.

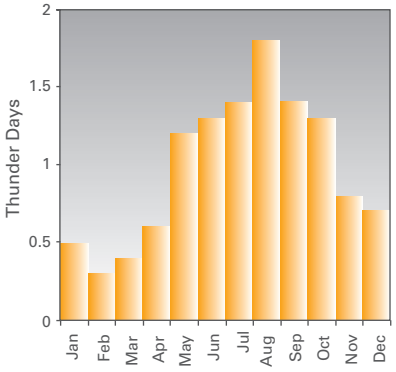
While tropical cyclones occur with a frequency of about once every year, low pressure systems are more common during the winter months. Both of these systems often bring extensive low cloud for prolonged periods.

When low cloud forms on the island it seldom lowers into a fog. This is in-part due to the cloud forming at the height of the terrain, Mount Bates being 1047 ft above mean sea level, and the fact that radiational cooling is hard to achieve in a maritime environment.

Thunderstorms

Thunderstorms at Norfolk Island are relatively infrequent, occurring on about 12 days per year on average. They usually develop along wind convergence lines associated with the passage of cold fronts and troughs across the Tasman Sea. Consequently, most thunderstorm activity tends to occur in the winter and spring months, when cold fronts are more active due to the mean position of the subtropical ridge.

Thunderstorms tend to affect Norfolk Island mostly when the wind change itself moves across the island, followed by generally stable conditions. Prolonged thunderstorm activity can occur with particularly slow moving or 'stalling' fronts in the vicinity of the aerodrome. If a sharp upper trough or cold pool is located behind the front, enough instability can be generated for a cold air mass thunderstorm. These events tend to be fairly uncommon with the most likely outcome being intermittent showers.

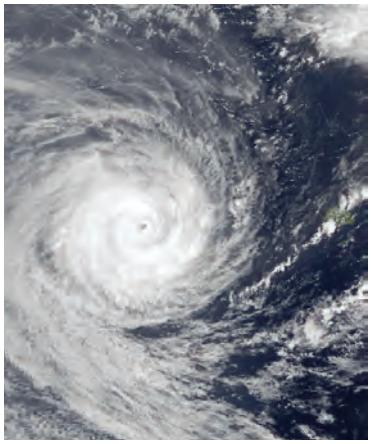


Mean number of days with thunder for Norfolk Island airport from 1939–2013.

Severe thunderstorms are uncommon, with hail reported less than once per year. Thunderstorms are more likely to produce heavy rainfall due to the availability of moisture in the subtropical environment. Strong wind gusts are also possible, usually when a strong cold front or upper-level jet stream is causing the thunderstorms.

Occasionally northwest cloud bands extending from the deep tropics produce isolated embedded thunderstorms which can be difficult to forecast accurately.

Thunderstorms, including severe thunderstorms with associated damaging winds, could be a cause for concern if tropical or ex-tropical cyclones pass by the island.

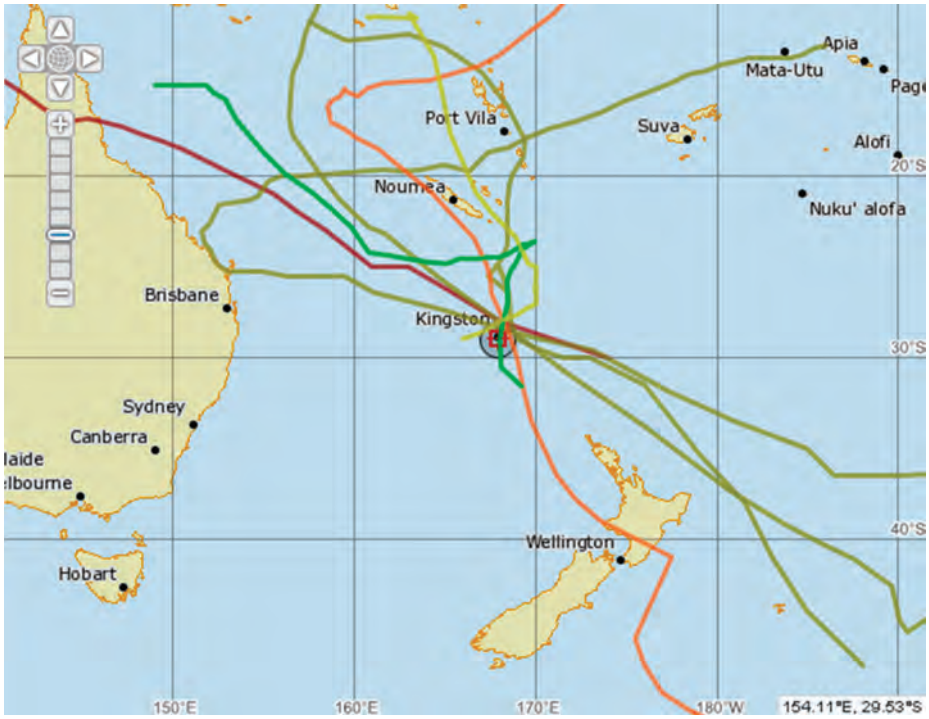


Tropical Cyclone *Fran*, March 1992. Maximum wind gust of 73 kt was the highest ever wind gust recorded on Norfolk Island. Image courtesy, NOAA.

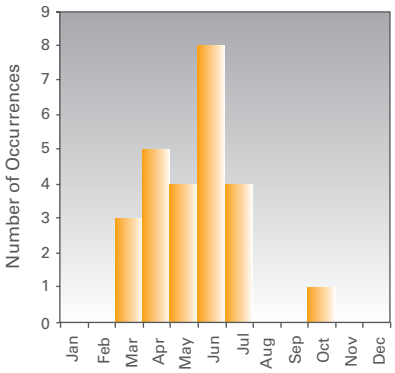
Tropical Cyclones

Tropical cyclones pose a real threat to Norfolk Island during the summer and autumn months. Between 1969 and 2010, approximately 49 cyclones have passed within 500 km of the island, averaging around one per year. Of the 49 cyclones, only seven have passed within 100 km of the island. Although many tropical cyclones do not move directly over the island they are still able to produce serious impacts, with 14 out of the 49 cases producing wind gusts in excess of 48 knots (90 km/h).

Fortunately, for the majority of cases, tropical cyclones form further north in the warmer tropical oceans before drifting down into the region and weakening; usually transitioning into ex-tropical cyclones. Despite this, ex-tropical cyclones still have the potential to generate strong wind gusts and heavy rain.



Tropical Cyclone tracks within 100 km of Norfolk Island between 1969–2010.



Occurrence of wind gusts in excess of 48 knots at Norfolk Island airport from 1947–2013.

Wind

In winter and spring, westerlies and south-westerlies are more common due to the subtropical ridge being further north, allowing cold fronts and westerlies from the Southern Ocean to extend over Norfolk Island. In late autumn and early winter, winds on average are lighter compared to other times of the year and seldom exceed 25 knots.

Strong winds are experienced when a tropical cyclone or ex-tropical cyclone passes by, often on a southeasterly or southerly track. Deep subtropical lows in the northern Tasman Sea also affect Norfolk Island, although the mean number of days with gales is only 0.6 days per year.

Aerial view of Norfolk Island runway.

Low Level Turbulence & Wind Shear

Norfolk is a table top island bounded by steep cliffs on most sides. The mountains situated in Norfolk Island's National Park at the northern side of the Island (highest point Mount Bates at 1047 ft) frequently generate mechanical turbulence when the wind blows from the northerly direction. Winds as light as 15 knots from the north to north easterly direction can sometimes cause moderate turbulence, and in extreme cases, strong northerly winds are capable of producing severe turbulence due to rotor streaming. SIGMETs for such phenomenon are issued and monitored by the New Zealand Meteorological Service. Low level turbulence can also be generated by strong stream flows (in any direction) associated with cyclonic systems (tropical cyclones and subtropical lows).

Wind shear is not usually a concern with frontal systems, as they tend to weaken before approaching Norfolk Island. However, wind shear is typically more of an issue within cyclonic systems due to the rapidly changing wind speed and direction with height. The topography surrounding the aerodrome is capable of generating locally induced wind shear due to mountain winds interacting with the synoptically driven airflow (the summer easterly trade winds for example).

Responsibility for Meteorological Services

The Bureau of Meteorology is responsible for the provision of aerodrome forecast (TAF), aerodrome warnings and observations (METAR/SPECI). Other meteorological services, such as SIGMETs, are the responsibility of the New Zealand Meteorological Service.

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