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PECULARITIES OF FOG FORMATION AT THE VANCOUVER AIRPORT

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PROBLEM

Vancouver, as almost any other Canadian knows, can be a foggy place. From a subjective point of view, the degree of foginess is very much a function of the individual Vancouverite. This note will deal with the problems of occurrence and persistence of fog as they affect an aviation briefer at the Vancouver Aviation Briefing Office.

When fog occurs at the Vancouver Airports, the briefing office is called on to supply aviation with information on:

- (a) how long the fog will last
- (b) when it may occur
- (c) how or if it is affecting other airports which could be used as alternates.

Although the briefer has both an area and terminal forecast to refer to, these forecasts are only the forecasters judgment based on meteorological information available at the time of issue. In the case of the parameters affecting fog that information is usually very nebulous. There are complications

added by the fact that adjusting forecast times for fog clearance falls somewhere in the poorly defined area between nowcasting in which briefers are allowed some discretion and forecasting which is to be done only by forecasters. The last mentioned problem may be the hardest to solve. However, it is not one that is created by geographical factors so it will not be pursued here.

DISCRIPTION OF AREA

Vancouver Airport (see figure 1) is located on a small island named Sea Island, at the mouth of the Fraser River. The island is oval shaped, about 5 km by 4 km. It is at sea level and practically flat. Any elevation over 3 meters is man made. Sea Island is on the western edge of a pocket of low lying land surrounded by very mountainous terrain.

This low lying land is variously referred to as the Lower B.C. Mainland, the Lower Fraser valley, or the Fraser Valley Lowlands. If the International boundary is disregarded, the Fraser Valley Lowlands may be considered a triangle measuring 80 - 100 km per side.

The northern side is bordered by the Coast Mountains rising from the north bank of the Fraser River in an approximately east-west line from the city of Chilliwack to the City of Vancouver, 100 km west. From Vancouver it is bordered by Georgia Strait and may be considered as continuing into the State of Washington, to the City of Bellingham, 80 km south east. From Bellingham the Fraser

Lowland is bordered by a line of hills and mountains to Chilliwack, another 80 km north east. This completes the picture of a low lying triangle bordered by mountains on two sides and water on the third. A study of the relief map will confirm this. (see figure 1)

FORMATION OF FOG

Much of the fog in Vancouver could be described as radiation fog. That is, it forms over the Fraser Valley lowlands due to radiational cooling on clear, autumn nights. While this is happening there is a parallel process occurring over Georgia Strait whereby water vapour escaping from the surface is immediately recondensed back into marine fog, or very low lying stratus. Most commonly there is no significant wind overnight, so the sun rises with marine fog over Georgia Strait and radiation fog over Sea Island and the Fraser Valley Lowland. The solar radiation quickly raises the temperature over the land and the fog in this area begins to dissipate within a couple of hours of sunrise. At continental airports this would be the end of the fog problem for another day. Since the time of sunrise is the most predictable thing in the universe, the time of fog burnoff could be predicted with a high degree of confidence if it were not for the extra fog lying over Georgia Strait. As soon as the heated air in the lowland begins to rise, it must be replaced by air moving in at the surface. Since the triangular

lowland is bordered by mountains on the north and the south east, the only place that air can come from is the Georgia Strait. As this Georgia Strait air is advected overland the marine fog is advected as well. If the above fog is evaporated, the resultant inflow is bring in more. The process can and sometimes does go on all day.

FORECASTING THE END OF FOG

The main problem (from the briefer's point of view) is advising fliers as to when the previously described process may end. If there is a major change coming to break the pattern, be it a front, increase in wind, or what ever, the briefer can simply pass along the forecaster's estimate of when this will happen. If there is no major change coming, the fog may lift, remain, or fluctuate seemingly without pattern. One day it will clear out by 9 am. Another day it will remain solid until mid afternoon. Another scenario which is not uncommon is for the fog to clear in the morning only to be replaced by more fog a few hours later.

Under these conditions the terminal forecast will usually indicate an improving trend after daybreak. This will occur approximately about mid day when conditions will become VFR. However, it is often the case that the forecaster has only history, plus the vaguest of indication on which to base his terminal forecast and the same thing to base an amendment on. The fog can come and go faster than the amendmending process can keep up with it.

CONCLUSION

The problems of predicting fog at Vancouver Airport is going to continue indefinitely. The area all ready has a network of observing stations much denser than most of Canada, so increasing the observing sites will not do much for this particular problem. More pilot reports would help at times, but at a big international airport the easy two-way rapport with pilots is largely lost, and the pipeline just seems too complicated to get enough messages through. Pilots don't seem to know what we need and feel their efforts would be duplicated. The only answee is to have every airopplane equipped with instruments that can land in zero visibility conditions.

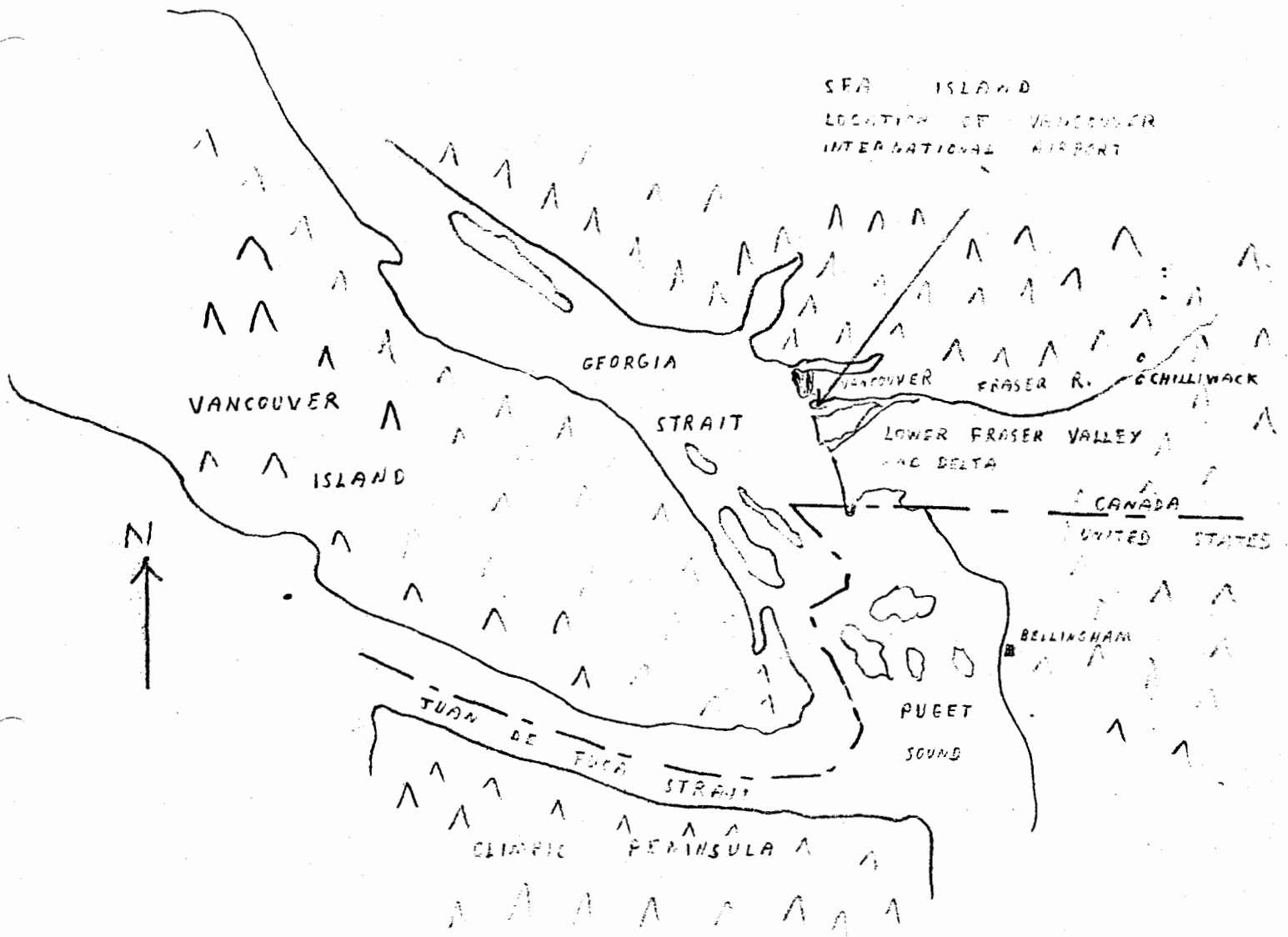


Figure 1.

GEOGRAPHY OF LOWER SOUTHWEST BC AND NORTHWEST WASHINGTON

Notice relative position of the Lower Fraser Valley and the Vancouver Airport.