4.10 AVIATION WEATHER ACROSS THE CANADIAN ARCTIC

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1. INTRODUCTION

Meteorologists of the Meteorological Service (MSC) of Canada have assembled information for a series of six weather manuals covering the seven aviation Graphic Area Forecast (GFA) areas of Canada (Fig. 1).

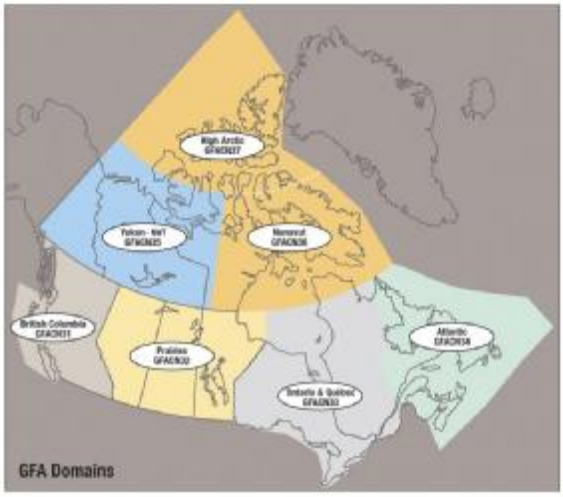

Fig. 1 Graphic Area Forecast areas

Each manual describes weather systems applicable to the area and "local" weather including seasonal effects. The project was funded by NAV CANADA and it is NAV CANADA who will make the manuals available. NAV CANADA is a private, not-for-profit agency that has sole responsibility for the Air Navigation Services in Canada, including the provision of aviation weather briefing and forecast services.

The purpose of the project from the NAV CANADA perspective was to gather and document aviation weather knowledge. That knowledge was transformed into resource manuals for NAV CANADA Flight Service Specialists who handle aviation weather briefings and for pilots new to an area to help them understand the local aviation weather.

For the manuals covering the Canadian Arctic - one for Graphic Area Forecast 35 and another for the combined 36 and 37 domains - meteorologists David Aihoshi, Tim Gaines and Ed Hudson went "north". There they gathered information through interviews with pilots, dispatchers, NAV CANADA Flight Service Specialists, National Park Wardens and many others. This information was added to information collected from fellow meteorologists, climate data, existing studies, and day-to-day forecasting experience.

This paper shares material from the manual for the GFA 36 and 37 (Fig. 2) and, in particular, information gathered by David Aihoshi for the eastern High Arctic and Baffin Island (Fig 3).

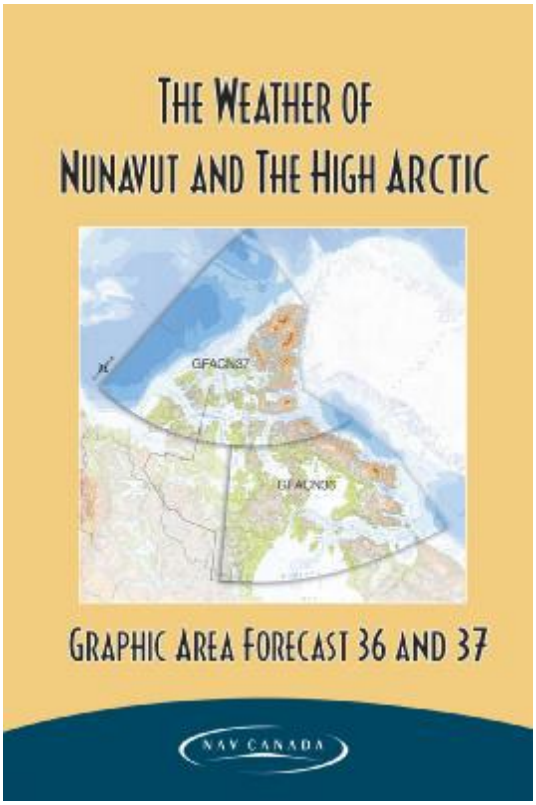

Fig. 2 Manual cover

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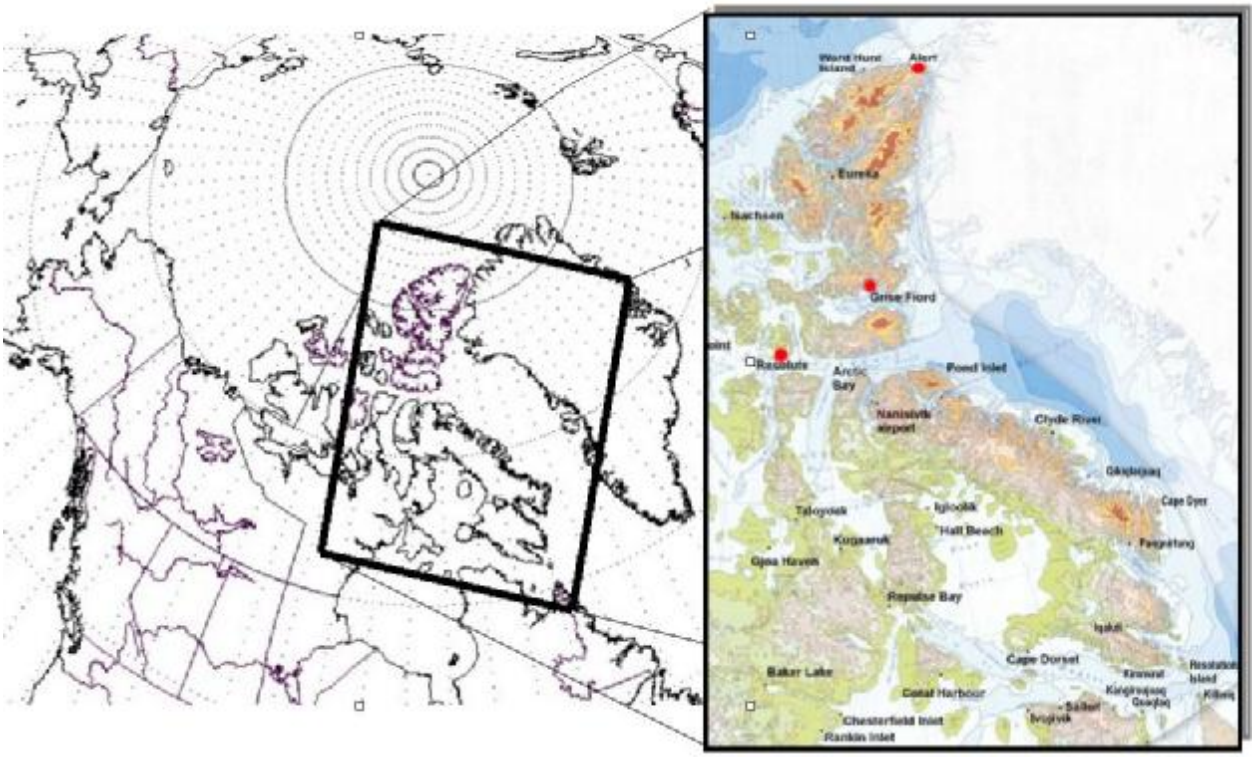

Fig. 3 Area of interest for David Aihoshi's data gathering

2. AVIATION WEATHER

The Graphic Area Forecast 36 and 37 domain covers terrain ranging from sea level to 8,500 feet. Indeed, Barbeau Peak, northern Ellesmere Island, is the highest mountain east of the Rockies. On Baffin Island and Ellesmere Island (Fig. 3), there are many bays and fiords along the coasts, along with ice caps on some of the islands. All this terrain makes for complex local weather. The manuals include topographic descriptions and their affect on the weather.

The weather in the Canadian Arctic varies by season. With increased darkness (twenty-four hours) in the winter and increased (twenty-four hours) daylight in the summer, diurnal trends are affected. Depending on the time of year, the spring melt of ice and the fall freeze-up have a large impact on the weather. The Arctic manuals include mappings of ice break-up and ice-freeze-up dates (courtesy Canadian Ice Service) and a few representative mean ice charts.

The manuals also have mappings and corresponding write-ups area by area to depict general aviation weather including hazards. Figure 4 shows the general aviation weather of southern Baffin Island.

Fig. 4 General aviation weather southern Baffin Island

For nearly every airport site in the Canadian Arctic, the manual includes graphs of ceiling below 1000 feet and/or visibility less than 3 miles. These graphs for winter, spring, summer, and fall visibly show seasonal and diurnal trends. The graphs can be significantly different from graphs prepared for airport sites "down south".

The Resolute graph (Fig. 5), for example, shows summer flying weather to be poor (stratus and fog off open water), while winter and spring weather are shown as being more favorable.

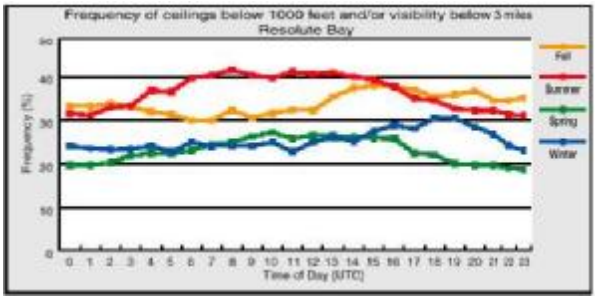

Fig. 5 Ceiling and Visibility Graph - Resolute

2.1 Local Effects and Aviation Weather

Trips "north" and speaking with pilots and others face-to-face brought forth and/or confirmed many local effects. For almost all Arctic communities, the Arctic manuals have write-ups of local effects and a runway photo.

Grise Fiord - Pilots state "If winds are 10 knots at Grise Fiord and increasing we won't go, but if (the winds) are decreasing we will." Grise Fiord, Canada's northern-most community, is located on the southern coast of Ellesmere Island. There is terrain to 2,000 feet complete with a drainage valley to the immediate north affecting the wind and causing moderate-to-severe turbulence and low-level wind shear to aircraft flying there.

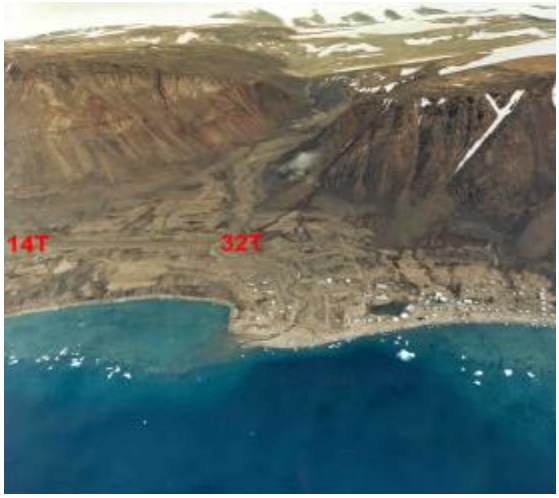

Fig. 6 Grise Fiord, looking northeast
Courtesy Government of Nunavut

Alert - At Alert, and many other Arctic sites, stratus and fog off open leads and polynyas (Fig. 7) during the "frozen" season and off open water during the "summer" season readily move inland. Accurate forecasting of wind direction when there is stratus and fog offshore is key.

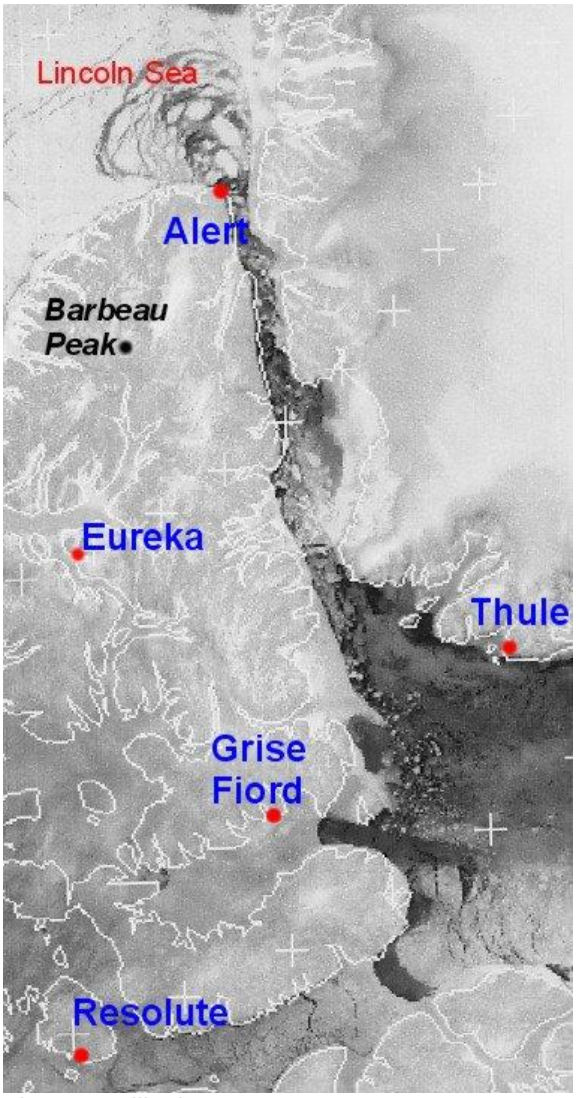

Fig. 7 Satellite imagery
Courtesy Meteorological Service of Canada

Resolute - Fog is a frequent visitor to Resolute during the summer when Cornwallis Island is surrounded by water. As a Resolute pilot said, "Summer has arrived. It's foggy outside." Fog is infrequent in the winter when the island is surrounded by ice.

Another weather element with local effects at Resolute is the wind. Pilots and residents of Resolute are quick to point this out. In the winter, strong northerly and northeasterly winds - and at times southeasterly winds - routinely bring

blowing snow and blizzard conditions to Resolute. With a ridge rising to the east of the runway (Fig. 8), pumping winds often occur leading to moderate turbulence and low-level wind shear.

Fig. 8 Resolute, looking east
Courtesy David Aihoshi

The winter wind rose for Resolute (see Fig. 9) shows northeast winds are not as frequent as northwest winds but a larger portion of them are strong. The manuals have summer and winter wind roses.

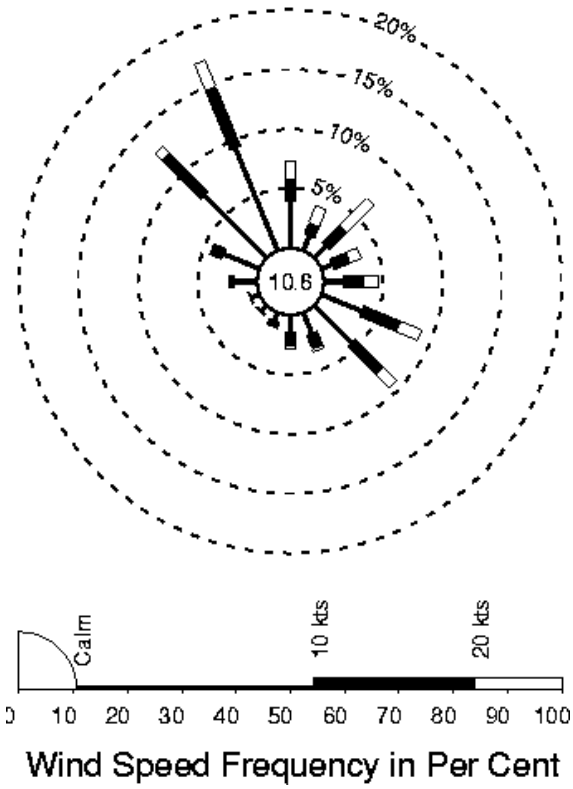

Fig. 9 Resolute winter wind rose

3. SUMMARY

Data gathered during the trips to the "north" provided valuable new material and substantiated existing material concerning local effects on aviation weather-wise across the Canadian Arctic. The importance of seasonal and local effects was reinforced by having many of the comments and observations being made by pilots in one area being repeated by pilots in other areas that had flown in the same location.

"Results" can be can be found in the manuals *Weather of Nunavut and High Arctic, Graphic Forecast Area 36 and 37* and *Weather of Yukon, Northwest Territories and Western Nunavut, Graphic Forecast Area 35.*

It is hoped that reading and using the manual will prompt pilots, NAV CANADA personnel, and others to provide still more information on local and seasonal weather effects. Indeed, it is the feeling of the meteorologists who went north that there is a lot more information about local weather to be gleamed, documented, studied, AND forecast.

For MSC, the manuals, provided an opportunity for the meteorologists who write the aviation forecasts for the north to meet face-to-face with pilots on their home turf (tundra). It has also provided documented material for the meteorologists to build on or to create, for example, forecasters handbooks (work in progress).

4. ACKNOWLEDGMENTS

During David Aihoshi's trip north, First Air, Kenn Borek Air Ltd., Unaalik Aviation and Air Nunavut Ltd. provided access to flights. Pilots, NAV CANADA, and Community Arctic Airports staff, Meteorological Service of Canada staff in Eureka, Polar Continental Shelf Personnel in Resolute, and people in communities of Nunavut provided insight into local weather.

Kent Johnson., Manager of the Mountain Weather Centre, Kelowna was the project lead for MSC for the production of the manuals. John Mullock, also from Mountain Weather Centre, ensured quality and consistent material from Atlantic to Pacific to Arctic.