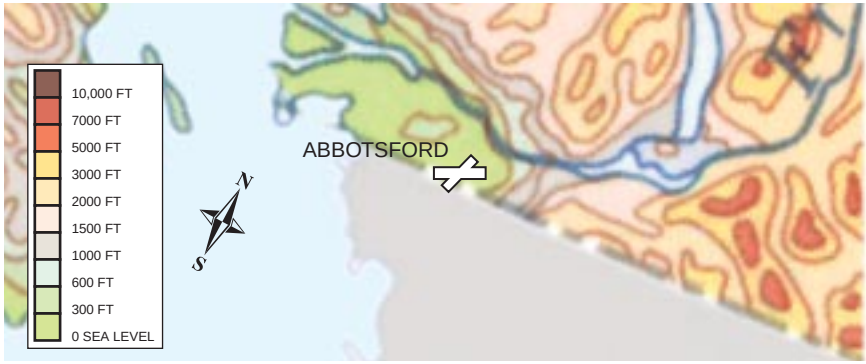
Chapter 5

Airport Climatology

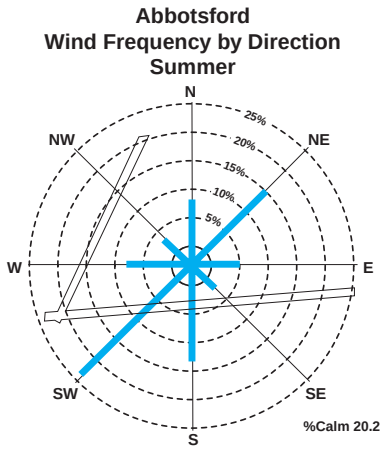
British Columbia

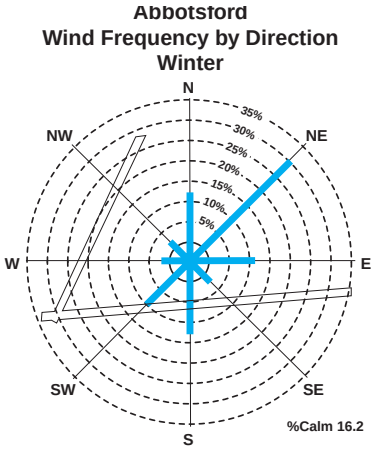
(a) Abbotsford



Abbotsford is located in the Fraser Valley, approximately 30 nautical miles east-southeast of Vancouver. The river valley in which the airport lies is quite broad at this point, with tree-covered peaks ranging from 3,000 to 4,000 feet ASL within 8 to 15 miles northeast into the southeast. Abbotsford International Airport sits on a slight rise of land just to the southwest of the city. Northeast of the airport, across the Trans-Canada Highway, is Sumas Mountain that rises to approximately 3,000 feet.

To the west of the airport is a rolling terrain containing agricultural and urban areas. To the east is a flat plain known as Sumas Prairie, which was formed from an old lake bottom and is now primarily used for agriculture.



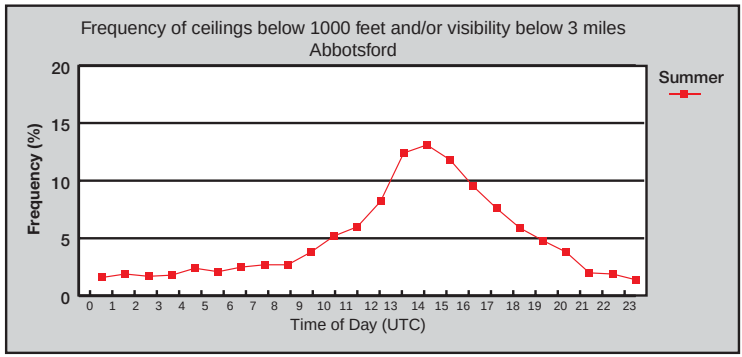


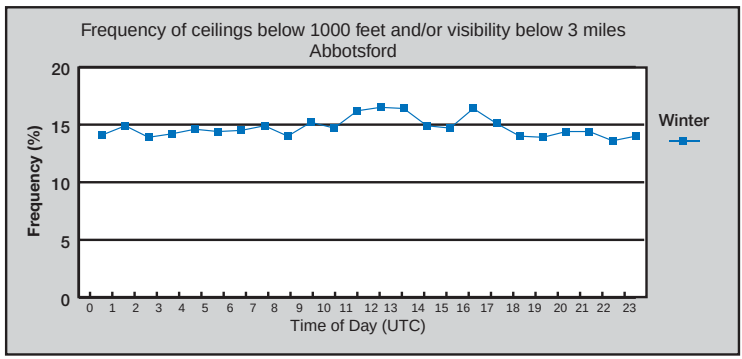
The winter winds show a strong bias to blowing either from the northeast to east, or from the south to southwest. Northeast winds are very common and can be attributed to a cool katabatic flow that comes out from the eastern end of the Fraser Valley and curls around Sumas Mountain. Typically, this wind will only be in the 5 to 10 knots range except in the case of very strong outflow conditions. If it is snowing or there is dry snow on the ground, the winds will produce blizzard-like conditions over the Sumas Prairie with the main core of strong winds passing just to the southeast of the airport. During these events, the winds will typically be northeasterly 10 to 20 knots at the airport. When low pressure systems or fronts approach the South Coast, there is a tendency for these winds to take on a more easterly direction and increase in strength. The south-southwest winds most often occur behind frontal systems as they move eastward into the interior. Other directions can occur but they are infrequent and tend to be light.

The summer winds show the same bias for northeast and southwest direction as the winter winds. However, in this case the most common direction is south to southwest. This is a sea breeze that often sets up in the mid-late afternoon. Frequently in the order of 10 to 20 knots, it will also have slightly stronger gusts. This sea breeze tends to die down in the mid-evening and by midnight the northeasterly katabatic wind will have re-asserted itself. Even the passage of a summer front will show little change in the bias to certain wind directions. Other directions can occur but they are infrequent and tend to be light.

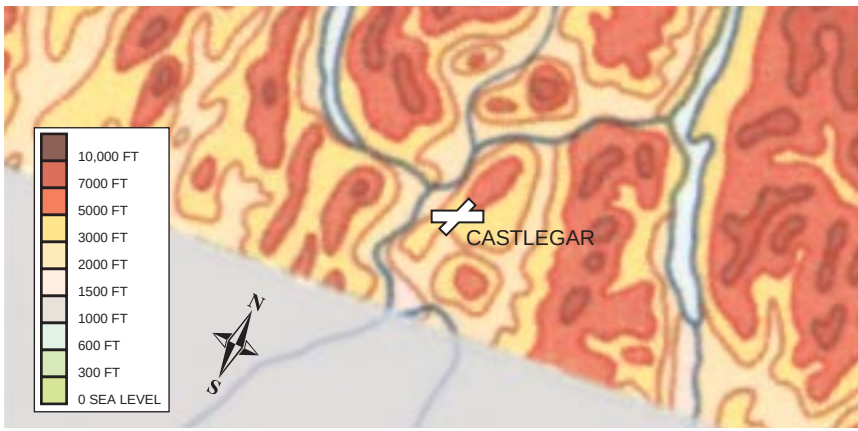
The occurrence of low ceilings and visibility in the winter months is almost uniform for any given hour, somewhere between 14 to 17 percent. This is because the major cause of low conditions is weather systems moving across the area, which have no diurnal pattern. Fog can be a problem at times, especially if it advects up from the Bellingham area in Washington but, for the most part, the most common cause of low ceilings is the frequent and prolonged periods of rain.

Summer tends to be the best time of year at Abbotsford. While cloud ceilings of 2,000 to 4,000 feet can be fairly common, below VFR conditions are rare. For the most part, they are related to passing weather systems with a slight component due to radiation fog.



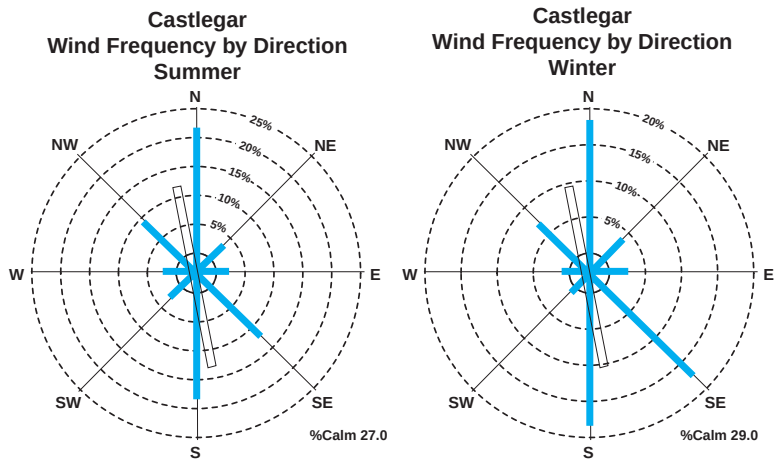


(b) Castlegar



Located in southeastern British Columbia, Castlegar is located in a narrow valley on the east bank of the Columbia River, approximately 2 nautical miles southeast of the city of Castlegar. The Columbia River runs north to south and joins the Kootenay River about 3/4 mile north of the airport. Other communities in the area are Trail (11 miles southwest), Rossland (14 miles southwest) and Nelson (17 miles northeast).

The terrain immediately surrounding the airport is that of a relatively flat bench that falls away to the Columbia River, in the west, and to the Kootenay River, in the north. However, beyond this, the area is hilly, mountainous and thickly wooded. The bases of the mountains are just over 1/2 nautical mile to the east and just under one mile to the west. Significant local elevations are Sentinel Mountain, which rises initially as a 2,500-foot cliff, 1-1/2 miles north-northeast of the runway, then slopes to a peak elevation of 5,645 feet ASL about 6 miles from the airport; Siwash Mountain, 7,600 feet ASL, 7-1/2 miles to the northeast; and Mount Mackie, 7,100 feet, 7-1/2 miles to the west-southwest.

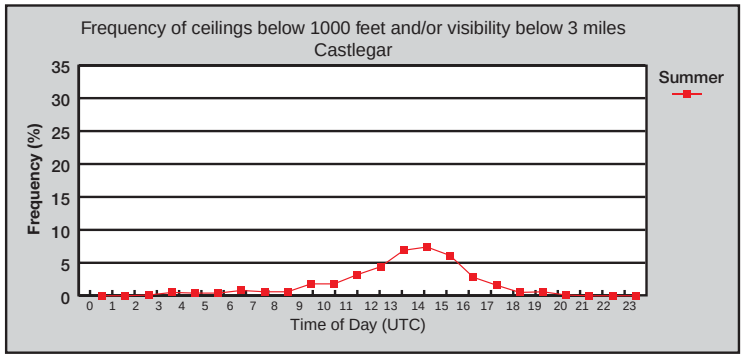


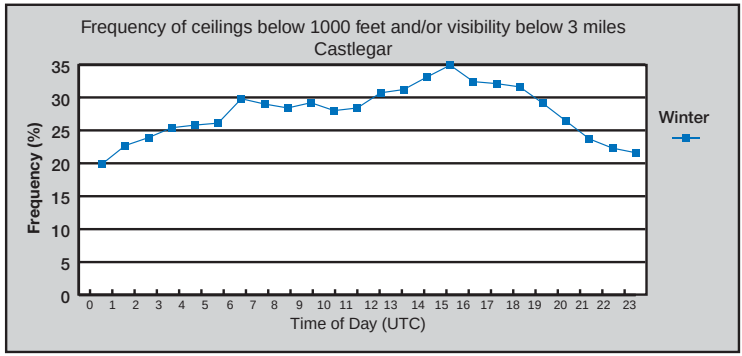
The winds at Castlegar show strong channelling by the terrain, both during the summer and winter. From the graphs, it is evident that the predominant winds are either from the north or south, about 20 percent of the time for each direction. The wind can alter slightly in northwest or southeast directions, with the southeast wind more common in the winter as it moves up the Columbia River Valley. All other directions are rare. It is worth noting that calm winds occur on an average of 28 percent of the time, summer and winter.

Low ceilings and visibility can be a problem in Castlegar during the winter. Like most of the valleys in the Southern Interior, the presence of water makes valley cloud a common phenomenon. However, with a pulp-and-paper plant along the Columbia River to the northwest and a large smelter operation in Trail to the south, the additional moisture and condensation nuclei make low ceilings a persistent problem. Below VFR conditions occur on an average of 20 to 25 percent for most hours of the day, rising to a peak of almost 35 percent at 1500 UTC, which coincides with the time of maximum cooling. Interestingly enough, the occurrence of ceilings less than 2,500 feet and/or visibility less than 5 miles ranges between 35 and 58 percent, depending

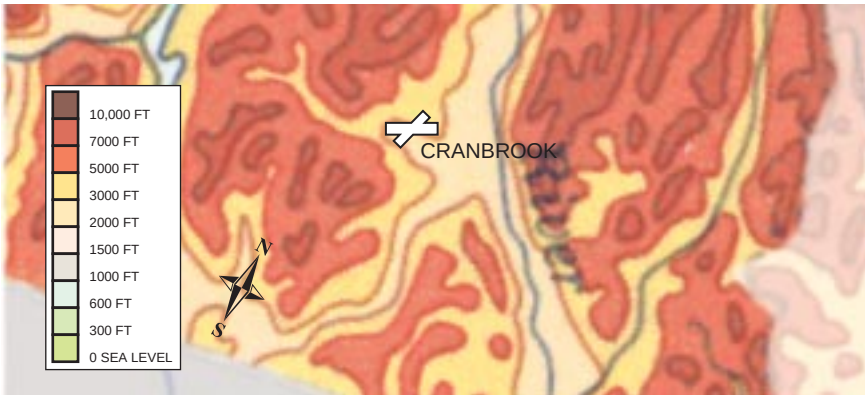
on the time of day. This means that Castlegar, with its high landing and takeoff limits, can be closed to commercial traffic for prolonged periods while local pilots are flying VFR under the cloud deck.

The summer is a much more pleasant story. The valley tends to be dry and hot much of the summer. As such, the occurrence of low ceilings and visibility is very low, less than 3 percent, for most hours. There is a slight peak of around 7 percent at 1500 UTC, and most often this is smoke trapped below the nocturnal inversion. This tends to be a short-lived problem and has disappeared by mid-morning.





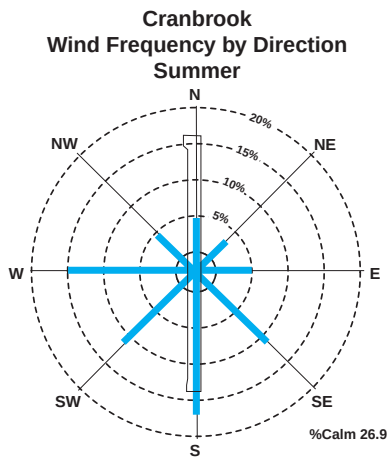
(c) Cranbrook

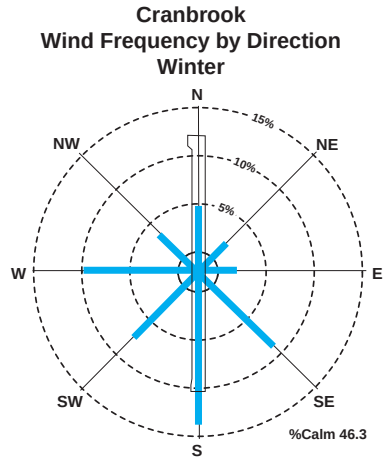


Cranbrook Airport is situated on a rolling plateau, approximately 5-1/2 nautical miles north-northwest of the city of Cranbrook, in the southwest BC Interior. The only other urban centre in the area is Kimberley, 9 miles to the west-northwest.

Two main rivers run past the airport, the St. Mary River and Kootenay River. The St. Mary River runs in a general easterly direction and passes one mile south of the airport, while the Kootenay River runs in a general north-northeast to south-southwest direction and passes approximately 5 miles to the northeast. The St. Mary River joins the Kootenay River 6-1/2 miles east of the airport.

Within 3 miles of the airport, the terrain is slightly rolling, then becomes quite mountainous. The Hughes Range, in which Mount Fisher rises to 9,337 feet ASL, is 11 miles east-northeast and dominates the area to the north and east. The McGillivra Range, with a peak height of 7,240 feet, lies 10 miles to the southeast while the Moyie Range dominates the western quadrant, rising to 5,800 feet within 10 miles of the airport.

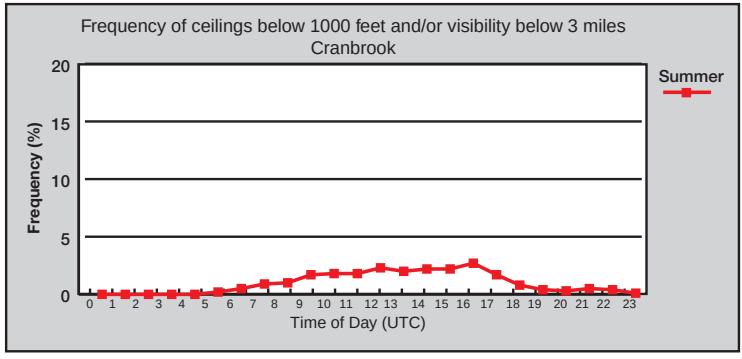


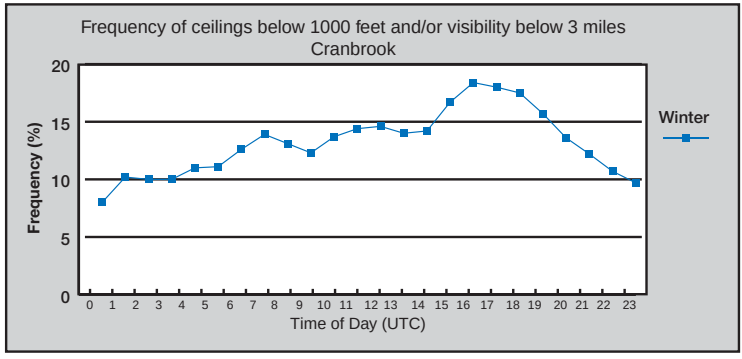


Cranbrook is not a windy location. During the winter months it is calm almost 46 percent of the time and the winds are less than 10 knots almost 90 percent of the time. When the wind does blow it has a strong preference for directions ranging from southeast to west. Winds from the south to west occur most often a few hours ahead and behind frontal systems as they move across the interior. The southeast wind, out of the Rocky Mountain Trench, is often a result of cold air invading from Alberta. This cold air tends to move through the Crowsnest Pass into the Trench. The cold air then tends to flow northwestward filling the Trench.

Cranbrook is slightly windier in the summer, mainly due to local convection, but even so it is calm 27 percent of the time. Like winter, it has a preference for winds from southeast to west. These winds tend to be largely a product of local pressure differences, as well as the movement of frontal systems through the area.

Cranbrook is seldom a problem due to low ceilings or visibility. During the summer, the probability of IFR conditions is less than 2 percent. During the winter, the probability is typically around 10 percent rising to a peak of 20 percent during the morning hours. This increase in probability is a mix between system weather, often snow, and the occurrence of local fog that makes its way onto the airport.





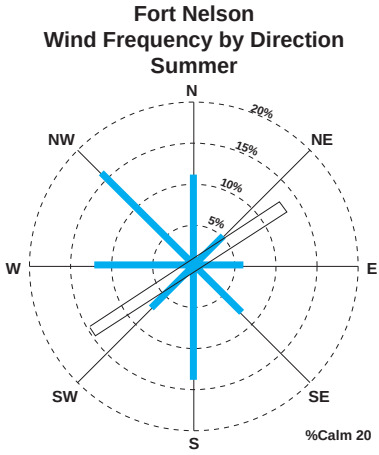
(d) Fort Nelson

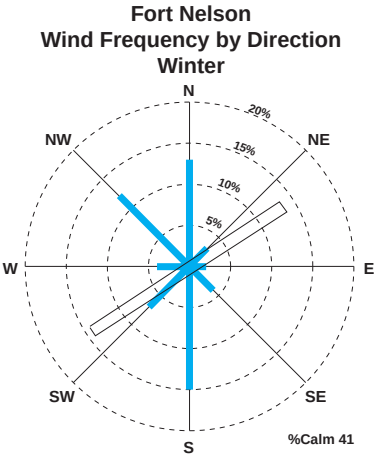
Fort Nelson is situated in the northeast corner of B.C. Straddling the Alaska Highway, it is a favourite stopping point for aircraft following the highway towards Alaska or returning from there.

Situated in a flat valley, the airport is exposed to the full extremes of the Canadian climate. During the winter, arctic air pools in the valley and can hold temperatures at subzero values long after the higher terrain warms up. The sharp inversions these cold pools form are a favourite haunt for widespread low stratus, fog and freezing drizzle.

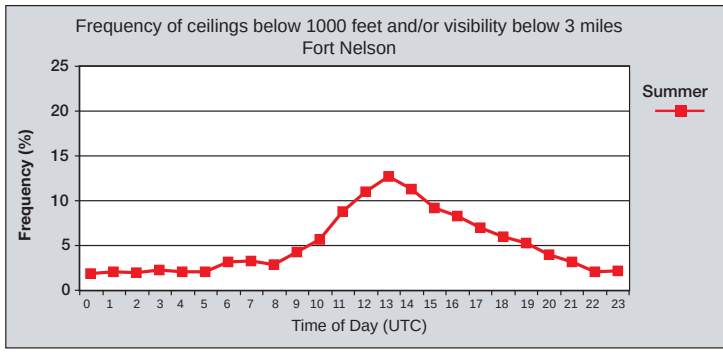
In the summer, the area is also subject to upslope flow resulting in widespread near-IFR conditions. Even when the weather is nice, thunderstorms are a frequent visitor.

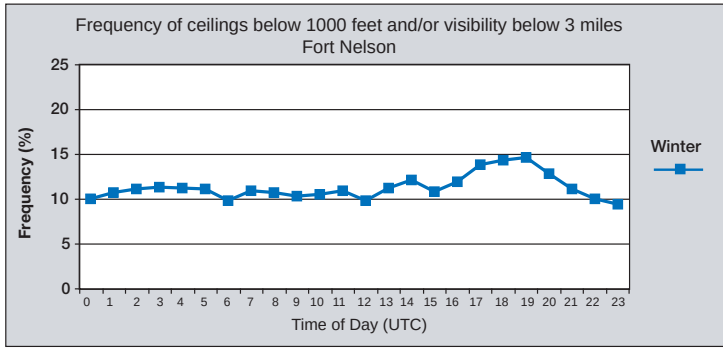
On the plus side, Fort Nelson is not a windy airport. While the winds can blow from almost any direction, about 70 percent of the time they remain at below 10 knots.





It is the low ceilings that offer the greatest difficulty to aviation. While no more frequent than Fort St. John, they can be extremely prolonged at Fort Nelson, going on for days at a time. This serves as a major problem for aircraft wishing to transit through the area.

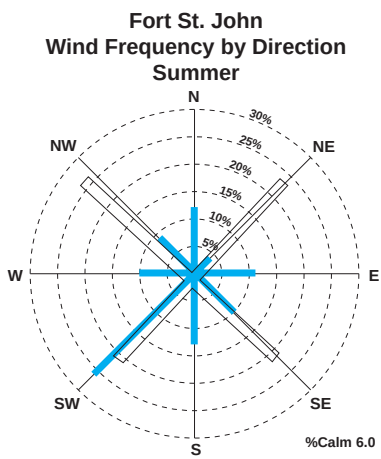


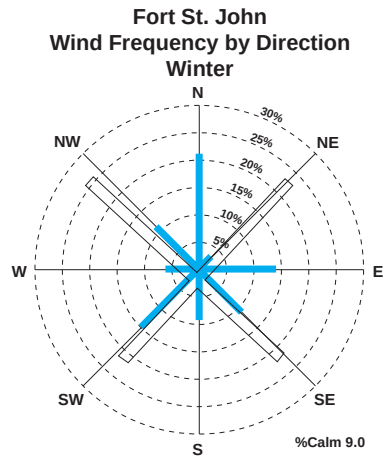


(e) Fort St. John

Fort St. John lies to the east of the Rocky Mountains and shares a climate similar to northwest Alberta. Situated on terrain that slopes gradually towards the east, it is subject to warm, dry summers and cold winters.

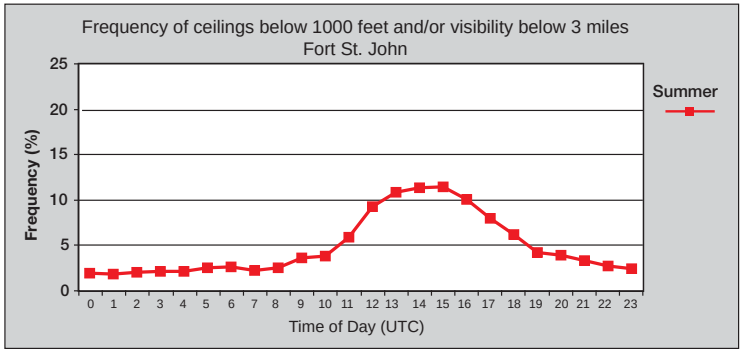
The winds of summer show three distinctive axes. The northerly winds occur quite frequently when a cold front moves southward through Alberta. Confined by the Rockies, the cooler air has little choice but to flow southwards along the mountains. The most common wind, the southwesterly, is a 'chinook-type' flow. Downslope off the Rockies, these winds tend to be strong, gusty and warm. They also usually provide excellent flying weather. The wind that offers the greatest problem is the east or southeast wind. This wind is upslope and often brings with it widespread low ceilings and visibility in precipitation and mist.

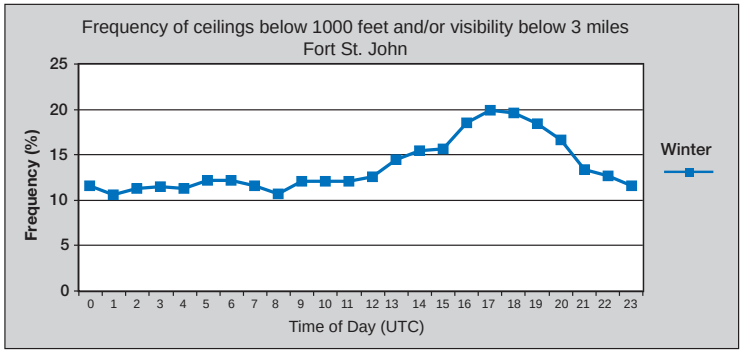




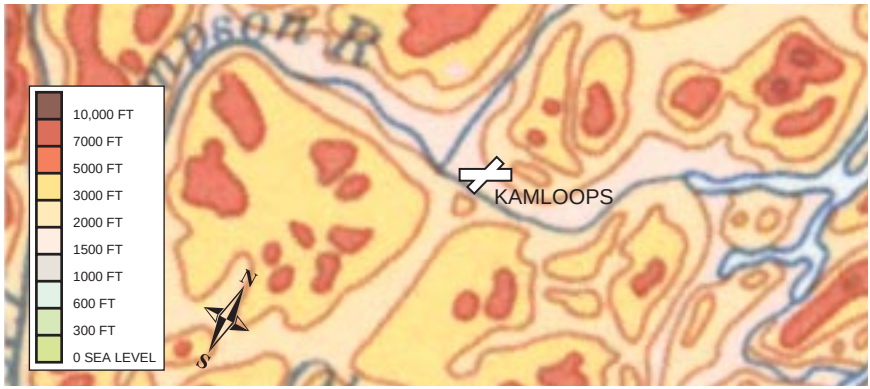
The winter winds show a stronger preference for the cold northerlies, usually associated with the arctic front. Another common wind is the warm southwesterlies. The result is that the entire area is subject to wide swings in temperature. The northerlies can be a problem if the cold air is moving slowly. In such a case, Fort St. John can receive a prolonged period of low ceilings and visibility in snow. Meanwhile, the east or southeast winds continue to be a problem in that there is a river to the southeast of the airport that remains open most winters. Fog banks form over this water and the wind carries it into the airport.

The following ceiling and visibility graph for Fort St. John confirms these periods of below VFR operations but also reveals that the occurrence is not all that frequent.





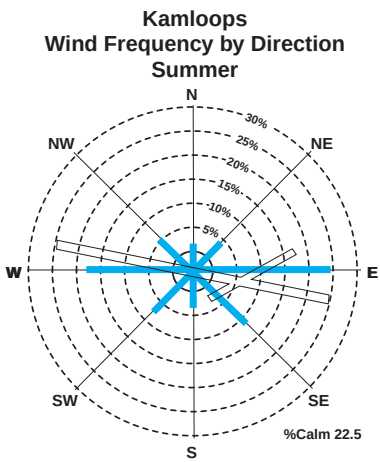
(f) Kamloops

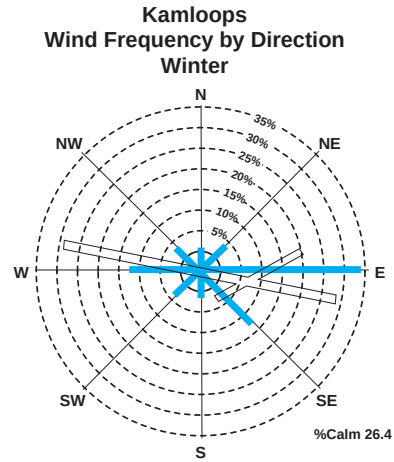


Kamloops Airport lies on the floor of the Thompson River Valley, a deep, narrow valley oriented in an east-west line. The site is about midway between the southern and northern branches of the westerly flowing river. The centre of the city of Kamloops lies approximately 5 miles to southeast, on the southern banks of the Thompson River.

From the valley floor, hills rise rapidly to heights of 3,000 to 4,000 feet ASL, which in turn give way to even higher ridges and peaks beyond 9 miles of the airport. Porcupine Ridge, 19 miles to the north-northwest, rises to 6,100 feet ASL; Mount Lolo, about 13-1/2 miles to the northeast, attains 5,500 feet; Chuwheels Mountain, nearly 11 miles south-southwest of the airport, is 6,233 feet; and, Greenstone Mountain, 9 miles to the southwest, rises to 5,883 feet ASL.

The hillsides up to an elevation of 3,000 feet ASL are grassed, with little or no tree growth. The higher slopes and plateau are where pine and spruce forests thrive.



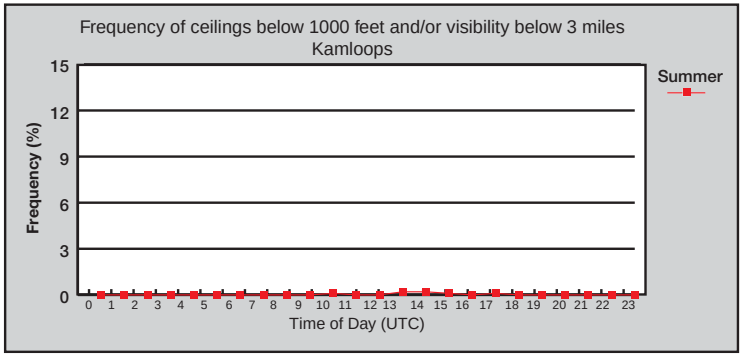


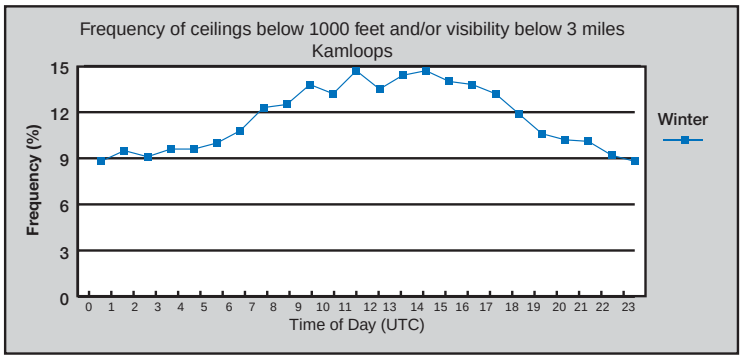
The winds at Kamloops Airport show the effects of the east to west orientation of the Thompson River Valley. During the winter months, the wind is easterly almost 35 percent of the time or calm 26 percent of the time. These easterly winds are a product of katabatic winds that develop along the local slopes most nights, converge in the valley bottom and flow towards Kamloops Lake. Normally these winds are only 5 to 10 knots, but can increase ahead of approaching frontal systems or with very strong drainage of arctic air towards the coast. Westerly winds occur less often and tend to be strong and gusty in the wake of an arctic front.

The terrain continues to influence the direction in the summer but convection gives a larger variation in wind direction. As in winter, the valley has a preference for an easterly drainage wind overnight and during the morning. In the afternoon, convection begins to mix the upper winds down to the surface causing the direction of the wind to shift to westerly. Also, frontal systems which move across the interior at regular intervals, bring wind shifts from east to west with their passage. Some of the strongest westerly winds will occur in this case. It is worth noting that, on occasion, strong subsidence winds aloft are brought down to the surface as south-to-southwest (190-230 degrees true) winds. These winds are not only quite strong but definitely abrupt in their onset.

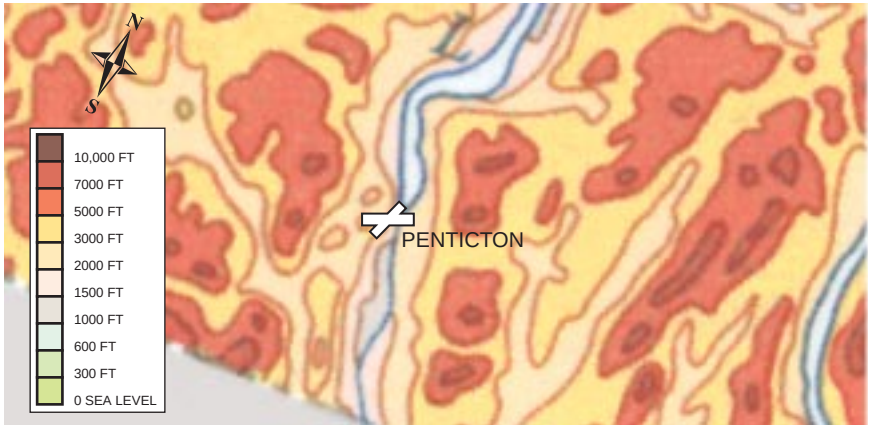
The Thompson River Valley tends to be hot and dry in the summer, creating a need for widespread irrigation. As such, below VFR conditions almost never occur.

The same cannot be said for the winter months. While the area is fairly dry, snow does occur from time to time and valley cloud is all too ready to put in an appearance. Cold air tends to get entrenched in the valley and with it comes valley cloud. Below VFR conditions occur about 10 percent of the time throughout the day with the probability rising to near 15 percent in the early morning, the time of maximum cooling. These statistics do not tell the whole story. The probability of ceilings below 2,500 feet and/or visibility below 5 miles is about 30 to 35 percent and only during the afternoon, the time of maximum heating, does the probability drop to around 20 percent. When you take into account some of the local elevations, this high occurrence of low cloud should make any pilot wary.





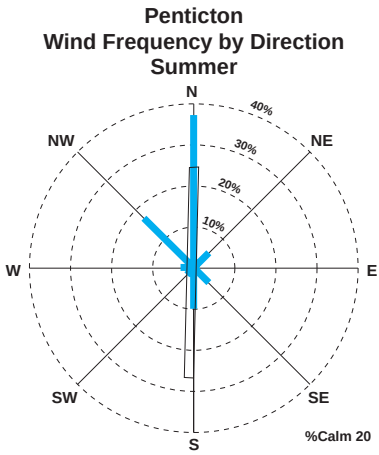
(g) Penticton

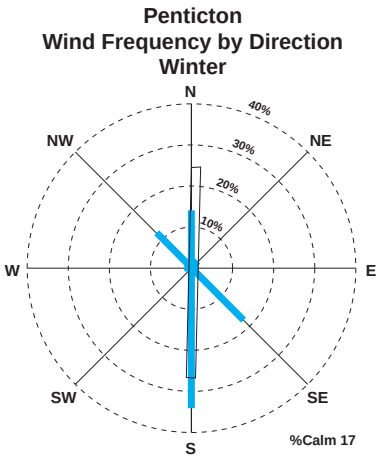


Penticton Airport is located in the Okanagan Valley, a deep, north to south valley in the Southwest Interior of British Columbia.

With such marked terrain influence, it should come as no surprise that most of the time the winds are either northerly or southerly.

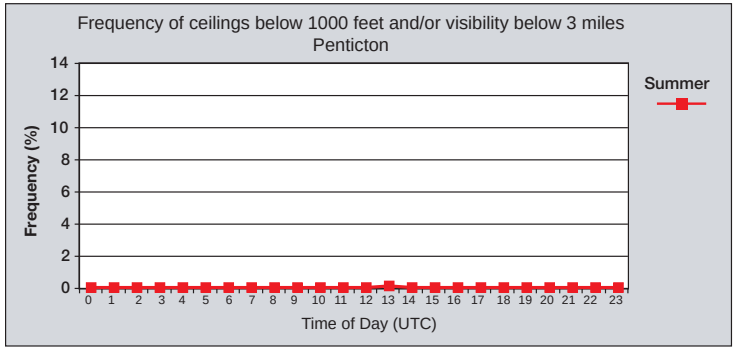
In the summer months, the winds are predominately thermally driven and result in a frequency distribution that is split between north and south. During the day, sunny, hot conditions tend to prevail especially in the south end of the valley. The strong convection produced by this heating eventually carries the predominately southerly winds aloft to the surface, resulting in strong southerly winds that persist into the evening. Overnight, the valley cools but remains warmer in the south, resulting in a weak trough of low pressure. Air begins to drain towards this low resulting in northerly winds that will persist into the morning. On the other hand, if the upper winds are not southerly or very light, a northerly wind will persist for the entire day.

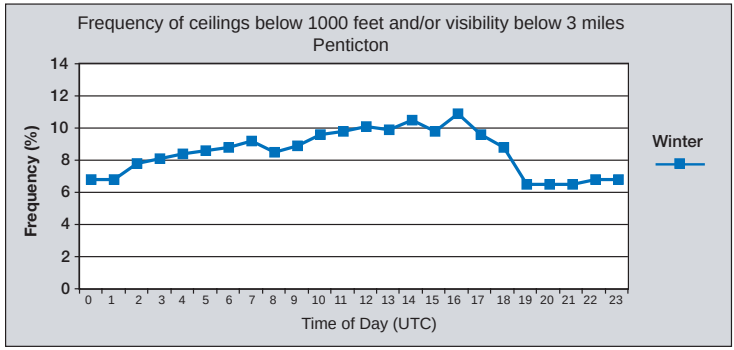




The winter wind pattern is largely driven by pressure gradient. Strong lows and frontal systems moving onto the coast result in significant pressure falls over the province, especially the Central Interior. Strong southerly winds develop through the southern valleys ahead of these systems, especially the trailing cold fronts, then change to a northerly flow in its wake. It should be noted that this wind change will not occur if the pressures to the north of the airport remain lower than those to the south. Northerly winds also occur when cold arctic air spreads into the Southern Interior and drains towards the coast and Washington.

The effects of a drier climate are very apparent in the ceiling and visibility charts for Penticton. Below VFR conditions occur only about 10 percent of the time. Seasonally, these occurrences are almost strictly confined to the winter period and are related to the formation of valley cloud.

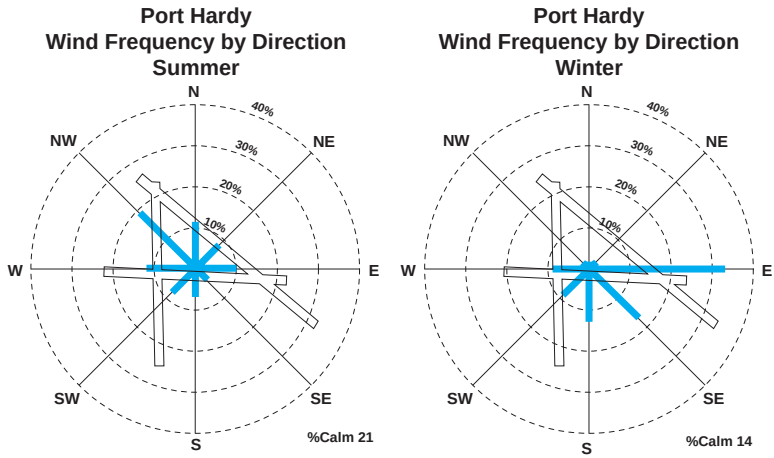




(h) Port Hardy

Port Hardy Airport is located on the northeastern end of Vancouver Island. For aircraft flying north or south along the coast, this airport along with Prince Rupert are key destinations. The airport lies on the western shore of Queen Charlotte Strait with the northern end of the Vancouver Island mountains just to the west of the airport.

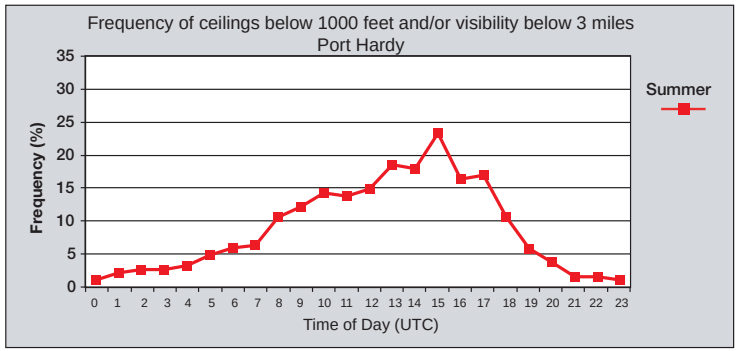
Like most other BC airports, the season of the year has a strong influence on the wind. In the summer, the most frequent winds tend to be easterlies that occur just ahead of frontal systems and northwesterlies that occur with its passage. The pressure falls due to the heating over the southern end of the island. This induces a sea breeze that begins as a northwesterly wind over Northern Queen Charolette Strait in the late afternoon, spreads southward and then slackens to light winds near midnight.

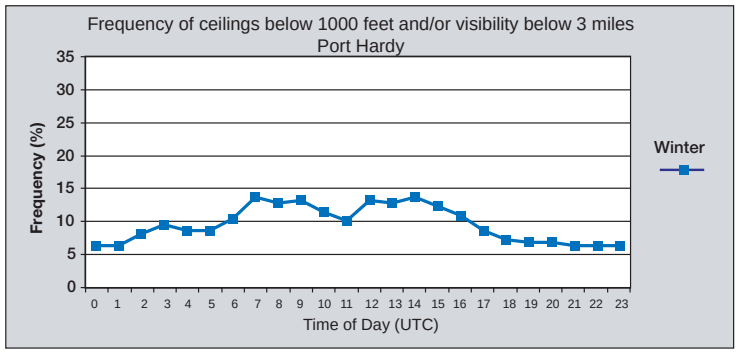


Winter at Port Hardy is a wet, windy time of year. Strong lows and frontal systems move onto the North Coast, generating frequent east to southeast winds up Queen Charlotte Strait and over the airport. While the airport can experience periods when the winds are light or calm, it is worth noting that over 25 percent of the time in the winter the winds are in excess of 10 knots. Very frequently, the winds are much stronger over Queen Charlotte Strait and these winds often move onto the airport a few hours ahead of an approaching frontal system.

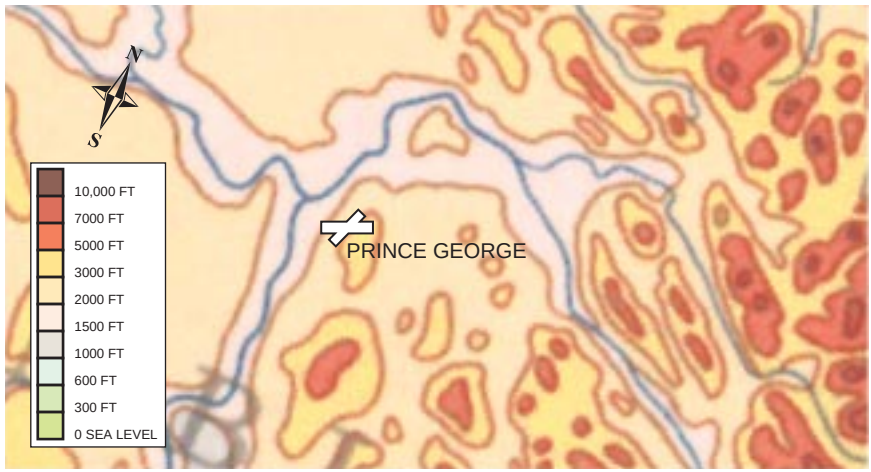
Port Hardy experiences below VFR flying conditions any time of the year. During the summer flying is generally good; however, fog banks are often located over Queen Charlotte Sound and often move onto the airport during the early morning.

The worst flying conditions occur during the period of late fall through winter, into early spring. Strong weather systems move up onto the coast resulting in widespread rain and low ceilings. Between the major systems there is a tendency for poor weather to move into Port Hardy just prior to sunrise and often persist into the afternoon. On the plus side, when the strong southeast winds are blowing the airport tends to remain just above the IFR category.



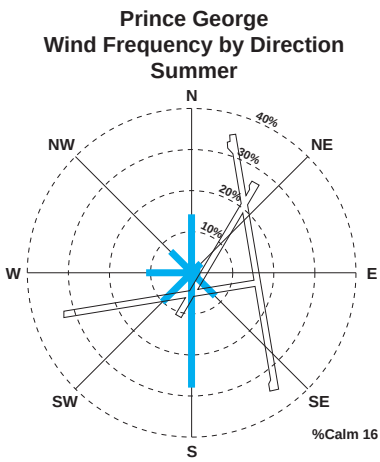


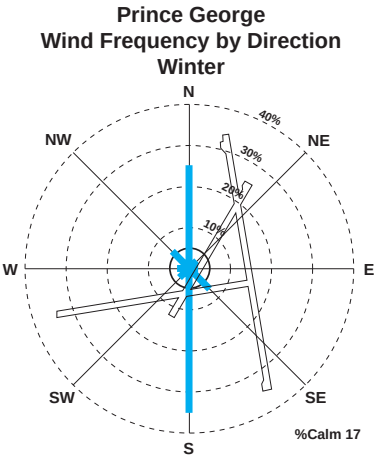
(i) Prince George



Prince George is the largest city in the Central Interior. The weather here is extremely variable, as the major storm tracks off the Pacific prefer to lie across this area. Cloudy skies and precipitation tend to be common, yet in the summer the days can be hot and sunny with the strongest thunderstorms anywhere in the province. Conversely, the arctic front can sweep across the area bringing clear, frigid conditions.

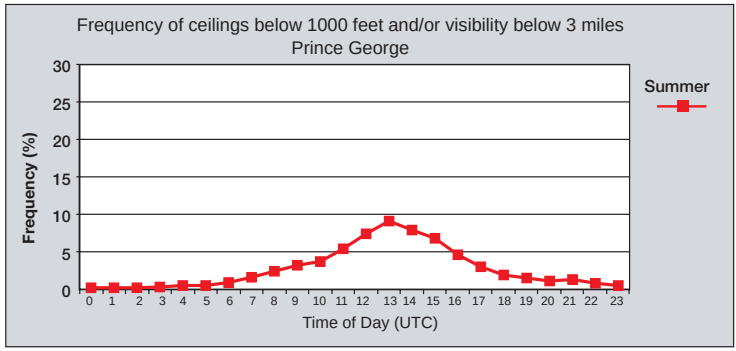
The wind pattern is fairly uniform across the entire year. Southerly winds tend to develop ahead of weather systems and then become northerly in their wake.

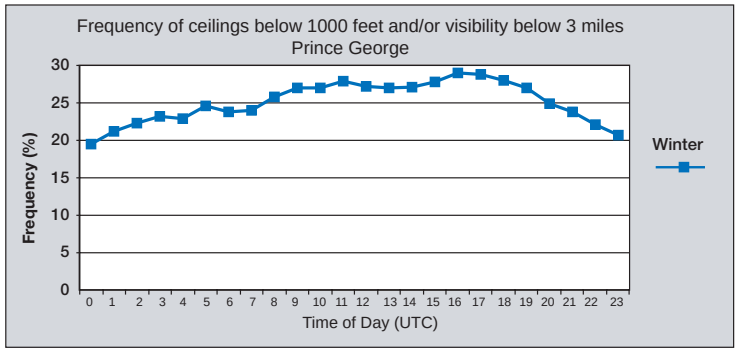




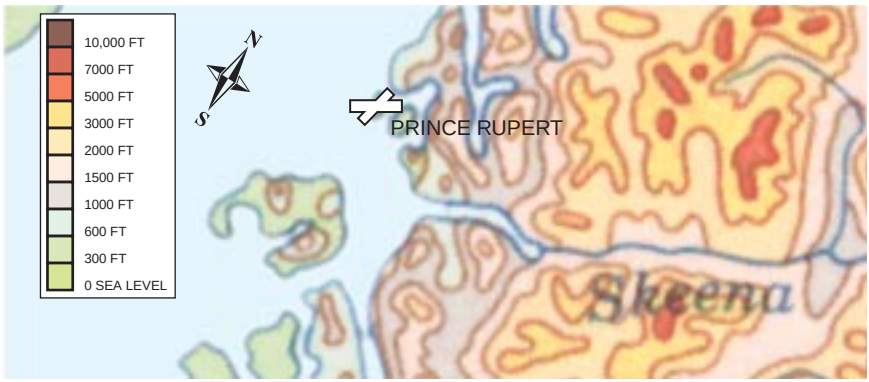
During the summer months, the airmass tends to be fairly convective. Thus, below VFR weather does not occur often except when major systems, such as a cold low, move across the area.

The same cannot be said for the winter. A major influence on weather in the Prince George area is the local forestry mills. There are three forestry mills located to the north of the airport. The combination of the moisture pumped out by these mills and the condensation nuclei provided ensure that low cloud and fog is a real problem. The normal trend is to see the low cloud and fog move into the airport during the night and persist well into the morning. These conditions tend to be episodic in that poor weather will redevelop night after night, until the wind or the airmass changes.





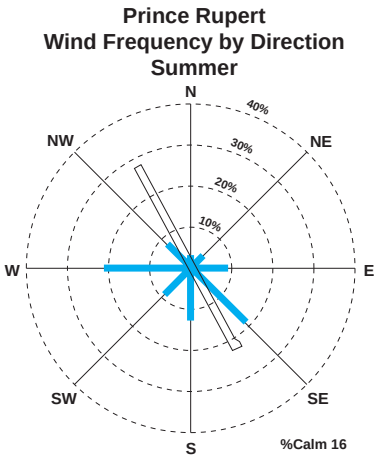
(j) Prince Rupert

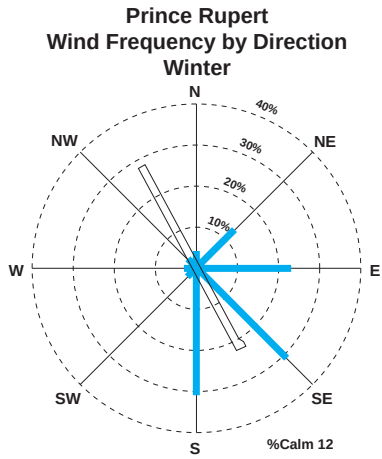


Prince Rupert Airport is located on an island just to the west of the city of Prince Rupert. With the Coast Mountains lying right along the shores of the sea, Prince Rupert is considered by many to be the cloudiest, wettest city in British Columbia.

The winds at Prince Rupert are for the most part light. Even in the winter months when vigourous weather systems sweep into the North Coast, the airport winds are less than 10 knots 75 percent of the time.

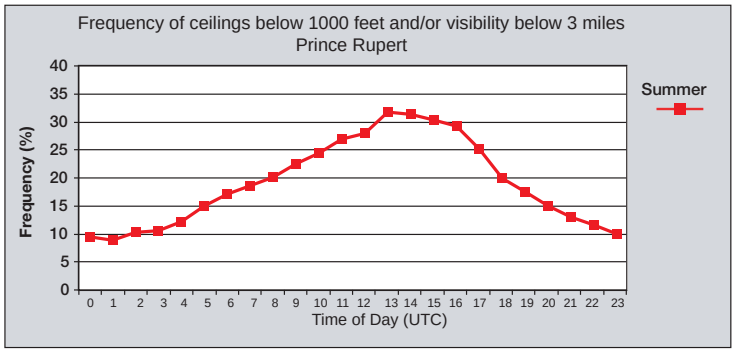
The wind patterns at Prince Rupert show a strong seasonal variation. In the summer months, two predominate wind directions prevail. The marked southeast wind occurs ahead of approaching weather systems. The west winds occurs behind the fronts and with sea breezes.

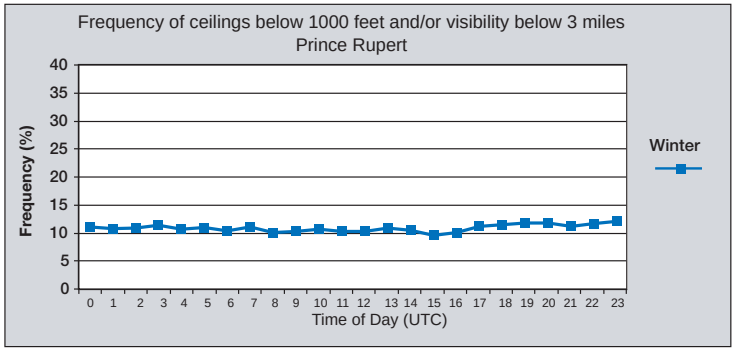




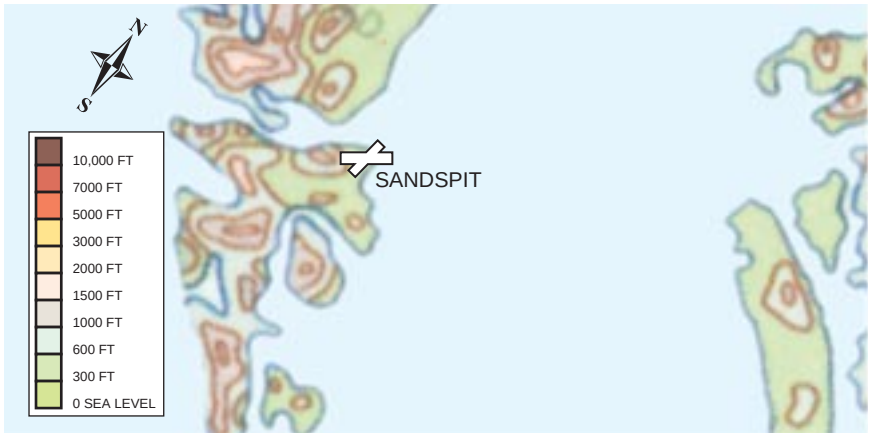
In winter, the strong low-pressure systems that move up across the Queen Charlottes make their presence felt. Almost one-third of the time the winds will blow strongly from the south to southeast.

Prince Rupert Airport is a tough airport even for commercial aircraft. The combination of weather systems crossing the coast in winter, as well as low cloud from the ocean moving onshore, keeps Prince Rupert below VFR conditions 30 to 35 percent of the time. Even in the summer, prolonged periods of rain and fog banks often form in the area or move ashore resulting in below VFR conditions.





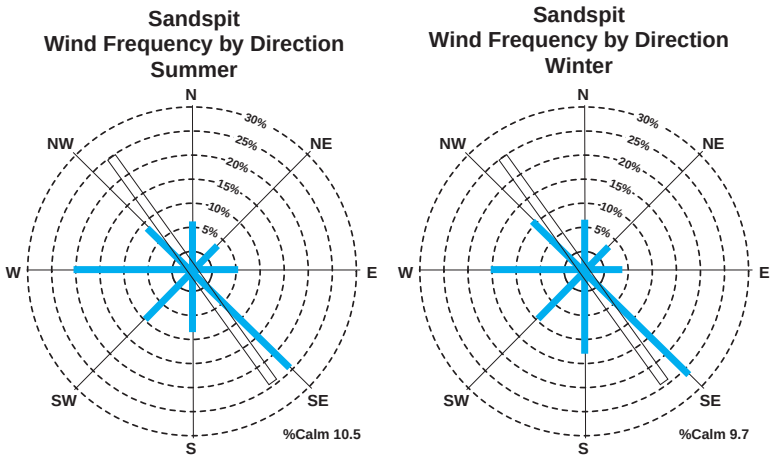
(k) Sandspit



The hamlet of Sandspit, the Gateway to Gwaii Haanas National Park, is located on the The Queen Charlotte Islands, off the north BC coast. The Queen Charlotte Islands consist of several islands of which two of the largest are Graham Island, in the north, and Moresby Island, in the south. Between Graham and Moresby Islands is a narrow channel known as Skidegate Channel that broadens into Skidegate Inlet on the east side.

The only settlement on Moresby Island, Sandspit lines both sides of the low-lying spit of land at the eastern end of Skidegate Inlet. This spit also protrudes out into Hecate Strait, which lies between the mainland coast and the Queen Charlotte Islands. Sandspit Airport is located at the end of this spit, the runway elevation a mere 20 feet above sea level.

The area immediately around the airport is relatively flat with a sandy, grassy covering. To the west, the terrain becomes forested and begins to rise into a set of ridges that rise above 1,000 feet, 10 miles to the southwest of the airport.

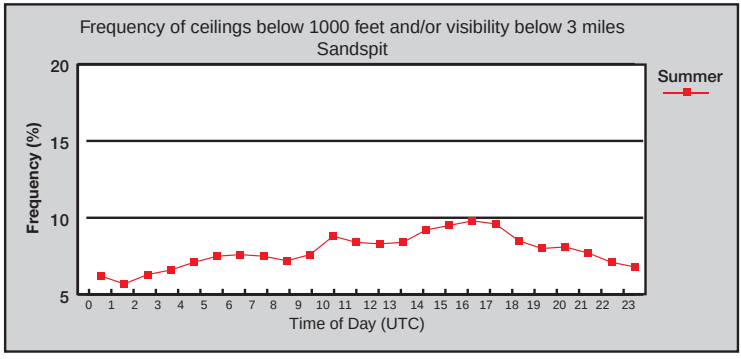


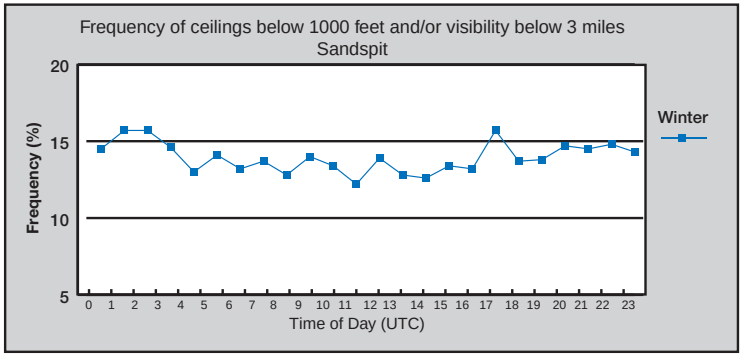
The winds at Sandspit are a product of only a limited number of influences. The southeast winds occur ahead of approaching low pressure systems. Beginning fairly light, these southeast winds will increase as they are channelled between the Coast Mountains and the Insular Mountains. At the peak of a storm, winds can be impressive at Sandspit with the winds being even stronger over Hecate Strait. It has been noted by forecasters that if the isobars on a surface weather map are oriented more northwest-southeast than north-south, then convergence will cause the winds to be strongest over the Sandspit.

The westerly wind is a channelled wind through Skidegate Inlet. Sandspit Airport will frequently show strong, gusty westerly winds behind a front that will last for several hours, then begin to diminish. These westerly winds will, however, persist until the high pressure ridge that is following the frontal system moves across the area. All other directions can occur but are infrequent.

Sandspit is fully exposed to all of the major systems that move through the area. With rain common in these systems, low cloud ceilings occur frequently. At the same time, the waters around the Charlottes are prone to low cloud and fog whenever warm air moves over the relatively cold water. As a result, below VFR conditions can

be expected around 15 percent of the time in the winter and 8 percent of the time in the summer. The nicest conditions in winter occur during times of outflow winds through the mainland inlets, although snow showers can be a problem over Hecate Strait and along the eastern shores. In summer, the best flying weather occurs when strong ridges of high pressure become fixed over the area.



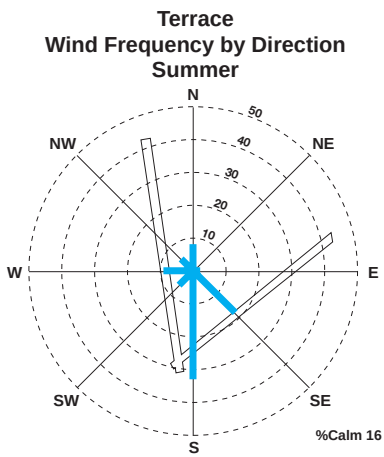


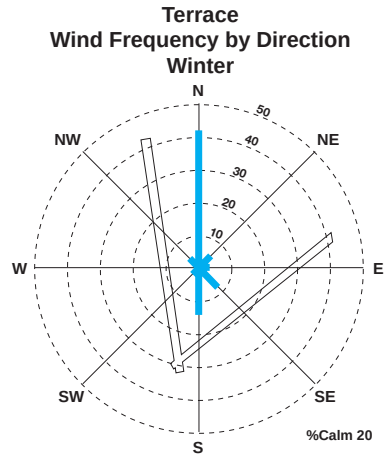
(l) Terrace

Terrace Airport is located on a plateau across the river just south of town. Despite being located inland from the coast, its weather is all too often a dramatic clash between the moist air from the coast and drier air from the interior.

Situated at the junction of several valleys, the wind pattern at Terrace Airport shows the strong influence of topography and pressure gradient.

During the summer months, the winds are quite variable and blow from almost all quadrants. The most prominent wind is a southerly that blows out of the Kitimat River Valley from Douglas Channel. This wind usually occurs ahead of an approaching frontal system. This southerly wind also occurs in the summer when there is a thermal trough inland and a ridge of high pressure along the coast. The other prominent wind is a northerly drainage wind out of the Kitsumkalem River Valley. The winds do blow easterly and westerly over the airport but are seldom strong.

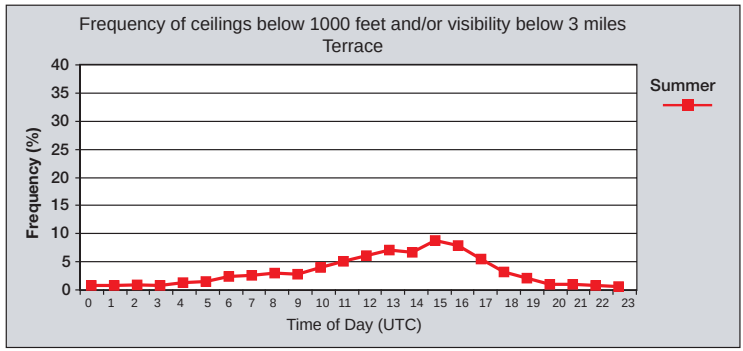


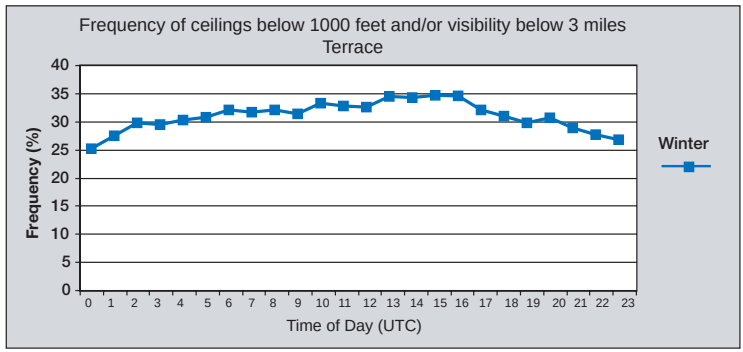


The influence of cold air and falling pressure along the coast ahead of a strong weather system is evident in the winter wind pattern at Terrace. North winds are very common ahead of a weather system. These winds also occur in outflow situations and can result in near blizzard conditions. Just ahead of an approaching frontal system, the winds will often switch to a southerly from the Kitimat River Valley as warm air begins to move into the area from the coast.

Like Prince Rupert, Terrace can be a very difficult airport for weather forcasting. During the winter, upslope conditions off the coast mixing with cold air from the interior will produce low cloud and poor visibility in rain or snow, depending on the temperature. During the changeover from snow to rain, mixed rain and snow or freezing rain can make flying into this area treacherous. Even when the precipitation stops, all too often radiation fog forms, rapidly producing prolonged IFR conditions.

July and August are the best flying months in this area. Low cloud off the ocean can still be a problem but, in general, conditions remain VFR.

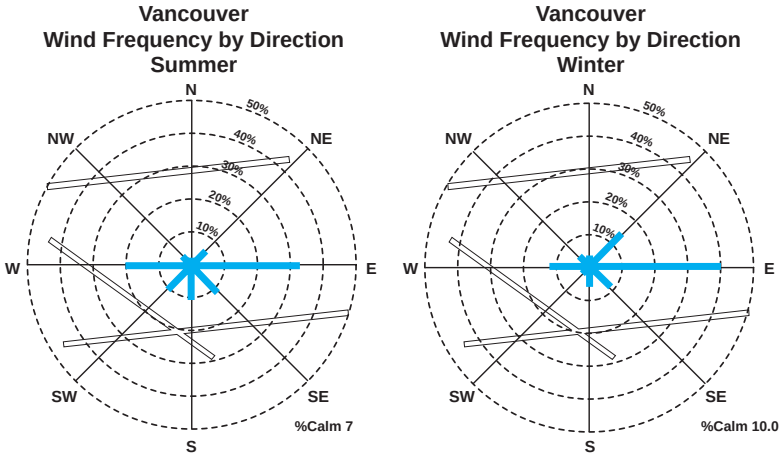




(m) Vancouver

Vancouver Airport is located on an island at the mouth of the Fraser River. With the Fraser Valley extending off to the east and the Strait of Georgia lying in a rough northwest-southeast line just to its west, the winds are strongly influenced by topography and season.

During the summer months, the winds are predominately east or west. The west wind tends to be a sea breeze while the east wind is a drainage wind coming out of the Fraser Valley. Minor frontal systems do move across the area resulting in a southeast wind ahead of the front changing to a northwest wind in its wake. Seven percent of the time the winds are calm and 85% of the time the winds are less than 10 knots. Only on the rare occasion do winds exceed 20 knots.

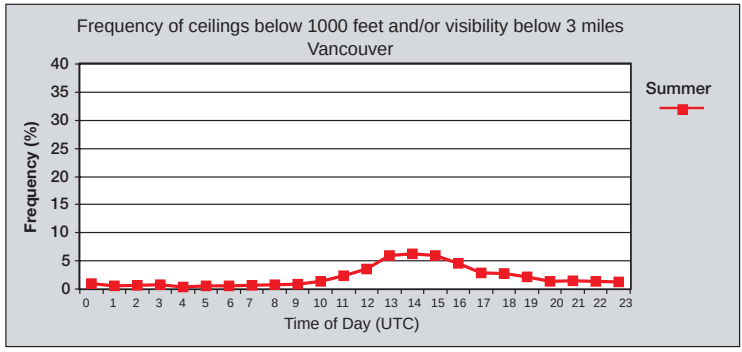


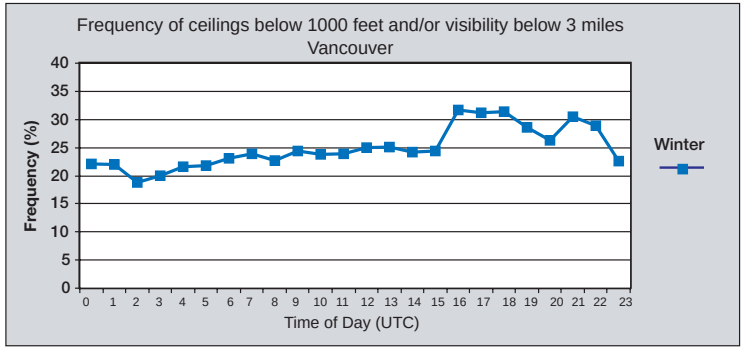
The winter winds show a similar pattern but are stronger in strength. The easterly wind is especially noticeable. Added to the normal easterly drainage wind, that occurs

almost every night at Vancouver Airport, is the enhanced easterly winds ahead of approaching coastal lows and arctic outflow winds that occur once or twice per winter.

The summer tends to be the best time of the year for recreational flying. The only real periods of below VFR conditions occur when low sea stratus from Juan de Fuca Strait gets drawn into the area.

The period late fall through winter into early spring is the most difficult time of the year. Strong weather systems move up onto the coast resulting in widespread rain and low ceilings. Between the weather systems, there is a noticeable peak near 1700 UCT which is just after local sunrise in the winter. Frequently at this time, fog or status slides into the airport and does not break up until the sun rises higher into the sky and some heating occurs.

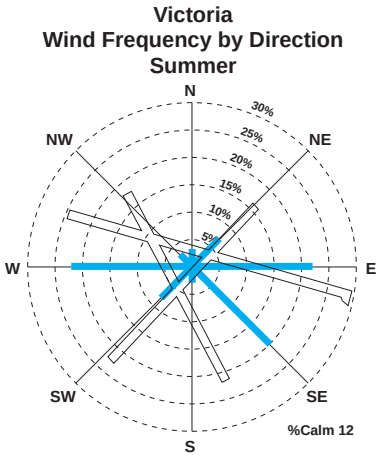


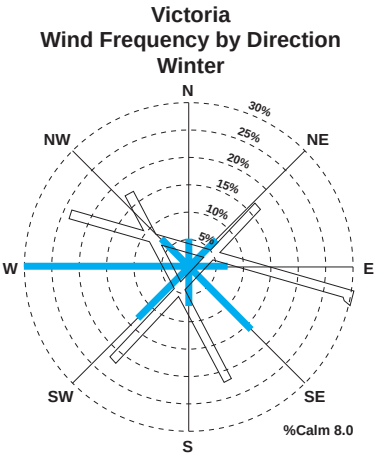


(n) Victoria

Victoria International Airport is situated on Vancouver Island, at the northern end of the Saanich Peninsula, 14 nautical miles north of the city of Victoria, and just to the west of the small city of Sidney. The airport is in close proximity to bodies of water on three sides; Saanich Inlet, one mile west; Satellite Channel, 3 miles to the north; and Haro Strait, 1-1/2 miles to the east. The airport is readily affected by marine influences.

The terrain around the airport is relatively flat except for Mount Newton that rises to 1,000 feet, some 3-1/2 miles to the south-southwest. However, just beyond Saanich Inlet, the Insular Mountains of Vancouver Island rise to 3,000 feet from the southwest to northwest direction.





Victoria Airport is not noted for its winds; in fact, about 90 percent of the time the winds are less than 10 knots. In winter, the winds at Victoria Airport are almost equally distributed around the compass, except for a strong preference for a westerly

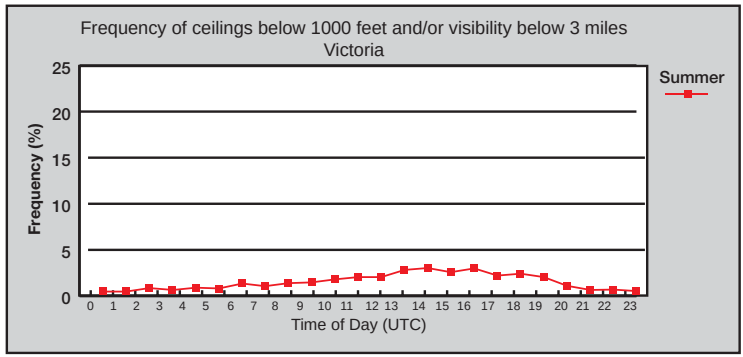
direction. This wind is a katabatic flow off of the Insular mountains, occurs most nights, and tends to be light, 5 to 10 knots. Winds from other directions also tend to be light, except for southeast winds which occur ahead of weather systems crossing Vancouver Island, and southwest winds that occur in the wake of these systems. With the passage of the cold front, a strong, gusty flow through the Strait of Juan de Fuca moves through Victoria Harbour and down across the airport, but it only persists for a few hours.

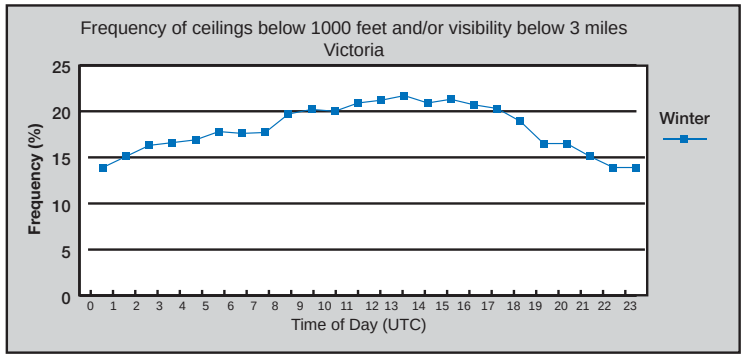
Summer winds are also mainly light and show a similar preference for the katabatic westerly flow. However, there is an increased occurrence of east to southeast winds. These winds are largely sea breeze in nature and occur during the afternoon and early evening.

Victoria is drier than most airports along coastal BC because it lies in the "rain shadow" of the Olympic Mountains. As such, the low cloud in precipitation tends to take longer to form ahead of an approaching frontal system and lifts to above 1,000 feet fairly quickly in its wake. Victoria Airport, being nearly surrounded by water, is quite susceptible to stratus and fog that have formed over the sea. Banks of stratus and fog move onto the airport, particularly those which formed over Pat Bay to the west. In such a case, the katabatic wind tends to carry it onto the airport near 0900 UTC, and it can persist to late morning, 1700 UTC or so.

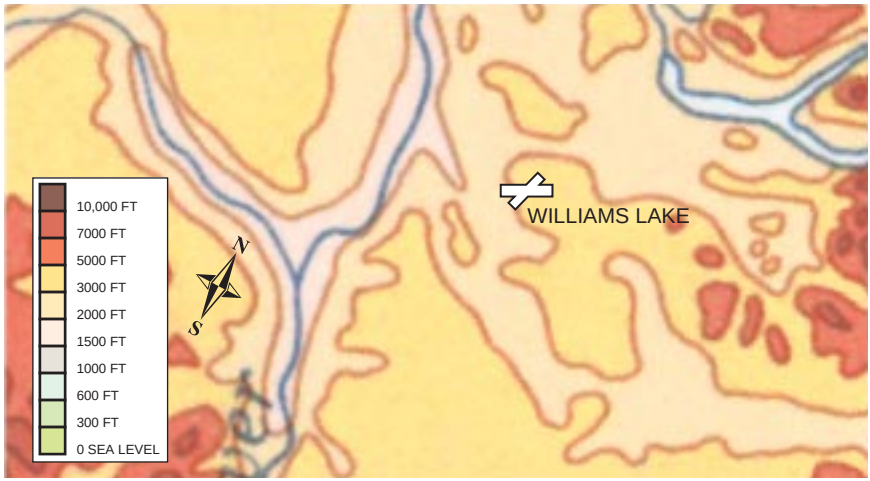
During the summer, the occurrence of low ceilings and visibility is quite low, less than 5 percent. Like winter, occasional fog off the ocean will move into the airport but tends to dissipate quickly after the sun rises.

During the winter, Northeast "Strait effect" winds can bring snow showers and low visibilities as cold air funnels out of the mainland inlets and valleys. Some say that part of the reason that Victoria received much more snow during Storm '96 was due to this local effect.





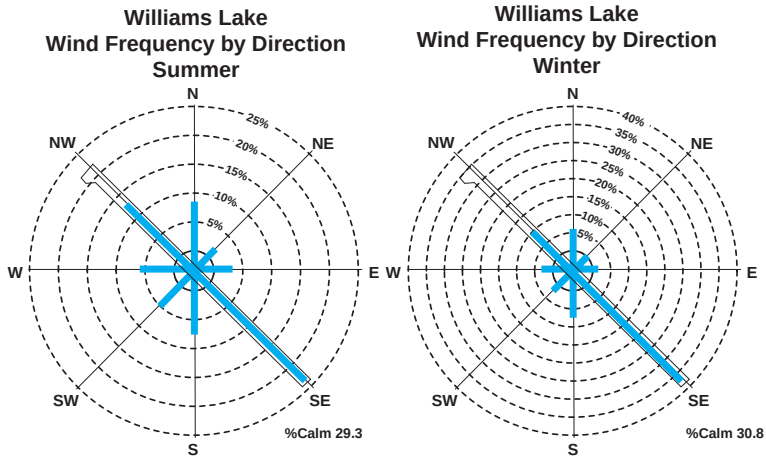
(o) Williams Lake



Located in the Central Interior, Williams Lake airport lies 4 nautical miles northeast of the town of Williams Lake. The only other urban centres in the immediate area are 150-Mile House, just under 7 miles to the southeast, and Glendale, about 5 miles to the west-southwest.

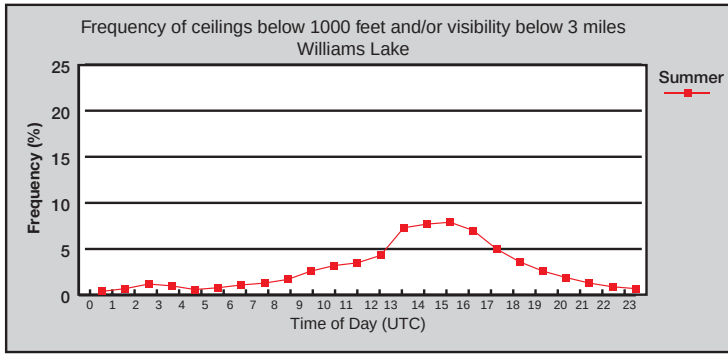
The airport is situated on the Fraser Plateau, approximately 7 miles east of the Fraser River. The Fraser River runs in a north-south line and is quite narrow. Four miles to the south of the Airport is Williams Lake, which is about 1/2 mile wide and nearly 4 miles long.

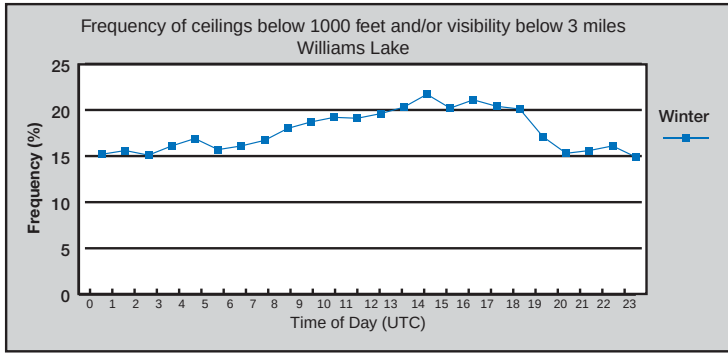
The surrounding countryside is hilly but only lightly wooded. The airport sits on one of the highest elevations in the area although a ridge, elevation just over 3,900 feet, lies 11 miles to the northeast of the airport.



The summer winds at Williams Lake are quite benign, being calm almost 30 percent of the time and less than 10 knots almost 90 percent of the time. When wind does occur, it shows a strong bias to being either from the northwest or southeast. This is usually the result of passing frontal systems and is strongly influenced by the orientation of the local terrain.

Winter is not much different. Winds continue to remain calm almost 30 percent of the time, and less than 10 knots, around 86 percent of the time. Of note is the preference for southeast winds over all other directions. The arctic front takes up a favoured position near Prince George for much of the winter. Ahead of frontal systems, the southeasterly winds frequently develop along the Fraser River and often reach values of 20 gusting to 30 or more knots. However, behind the front, the cold northwesterly winds tend to be confined behind the arctic front.


Frequency of ceilings below 1000 feet and/or visibility below 3 miles
Williams Lake
Frequency (%)
25
20
15
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Time of Day (UTC)
Summer


Frequency of ceilings below 1000 feet and/or visibility below 3 miles
Williams Lake
Frequency (%)
25
20
15
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Time of Day (UTC)
Winter

Glossary of Weather Terms

anabatic wind - a local wind which blows up a slope heated by sunshine.

advection - the horizontal transportation of air or atmospheric properties.

air density - the mass density of air expressed as weight per unit volume.

air mass - an extensive body of air with uniform conditions of moisture and temperature in the horizontal.

albedo – the ratio of the amount of solar radiation reflected by a body to the amount incident on it, commonly expressed as a percentage.

anticyclone - an area of high atmospheric pressure which has a closed circulation that is anticyclonic (clockwise) in the Northern Hemisphere.

blizzard - a winter storm with winds exceeding 40 km/h, with visibility reduced by falling or blowing snow to less than one kilometre, with high windchill values and lasting for at least three hours. All regional definitions contain the same wind speed and visibility criteria but differ in the required duration and temperature criterion.

cat's paw – a cat paw-like, ripple signature on water given by strong downdrafts or outflow winds. A good indication of turbulence and wind shear.

ceiling - either (a) the height above the surface of the base of the lowest layer of clouds or obscuring phenomena (i.e. smoke) that hides more than half of the sky; (b) the vertical visibility into an obstruction to vision (i.e. fog).

chinook - a warm dry wind blowing down the slopes of the Rocky Mountains and over the adjacent plains.

clear air turbulence (CAT) - turbulence in the free atmosphere not related to convective activity. It can occur in cloud and is caused by wind shear.

clear icing - the formation of a layer or mass of ice which is relatively transparent because of its homogeneous structure and smaller number and size of air spaces; synonymous with glaze.

climate - the statistical collection of long-term (usually decades) weather conditions at a point; may be expressed in a variety of ways.

cold front - the leading edge of an advancing cold air mass.

convection - atmospheric motions that are predominately vertical, resulting in the vertical transport and mixing of atmospheric properties.

convergence - a condition that exists when the distribution of winds in a given area is such that there is a net horizontal inflow of air into the area; the effect is to create lift.

cumuliform - a term descriptive of all convective clouds exhibiting vertical development.

cyclone - an area of low atmospheric pressure which has a circulation that is cyclonic (counterclockwise) in the Northern Hemisphere.

deepening - a decrease in the central pressure of a pressure system; usually applied to a low. Indicates a development of the low.

deformation zone - an area in the atmosphere where winds converge along one axis and diverge along another. Where the winds converge, the air is forced upward and it is in these areas where deformation zones (or axes of deformation as they are sometimes referred to) can produce clouds and precipitation.

disturbance - applied loosely: (a) any small-sized low pressure system; (b) an area where the weather, wind, and air pressure show signs of cyclonic development; (c) any deviation in flow or pressure that is associated with a disturbed state in the weather; and (d) any individual circulatory system within the primary circulation of the atmosphere.

divergence - a condition that exists when the distribution of winds in a given area is such that there is a net horizontal outflow of air from the area.

downdraft - a small scale downward current of air; observed on the lee side of large objects that restrict the smooth flow of air or in or near precipitation areas associated with cumuliform clouds.

downburst - an exceptionally strong downdraft beneath a thunderstorm usually accompanied by a deluge of precipitation.

filling - an increase in the central pressure of a pressure system; applied to a low.

Föhn wind (foehn wind)- a warm dry wind on the lee side of a mountain range, whose temperature is increased as the wind descends down the slope. It is created when air flows downhill from a high elevation, raising the temperature by adiabatic compression.

front - a surface, interface or transition zone of discontinuity between two adjacent air masses of different densities.

Fujita Scale – a scale used to rate the intensity of a tornado by examining the damage caused by the tornado after it has passed over a man-made structure (see Table 1).

Table 1 - The Fujita Scale

F-Scale Number	Intensity Phrase	Wind Speed (kts)	Type of Damage Done
F0	**Weak** Tornado	35-62	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
F1	**Moderate** Tornado	63-97	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	**Strong** Tornado	98-136	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	**Severe** Tornado	137-179	Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted
F4	**Devastating** Tornado	180-226	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large-object missiles generated.
F5	**Incredible** Tornado	227-285	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-inforced concrete structures badly damaged.

funnel cloud - a tornado cloud or vortex cloud extending downward from the parent cloud but not reaching the ground.

gust - a sudden, rapid and brief increase in wind speed. In Canada, gusts are reported when the highest peak speed is at least 5 knots higher than the average wind and the highest peak speed is at least 15 knots.

gust front - the leading edge of the downdraft outflow ahead of a thunderstorm.

high - an area of high barometric pressure; a high pressure system.

hurricane – an intense tropical weather system with a well defined circulation and maximum sustained winds of 64 knots or higher. In the western Pacific, hurricanes are called “typhoons,” and similar storms in the Indian Ocean are called “cyclones” (see Table 2 for hurricane intensitites).

Table 2 - Saffir-Simpson Hurricane Scale

Category #	Sustained Winds (kts)	Damage
1	64-82	Minimal
2	83-95	Moderate
3	96-113	Extensive
4	114-135	Extreme
5	>155	Catastrophic

icing - any deposit of ice forming on an object.

instability - a state of the atmosphere where the vertical distribution of temperature is such that a parcel displaced from its initial position will continue to ascend.

inversion - an increase of temperature with height - a reversal of the normal decrease of temperature with height.

isothermal layer - equal or constant temperature with height.

jet stream - a quasi-horizontal stream of wind concentrated within a narrow band; generally located just below the tropopause.

katabatic wind - downslope gravitational flow of colder, denser air beneath the warmer, lighter air. Also known as "drainage wind" or "mountain breeze". Strength can vary from gentle to extremely violent winds.

knot - a unit of speed equal to one nautical mile per hour.

lapse rate - the rate of change of an atmospheric variable (usually temperature) with height.

lee wave - any stationary wave disturbance caused by a barrier in a fluid flow; also called mountain wave or standing wave.

lightning - any and all forms of visible electrical discharge produced by a thunderstorm.

low - an area of low barometric pressure; a low pressure system.

meridional flow – airflow in the direction of the geographic meridians, i.e. south-north or north-south flow.

meteorology - the science of the atmosphere.

mixed icing - the formation of a white or milky and opaque layer of ice that demonstrates an appearance that is a composite of rime and clear icing.

occluded front - a front that is no longer in contact with the surface.

orographic - of, pertaining to, or caused by forced uplift of air over high ground.

outflow - a condition where air is flowing from the interior land area through mountain passes, valleys and inlets onto the coastal areas; used most commonly in winter when cold Arctic air spreads onto the coastal area and adjoining sea.

overrunning - a condition when warm air overtakes or is lifted by colder denser air.

parcel - a small volume of air, small enough to contain uniform distribution of meteorological properties, and large enough to remain relatively self-contained and respond to all meteorological processes.

plow wind - usually associated with the spreading out of a downburst from a thunderstorm; a strong, straight-line wind in advance of a thunderstorm that often results in severe damage.

precipitation - any and all forms of water particles, whether liquid or solid, that fall from the atmosphere and reach the surface.

quasi-stationary front - a front that is stationary or nearly so; commonly called stationary front.

ridge - an elongated area of relatively high atmospheric pressure; also called ridge line.

rime icing - the formation of a white or milky and opaque granular deposit of ice formed by the rapid freezing of supercooled water droplets.

saturation - the condition in the atmosphere where actual water vapour present is the maximum possible at the existing temperature.

shower - precipitation from cumuliform cloud; characterized by suddenness of beginning and ending, by rapid changes in intensity, and usually by rapid changes in the appearance of the sky.

squall - essentially gusts of longer duration. In Canada, a squall is reported when the wind increases by at least 15 knots over the average speed for a duration of at least 2 minutes and the wind reaches a speed of at least 20 knots.

squall line - a non-frontal line or narrow band of active thunderstorms.

stability - a state of the atmosphere where the vertical distribution of temperature is such that a parcel will resist displacement from its initial position.

stratiform - term descriptive of clouds of extensive horizontal development; flat, lacking definition.

stratosphere - the atmospheric layer above the tropopause; characterized by slight increase in temperature from base to top, very stable, low moisture content and absence of cloud.

subsidence - the downward motion of air over a large area resulting in dynamic heating.

supercooled water - liquid water at temperatures below freezing.

thunderstorm - a local storm invariably produced by a cumulonimbus cloud, and always accompanied by lightning and thunder.

tornado - a violently rotating column of air, shaped from a cumulonimbus cloud, and nearly always observed as “funnel-shaped;” other names are cyclone and twister.

tropopause - the transition zone between the troposphere and the stratosphere; characterized by an abrupt change in lapse rate.

troposphere - the portion of the earth's atmosphere from the surface to the tropopause; characterized by decreasing temperature with height and appreciable water vapour. Often referred to as the weather layer.

trough - an elongated area of relatively low atmospheric pressure; also called trough line.

trowal - a trough of warm air aloft; related to occluded front.

turbulence - any irregular or disturbed flow in the atmosphere.

updraft - a localized upward current of air.

upper front - any frontal zone which is not manifested at the surface.

virga - water or ice particles falling from a cloud, usually in wisps or streaks, and evaporating completely before reaching the ground.

warm front - the trailing edge of retreating cold air.

weather - the instantaneous conditions or short term changes of atmospheric conditions at a point; as opposed to climate.

wind - air in motion relative to the earth's surface; normally horizontal motion.

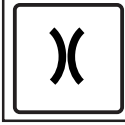
wind direction - the direction from which the wind is blowing.

wind speed - rate of wind movement expressed as distance per unit time.

wind shear - the rate of change of wind direction and/or speed per unit distance; conventionally expressed as vertical and horizontal wind shear.

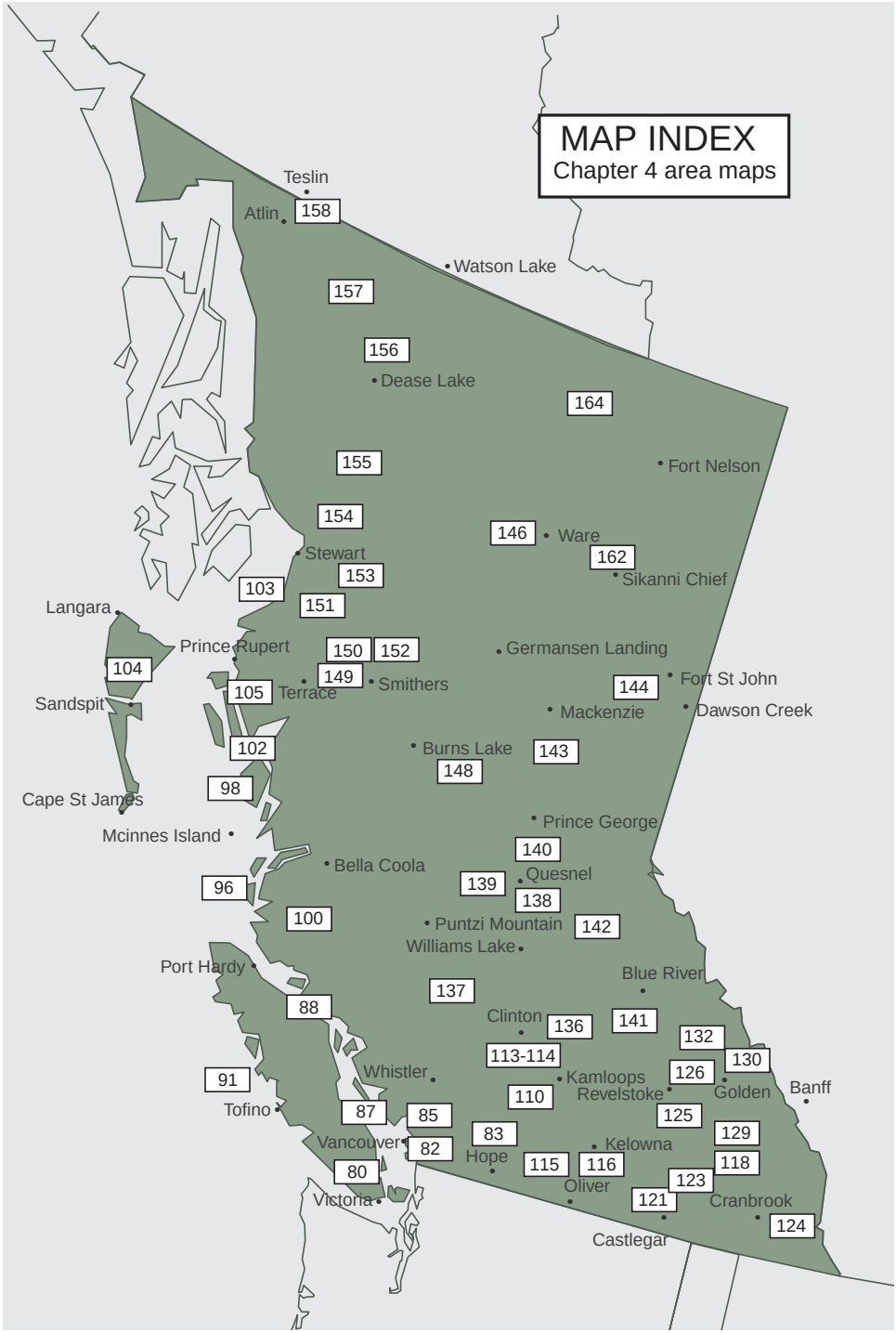
zonal wind - a west wind; conventionally used to describe large-scale flow that is neither cyclonic or anticyclonic; also called zonal flow.

Table 3: Symbols Used in this Manual

	**Fog Symbol (3 horizontal lines)** This standard symbol for fog indicates areas where fog is frequently observed.
	**Cloud areas and cloud edges** Scalloped lines show areas where low cloud (preventing VFR flying) is known to occur frequently. In many cases, this hazard may not be detected at any nearby airports.
	**Icing symbol (2 vertical lines through a half circle)** This standard symbol for icing indicate areas where significant icing is relatively common.
	**Choppy water symbol (symbol with two wavelike points)** For float plane operation, this symbol is used to denote areas where winds and significant waves can make landings and takeoffs dangerous or impossible.
	**Turbulence symbol** This standard symbol for turbulence is also used to indicate areas known for significant windshear, as well as potentially hazardous downdrafts.
	**Strong wind symbol (straight arrow)** This arrow is used to show areas prone to very strong winds and also indicates the typical direction of these winds. Where these winds encounter changing topography (hills, valley bends, coastlines, islands), turbulence, although not always indicated, can be expected.
	**Funnelling / Channelling symbol (narrowing arrow)** This symbol is similar to the strong wind symbol except that the winds are constricted or channeled by topography. In this case, winds in the narrow portion could be very strong while surrounding locations receive much lighter winds.
	**Snow symbol (asterisk)** This standard symbol for snow shows areas prone to very heavy snowfall.
	**Thunderstorm symbol (half circle with anvil top)** This standard symbol for cumulonimbus (CB) cloud is used to denote areas prone to thunderstorm activity.
	**Mill symbol (smokestack)** This symbol shows areas where major industrial activity can impact on aviation weather. The industrial activity usually results in more frequent low cloud and fog.
	**Mountain pass symbol (side-by-side arcs)** This symbol is used on aviation charts to indicate mountain passes, the highest point along a route. Although not a weather phenomenon, many passes are shown as they are often prone to hazardous aviation weather.

Appendix


Skagway
Dease Lake
Mucho Lake
Fort Nelson
Ware
Stewart
Sikanni Chief
Langara
Prince Rupert
Germansen Landing
Fort St John
Smithers
Terrace
Sandspit
Mackenzie
Burns Lake
BRITISH COLUMBIA
Cape St James
Prince George
Mcinnes Island
Bella Coola
Quesnel
Puntzi Mountain
Port Hardy
Williams Lake
Blue River
Clinton
Whistler
Revelstoke
Kamloops
Tofino
Vancouver
Hope
Kelowna
Oliver
Victoria
Cranbrook
Castlegar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