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Juneau Terrain Induced Turbulence Project: Non-FAR Part 121 User Needs Summary Report

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May 2000

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16. Abstract

Juneau International Airport (PAJN), Alaska, has a combination of extreme terrain features and adverse weather patterns that creates moderate to severe Terrain Induced Turbulence. As a result of this turbulence, the Federal Aviation Administration (FAA) has funded the National Center for Atmospheric Research (NCAR) to develop a Wind Hazard Information System (WHIS) for use by aviation users. This report describes the user needs assessment of the Juneau Terrain Induced Turbulence Project by ACT-320.

Current practices were baselined and wind information needs were identified and defined for Non-FAR Part 121 Pilots, Automated Flight Service Station (AFSS) Specialists, Air Traffic Control Tower (ATCT) Specialists, and National Weather Service (NWS) Forecasters. Surveys and on-site interviews were used to gather information.

In general, wind information used by the above mentioned users was not timely. The Gastineau Channel, Taku Inlet area, Outer Point, and PAJN were identified as being most impacted by winds. The importance of wind information varied across user groups.

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EXECUTIVE SUMMARY

This report summarizes Non-FAR Part 121 user needs for the Juneau Terrain Induced Turbulence Project. The user needs analysis was conducted in Juneau, Alaska, for Air Taxi/Charter companies during March 1999. Site visits were conducted in Juneau, AK, from November 16 through 21, 1998. During this time period, personnel from the Federal Aviation Administration (FAA) William J. Hughes Technical Center visited various air taxi/charter companies, FAA facilities, and the local National Weather Service (NWS) facility to conduct interviews and distribute surveys. Specific results, conclusions, and recommendations from the user needs analysis are detailed in this report.

Juneau, Alaska, is characterized by a combination of extreme terrain features and adverse weather. This combination can create moderate to severe Terrain Induced Turbulence for flights into and out of the Juneau International Airport (PAJN). The Lemon Creek and Fox departures are most susceptible to this turbulence. In an effort to better understand the Terrain Induced Turbulence problem, the FAA Aviation Weather Research Program (AWRP) has funded the National Center for Atmospheric Research (NCAR) to conduct research and develop a Wind Hazard Information System (WHIS).

As part of the early stages of this project, NCAR currently has a Terrain Induced Turbulence research system at some user sites. The system processes and displays wind data from anemometers and wind profilers currently placed around the airport and on several nearby mountaintops (i.e., Eagle Crest, Mt. Roberts, and Sheep Mountain). System displays are located at the Alaska Airlines Dispatch Office, the Alaska Airlines Juneau Operations Tower, and at the Juneau Automated Flight Service Station (AFSS). The display at the AFSS is currently turned off until procedures can be created to govern the use of the research data.

As part of the research and development program, the Aviation Weather Requirements (ARW) Service and the FAA William J. Hughes Technical Center (ACT-320) conducted a User Needs Analysis. To accommodate schedules, the analysis was conducted in two parts. The first part, addressed in this report, identified the wind information needs of air taxi/charter pilots, AFSS Specialists, Air Traffic Control Tower (ATCT) Specialists, NWS Forecasters, and Alaska Airlines Operations Tower Agents. It was completed in February 1999. The second part, addressed in a separate report, identifies the wind information needs of Federal Air Regulation (FAR), Part 121 Pilots and Dispatchers.

The user needs analysis was conducted using a two-step approach. In the first step, users were asked to respond to a brief survey. Once information was gathered from the survey, interviews were conducted on-site with a subset of users in the Juneau area. Objectives of the user needs analysis were to determine (1) wind information currently available to users, (2) areas of aviation concern regarding winds in the Juneau area, (3) types of wind information useful for aviation in the Juneau area, and (4) how users would like to obtain winds information.

The importance of wind information varied across user groups. In many instances, users were uncertain about how they would use additional anemometer and wind profiler data. The Gastineau Channel, Taku Inlet area, Outer Point, and PAJN were identified by all user groups as being impacted the most by winds. The Gastineau Channel and the Taku Inlet area are most impacted by northerly winds (i.e., Taku Winds), while the PAJN and Outer Point are most impacted by a southeasterly wind pattern. Additional wind information for these areas was identified as being useful but not critical, as almost all aviators know to avoid the areas under

the aforementioned conditions. One location of interest noted by several user groups was Pederson Hill. Users indicated that anemometer information from this area would be very useful to flight operations.

The conclusions and recommendations contained within this report should be assessed for their feasibility and included in the Juneau Terrain Induced Turbulence Project as needed. While it is not possible to implement all of the user suggestions, addressing some of the issues and concerns may lead to a system that better meets the needs of its users.

1. INTRODUCTION.

Juneau, Alaska, is characterized by a combination of extreme terrain features and adverse weather. This combination can create moderate to severe Terrain Induced Turbulence for flights into and out of the Juneau International Airport (PAJN). The Lemon Creek and Fox departures are most susceptible to this turbulence. In an effort to better understand the terrain induced turbulence problem, the Federal Aviation Administration (FAA) Aviation Weather Research program has funded the National Center for Atmospheric Research (NCAR) to conduct research and develop a Wind Hazard Information System (WHIS).

The implementation plan for this system consists of three phases. Phase 1 is a near-term capability based on sensors (i.e., anemometers and wind profilers) currently installed in the Juneau area. Phase 1 would present raw anemometer and wind profiler data using existing distribution capabilities (i.e., Automated Flight Service Station [AFSS], Internet). The Phase 2 and 3 systems would provide real-time, automated turbulence warning products for the Juneau area. Phases 2 and 3 are dependent on sufficient progress in the area of forecasting complex wind flows in areas of significant terrain. The Phase 2 system would be a research oriented system while the Phase 3 system would be the final deployment system with the necessary testing and certification.

As part of the research and development program, the Aviation Weather Requirements (ARW) Service and the FAA William J. Hughes Technical Center conducted a user needs analysis. The goal of this analysis was to baseline current practices, and identify and define necessary wind information for FAR Part 121 Pilots, Non-FAR Part 121 Pilots, FAA AFSS Specialists, FAA Air Traffic Control Tower (ATCT) Specialists, and National Weather Service (NWS) Forecasters.

1.1 PURPOSE OF REPORT.

The purpose of this report is to summarize information collected during the user needs analysis for the Phase 1 WHIS. The report will also provide conclusions and recommendations for additional user needs analysis and system concept modifications.

1.2 SCOPE OF REPORT.

This report will discuss the techniques used for data collection during the user needs analysis. Results from the analysis will be presented for Non-FAR Part 121 Pilots, FAA AFSS Specialists, FAA ATCT Specialists, and NWS Forecasters. It is important to note that this report summarizes user needs for the Phase 1 WHIS and is not meant as an assessment of the current NCAR research system.

FAA Technical Center personnel were unable to interview FAR Part 121 Pilots and Dispatchers because of scheduling difficulties. Therefore, results from these user groups will be summarized separately and issued as an addendum to this report.

2. REFERENCE DOCUMENTS.

FAA Standard 024b, Content and Format Requirements for the Preparation of Test and Evaluation Documentation, August 22, 1994.

FAA Acquisition Management System Test and Evaluation Guidelines, April 29, 1997.

Juneau FY98 Year End Report, SOW FY98 98.7.4.4.E5

3. SYSTEM DESCRIPTION.

3.1 MISSION REVIEW.

The goal of the Phase 1 WHIS is to provide pilots and other aviation end-users with real-time wind information for the PAJN area. This will be a near-term capability based on sensors (i.e., anemometers and wind profilers) installed in the Juneau area and will present raw anemometer and wind profiler data using existing distribution capabilities (e.g., AFSS, Internet). The Phase 1 WHIS will consist of at least some of the current sensors, but may not include all of the sensors currently being used in the NCAR Terrain Induced Turbulence Research System.

3.2 SYSTEM CONFIGURATION.

The current Terrain Induced Turbulence Research System consists of a small network of anemometers and wind profilers. FAA anemometers are currently located at the airport on the east and west ends of the runway as well as at midfield. NCAR research anemometers are currently located at Lena Point, Pederson Hill, Eagle Crest, Sheep Mountain, Mt. Roberts, Lemon Creek, North Douglas, Hintzelman Ridge, KTOO TV Tower, and the PAJN. Wind profilers are located at Lemon Creek, South Douglas, and North Douglas. Figure 1 illustrates these anemometer and wind profiler locations.

The anemometers and wind profilers are located around the airport and in the vicinity of arrival and departure routes. Communication between NCAR and participating users is accomplished using telephone and wireless transmission. Figure 2 shows the network configuration. The ownership of each anemometer and interface/communications electronics is indicated in parentheses. The Lemon Creek profiler was removed and stored in April 1998, so that site preparation for a new police facility could proceed.

The communications hub of the anemometer network is located in the Alaska Airlines Operations Center. All anemometer data, including NCAR and NWS data, is ingested through an NCAR computer located in an interstitial area under the Operations Center floor. From that location, data is fed to the NCAR laboratory at PAJN. The incoming anemometer data (nominally 1 second) is averaged to produce 1-minute data and is then transferred to the NCAR laboratory via a wireless Ethernet link. Data from the wind profilers is sent directly to the NCAR laboratory at PAJN via telephone lines using 56 kilo (k) dial-up modems.

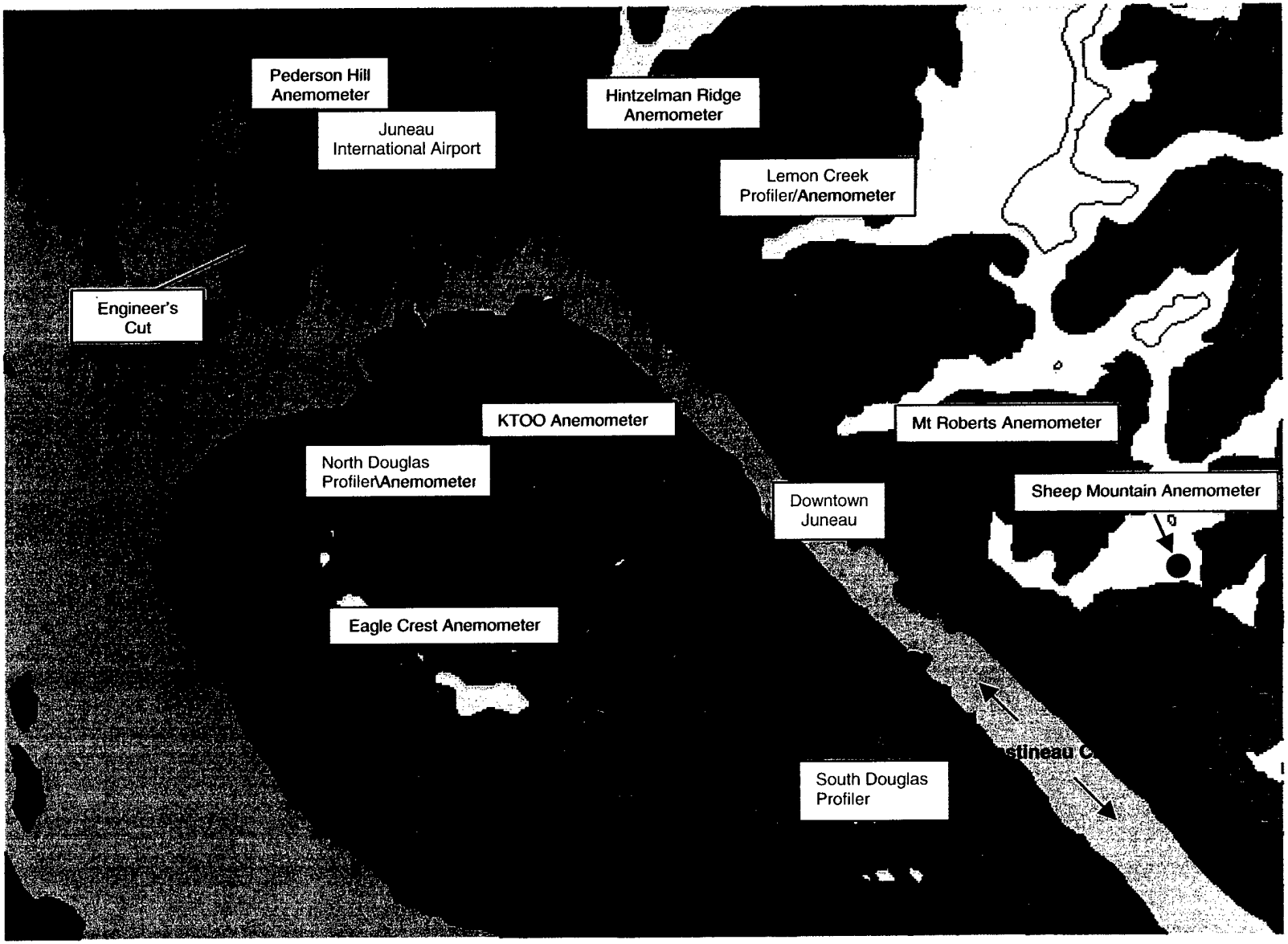

FIGURE 1. ANEMOMETER AND WIND PROFILER LOCATIONS

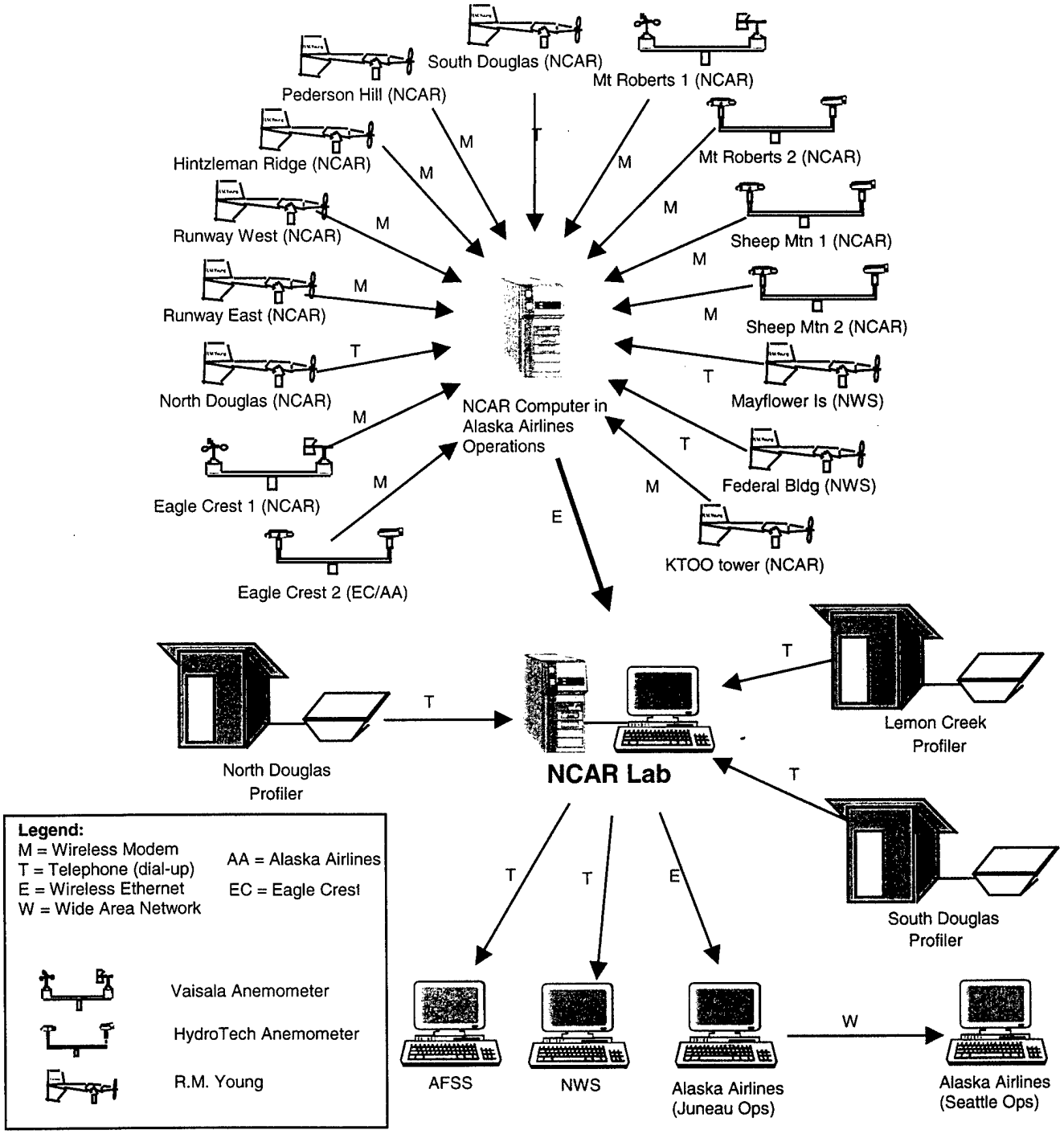

FIGURE 2. JUNEAU TERRAIN INDUCED TURBULENCE COMMUNICATIONS NETWORK

Software, developed by NCAR, evaluates the data, performs quality control, selects the most accurate data (when there are redundant sources), and displays the surface and wind profiler data on a graphical display. Once the data from all sources has been manipulated by the NCAR software, it is sent to several locations. The NWS and Juneau AFSS each have an NCAR research display. It should be noted that AFSS Specialists are not currently using the data for operations. The Operations Tower for Alaska Airlines also has an NCAR research display.

4. USER NEEDS ANALYSIS DESCRIPTION.

The user needs analysis was conducted using a two-step approach. In the first step, users were asked to respond to a brief survey. The goal of the survey was to gather information regarding the type of weather information currently available, identify areas or regions where significant wind related problems occur and define the need for any additional wind data. Once this information was gathered, interviews were conducted on-site with a subset of users in the Juneau area.

In many instances, surveys were not completed prior to interviews due to scheduling problems or a lack of response from the users. Therefore, interview questions were modified to obtain the type of information targeted in the survey. Section 4.4 provides a more detailed description of the user needs analysis.

4.1 SCHEDULE AND LOCATION.

Surveys were made available on the Internet on November 3, 1998. Due to delays in obtaining necessary approvals, AFSS and ATCT Specialists completed surveys during the site visits. Site visits were conducted in Juneau, AK, from November 16 through 21, 1998. During this time period, personnel visited various air taxi/charter companies, FAA facilities, and the local NWS facility to conduct interviews and distribute surveys.

4.2 PARTICIPANTS.

User needs analysis participants included:

a. Air taxi/charter pilots from the following Juneau companies:

1. ERA Helicopters,
2. Coastal Helicopters,
3. Temsco Helicopters,
4. Ward Air,
5. Air Excursions,
6. Silver Bay Logging,
7. Wings of Alaska,
8. LAB Flying,
9. Alaska Coastal, and
10. Alaska Seaplane Service.

b. Specialists, FAA ATCT, PAJN, Juneau, AK;

c. Specialists, FAA AFSS, Juneau, AK;

d. Forecasters, NWS Forecast Office, Juneau, AK; and

e. Tower Operations Agents, Alaska Airlines, PAJN, Juneau, AK.

4.3 OBJECTIVES.

Objectives of the user needs analysis were to determine:

a. Wind information currently available to users,
b. Areas of aviation concern regarding winds in the Juneau area,
c. Types of wind information useful for aviation in the Juneau area, and
d. How users would like to obtain winds information.

4.4 USER NEEDS ANALYSIS DESCRIPTION.

The user needs analysis identified wind information currently available, wind information desired, and how users would like to obtain that wind information. In order to define and develop appropriate data collection techniques, preliminary information regarding Juneau terrain induced turbulence was gathered. Once the problem area was defined, surveys and interview questions were developed to collect data that would answer the objectives. These surveys and interview questions are discussed in greater detail below.

4.4.1 Surveys.

Surveys were developed for each of the following user groups:

a. Non-FAR Part 121 Pilots,
b. FAR Part 121 Pilots,
c. Air Traffic Control (ATC) Specialists, and
d. Airline Dispatchers.

Surveys were tailored to each user group in order to identify differences in user needs. Non-FAR Part 121 Pilot Surveys asked users to identify various demographic information (e.g., type of aircraft, number of hours flown, Instrument Flight Rule (IFR) qualifications, etc...), wind information currently available, wind information desired, and phases of flight that would be aided by additional wind information. An example Non-FAR Part 121 Pilot survey is located in appendix A.

The ATC Specialist Survey asked users to identify wind information currently available as well as wind information desired to complete various ATCT and AFSS job tasks. An example of the ATC Specialist Survey is located in appendix B.

Users were able to answer the survey one of two ways. First, the survey was available on the Internet and users were provided with information enabling them to answer the survey on-line. If users were unable to answer the survey on-line, they were provided with a paper and pencil version of the survey. When responding using paper and pencil, users were provided with a self-addressed, stamped return envelope for their convenience.

It should be noted that while almost all of the air taxi/charter companies in the Juneau area were contacted prior to the site visits, only two companies completed or returned surveys. During the site visits, three more companies returned surveys.

4.4.2 Interviews.

Structured interviews were conducted with several users in the Juneau area. Given the low response rate with the surveys, interview questions were modified to obtain more general information similar to that requested in the surveys. The interview questions are listed in appendix C. Interview questions varied across user groups.

4.5 DATA COLLECTION AND ANALYSIS METHOD.

Data collected during interviews and survey data was summarized. Demographic data from the survey was tabulated.

5. RESULTS AND DISCUSSION.

Results from the User Needs Analysis are presented in this section. Survey and interview data were collected for AFSS and ATCT Specialists as well as air taxi/charter pilots. ATCT Specialist interviews were very limited in scope. Interview only data was collected for NWS Forecasters and Alaska Airlines Operations Agents while survey only data was obtained for General Aviation Pilots. The user group summaries represent the opinions of the interviewees and do not reflect the official position of any one organization or group.

Results will be summarized for each user group according to the user needs analysis objectives.

5.1 AIR TAXI AND/OR CHARTER PILOTS.

The following air taxi/charter and helicopter companies were interviewed:

a. ERA Helicopters,
b. Coastal Helicopters,
c. Temsco Helicopters,
d. Ward Air,
e. Air Excursions,
f. Silver Bay Logging,
g. Wings of Alaska,
h. LAB Flying,
i. Alaska Coastal, and
j. Alaska Seaplane Service.

The following companies were contacted several times; however, it was not possible to schedule interviews:

a. Skagway Air Service,
b. Haines Airways,
c. Taquan Air, and
d. Medivac services.

Thirteen interviews were conducted with air taxi/charter pilots during the site visits. Eight pilots responded to the survey. Survey responses are summarized in appendix D while interviews are summarized in appendix E. Most of the pilots interviewed and surveyed operated from the PAJN. Based on survey information, none of the air charter/taxi and helicopter companies were equipped for IFR and none of the companies operated the Required Navigation Performance (RNP) arrival or departure. Most pilots noted they were more concerned with ceiling and visibility than with winds or turbulence. Responses to the survey indicated that about 50 percent of the pilots flew over 4000 feet. However, none of the survey responses and only a few of the interview responses indicated that pilots thought winds information above 5000 feet would be useful.

5.1.1 Wind Information Currently Available.

The most common sources of wind information (in no particular order of importance) were the Automated Terminal Information System (ATIS), dial-in Automated Surface Observing System (ASOS) locations, NWS Forecast Office (specifically for NWS anemometer locations), AFSS, and the Internet. Interestingly, one of the most important sources of wind information for the pilots was the water. Every pilot interviewed said that once in the air, they navigated by the "catpaws" on the water. These dark areas on the water tell pilots where the wind is hitting the water and the direction of that wind. Water spray caused by wind swirls also provides useful information. Many pilots noted that marine weather impacted much of their flying. For this reason, pilots often obtained reports from lighthouses and buoys. Pilots also obtained forecasts from the Direct User Access Terminal (DUAT).

5.1.2 Wind Related Aviation Concerns In Juneau Area.

When asked how winds impacted their operations, most pilots indicated winds did not impact operations. Some pilots did indicate that it was difficult to takeoff in winds greater than 45 knots (kns); this was especially true for the floatplanes. Almost all pilots indicated that turbulence did not stop them from flying; however, it could cause them to take a different route. Pilots noted it was common knowledge that a plane would encounter severe turbulence in the Gastineau Channel when the Taku Winds were blowing; therefore, pilots rarely flew down the channel during these conditions. It was also common knowledge that there was a lot of turbulence around Outer Point on the northwest tip of Douglas Island. Most pilots indicated they would fly wide around the point in order to avoid turbulence. The "cut"* area on final approach to Runway 8 was indicated as being turbulent by about half of the pilots. A few of the pilots thought that the Pederson Hill anemometer would provide useful information in determining how much turbulence and/or windshear would be encountered in the "cut" area.

*NOTE: The "cut" refers to the engineers cut in the hill on approach for Runway 8. The Pederson Hill anemometer is located to the north-northeast of the cut. The cut is labeled in figure 1.

None of the pilots interviewed had had an incident related to turbulence (reportable or otherwise). Only one survey respondent had encountered a turbulence-related incident. The respondent noted that the incident occurred in the "cut" area on approach; however, specific details were not provided. During interviews, no specific areas were identified as being unsafe because of the lack of wind information. While all of the pilots indicated winds information currently presented on the terrain induced turbulence research system would be useful, none of the pilots indicated the information would be critical to flight. Most of the pilots saw little utility in the raw wind profiler data.

5.1.3 Types Of Wind Information That Would Be Useful.

Almost all of the pilots indicated that ceiling and visibility was a much greater concern and had a much greater impact on operations than turbulence. However, some pilots did indicate that additional anemometer locations would be useful. These locations included:

a. Pederson Hill,
b. Auke Mountain,
c. Lena Point,
d. Tip of Admiralty Island or where Gastineau Channel and Taku Inlet intersect,
e. Funter Bay, and
f. Robert Barron Mountain.

While other locations were mentioned, the locations listed above seemed to be common to two or more pilots. Interview summaries contain all locations discussed during the interviews.

5.1.4 Wind Information Accessibility.

Pilots most commonly indicated they would like to obtain the WHIS winds information via the NWS, the Internet, or the AFSS. Other options included dial-in telephone recordings (similar to ASOS) or a briefing terminal in the airport. It should be noted that many users are not located in the terminal building; therefore, the latter option would not service all the intended users.

5.2 AUTOMATED FLIGHT SERVICE STATION AIR TRAFFIC CONTROL SPECIALISTS.

Five AFSS Air Traffic Control Specialists were interviewed. These specialists also completed surveys. AFSS Specialist survey results are summarized in appendix F. Interview responses are summarized in appendix G. The AFSS currently has a terrain induced turbulence research display; however, it is not being used. Conversations with AFSS management indicated that the AFSS would prefer to not have wind profiler data in its raw format. However, all specialists have been trained to read anemometer data and could disseminate the Eagle Crest, Sheep Mountain, and Mount Roberts anemometer data. Specialists did note that wind profiler data might be usable if the AFSS specialists receive extensive training or if the NWS were to disseminate profiler products for easier interpretation.

5.2.1 Wind Information Currently Available.

Currently, AFSS Specialists use airport winds from local sensors, ASOS, and winds from anemometers located at the Federal Building, Tramway (Mt. Roberts), Mayflower Island, and Point Bishop on an hourly basis. Pilot Reports are obtained on an as needed basis. Terminal Area Forecasts (TAF) and winds aloft are used for forecast purposes and are obtained from the

NWS. AFSS Specialists also tend to use winds information reported from lighthouses in southeast Alaska.

5.2.2 Wind Related Aviation Concerns In Juneau Area.

In survey responses, specialists indicated that windshear and low-level turbulence was of greatest concern at the following locations:

a. Juneau International Airport,
b. Approach to Runway 8 (i.e., the "cut"),
c. Gastineau Channel,
d. Taku Inlet/River area, and
e. Outer Point.

These areas are similar to those identified by the air taxi/charter pilots. Additionally, specialists indicated that winds aloft were an issue for the Lynn Canal, Gastineau Channel, and the Taku Inlet area. AFSS Specialists interviewed did note that Alaska Airlines tends to be less concerned about the winds since the implementation of the RNP approach and departure.

5.2.3 Types Of Wind Information That Would Be Useful.

Most of the specialists indicated they would like to have the anemometer data currently presented on the NCAR terrain induced turbulence research display. During summertime operations, seaplane pilots tend to request winds in the downtown area. This is logical given the amount of traffic in the Gastineau Channel near the ship docks. Real-time reports of winds at Mt. Roberts and Sheep Mountain would enable specialists to disseminate the latest wind information for this area. During wintertime operations, pilots tend not to ask specific questions regarding the winds.

Some AFSS Specialists indicated that the Pederson Hill anemometer would provide useful data to determine the winds around the airport. The utility of the Pederson Hill anemometer data was noted earlier by the air taxi/charter pilots. Additional wind information at Auke Mountain and Robert Barron Mountain was also noted as needed information. Based on survey responses, three specialists indicated that winds information above 5000 feet would be useful. Specifically, specialists reported this information would be useful for profiling winds and indicating whether aircraft climbing to higher altitudes might encounter turbulence.

5.2.4 Wind Information Accessibility.

As noted earlier, the AFSS has an NCAR terrain induced turbulence research display. Currently, that display is not being used; however, users had some initial display comments based on limited prior use of the display. These comments included:

a. add indicator for missing or down data,
b. add legend for airport as to whether it is true or magnetic degrees, and
c. add labels to identify whether anemometers are at east or west end of the runway.

5.3 AIR TRAFFIC CONTROL TOWER SPECIALISTS.

Two ATCT Specialists were interviewed and four surveys were completed. ATCT survey responses are summarized in appendix H and interview responses are summarized in appendix I. The Juneau ATCT Controllers interviewed indicated they were concerned about receiving raw data from the WHIS without a "red light – green light" warning. The controllers expressed concerns regarding the responsibilities of interpreting and disseminating additional wind data to pilots. The controllers would prefer to only transmit information that is approved for public knowledge, requires no interpretation (i.e., read information verbatim), and is not time consuming. Interviewees were concerned about the impact that interpreting and disseminating additional weather data would have on controller workload.

5.3.1 Wind Information Currently Available.

Currently, ATCT Specialists have the following wind information available:

a. Automated Surface Observing System,
b. Three runway anemometers,
c. Four windsocks,
d. Airmen Meteorological Statements (AIRMET),
e. Significant Meteorological Statements (SIGMET),
f. Terminal Area Forecast (TAF), and
g. Pilot Reports.

ATCT Specialists also indicated they used visual information obtained from snow blowing off the mountaintops and watching the water (i.e., "catpaws", see section 5.1.1) on the "pond" (i.e., the water runway).

5.3.2 Wind Related Aviation Concerns In Juneau Area.

ATCT Specialists were most concerned with surface winds, windshear, and low-level turbulence in the vicinity of the airport and within the Class D and E airspace.

5.3.3 Types Of Wind Information That Would Be Useful.

As noted earlier, air taxi/charter pilots indicated the Pederson Hill anemometer might be useful in determining the amount of turbulence that would be encountered on approach over "the cut". The ATCT Specialists interviewed agreed with this opinion. ATCT Specialists noted they would consider disseminating this information to pilots if there was a major discrepancy between the Pederson Hill and the airport anemometers. The interviewees believed this would be under the ATCT's area of responsibility as the Pederson Hill anemometer is located within the airport approach area.

5.3.4 Wind Information Accessibility.

The ATCT does not currently have an NCAR terrain induced turbulence research display. Specialists indicated they would prefer to have a simple tabular format from which to read the winds information. Specialists would prefer an end-state system that would present a "red light – green light" type decision aid.

5.4 GENERAL AVIATION PILOTS.

Twenty-four general aviation pilots completed surveys. General aviation responses to the survey are summarized in appendix J. Almost all of the responses were from fixed wing pilots, four of which were equipped for IFR flight. Only four of the pilots indicated they flew above 4000 feet. Almost all of the respondents operated from the Juneau International Airport and none of the respondents flew RNP arrivals and departures.

5.4.1 Wind Information Currently Available.

The most common sources of wind information were from the AFSS, Internet, ATIS, and NWS. Winds aloft, Aviation Routine Weather Reports (METAR), AIRMETs, and SIGMETs were obtained from the AFSS and Internet most often. Surface winds were obtained from the AFSS prior to flight and from the ATIS during flight. Pilot Reports were also listed as a source of information both enroute and for outlying airports. Some general aviation pilots indicated they used the marine weather forecasts (similar to air taxi/charter pilots) as aviation weather was greatly impacted by marine weather. The primary focus of the general aviation pilots' responses prior to takeoff was obtaining a standard weather briefing from the AFSS and/or calling the NWS for a weather forecast. Once airborne, pilots most commonly noted they obtained weather from the ATIS, Pilot Reports (PIREP), and AFSS. The Internet was used much more in this user group than in any of the other groups surveyed.

5.4.2 Wind Related Aviation Concerns In Juneau Area.

Similar to the air taxi/charter pilots, general aviation pilots found windshear and low-level turbulence to be of greatest concern in the following areas:

a. Gastineau Channel,
b. Taku Inlet area,
c. Juneau International Airport,
d. Outer Point, and
e. Ridgetops.

Surface winds were noted as being a problem in the Gastineau Channel, Taku Inlet, and around the airport while winds aloft were most commonly a concern within 20-50 miles of the airport and around Admiralty Island. Respondents indicated that the following areas were dangerous due to the lack of wind information:

a. Gastineau Channel,
b. Funter Pass,
c. Hawk Inlet,
d. Lynn Canal, and
e. Sheep Creek.

Five out of the 24 respondents had encountered a turbulence-related incident. None of the respondents provided reference information regarding the incident. In general, the incidents occurred in the vicinity of the drainage areas (e.g., Sheep Creek, Gold Creek, Lemon Creek) and in the Gastineau Channel area.

5.4.3 Types Of Wind Information That Would Be Useful.

In general, most users indicated that additional wind information would be useful. Specifically, the Eagle Crest, Mt. Roberts, and Sheep Mountain anemometers were identified as being useful during the following phases of flight:

a. Pre-Takeoff – Wind information is useful to aid in determining direction of flight or canceling operations.

b. Takeoff and Departure – Wind information is useful to change departure routes, avoid turbulent areas, and cancel flight if necessary.

c. Enroute – Wind information could be used to change flight path, avoid turbulent areas, and determine elevation of flight and safest route to destination.

d. Approach and Landing – Wind information could be used to determine approach path to airport, determine approach speed, find alternative landing site, and enhance expectations of winds on approach.

Users indicated additional wind information from Robert Barron Peak would be useful for winds aloft type information. Obtaining winds from all of the Remote Communication Outlet (RCO) locations was identified as being useful information as well. While most users did not fly above 4000 feet, many users noted that wind information above 5000 feet would be useful. Specific uses included finding smooth air, flying around and over mountain ridges, and determining the feasibility of landing on the ice fields.

Similar to air taxi/charter pilots, all of the general aviation pilots indicated that ceiling and visibility was their greatest concern. More reporting stations throughout southeast Alaska was the most common request.

5.4.4 Wind Information Accessibility.

The AFSS, ATIS, and Internet were listed as the most desired sources for obtaining winds information.

5.5 NATIONAL WEATHER SERVICE OFFICE FORECASTERS.

Two forecasters at the NWS forecast office were interviewed. During the FAA Technical Center visit to the Juneau NWS Forecast Office, the Advanced Weather Information Processing System (AWIPS) was being installed. Currently, the forecasters rely on the Alaska Region Operational Network (ARONET) for Alaskan weather. The Juneau NWS Forecast Office operations area is divided into three forecast areas: Long-term forecast, short-term forecast, and public service forecasts. The long-term forecast desk provides trends from 12 hours to 5 days. The short-term forecast desk provides 12-hour forecasts, TAFs, warnings and the first period of the local forecast. The public service forecast desk provides nowcasts and 3-hour bulletins.

5.5.1 Wind Information Currently Available.

In addition to the weather data previously mentioned in this report, forecasters also utilize various other types of meteorological data such as model data and sounding data. The NWS forecasters also utilize all of the data available from the NCAR terrain induced turbulence research system, including the wind profiler data. The anemometer data is used as a data source for the TAF, while the wind profiler data is used to examine the structure of the frontal systems moving through southeast Alaska.

5.5.2 Wind Related Aviation Concerns In Juneau Area.

The greatest concern for forecasters is accurately forecasting the winds in the Juneau area as well as weather patterns. In order to satisfy this goal, forecasters desire as much meteorological data as possible.

5.5.3 Types Of Wind Information That Would Be Useful.

Forecasters indicated the addition of pressure and temperature to the wind profilers would allow them to obtain a better understanding of the weather patterns in the Juneau area, especially weather associated with frontal passages. Forecasters noted that pilots often call the NWS forecast office to obtain information from specific weather instruments. On occasion, pilots request extended weather outlooks for longer trips or for planning purposes. The Science Officer for the Juneau NWS Forecast Office indicated that the NWS regional office would be willing to issue special Aviation Weather products if the anemometers and profilers had good predictive value.

5.5.4 Wind Information Accessibility.

The NWS Forecast Office currently has an NCAR terrain induced turbulence research display that is operational. While the display is used often, forecasters would like to see the NCAR data on their own platforms to simplify the process of using the data. The current NCAR platform is not compatible with NWS data formats. Therefore, the NWS Forecast Office is working with NCAR to modify the data formats of the anemometer and wind profiler data to make the data compatible with the NWS platforms. Once modifications are complete, the NWS will be able to ingest data into their platforms for data manipulation.

5.6 ALASKA AIRLINES TOWER OPERATIONS AGENTS.

Two Alaska Airlines Tower Operations Agents were interviewed. The Alaska Airlines tower currently has the NCAR terrain induced turbulence research display. Operations agents use this information operationally.

5.6.1 Wind Information Currently Available.

In addition to the NCAR display, operations agents obtain wind information from the airport anemometers, TAFs, and the Juneau ASOS report.

5.6.2 Wind Related Aviation Concerns In Juneau Area.

Tower agents are primarily concerned with airport winds and the winds at Eagle Crest, Mt. Roberts, and Sheep Mountain. Eagle Crest, Mt. Roberts, and Sheep Mountain winds are of particular concern when aircraft are operating the Lemon Creek and Fox departures. While operating these departures, tower agents are required to complete a departure worksheet prior to takeoff, which is faxed to the Alaska Airlines Operations Center in Seattle, WA. Information recorded on the departure worksheet includes:

a. Date, departure time, and flight number,
b. Aircraft type,
c. Departure type,
d. Airport winds at pushback and departure, and
e. Winds at Eagle Crest and Sheep Mountain or Mt. Roberts.

A copy of this departure worksheet is located in appendix K. According to FAA Operations Specifications, Alaska Airlines cannot operate the Lemon Creek and Fox departures if midfield winds are above 25 kns and any of the mountain top locations are 35 kns or above. Tower agents have additional concerns with the winds as they impact airspeed, which, in turn, impacts the weight of the aircraft. One of the agents interviewed noted that he viewed the wind profiler data if pilots were reporting turbulence on the departure. No other specific use was identified for the wind profiler data.

5.6.3 Types Of Wind Information That Would Be Useful.

No additional information beyond information currently available was noted as having utility.

5.6.4 Wind Information Accessibility.

Both operations agents interviewed indicated the current NCAR terrain induced turbulence research display was satisfactory.

6. CONCLUSIONS.

The user needs analysis was completed for air taxi/charter pilots, Automated Flight Service Station (AFSS) Specialists, Air Traffic Control Tower (ATCT) Specialists, general aviation pilots, National Weather Service (NWS) Forecasters, and Alaska Airlines Tower Operations Agents. Information regarding Part 121 Pilots and Airline Dispatchers will be released at a later date.

In general, users were concerned about winds in the Juneau area; however, they were more concerned about the lack of ceiling and visibility information throughout southeast Alaska. While this report focuses on wind information needs, users repeatedly identified the need for additional ceiling and visibility information.

Users interviewed do not currently have unique wind information available to them. With the exception of windsock data, all of the wind data used by Juneau aviators have update rates of 1 hour or longer. Update rates can be more frequent if the automated reporting stations issue special reports. In many instances, users were uncertain about how they would use additional anemometer and wind profiler data. Users may develop more definitive uses for the

anemometer and wind profiler data once the Wind Hazard Information System (WHIS) is deployed.

The Gastineau Channel, Taku Inlet area, Outer Point, and Juneau International Airport were identified by all user groups as being impacted the most by winds. The Gastineau Channel and the Taku Inlet area are most impacted by northerly winds (i.e., Taku Winds), while the Juneau International Airport and Outer Point are most impacted by a southeasterly wind pattern. Additional wind information for these areas was identified as being useful but not critical as almost all aviators know to avoid these areas under the aforementioned conditions.

The importance of wind information varied across user groups. Specific conclusions for each of the user groups are listed below.

a. The air taxi/charter and helicopter pilots indicated that although the anemometer data was not critical to their operations, it would be useful. Pilots would like to obtain the winds information from the Internet, National Weather Service Forecast Office (NWSFO), or AFSS. Air taxi/charter pilots suggested that the Pederson Hill anemometer might provide useful information regarding windshear in the "cut" area on approach to Runway 8.

b. While the AFSS was willing to disseminate the anemometer data, they would prefer to not disseminate wind profiler data until it is in a warning product format or they receive extensive training regarding the interpretation of the data. Specialists also noted additional anemometer locations such as Pederson Hill, Auke Mountain, and Robert Barron Mountain would be useful.

c. ATCT Specialists interviewed indicated they were concerned about receiving raw data from the WHIS without a "red light – green light" warning. Interviewees noted they were concerned about the impact that interpreting and disseminating additional weather data would have on controller workload. While ATCT Specialists were primarily interested in only receiving airport wind information, they were willing to disseminate Pederson Hill data if it identified potential windshear problems on approach to Runway 8.

d. General aviation pilots indicated that additional wind information would be useful. The Eagle Crest, Mt. Roberts, and Sheep Mountain anemometers were identified as being useful for all phases of flight. General aviation pilots most often obtained their winds information from the AFSS, Internet, and Automated Terminal Information System (ATIS). These dissemination points were identified as being the most desirable way to obtain new winds information.

e. NWS forecasters are using every aspect of the terrain induced turbulence research system data. Anemometer data is used most for Terminal Area Forecast (TAFs), while profiler data is used to examine frontal passages. Forecasters noted the data would be more useful if temperature and pressure were added to the profilers.

f. Alaska Airlines Operations Agents currently utilize the anemometer data operationally. Agents record wind speed on departure worksheets for the Lemon Creek and Fox departures as part of the FAA Operations Specification.

7. RECOMMENDATIONS.

The following recommendations are offered:

a. Further study the feasibility of incorporating the Pederson Hill Anemometer into the Wind Hazard Information System (WHIS) for Phase 1 deployment.

b. Investigate the use of the Internet for Phase 1 dissemination in addition to Federal Aviation Administration (FAA) and National Weather Service (NWS) systems and methods.

c. Following Phase 1 deployment, conduct field interviews and surveys to:

1. determine how the various users are utilizing the Phase 1 information,
2. determine what additional modifications or options users would like to have, and
3. begin to assess Phase 2 requirements.

8. ACRONYMS AND ABBREVIATIONS.

AFSS	Automated Flight Service Station
AIRMET	Airmen Meteorological Statement
ARONET	Alaska Region Operational Network
ARW	Aviation Weather Requirements
ASOS	Automated Surface Observation System
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
ATIS	Automated Terminal Information System
AWIPS	Advanced Weather Information Processing System
DUAT	Direct User Access Terminal
FAA	Federal Aviation Administration
IFR	Instrument Flight Rules
kn	knot
METAR	Aviation Routine Weather Report
NCAR	National Center for Atmospheric Research
NWS	National Weather Service
NWSFO	National Weather Service Forecast Office
PAJN	Juneau International Airport
PIREP	Pilot Report
RCO	Remote Communication Outlet
RNP	Required Navigation Performance
SIGMET	Significant Meteorological Statement
TAF	Terminal Area Forecast
WHIS	Wind Hazard Information System

APPENDIX A

JUNEAU NON-FAR PART 121 PILOT SURVEY

FAR Non-Part 121 Pilots
Terrain Induced Turbulence Project
Juneau User Needs Survey

November 3,1998

Prepared by:

Communication/Navigation/Surveillance
Engineering and Test Division, Weather Branch, ACT-320
William J. Hughes Technical Center
Federal Aviation Administration
Atlantic City International Airport
Atlantic City, NJ 08405

Background

As part of the Juneau Terrain Induced Turbulence Research and Development Program, the Aviation Weather Requirements Service (ARW) and the FAA William J. Hughes Technical Center are conducting a user needs analysis. The goal of this analysis is to identify and define necessary wind information for FAR Part 121 pilots, FAR Non-Part 121 pilots, FAA Automated Flight Service Station Specialists, Air Traffic Controllers, and National Weather Service Forecasters.

The user needs analysis will be a two step approach. In the first step, users are asked to respond to this brief survey. The goal of this survey is to gather information regarding the type of weather information currently available, identify areas or regions where significant wind related problems occur and define the need for any additional wind data. Once this information is gathered, an initial set of user needs will be developed. During step two, FAA Technical Center personnel will conduct interviews with a subset of users in the Juneau area. The goal of these interviews will be to verify and modify survey information as necessary and to discuss survey questions in more detail.

As a member of the Juneau aviation community, your input is very valuable. By responding to this survey, you are assisting the FAA in gaining a full understanding of the impact that winds have on Juneau flight operations. Your feedback is a vital part of the development of the terrain induced turbulence warning system. All of your responses will remain confidential and anonymous.

If you would like to participate, simply fill out the survey and return it to the address listed below.

Starr McGettigan
Raytheon Systems Company
Suite 304
500 Scarborough Drive
Egg Harbor Township, NJ 08234-4858

Phone (609) 641-5544
Fax (609) 641-8095

Starr_Fox-McGettigan@raytheon.com

Juneau Terrain Induced Turbulence User Needs Survey

Please provide the following contact information:

Name (Optional): _____

Title: _____

Company: _____

Phone Number (Optional): _____

E-Mail Address (Optional): _____

1. What type of pilot are you? *(Mark all that apply)*

   ☐ Commercial Air Taxi or Charter Pilot
   ☐ Private General Aviation Pilot
   ☐ Corporate or Agency Pilot
   ☐ Other –

2. What type of aircraft do you fly? *(Mark all that apply)*

   ☐ Fixed Wing, Wheeled
   ☐ Fixed Wing, Float
   ☐ Fixed Wing, Skis
   ☐ Helicopter

3. Is your aircraft equipped for IFR?

   ☐ Yes
   ☐ No

4. Estimate the number of hours per month you fly during peak season (May-Sept.)? _____

5. Estimate the number of hours per month you fly during off peak season (Oct.-Apr.)? _____

6. At what flight levels do you most commonly operate when within 50 NM of Juneau International Airport? *(Mark all that apply)*

   ☐ 0 - 2000 feet
   ☐ 2001 - 4000 feet
   ☐ 4001 - 6000 feet
   ☐ 6000 feet and above

7. Which airport(s) do you operate from? *(Mark all that apply)*

   ☐ Juneau International Airport
   ☐ Juneau Harbor
   ☐ Company-Based or Private Site

8. Do you fly RNP arrivals and departures?

   ☐ Yes
   ☐ No

   If yes, has this procedure changed the need for weather information? Please explain.

   _____

   _____

   _____

   _____

9. What weather information do you currently obtain **30 minutes or more prior to takeoff and departure**? Weather information could include but is not limited to METARs, AIRMETs, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.

Weather Information Obtained	Provider (e.g., AFSS, air traffic, ATIS, NWS, Internet, etc...)	How current is the information? (If known)

10. What weather information do you currently obtain **immediately preceding takeoff and departure**? Weather information could include but is not limited to METARs, AIRMETs, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.

Weather Information Obtained	Provider (e.g., AFSS, air traffic, ATIS, NWS, Internet, etc...)	How current is the information? (If known)

11. What weather information do you currently obtain **en-route**? Weather information could include but is not limited to METARs, AIRMETs, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.

Weather Information Obtained	Provider (e.g., AFSS, air traffic, ATIS, NWS, Internet, etc...)	How current is the information? (If known)

12. What weather information do you currently obtain **prior to approach and landing**? Weather information could include but is not limited to METARs, AIRMETs, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.

Weather Information Obtained	Provider (e.g., AFSS, air traffic, ATIS, NWS, Internet, etc...)	How current is the information? (If known)

13. Please mark the phases of flight where wind speed, wind direction, and wind gusts from the Eagle Crest, Mt. Roberts, and Sheep Mountain anemometers would be useful. *(Mark all that apply)*

- ☐ Pre-Takeoff
- ☐ Takeoff and Departure
- ☐ En-route
- ☐ Approach and Landing

14. For each of the phases of flight marked in Question #13, describe how wind speed and direction and wind gust information would be useful (e.g., cancel operations, avoid turbulent areas, change departure, change flight path, etc...).

Pre-Takeoff - _____

_____

Takeoff/Departure - _____

_____

Enroute - _____

_____

Approach/Landing - _____

Juneau Terrain Induced Turbulence User Needs Survey

15. Please mark all of the following that have an impact on your operations in the Juneau area (Mark all that apply). If the problem is specific to a certain area(s) or region(s), please indicate the area(s)/region(s) in the box to the right of the problem.

	Specific Region/Area (e.g., Taku Inlet, Gastineau Channel)
☐ Surface Winds	
☐ Windshear	
☐ Low-level Turbulence	
☐ Winds Aloft	
☐ Other	

16. If a particular problem and/or region were indicated in Question #15, would additional wind information in those regions provide benefit? Please explain.

17. Have you experienced any specific turbulence-related incidents in the Juneau area?

☐ Yes
☐ No

If yes, please explain the incident. If appropriate, reference any National Transportation Safety Board, FAA, or NASA database where additional information can be found.

18. Are there any areas (e.g., Taku Inlet, Gastineau Channel) where, in your opinion, the lack of current wind information poses a threat to flight safety? If yes, please identify the region(s) and explain.

Juneau Terrain Induced Turbulence User Needs Survey

19. Would wind information above 5000 feet provide benefit to flight operations in the Juneau area? If yes, would they be beneficial for any specific area or region (e.g., Taku Inlet, Gastineau Channel)? Please explain.

_____

_____

_____

_____

20. Please provide any additional comments, concerns, or suggestions, regarding winds information in the Juneau area. If you suggest providing additional information, please include what area(s) (e.g., Taku Inlet, Gastineau Channel) you would like the information for, when you would want the information, and how you would like to obtain that information.

_____

_____

_____

_____

Thank you very much for your time.
The information you have provided will be very useful in the development of the terrain induced turbulence warning system.

We may need to contact individuals at a later date to clarify information or gather more detailed information. If you are interested in being contacted, please make sure you have completed all of the contact information fields at the beginning of the survey.

APPENDIX B

JUNEAU AIR TRAFFIC CONTROL SURVEY

Air Traffic Control and Automated Flight Service Station Specialists Terrain Induced Turbulence Project Juneau User Needs Survey

November 3,1998

Prepared by:

Communication/Navigation/Surveillance
Engineering and Test Division, Weather Branch, ACT-320
William J. Hughes Technical Center
Federal Aviation Administration
Atlantic City International Airport
Atlantic City, NJ 08405

Background

As part of the Juneau Terrain Induced Turbulence Research and Development Program, the Aviation Weather Requirements Service (ARW) and the FAA William J. Hughes Technical Center are conducting a user needs analysis. The goal of this analysis is to identify and define necessary wind information for FAR Part 121 pilots, FAR Non-Part 121 pilots, FAA Air Traffic Control Specialists, and National Weather Service Forecasters.

The user needs analysis will be a two step approach. In the first step, users are asked to respond to this brief survey. The goal of this survey is to gather information regarding the type of weather information currently available, identify areas or regions where significant wind related problems occur and define the need for any additional wind data. Once this information is gathered, an initial set of user needs will be developed. During step two, FAA Technical Center personnel will conduct interviews with a subset of users in the Juneau area. The goal of these interviews will be to verify and modify survey information as necessary and to discuss survey questions in more detail.

As a member of the Juneau aviation community, your input is very valuable. By responding to this survey, you are assisting the FAA in gaining a full understanding of the impact that winds have on Juneau flight operations. Your feedback is a vital part of the development of the terrain induced turbulence warning system. All of your responses will remain confidential and anonymous.

If you would like to participate, simply fill out the survey and return it to the address listed below.

Starr McGettigan
Raytheon Systems Company
Suite 304
500 Scarborough Drive
Egg Harbor Twp, NJ 08234-4858

Phone (609) 641-5544
Fax (609) 641-8095

Starr_Fox-McGettigan@raytheon.com

Juneau Terrain Induced Turbulence User Needs Survey

Please provide the following contact information:

Name (Optional) _____

Title: _____

Company: _____

Phone Number (Optional): _____

E-Mail Address (Optional): _____

1. What winds information do you currently have to assist with your job tasks? Winds information could include but is not limited to Winds Aloft, Surface Winds, Turbulence AIRMETs and SIGMETs, PIREPs, etc... For example, Juneau Surface Winds are obtained from the airport anemometer. In each row, please enter one type of wind information.

Winds Information Available	Provider (e.g., AWOS, NWS, Private Vendor, ASIS, Airport Anemometer, etc...)	How current is the information? (If known)

2. Please mark all of the following that have an impact on your operations in the Juneau area (Mark all that apply). If the problem is specific to a certain area(s) or region(s), please indicate the area(s)/region(s) in the box to the right of the problem.

	Specific Area/Region (e.g.,Taku Inlet, Gastineau Channel)
☐ Surface Winds	_____
☐ Windshear	_____
☐ Low-level Turbulence	_____
☐ Winds Aloft	_____
☐ Other	_____

3. If a particular problem and/or region were indicated in Question #2, would additional wind information in those regions provide benefit? Please explain.

_____

_____

_____

4. Are there any areas (e.g., Taku Inlet, Gastineau Channel) where, in your opinion, the lack of current wind information poses a threat to flight safety? If yes, please identify the region(s) and explain.

_____

_____

_____

Automated Flight Service Station Only

5. While providing the **Standard Preflight Weather Briefing**, what winds information is discussed? Please indicate any information that would be specific to a time of year and/or local phenomena. Winds information could include but is not limited to Winds Aloft, Surface Winds, Turbulence AIRMETs and SIGMETs, PIREPs, etc... For example, Juneau Surface Winds are disseminated but are not specific to a time of year or area (e.g., Taku Inlet, Gastineau Channel). In each row, please enter one type of wind information.

Winds Information Disseminated	Specific to Time of Year? (Please identify)	Specific to local phenomena or area? (Please identify)

Juneau Terrain Induced Turbulence User Needs Survey

6. While disseminating **In-Flight Weather**, what winds information is discussed? Please indicate any information that would be specific to a time of year and/or local phenomena. Winds information could include but is not limited to Winds Aloft, Surface Winds, Turbulence AIRMETs and SIGMETs, PIREPs, etc... For example, Juneau Surface Winds are disseminated but are not specific to a time of year or area (e.g., Taku Inlet, Gastineau Channel). In each row, please enter one type of wind information.

Winds Information Disseminated	**Specific to Time of Year? (Please identify)**	**Specific to local phenomena or area? (Please identify)**

7. Please mark the tasks where wind speed, wind direction, and wind gusts from the Eagle Crest, Mt. Roberts, and Sheep Mountain anemometers would be useful. *(Mark all that apply)*

☐ Preflight Weather Briefing
☐ Abbreviated Weather Briefing
☐ In-Flight Weather Dissemination
☐ Outlook Weather Briefing

8. For each of the tasks marked in Question #7, describe how wind speed and direction and wind gust information would be useful (e.g., disseminate turbulent areas, suggest flight path changes, etc...).

Preflight Weather Briefing - _____

_____

Abbreviated Weather Briefing - _____

_____

In-Flight Weather Dissemination - _____

_____

Outlook Weather Briefing - _____

_____

9. Would wind information above 5000 feet provide benefit to flight operations in the Juneau area? If yes, would they be beneficial for any specific area or region (e.g., Taku Inlet, Gastineau Channel)? Please explain.

_____

_____

_____

10. Please provide any additional comments, concerns, or suggestions regarding winds information in the Juneau area. If you suggest providing additional information, please include what area(s) (e.g., Taku Inlet, Gastineau Channel) you would like the information for, when you would want the information, and how you would like to obtain that information.

_____

_____

_____

Thank you very much for your time.
The information you have provided will be very useful in the development of the terrain induced turbulence warning system.

We may need to contact individuals at a later date to clarify information or gather more detailed information. If you are interested in being contacted, please make sure you have completed all of the contact information fields at the beginning of the survey.

APPENDIX C

INTERVIEW QUESTIONS

Juneau Interview Questions
Air Taxi/Charter Pilots

1. What type of flights characterize your operation? What are your most common destinations?

2. Are you equipped for IFR flight?

3. How many operations do you have per week during the on-season?

4. How many operations do you have per week during the off-season?

5. What winds information do you currently have?

6. What are your primary concern with regard to winds? Are these concerns specific to an area or phenomenon?

7. When and what type of winds impact your operations most?

8. Are there any areas where, in your opinion, the lack of winds information make it unsafe to fly?

9. Do you fly RNP? If yes, has RNP changed the need for wind information?

10. Is there any additional wind information that you would like to have? If yes, where?

11. Have you had an incident with regard to the winds? Is there any report or reference for this incident?

12. How would you like to access the winds information?

Interview Questions
Automated Flight Service Station and Air Traffic Control
Air Traffic Control Specialists

1. What wind information do you currently use in completing your job tasks?

2. What are your primary concerns with regard to winds? Are these concerns specific to an area or phenomenon?

3. When and what type of winds impact your operations most?

4. Is there any additional wind information that you would like to have? If yes, where?

5. How would you like to access wind information?

APPENDIX D

AIR TAXI/CHARTER PILOT SURVEY RESULTS

SURVEY RESPONSES
AIR TAXI COMPANIES
NON-FAR 121 PILOTS
(8 Surveys Completed)

1. **What type of pilot are you?**

Pilot Type	Number of Respondents
Commercial Air Taxi or Charter	8
Private General Aviation	
Corporate or Agency	
Other	

2. **What type of aircraft do you fly?**

Aircraft Type	Number of Respondents
Fixed Wing, Wheeled	3
Fixed Wing, Float	5
Fixed Wing, Skis	
Helicopter	3

3. **Is your aircraft equipped for IFR?**

	Number of Respondents
Yes	
No	8

4. **Estimate the number of hours per month you fly during peak season (May-Sept.)?**
100, 350, 75, 100+, 80-90, 60, 50, 60

5. **Estimate the number of hours per month you fly during off peak season (Oct.-Apr.)?**
50, 200, 35, 60+, 25-30, 25, 28, 30

6. **At what flight levels do you most commonly operate when within 50 NM of Juneau International Airport?**

Mileage Range	Number of Respondents
0 – 2000 feet	8
2001 – 4000 feet	6
4001-6000 feet	4
6000 feet and above	1

7. **Which airport(s) do you operate from?**

Airport	Number of Respondents
Juneau International Airport	8
Juneau Harbor	1
Company-based or Private site	1

8. **Do you fly RNP arrivals and departure?**

	Number of Respondents
Yes	
No	8

9. **What weather information do you currently obtain 30 minutes or more prior to takeoff and departure? Weather information could include but is not limited to METARs, AIRMETs, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.**

Winds Information Available	Provider (e.g., AWOS, NWS, Private Vendor, ASOS, Airport Anemometer, etc...)	How current is the information? (If known)
Automated Surface Observing System Report	ASOS/NWS	Hourly with specials
Area Forecast	AFSS	6 hour
Station Reports	AFSS	Hourly
Marine weather	NWS	
Pilot Reports	Pilots	As provided
Local Weather from company agents	Local agents	As provided
Southeast Alaska Forecasts	DUAT, NWS	Daily
Standard Weather Briefing	AFSS	Within 1 hour of departure
Forecast Ceiling and Visibility	NWS	

10. What weather information do you currently obtain immediately preceding takeoff and departure? Weather information could include but is not limited to METARs, AIRMETS, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.

Winds Information Available	Provider (e.g., AWOS, NWS, Private Vendor, ASOS, Airport Anemometer, etc...)	How current is the information? (If known)
Winds	ATIS	Hourly
Visibility	ATIS	Hourly
Ceiling	ATIS	Hourly
Marine weather	NWS	
Pilot Reports	Pilots	As provided
Altimeter	ATIS	Hourly
AIRMETs, SIGMETs	AFSS	As issued

11. What weather information do you currently en-route? Weather information could include but is not limited to METARs, AIRMETS, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.

Winds Information Available	Provider (e.g., AWOS, NWS, Private Vendor, ASOS, Airport Anemometer, etc...)	How current is the information? (If known)
Ceiling	AFSS, PIREPs	Hourly
Visibility	AFSS, PIREPs	Hourly
Wind	AFSS, PIREPs	Hourly
Marine weather	NWS	
Pilot Reports	Pilots	As provided
AIRMETs, SIGMETs	AFSS	

12. What weather information do you currently prior to approach and landing? Weather information could include but is not limited to METARs, AIRMETS, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.

Winds Information Available	Provider (e.g., AWOS, NWS, Private Vendor, ASOS, Airport Anemometer, etc...)	How current is the information? (If known)
Ceiling	AFSS, ATIS, AWOS	Hourly
Visibility	AFSS, ATIS, AWOS	Hourly
Wind	AFSS, ATIS, AWOS	Hourly
Marine weather	NWS	
Pilot Reports	Pilots	As provided

13. Please mark the phases of flight where wind speed, wind direction, and wind gusts from the Eagle Crest, Mt. Roberts, and Sheep Mountain anemometers would be useful.

Phases of Flight	Number of Respondents
Pre-Takeoff	2
Takeoff and Departure	5
En-route	1
Approach and Landing	6

14. For each of the phases of flight marked in Question #13, describe how wind speed and direction and wind gust information would be useful (e.g., cancel operations, avoid turbulent areas, change departure, change flight path, etc...).

Phases of Flight	Number of Respondents
Pre-Takeoff	Avoid turbulent areas (i.e., change planned route of departure), Change departure pattern and bank angles
Takeoff and Departure	Avoid turbulent areas (i.e., change planned route of departure), Avoid terrain, Change departure procedure and avoid turbulent areas, Change departure by climbing higher on upwind leg then turning downwind
En-route	Avoid turbulent areas (i.e., change flight path)
Approach and Landing	Avoid turbulent areas (i.e., change approach), Avoid terrain, Change approach procedures and avoid turbulent areas, Avoid known turbulent areas as much as possible, slow descent, maintain a higher approach speed in anticipation of downdrafts. Knowing whether mountain tops are workable for the customer. Cancel landings in those areas.

15. Please mark all of the following that have an impact on your operations in the Juneau area. If the problem is specific to a certain area(s) or region(s), please indicate the area(s)/region(s) in the box to the right of the problem.

Type of Winds	Specific Region/Area
Surface Winds	Airport, approach corridor for Runway 8, Gastineau Channel, Eagle Crest, Sheep Creek, Gold Creek
Windshear	Downtown and Outer Point, Approach for Runway 8, Juneau harbor area, Lena point and Montana creek
Low-level Turbulence	Airport, Gastineau Channel area, North Douglas Area, Eagle Crest, Sheep Creek, Gold Creek, Outer Point, Lena Point, Rough from "cut" to landing.
Winds Aloft	

16. If a particular problem and/or region were indicated in Question #15, would additional wind information in those regions provide benefit? Please explain.

-Information about winds downtown and outer point might be useful for decision to avoid these areas but we are fairly capable of making these decisions at this time based on the weather information currently available.

-I guess so, common sense should dictate.

-Yes, it would give the pilot information that would alert him/her of a potential downdraft, turbulence, or tailwind situation.

17. Have you experienced any specific turbulence-related incidents in the Juneau area?

	Number of Respondents
Yes	1
No	5

If yes, please explain the incident. If appropriate, reference any National Transportation Safety Board, FAA, or NASA database where additional information can be found.

-Typically it is in the area of the "cut" inbound toward the runway. Often accompanied by a tailwind, and at the mouth of the "Eagle Crest Valley" just toward the airport from the "gravel pit".

18. Are there any areas (e.g., Taku Inlet, Gastineau Channel) where, in your opinion, the lack of current wind information poses a threat to flight safety? If yes, please identify the region(s) and explain.

-I don't think so. We know that high northerly winds make downtown very bumpy and high southeasterly winds make outer point very bumpy.

-No

-Downtown harbor area, Gastineau Channel, and the "cut" on final approach to Runway 8.

-No

-I feel that 1 area is just due east of "Marmian Island" and due south of Point Bishop. It would be nice to have that information although I don't know if it would be a "threat to flight safety". Also, it would be helpful for everyone involved to have an anemometer on Coughlin Island although again I don't feel it poses a threat to flight safety.

19. Would wind information above 5000 feet provide benefit to flight operations in the Juneau area? If yes, would they be beneficial for any specific area or region (e.g., Taku Inlet, Gastineau Channel)? Please explain.

-I guess I don't have an opinion on this one. I don't see how this would help us significantly in our operation.

-No, not for our operations.

-Not for our company operations.

-Only to Alaska Airlines when they are flying the RNP approach down the Gastineau Channel.

-No. With southeast winds, they generally increase with altitude with decreasing turbulence in Juneau area. Typically, an increase in altitude during a southeast flow also brings an increase in clouds, which we do not operate in. With north winds, an increase in altitude above 5000 feet brings a smooth ride.

20. Please provide any additional comments, concerns, or suggestions, regarding winds information in the Juneau area. If you suggest providing additional information, please include what area(s) (e.g., Taku Inlet, Gastineau Channel) you would like the information for, when you would want the information, and how you would like to obtain that information.

-For our operations, Juneau area reports are adequate. More than wind information, we would like to see more en-route weather reporting. Seymour Canal, Stephens Passage, Chatham Straight, cross sound areas are practically void of good current information. We more or less must "go and see". How about more remote AWOS sights and "weather cameras" like channel 23.

-Juneau indeed is a unique area for winds. Many factors must be studied due to the many different canals, channels, and valleys. I feel the Juneau Ice Cap contributes a great deal to the "wind problems" due to the cold air off the Ice Cap settling down and meeting the warm moist air of the ocean. If someone could only harness these winds, then we wouldn't have to worry about flight safety. But then, that is what makes Juneau, Alaska such a beautiful, unique, and wonderful place to live.

-Having wind information for Sheep Mountain, Juneau Ice Field, and Taku Inlet would be helpful.

-We currently have a number of wind indicators to gain information from before and during flight. The only recommendation I have is to not make it a political issue. If a pilot could obtain all the available wind information from one source, it would be infinitely helpful. As helicopter pilots, we do encounter windshear and turbulence, but they are local conditions and generally are not something that can be fixed by forecasting complex wind flows. As far as we are concerned, avoiding the situations you hope to predict is accomplished through pilot training and can then be utilized in any flying environment.

APPENDIX E

INTERVIEW SUMMARIES FOR AIR TAXI/CHARTER PILOTS

Air Taxi/Charter Pilots
Interview Responses

1. **What type of flights characterize your operation? What are your most common destinations?**

   User 1 – Helicopter charter flights. We go pretty much anywhere.

   User 2 – Anywhere within 60 to 70 miles of Juneau.

   User 3 – Fly cherokee charters to anywhere.

   User 4 – Usually work remote sites as we carry cargo and sling loads. We do commercial heavy work. Fly in buildings, logs, aircraft, supplies to remote sites.

   Users 5,6,7 – Scheduled flights and chartered flights to many locations.

   User 8 – Charter flights and scheduled flights.

   User 9 – Charter flights mostly.

   Users 10,11,12 – Helicopter charter flights.

   User 13 – Charter helicopter flights. Glacier tours, medivac services.

2. **Are you equipped for IFR flight?**

   User 1 – No.

   User 2 – No.

   User 3 – No.

   User 4 – Yes, but we don't fly IFR.

   Users 5,6,7 – No.

   User 8 – Yes.

   User 9 – Equipped but not operating.

   Users 10,11,12 – No.

   User 13 – No.

3. **How many operations do you have per week during the on-season?**

   User 1 – Ten to twelve operations per day

   User 2 – Every 30 minutes during the day.

User 3 – 22 flights per day mostly between Gustavus and Juneau.

User 4 – Depends on charters.

Users 5,6,7 – 95 per day (one way).

User 8 – 200-300 per week.

User 9 – 300 hours per month

Users 10,11,12 – Unknown.

User 13 – Unknown.

4. **How many operations do you have per week during the off-season?**

User 1 – Couple operations per week.

User 2 – About every hour during daylight.

User 3 – 8-10 flights per day.

User 4 – Depends on charters.

Users 5,6,7 – 20 per day (one way).

User 8 – 30 per week.

User 9 - 50 hours per month.

Users 10,11,12 – Unknown.

User 13 – Unknown.

5. **What wind information do you currently have?**

User 1 – Windsock on site. ASOS reports, NWS, Pt Retreat, Eldred Rock, and basically look out the window. Channel (Gastineau) is worst during north winds.

User 2 – ATIS, call destinations, ASOS, talk with AFSS briefers. Catpaws.

User 3 – ASOS for Juneau and Gustavus. Call AFSS for general weather. Look at catpaws and mountain top areas.

User 4 – Internet, dial-in ASOS, PIREPs, AFSS.

Users 5,6,7 – DUAT weather briefing, AFSS, NWS. Use ATIS to update. PIREPs, surface weather charts from NWS. TV weather forecast on Channel 10 (6:30pm), catpaws on water.

User 8 – Watch the water for catpaws, DUAT, ASOS, Just know that drainages will be bad.

User 9 – NWS is primary weather source. AFSS is not used for PIREPs because there are gross inaccuracies in AFSS recording and reporting. Internet, dial in ASOS,.

Users 10,11,12 – NWS, ATIS, AFSS, dial-in ASOS. Call NWS for Eagle Crest, Mt. Roberts, and Sheep Mountain anemometer information. Look at Alascom sites.

User 13 – Windsock, ATIS, AFSS

6. **What are your primary concerns with regard to winds? Are these concerns specific to an area or phenomenon?**

User 1 – Have a lot of flexibility with the aircraft. Helicopters handle turbulence a little better than fixed wing.

User 2 – Outer Point, Eagle Crest, Gold Creek, Lemon Creek, Sheep Creek, and Taku Valley. The drainages always have wind problems associated with them.

User 3 – Turbulence over outer marker and to the north.

User 4 – Avoid channel because of all of the traffic. Avoid any area where there is gusts or windshear. Funter Bay needs more weather.

Users 5,6,7 – Outer Point will be rough with southeast winds. Channel is rough with Taku winds. Water and catpaws are the cue for all pilots.

User 8 – No concerns really. Just know that Outer Point and Airport will be bad with southeast winds and downtown and Taku Inlet will be bad with north winds.

User 9 – Never been shut down by winds in Juneau.

Users 10, 11, 12 – Traditional locations such as Outer Point and Gastineau Channel and Taku Inlet.

User 13 – Critical windspeed and azimuth as you need a certain amount of wind to start up and shut down.

7. **When and what type of winds impact your operations most?**

User 1 – None really.

User 2 – Easterly winds are tough in general. Taku can create problems if going to inlet area. Won't takeoff in crosswinds beyond 40 kts at the water runway (pond).

User 3 – None really.

User 4 – Gusts, Windshear.

Users 5,6,7 – Hard southeast winds and 40 knots or greater at airport.

User 8 – When winds go above 50 knots at the airport, we cut flights down to our best aircraft. 60-70 knots is traditionally stop of operations. Wheeled winds handle wind better than floats.

User 9 - None.

Users 10, 11, 12 – None.

User 13 – Moderate turbulence is pretty bumpy for helicopters.

8. **Are there any areas where, in your opinion, the lack of wind information make it unsafe to fly?**

User 1 – Lynn Canal with 50 knot winds is different than Taku Inlet with 50 knot winds. Any place where there are crosswinds (i.e., drainages) is difficult to fly.

User 2 – Not really.

User 3 – No.

User 4 – General winds don't impact operations that much.

Users 5,6,7 – Not really.

User 8 – No. Dark spots in water are key indicators.

User 9 – Elfin Cove. Ceiling and Visibility is biggest problem.

Users 10, 11, 12 – No.

User 13 – Taku Inlet.

9. **Do you fly RNP? If yes, has RNP changed the need for wind information?**

User 1 – No.

User 2 – No.

User 3 - No.

User 4 – No.

Users 5,6,7 – No.

User 8 – No.

User 9 – No.

Users 10,11, 12 – No.

User 13 – No.

10. Is there any additional wind information that you would like to have? If yes, where?

User 1 – Pederson Hill and Outer Point would be good.

User 2 – Pederson Hill, Outer Point.

User 3 – Outer Point, Pederson Hill, Lena Point, Coughlin Island since that is the missed approach point. Also at tip of Admiralty Island for Taku winds.

User 4 – Really want new anemometer at Pt. Bishop as the current one is sheltered. Funter Bay needs additional weather information.

Users 5,6,7 – Outer Point, Pederson Hill, Hoonah, Sisters Island, Angoon, Annex Creek, Auke Mountain, Elfin cove, Pelicon

User 8 – Maybe Pederson Hill.

User 9 – Elfin Cove, maybe Cordova.

Users 10,11,12 – Grand Island, Point Arden, Berners Bay, Angoon.

User 13 – Not really.

11. Have you had an incident with regard to the winds? Is there any report or reference for this incident?

User 1 – No.

User 2 – No.

User 3 – No.

User 4 – No real incidents. Helicopters create so much wind they dissipate most of the external winds. Our fixed wing aircraft have hit clear air turbulence and had load shifts.

Users 5,6,7 – Had problems at Elfin Cove. Almost rolled a plane

User 8 – Not really anything bad.

User 9 – No.

Users 10, 11, 12 – No.

User 13 – No.

12. How would you like to access the wind information?

User 1 – Internet, AFSS, NWS. NWS is better than AFSS.

User 2 – AFSS, Internet

User 3 – Dial in to get winds similar to ASOS.

User 4 – Internet is best place. AFSS is an option while in the air.

Users 5,6,7 – Internet, AFSS, NWS, DUAT, dial in.

User 8 – Internet. Not AFSS. Make it part of DUAT.

User 9 - Internet, NWS.

Users 10, 11, 12 – AFSS, Internet, dial up, NWS.

User 13 – AFSS, Internet, NWS.

APPENDIX F

AFSS SPECIALIST SURVEY RESULTS

SURVEY RESPONSES
AUTOMATED FLIGHT SERVICE STATION
AIR TRAFFIC CONTROL SPECIALISTS
(5 Surveys Completed)

1. **What winds information do you currently have to assist with your job tasks? Winds information could include but is not limited to Winds Aloft, Surface Winds, Turbulence AIRMETs and SIGMETs, PIREPs, etc...**

Winds Information Available	Provider (e.g., AWOS, NWS, Private Vendor, ASOS, Airport Anemometer, etc...)	How current is the information? (If known)
Runway Winds	Airport Anemometers	Real-Time
Juneau Automated Surface Observation	Automated Surface Observation System (ASOS)	Hourly with special releases if necessary
Federal Building, Mt. Roberts Tramway, Mayflower Island Winds	National Weather Service (NWS) Anemometers	Hourly
Point Bishop winds	NWS Anemometer	Hourly
Pilot Reports	Pilots	Irregular
Lighthouse winds	Reporting stations based at lighthouse	Hourly
Terminal Area Forecast	NWS	Every 6 hours or as necessary
Winds Aloft	NWS	12 hours

2. **Please mark all of the following that have an impact on your operations in the Juneau area (Mark all that apply). If the problem is specific to a certain area(s) or region(s), please indicate the area/region in the box to the right of the problem.**

Winds	Specific Region/Area of Problem
Surface Winds	Airport, Downtown, Gastineau Channel, Taku area, Lemon Creek
Windshear	Runway 8, Approach, Gastineau Channel, Taku area,
Low-level Turbulence	Around Airport, Gastineau Channel, Taku area, Outer Point, Cut on Approach
Winds Aloft	Lynn Canal, Gastineau Channel, Taku area

3. **If a particular problem and or region were indicated in Question #2, would additional wind information in those regions provide benefit? Please explain.**

   -Wind profiler data over Juneau Airport to determine windshear situations.

   -None

   -Only to make the lawyers happy.

   -Any and all wind information is very useful and safety related.

4. **Are there any areas (e.g., Taku Inlet, Gastineau Channel) where, in your opinion, the lack of current wind information poses a threat to flight safety? If yes, please identify the region(s) and explain.**

   -None

   -Yes, both Taku Inlet and Gastineau Channel. These areas have a high volume of traffic and are well known for turbulence and windshear.

   -Only if you have to fly the area and have an IQ of 3.

   -Any inlet or channel can have local winds of high velocity or significantly different direction to pose a threat to aviation and marine public.

5. **While providing the Standard Preflight Weather Briefing, what winds information is discussed. Please indicate any information that would be specific to a time of year and/or local phenomena. Winds information could include but is not limited to Winds Aloft, Surface Winds, Turbulence AIRMETs and SIGMETs, PIREPs, etc... For example, Juneau surface winds are disseminated but are not specific to a time of year or area (e.g., Taku Inlet, Gastineau Channel). In each row, please enter one type of wind information.**

Winds Information Disseminated	**Specific to Time of Year? (Please identify)**	**Specific to local phenomena or area? (Please identify)**
METARs, Specials	All times of the year	Juneau Airport
Terminal Area Forecast	All times of the year	Juneau Airport, windshear
SIGMETs, AIRMETs, Area Forecast	All times of the year	Reason for turbulence
PIREPs	Winter for Taku, Gastineau Channel, Lynn Canal	
Federal Building Winds	Summer	Tourist traffic downtown
Lighthouse Winds	Mostly Winter	Turbulence in Lynn Canal and Taku Inlet
Mt. Roberts Tramway Winds	Summer	Paragliding operations, tourist traffic downtown
Eagle Crest	As requested	As requested

6. **While disseminating In-Flight Weather, what winds information is discussed. Please indicate any information that would be specific to a time of year and/or local phenomena. Winds information could include but is not limited to Winds Aloft, Surface Winds, Turbulence AIRMETs and SIGMETs, PIREPs, etc... For example, Juneau surface winds are disseminated but are not specific to a time of year or area (e.g., Taku Inlet, Gastineau Channel). In each row, please enter one type of wind information.**

Winds Information Disseminated	Specific to Time of Year? (Please identify)	Specific to local phenomena or area? (Please identify)
METARs, Specials	All times of the year	Juneau Airport
Terminal Area Forecast	All times of the year	Juneau Airport, windshear
SIGMETs, AIRMETs, Area Forecast	All times of the year	Reason for turbulence
PIREPs	Winter for Taku, Gastineau Channel, Lynn Canal	
Airport Real-Time Winds	All times of the year	Juneau Airport
Mt. Roberts, Eagle Crest Winds	Summer	Paragliding briefing
Taku Inlet Winds	As requested	As requested
Lighthouse Winds & Temperature	Summer	Taku Inlet, Lynn Canal

7. **Please mark the tasks where wind speed, wind direction, and wind gusts from the Eagle Crest, Mt. Roberts, and Sheep Mountain anemometers would be useful.**

Preflight Weather Briefing – (3 out of 4 users)
Abbreviated Weather Briefing – (4 out of 4 users)
In-Flight Weather Dissemination – (3 out of 4 users)
Outlook Weather Briefing – (1 out of 4 users)

8. **For each of the tasks marked in Question #7, describe how wind speed and direction and wind gusts information would be useful (e.g., disseminate turbulent areas, suggest flight path changes, etc...).**

Tasks	How Wind Information is Used
Preflight Weather Briefing	Describing to pilots where strongest winds and turbulence are.
	Pilots like the information to evaluate for their own purposes. It is helpful to know altitudes of forecasted turbulence, intensity, and location as well as possible duration.
	Winds are always looked at for any briefing for safety issues. Specifically look at differences in direction and velocity for known and forecast winds to alert the pilot to turbulence. Wind information is extremely valuable for pilot weather briefing especially in mountainous and channeled terrain.
Abbreviated Weather Briefing	Describing to pilots where strongest winds and turbulence are.
	Helpful for paragliding briefings and helping pilots plan flight.
In-Flight Weather Dissemination	Airport Advisory Service
Outlook Weather Briefing	

9. **Would wind information above 5000 feet provide benefit to flight operations in the Juneau area? If yes, would they be beneficial for any specific area or region (e.g., Taku Inlet, Gastineau Channel)? Please explain.**

-Lynn Canal, Gastineau Channel. Pilots can determine which altitude is most wind favorable for saving fuel and time.

-No, I do not believe this would be necessary.

-Current wind conditions would determine if you could climb over low-level turbulence.

-Helpful for profile winds and to indicate turbulence for aircraft climbing to higher altitudes.

10. Please provide any additional comments, concerns, or suggestions regarding winds information in the Juneau area. If you suggest providing additional information, please include what area(s) (e.g., Taku Inlet, Gastineau Channel) you would like the information for, when you would want the information, and how you would like to obtain that information.

-The wind profiler data would be useful over Juneau Airport and Gastineau Channel during precipitation events to determine how the precipitation is distorting the winds.

-Mount Roberts and Sheep Creek are important for determining turbulence and windshear from the Taku River area. Mt. Roberts also is frequently requested by paragliders and float planes. Information for safe operations in this area should be made available to the flying public.

-Should contact air taxi pilots to see what they are using now.

-Any wind information at any and all locations are useful tools to the pilot weather briefer as well as other users. To have additional wind information available and not be able to use it is frustrating.

APPENDIX G

INTERVIEW SUMMARIES FOR AFSS SPECIALISTS

Automated Flight Service Station
Air Traffic Control Specialists
Interview Responses

1. **What wind information do you currently use in completing your job tasks?**

   User 1 – Airport anemometers, ASOS winds on Airport, Federal Building winds, Tramway winds, Mayflower Island winds, Point Bishop winds, PIREPs, TAF, Winds Aloft.

   User 2 – Airport winds, Mt. Roberts and Federal Building, PIREPs are good for questions concerning wind and airspeed deviations. Winds aloft are also available along with the TAF.

   User 3 – Same as others have indicated.

   User 4 – Same as others.

   User 5 – Same as others.

2. **What are your primary concerns with regard to winds? Are these concerns specific to an area or phenomenon?**

   User 1 – In summertime, the federal building winds are the most important for seaplanes while the mountaintop winds are most important for the gliders. In wintertime, pilots don't ask for winds as much.

   User 2 – Weather systems from Arctic create a lot of interest in the Taku area. Lynn Canal winds are significant as well. Southeast winds create problems in Gastineau Channel and at airport. High-pressure systems cause significant drainage winds.

   User 3 – I really want good raw data. I would like to verify data against raw data and pilot reports.

   User 4 – Evergreen has a lot of questions regarding the winds. Air taxis know what areas to avoid, but their concerns are known. They use downtown winds and federal building winds the most.

   User 5 – Any wind information is good. Safety is the key issue. Difference between direction and velocity is important for turbulence prediction. Profiler data would be useful. Any new data would be useful.

3. **When and what type of winds impact your operations most?**

   User 1 - Winds do not specifically impact our operation. However we do use Point Bishop winds to interpret the Taku Winds. The more winds information we have the better. Within the terminal area there is no need for additional winds information. The NWS Juneau FPAK20 discussion of winds provides good information. It provides the reason for the winds in the area.

User 2 – We are not specifically impacted by winds. Alaska Airlines does not seem to be as impacted by the winds since the implementation of the RNP departure. Turbulence and windshear all around airport is of primary concern.

User 3 – None.

User 4 – Winds do not impact air taxis. C&V is usually a factor.

User 5 – None really.

4. Is there any additional wind information that you would like to have? If yes, where?

User 1 – Auke Mountain, Pederson Hill would be good additional locations. North Douglas profiler should actually be at Pederson Hill. Lemon Creek does not have much use.

User 2 – Lighthouse winds are available and provide good information. Auke Mountain and Robert Barron Mountain would be good additional sources of anemometer information. Cordova airport also needs winds information.

User 3 – Berners Bay would be a good place for an anemometer as it has high winds. Grand Island would also be good as it would indicate Taku winds.

User 4 - Funter Pass used to have an observer. It would be useful to have that information again.

User 5 – Don't need anymore sites than what is currently available on NCAR display. Pederson Hill is good. Point Bishop and lighthouse winds would be really useful.

5. How would you like to access wind information?

User 1 – Current display is fine. However, need to indicate when data is down and use graphical map for outlying stations. Also need to confirm east and west labels for the runway anemometers.

User 2 – Current presentation of winds on NCAR display is fine. NWS needs profiler winds but not AFSS. Would only use profiler as anemometer and nothing else.

User 3 – Current display is fine.

User 4 – The NCAR display of the timetrack was not very good. The icons were too small and hard to read. Trend information is for operations purposes. All we really need is the last few minutes. The new display from NCAR was better. We need open architectures and displays need to be standardized.

User 5 – Current display is fine.

APPENDIX H

ATCT SPECIALIST SURVEY RESULTS

SURVEY RESPONSES
AIR TRAFFIC CONTROL TOWER
AIR TRAFFIC CONTROL SPECIALISTS
(4 Surveys Completed)

1. **What winds information do you currently have to assist with your job tasks? Winds information could include but is not limited to Winds Aloft, Surface Winds, Turbulence AIRMETs and SIGMETs, PIREPs, etc...**

Winds Information Available	Provider (e.g., AWOS, NWS, Private Vendor, ASOS, Airport Anemometer, etc...)	How current is the information? (If known)
Automated Surface Observing System Report	ASOS/NWS	Hourly with specials
3 Runway Anemometers	FAA	Real-time
4 Windsocks	Airport	Real-time
AIRMETs/SIGMETs	FAA/Automated Flight Service Station	Once a day
Forecast Surface Winds	NWS/TAF	
Blowing Snow off of mountain tops	Mother Nature	
Watching water on the Pond (water runway)		Current
Pilot Reports	Pilots	Somewhat current

2. **Please mark all of the following that have an impact on your operations in the Juneau area (Mark all that apply). If the problem is specific to a certain area(s) or region(s), please indicate the area/region in the box to the right of the problem.**

Winds	Specific Region/Area of Problem
Surface Winds	Airport and Class D & E Airspace
Windshear	Airport and Class D & E Airspace
Low-level Turbulence	Airport and Class D & E Airspace
Mountaintop sensors	Eagle Crest, Mt. Roberts, and Sheep Creek

3. **If a particular problem and or region were indicated in Question #2, would additional wind information in those regions provide benefit? Please explain.**

-More wind information at the "cut" (Engineers Cut) and Peterson Hill would be helpful for turbulence and windshear trends.

-For FAA ATCT concerns, wind information at Pederson Hill could be a benefit for detection of possible windshear to Runway 8. Some form of LLWAS within 3-5 miles of the airport may prove useful as well.

-Due to the terrain around the airport, there is quite frequently low-level windshear, but we don't know unless a pilot tells us. It would be very nice for the pilots to have that information before they have to fly through it.

-Yes, if certified, credible information is good.

4. **Are there any areas (e.g., Taku Inlet, Gastineau Channel) where, in your opinion, the lack of current wind information poses a threat to flight safety? If yes, please identify the region(s) and explain.**

-No opinion.

-The Gastineau Channel and Taku Area can be quite nasty

APPENDIX I

INTERVIEW SUMMARIES FOR ATCT SPECIALISTS

Air Traffic Control Specialists
Interview Summary

Current Winds:

We currently have the three airport anemometers and four windsocks. Also have the ASOS reports. Runway 8 is used more in the wintertime while Runway 26 is used more in the summertime.

Concerns:

Tower is concerned most with runway. Tower doesn't really want raw data without red light – green light type system. Pederson Hill is a prime windshear area. ATCT would be interested in seeing the Pederson Hill anemometer data. However, they don't necessarily want it in the tower. Maybe if there was a comparison chart – something that showed if there was a discrepancy between Pederson Hill and the airport.

Tower is lobbying to put ASOS and frequency towers on Pederson Hill so it may not be difficult to maintain one more piece of equipment up there.

Tower does not want any information until it is public information that is not time consuming and does not increase workload. Want to read the information verbatim with no interpretation. Really want a red light green light system.

APPENDIX J

GENERAL AVIATION PILOT SURVEY RESULTS

SURVEY RESPONSES
GENERAL AVIATION PILOTS
(24 Surveys Completed)

1. **What type of pilot are you?**

Pilot Type	Number of Respondents
Commercial Air Taxi or Charter	1
Private General Aviation	23
Corporate or Agency	
Other	

2. **What type of aircraft do you fly?**

Aircraft Type	Number of Respondents
Fixed Wing, Wheeled	20
Fixed Wing, Float	10
Fixed Wing, Skis	
Helicopter	2

3. **Is your aircraft equipped for IFR?**

	Number of Respondents
Yes	4
No	20

4. **Estimate the number of hours per month you fly during peak season (May-Sept.)?**
20, 75, 40, 15, 20, 20, 4, 20, 7, 10, 10, 12, 5, 20, 20, 300-500, 20, 25, 70, 15, 3, 20, 20, 25

5. **Estimate the number of hours per month you fly during off peak season (Oct.-Apr.)?**
3, 25, 10, 5, 10, 8, 1, 5, 5, 0, 10, 8, 1, 10, 10, 100-200, 5, 10, 30, 5, 3, 5, 10, 5

6. **At what flight levels do you most commonly operate when within 50 NM of Juneau International Airport?**

Mileage Range	Number of Respondents
0 – 2000 feet	17
2001 – 4000 feet	14
4001-6000 feet	3
6000 feet and above	1

7. **Which airport(s) do you operate from?**

Airport	Number of Respondents
Juneau International Airport	21
Juneau Harbor	1
Company-based or Private site	4
Haines	1

8. **Do you fly RNP arrivals and departure?**

	Number of Respondents
Yes	
No	24

9. **What weather information do you currently obtain 30 minutes or more prior to takeoff and departure? Weather information could include but is not limited to METARs, AIRMETS, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.**

Winds Information Available	Provider (e.g., AWOS, NWS, Private Vendor, ASOS, Airport Anemometer, etc...)	How current is the information? (If known)
Ceiling and Visibility	AFSS, Internet	Hourly
Winds Aloft	AFSS, Internet	
Surface Winds	AFSS, Internet	Hourly
METARs	AFSS, Internet	Hourly
AIRMETs, SIGMETs	AFSS, Internet	As issued
Standard Weather Brief	AFSS	1-3 hours
Dewpoint/Temperature Spread	AFSS	Not very current or accurate
Forecast and current general weather	NWS	
Watch The Weather Channel		Real-time

10. What weather information do you currently obtain immediately preceding takeoff and departure? Weather information could include but is not limited to METARs, AIRMETS, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.

Winds Information Available	Provider (e.g., AWOS, NWS, Private Vendor, ASOS, Airport Anemometer, etc...)	How current is the information? (If known)
Ceiling and Visibility	AFSS, Internet, ATIS	Hourly
Winds Aloft	AFSS, Internet	
Surface Winds	AFSS, Internet, ATIS	Sometimes information from AFSS is very poor.
METARs	AFSS, Internet, ATIS	Hourly
Airport Weather	ATIS	Hourly
Advisories	AFSS	Current
Temperature and Dewpoint	ATIS	Hourly

11. What weather information do you currently en-route? Weather information could include but is not limited to METARs, AIRMETS, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.

Winds Information Available	Provider (e.g., AWOS, NWS, Private Vendor, ASOS, Airport Anemometer, etc...)	How current is the information? (If known)
Ceiling and Visibility	AFSS	Hourly
Winds Aloft	AFSS	
Surface Winds	AFSS	Hourly
METARs	AFSS, ATIS	Hourly
AIRMETs, SIGMETs	AFSS	As issued
PIREPs for outlying airports	Pilots, AFSS	As issued
Provide PIREP		
Altimeter	AFSS	Hourly

12. What weather information do you currently prior to approach and landing? Weather information could include but is not limited to METARs, AIRMETS, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, the PAJN METAR is obtained from AFSS or ATIS and is updated hourly. In each row, please enter one type of weather information.

Winds Information Available	Provider (e.g., AWOS, NWS, Private Vendor, ASOS, Airport Anemometer, etc...)	How current is the information? (If known)
Ceiling and Visibility	ATIS	Hourly
Winds	ATIS	Hourly
Pressure	ATIS	Hourly
METAR	ATIS	Hourly
Airport Weather	ATIS	Hourly
PIREPs	Pilots, AFSS	As issued
Altimeter	ATIS, Air Traffic	Hourly
Temperature and Dewpoint	ATIS	Hourly

13. Please mark the phases of flight where wind speed, wind direction, and wind gusts from the Eagle Crest, Mt. Roberts, and Sheep Mountain anemometers would be useful.

Phases of Flight	Number of Respondents
Pre-Takeoff	14
Takeoff and Departure	8
En-route	11
Approach and Landing	19

14. For each of the phases of flight marked in Question #13, describe how wind speed and direction and wind gust information would be useful (e.g., cancel operations, avoid turbulent areas, change departure, change flight path, etc...).

Phases of Flight	Number of Respondents
Pre-Takeoff	Help determine direction of flight or making go/no-go decisions. Cancel planned flight. I am on floats, it is hard to taxi or turn when 20 knots or greater. Change departure or shorten exposure.
Takeoff and Departure	Change departure, Final decision of conditions, which might have changed during preflight. Avoid turbulent areas, change flight path, Cancel flight if necessary
En-route	Change flight path, Avoid turbulent areas, Help determine best/safest route to airport. Elevation of flight. Pass conditions.
Approach and Landing	Make final decision or flight path to final approach, Determine type of approach to land helicopter. Approach speed and glide path. Find alternative landing site. Mountain top conditions. I would become extremely cautious. Enhance wind expectations on approach

15. Please mark all of the following that have an impact on your operations in the Juneau area. If the problem is specific to a certain area(s) or region(s), please indicate the area(s)/region(s) in the box to the right of the problem.

Type of Winds	Specific Region/Area
Surface Winds	Airport area, Gastineau Channel, Outer Point, Taku Inlet
Windshear	Lemon Creek through Taku Inlet, Airport, Gastineau Channel, Outer Point, Mendenhall Glacier, ridgetops
Low-level Turbulence	Within 5-10 NM of airport, Gastineau Channel, Immediate southwest of airport. Outer Point, ice field
Winds Aloft	Within 20-50 NM of airport, Admiralty Island
Other	Actual Flight Service Station observer outside building would be helpful

16. If a particular problem and/or region were indicated in Question #15, would additional wind information in those regions provide benefit? Please explain.

-Strong northerly winds with strong gusts combined with downdrafts made it very hard to obtain safe altitudes.

-Sure. The more information the better and safer

-Information would help some passengers to decide whether to make the flight. Also would tell how secure the cargo must be tied down.

-Presence of windshear, low-level turbulence, and surface wind speed and direction.

-Yes. If I could talk with the observer.

-Yes.

-Yes, additional wind information would assist in route planning and avoiding turbulence.

-Windsock is good enough.

-I would like to see wind information from Robert Barron Peak as it would give accurate information for winds aloft and not be affected by terrain acceleration.

-Good information is always good

-The area of Gastineau Channel over town and tip of Outer Point has extreme winds when Taku wind is blowing and knowing wind could permit avoiding the area.

-I don't think so. If surface wind is ok at airport I may takeoff. If visual at Taku Inlet looks rough, I'll fly elsewhere.

-Visibilities and ceiling

-No, the tower already reports low-level windshear from pilot reports.

17. Have you experienced any specific turbulence-related incidents in the Juneau area?

	Number of Respondents
Yes	5
No	15

If yes, please explain the incident. If appropriate, reference any National Transportation Safety Board, FAA, or NASA database where additional information can be found.

-Cross winds from Lemon Creek, Gold Creek, and Sheep Creek valleys have created moderate turbulence on several occasions.

-Use caution around Sheep Creek.

-Twice this year. Only because I did look at the weather conditions and found that it was hazardous to fly. I complained to flight service people that fog to the surface existed 12 NM north of the airport when ATIS stated otherwise and weather briefing stated otherwise. Also complained about 40+knot winds at 3000 and 6000 feet when flight service said they would be less than 15 knots.

-Severe winds up and down drafts on departure from Juneau heading through the Gastineau Channel towards the southeast.

-Just normal stuff. Have to avoid known areas of turbulence when wind is excessive.

18. Are there any areas (e.g., Taku Inlet, Gastineau Channel) where, in your opinion, the lack of current wind information poses a threat to flight safety? If yes, please identify the region(s) and explain.

-Gastineau Channel, it may be dead calm at Juneau International Airport but severe turbulence at all elevations below 3500 feet at about 2 mile Egan Highway beyond Taku Inlet.

-Funter Pass, Hawk Inlet

-Lynn Canal has high winds with no reporting.

-Sheep Creek

-If all RCO locations in southeast mountains and waterways could give wind speeds. I would find it very helpful.

-There is no radio contact up Taku River.

-No.

-Gastineau Channel

-No

-No

-These are very turbulent areas (Taku, Gastineau) so if you have current information it is always good.

-Not if familiar with the area. Should be made known when excessive for those unfamiliar with this terrain and "normal" conditions in strong winds.

-I don't think so. If it gets rough, I'll head back to airport or alter course around the backside of Douglas Island.

-Glacier and ice field areas affect use of low power aircraft.

-Gastineau Channel is a know area of moderate to severe turbulence, usually near the drainages (Gold Creek, Sheep Creek)

19. Would wind information above 5000 feet provide benefit to flight operations in the Juneau area? If yes, would they be beneficial for any specific area or region (e.g., Taku Inlet, Gastineau Channel)? Please explain.

-Would be good to know but know as useful as below 5000 feet.

-Yes, especially near the mainland mountains.

-Not for VFR

-Mountain ridges are 3500 to 7000 feet. Local winds information at 3000 and 6000 feet would be very helpful.

-Yes. When departing Juneau on Cross-Country flights, I climb as high as possible or legal whichever is higher. Therefore, winds aloft would be helpful for planning. All directions from Juneau i.e., Lynn Canal, Glacier Bay, Stephens Passage, toward Sitka, etc...

-No. Current winds aloft are sufficient.

-Yes. When high surface winds are out of the north/northeast down Lynn Canal, sometimes they can be avoided when coming from Icy Straight by climbing above.

-Yes for Gastineau Channel and Taku Inlet.

-No

-I don't know. I do not fly that high.

-Yes, over ice field.

-Yes, in general, to indicate if higher flight would be better or worse.

20. Please provide any additional comments, concerns, or suggestions, regarding winds information in the Juneau area. If you suggest providing additional information, please include what area(s) (e.g., Taku Inlet, Gastineau Channel) you would like the information for, when you would want the information, and how you would like to obtain that information.

-Lynn Canal has high winds with no reporting.

-If I relied on FAA weather, wind information, I would die at least twice a year. Problem is, I don't know when the information will be hazardous, so I don't trust ATIS or the forecast. Need real live observers to talk to with current local winds aloft information.

-Preflight information would be nice so I could decide whether to fly or not. Would prefer Internet access or weather information at a 1-800 number.

-Having lived here all my life, I have the advantage of knowing local weather patterns and can usually predict with comfortable certainty based on weather information provided by NWS and what conditions to anticipate.

-This can be a very turbulent area so certified wind information is always good. Thanks.

-Gastineau Channel form Taku Inlet to Salmon Creek.

-I have flown in and out on Alaska Airlines in very rough weather using Runway 8. It has gotten a bit bumpy but nothing of great concern. I don't know enough about such approaches using Runway 26, this may be a challenge.

-By radio, on TWEB, or ATIS or by phone from AFSS. More information is better.

-Low and slow flight operations do not require any more information than currently available.

APPENDIX K

ALASKA AIRLINES TURNING DEPARTURE WORKSHEET

Alaska Airlines

JUNEAU OPERATIONS

This report must be completed for all Lemon Creek and Fox departures. Original to be kept in station file, FAX a copy to Paul Majer SEAOZ as soon as possible after each departure. Fax #1-206-431-7503.

GROUND:

Date_____ Departure Time _____ Flight_____

A/C type: -200 ☐ -400 ☐ MD-80 ☐

Departure type: Lemon Creek ☐ Fox ☐

IOE Departure ☐ Ferry Departure (Part 91) ☐

Airport current wind direction and velocity

10 knot headwind component required unless waived by check airman for IOE.
No tailwind permitted at any time

(ASOS or MID FIELD)
Max.25 knots

AT PUSHBACK _____ Kts AT DEPARTURE _____ Kts

Eagle Crest (REQUIRED) Kts. _____ Max.35 knots
AND
Sheep Mountain. (REQUIRED) Kts. _____ Max.35 knots
OR
Mt. Roberts Tram (REQUIRED) Kts. _____ Max.35 knots

Sheep Mtn. and Mt. Roberts can substitute for each other, but if both are operational neither may indicate above 35 knots.

AIRBORNE:

Turbulence Report from crew:

None ☐ Light ☐ Moderate ☐ Severe ☐

In addition, 737-400, WORKLOAD PERMITTING ON MH OF 265°.

Wind direction and velocity _____

Attempt to capture wind direction and velocity as close to the 2,800-foot level as possible, otherwise, include altitude as well.

Report all anemometer outages i.e. location and duration.

Operations Agent Signature required _____