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Juneau Terrain Induced Turbulence Project: 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 FAR Part 121 Pilots and Airline Dispatchers. Surveys and on-site interviews were used to gather information. Part 121 Pilots and Dispatchers are most impacted by the operations specification currently in place. Pilots are most concerned about windshear and turbulence in the vicinity of the airport, in the Gastineau Channel, and near Taku Inlet.

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EXECUTIVE SUMMARY

This report summarizes FAR Part 121 Pilot and Dispatcher user needs for the Juneau Terrain Induced Turbulence Project. The user needs analysis was conducted at Alaska Airlines facilities in Seattle, Washington, and Juneau, Alaska, during March 1999. 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 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).

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). 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 addressed the needs of air taxi/charter pilots, AFSS Specialists, Air Traffic Control Tower (ATCT) Specialists, National Weather Service (NWS) Forecasters, and Alaska Airlines Operations Tower Agents. It was completed in February 1999. The second part is addressed in this report and 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 interviewed in their operational setting. Following interviews, surveys were distributed to both pilots and dispatchers. Pilots who flew Juneau routes were specifically targeted. The 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. Part 121 pilots are most impacted by their operations specification. If the winds are within limits, the pilots will use the Required Navigation Performance (RNP) Channel departure as well as the Fox and Lemon Creek turning departures; however, if the winds exceed limits outlined in the operations specification, use of some or all of the departures may be prohibited. Pilots indicated they are concerned most about windshear and turbulence in the vicinity of the airport (i.e., Engineer's Cut, Lemon Creek, Fox), in the Gastineau Channel, and near Taku Inlet. Due to the limitations on Part 121 carriers, dispatchers are impacted by the operations specification as well. Dispatchers must plan for additional fuel, holding times, diversions, and flight cancellations when the winds are near or exceeding the operations specification limits. Additional wind

information was requested near Coghlan Island and above 5000 feet at various locations near Juneau.

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. 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 anemometer and wind profiler data using existing distribution capabilities (i.e., Automated Flight Service Station (AFSS), Internet). 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. The Phase 3 system 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.

As part of the early stages of this project, NCAR currently has a Terrain Induced Turbulence research system at some user sites. This system displays wind data from the anemometers and wind profilers currently placed around the airport and at the mountaintops (i.e., Eagle Crest, Mt. Roberts, and Sheep Mountain). These systems are located at the Alaska Airlines Dispatch Office, the Alaska Airlines Juneau Operations Tower, and at the Juneau 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 (AWR) 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 addressed the needs of air taxi/charter pilots, AFSS Specialists, Air Traffic Control Tower (ATCT) Specialists, National Weather Service (NWS) Forecasters, and Alaska Airlines Operations Tower Agents. It was completed in February 1999. The second part was completed in May 1999, and addressed the weather needs of Federal Air Regulation (FAR) Part 121 Pilots and Dispatchers. The overall purposes of this effort were to baseline current practices, and identify necessary wind information for FAR Part 121 Pilots and Dispatchers.

1.1 PURPOSE OF REPORT.

The purpose of this report is to summarize Part 121 Pilot and Dispatcher information collected during the second portion of 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 for these user groups.

1.2 SCOPE OF REPORT.

This report will discuss data collection techniques and results for Part 121 Pilots and Dispatchers. It is important to note this report summarizes user needs for the Phase 1 WHIS and is not meant as an assessment of the current NCAR research system.

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

Juneau Terrain Induced Turbulence Project – User Needs Summary Report, February 9, 1999

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 anemometer and wind profiler data using existing data dissemination capabilities (e.g., Part 121 Dispatch Office, Automated Flight Service Station [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 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 the anemometer and wind profiler locations.

The locations of the anemometers and wind profilers are designed to provide coverage around the airport and in the vicinity of arrival and departure routes. Communication between NCAR, the sensors, and participating users is accomplished using telephone and wireless transmission. Figure 2 shows the network configuration. The ownership of each anemometer and each set of interface/communications electronics is indicated in parentheses. The Lemon Creek profiler

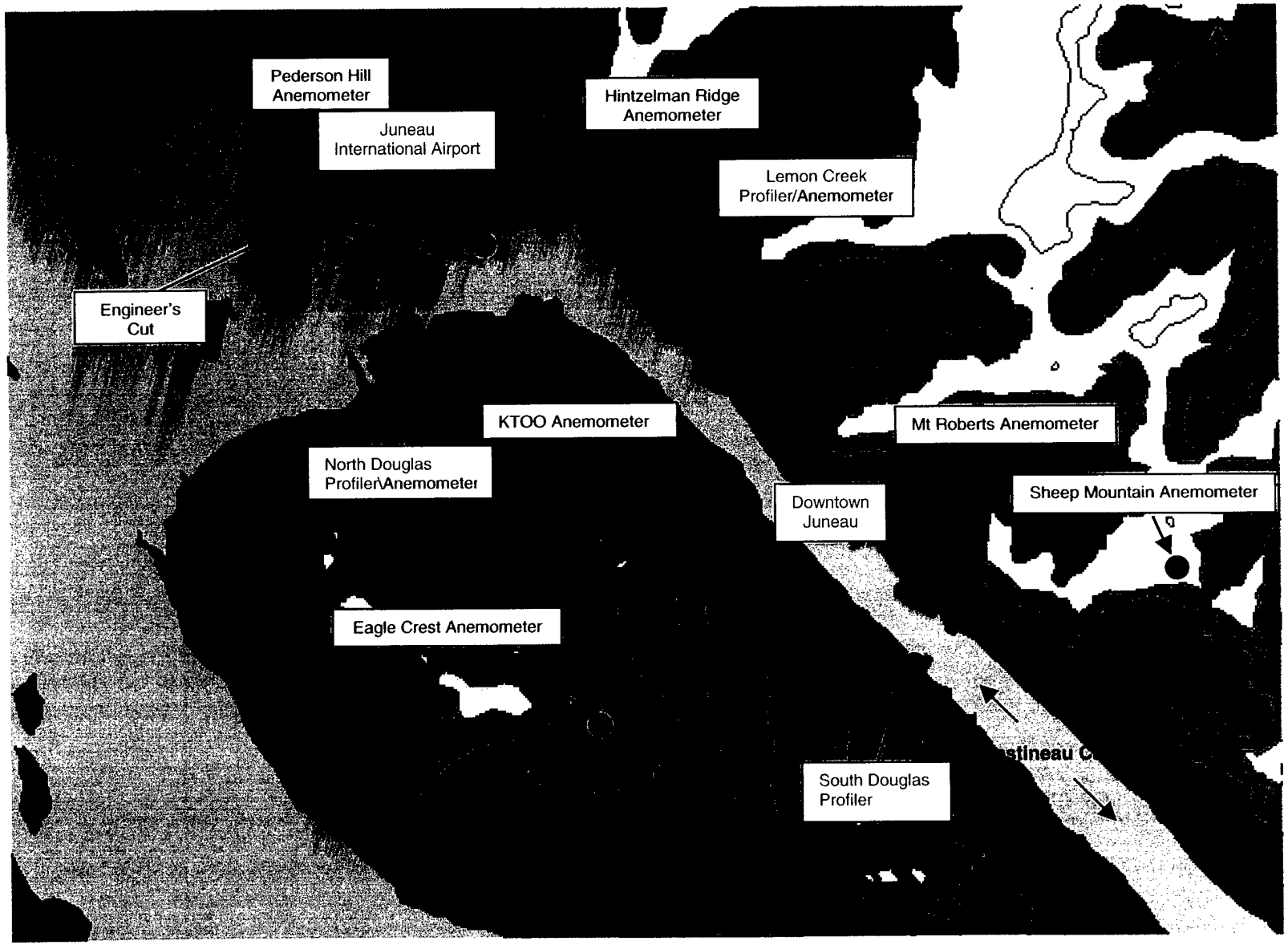

FIGURE 1. ANEMOMETER AND WIND PROFILER LOCATIONS

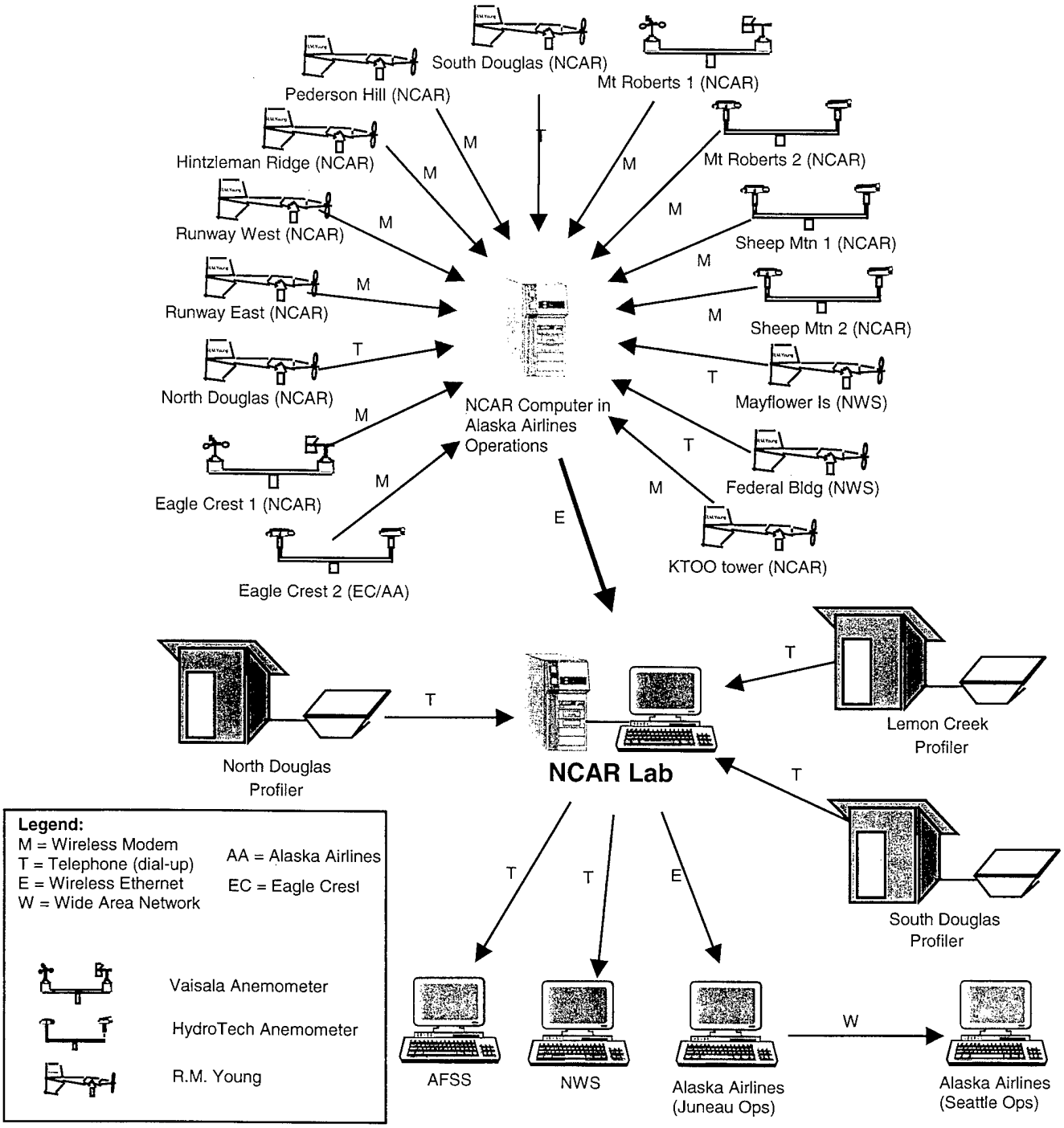

FIGURE 2. JUNEAU TERRAIN INDUCED TURBULENCE COMMUNICATIONS NETWORK

was removed and stored in April 1998, so that site preparation for a new police facility could proceed.

Specific communications and software architecture information is discussed in the primary user needs report (Reference: Juneau Terrain Induced Turbulence Project – User Needs Summary Report, February 9, 1999).

4. USER NEEDS ANALYSIS DESCRIPTION.

The user needs analysis was conducted using a two-step approach. In the first step, users were interviewed in their operational setting. Specifically, the ACT-320 personnel flew jumpseat into and out of the Juneau International Airport on two flights and conducted interviews with three pilots during these flights. Dispatchers were interviewed at their dispatch desks while on duty.

Following the interviews, the Lead Dispatcher distributed dispatcher surveys. The surveys were collected 1 week later and returned to FAA Technical Center personnel. Pilot surveys were distributed two ways. First, 130 surveys were delivered to the Alaska Airlines Juneau Operations Tower. Operations agents distributed survey packets to each flight crew as part of their standard briefing package. Second, an Alaska Airlines Airline Pilot Association (ALPA) representative distributed surveys to 200 pilot mailboxes. Pilots who flew Juneau routes were specifically targeted.

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.

4.1 SCHEDULE AND LOCATION.

Interviews were conducted on-site from March 1-5, 1999. Dispatcher surveys were distributed on March 2, 1999. Pilot survey distribution occurred from March 12-22, 1999.

4.2 PARTICIPANTS.

User needs analysis participants included:

a. Part 121 Pilots, Alaska Airlines, Seattle, WA, and
b. Part 121 Dispatchers, Alaska Airlines, Seattle, WA.

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 below.

4.4.1 Surveys.

Surveys were developed for each of the following user groups:

a. Part 121 Pilots,
b. Part 121 Dispatchers.

Surveys were tailored to each user group in order to identify differences in user needs. Example surveys are located in appendices A and B, respectively. Users were provided with paper and pencil surveys. Dispatchers returned surveys to their Lead Dispatcher, while pilots were provided with a self-addressed, stamped return envelope for their convenience.

4.4.2 Interviews.

Jumpseat interviews were conducted with three pilots during two jumpseat flights into and out of the PAJN. Additionally, dispatchers were interviewed in their operational setting. The interview questions for each group are listed in appendix C

4.5 DATA COLLECTION AND ANALYSIS METHOD.

Interview 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 are discussed for Part 121 Pilots and Dispatchers. The user group summaries represent the opinions of the interviewees and do not reflect the official position of any particular agency or company.

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

5.1 PART 121 PILOTS.

Three interviews were conducted during jumpseat flights. Forty-five pilots responded to the survey. Survey responses are summarized in appendix D while interviews are summarized in appendix F. Forty-six percent of all respondents were Captains, 20 percent were First Officers, 7 percent were Check Airmen, and 27 percent did not provide a rank. Seventy-six percent of all respondents flew B737-400 aircraft while the remainder flew B737-200s. Sixty-nine percent of pilots were Required Navigation Performance (RNP) certified. Fifteen percent of pilots had

experienced a turbulence related incident; however, most indicated it was not a reportable incident. Almost all of the pilots interviewed and surveyed operated from the PAJN at least five times per month.

5.1.1 Wind Information Currently Available.

The most common sources of wind information (in order of importance) were Dispatch, Alaska Airlines Juneau Operations Tower, Automated Terminal Information System (ATIS), and the Internet. In general, pilots received wind information in their briefing packages prior to takeoff. This wind information would include surface winds at their destination, winds aloft along their route of flight, and mountaintop winds if their destination was Juneau. The mountaintop winds are provided from the Sheep Mountain, Mt. Roberts, and Eagle Crest anemometers, which are part of the NCAR research network. Approximately 40 minutes prior to landing in Juneau, pilots call their dispatcher to verify surface winds and mountaintop winds for their arrival. If the winds are questionable, the pilot will call the Alaska Airlines Operations Tower in Juneau to obtain winds information just prior to starting his/her descent into Juneau.

Pilots indicated they would use the NCAR display in their Seattle dispatch office or the Juneau Operations Tower to look at the wind profiler data. Two other valuable sources were Pilot Reports from within the company and outside the company as well as turbulence plots generated by Northwest Airlines. These turbulence plots are made available to pilots in the briefing packages.

Wind speed, direction, and gusts from Eagle Crest, Mt. Roberts, and Sheep Mountain were noted as being important for all aspects of takeoff and landing. More specifically, the following areas of use were identified (items 1-4 were most commonly noted):

a. Pre-Takeoff and Takeoff:

    1. Change departure,
    2. Cancel departure,
    3. Delay departure,
    4. Lower takeoff weights,
    5. Suspect where turbulence will be,
    6. Plan departure to minimize turbulence,
    7. Choose alternate departure procedure,
    8. Advise passengers and crew about turbulence,
    9. Determine amount of rotor turbulence off of Douglas Island, and
    10. Determine whether or not to climb faster to avoid turbulence.

b. Approach and Landing:

    1. Change arrival direction,
    2. Postpone arrival,
    3. Cancel approach,
    4. Determine which runway to use,
    5. Downwind height decision,
    6. Avoid turbulent areas,
    7. Select flaps setting,
    8. Fuel planning, and
    9. Anticipate windshear near Coghlan Island.

5.1.2 Wind-Related Aviation Concerns in Juneau Area.

The pilots were most concerned about the operations specification. The FAA Operations Specification states that Part 121 pilots cannot depart Juneau using a Lemon Creek, Fox, or RNP Channel departure if the winds are from 080^0 to 180^0 and exceed 25 knots (kn) at the surface and 35 kn at Eagle Crest, Mt. Roberts, and Sheep Mountain. Their decisions with regard to winds were very simple, as the decisions are bound by the specification. If the winds are within limits, the pilots can use the Gastineau Channel or turning departures. If the winds are out of limits, they are restricted to Visual Flight Rules (VFR) departures or Runway 26 departures. When asked about surface winds, windshear, low-level turbulence, and winds aloft, the following areas of concern were identified (items 1-4 were most common):

a. Surface Winds:

1. Airport,
2. Runways,
3. Engineer's Cut,*
4. Lemon Creek,
5. Gastineau Channel,
6. Mendenhall Peninsula,
7. Taku Inlet.

b. Windshear:

1. Gastineau Channel – specifically from 1000 to 5000 feet,

2. Engineer's Cut – specifically from 700 to 300 feet on descent,

3. On Localizer Directional Approach (LDA) to RWY 8 from Barlo Cove to Engineer's Cut – specifically from 3400 to 700 feet,

4. Fox Departure – specifically from 800 to 3000 feet,

5. Lemon Creek – specifically from 3000 feet to surface.

c. Low-level Turbulence:

1. Gastineau Channel – specifically from 1000 to 5000 feet,

2. Lynn Canal (On LDA to RWY 8 from Barlo Cove to Engineer's Cut) – specifically from 5000 to 1000 feet,

3. Engineer's Cut – specifically from 1500 to 300 feet on descent,

4. Airport area (incl. Fox and Lemon Creek) – specifically from surface to 3000 feet,

5. Taku Inlet – specifically up to about 5000 feet.

d. Winds Aloft:

1. Sister's Island to Lynn Canal – specifically from 10,000 to 5000 feet,

2. Barlo to Coghlan (LDA RWY8/ RNP RWY26) - specifically from 5000 to 1000 feet,
3. Gastineau Channel – specifically from 5000 to 8000 feet.

*NOTE: The engineer's "cut" refers to a 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.

Fifty-eight percent of all respondents indicated that winds above 5000 feet would be useful. The most common areas of utility noted were the Gastineau Channel and the LDA to RWY 8 from Barlo to Coghlan Island. A few respondents indicated that winds aloft would be useful over the Chilkat Mountains and the Fairweather Mountain Range. When asked how they would like winds aloft information displayed, the overwhelming response was the standard text format (altitude, DDD/SS).

5.1.3 Types of Wind Information That Would Be Useful.

While specific locations for anemometers and profilers were not noted, additional wind information for several areas were identified:

a. Windshear and turbulence information for airport vicinity including Engineer's Cut, Fox Departure, Lemon Creek Departure, and Gastineau Channel;

b. Windshear, turbulence and winds aloft information for LDA to RWY 8 from Sister's Island to Barlo Cove to Coghlan Island;

c. Current wind information for Gastineau Channel; and

d. More anemometers in airport vicinity.

5.1.4 Wind Information Accessibility.

The most desired methods of wind data dissemination in order of rank were Very High Frequency (VHF) Voice, ATIS, Dispatch/Operations Tower, and Datalink. If a WHIS were developed for pilots, 82 percent of the respondents indicated they would want both windshear and turbulence intensities presented. Fifty-three percent indicated they would want the intensities presented using the standard terminology (i.e., Light, Moderate, Severe) according to the B737 aircraft.

Table 1 contains the intensity values desired by pilots. Seventy-three percent of the respondents want the mean intensity, maximum intensity, or a combination thereof. Tables 2 and 3 contain the desired spatial resolution of a windshear/turbulence product. Sixty-five percent of respondents indicated a horizontal resolution of 2 nautical miles (nmi) or less would be useful while 85 percent of respondents indicated a vertical resolution of 1000 feet or less would be useful.

TABLE 1. INTENSITY VALUES AS REQUESTED BY PILOTS

	Percent	Cumulative Percent
Mean Intensities	22.2	22.2
Maximum Intensities	24.4	46.7
Mean and Maximum	26.7	73.3
Minimum and Maximum	20.0	93.3
Min., Max., and Mean	6.7	100.0

TABLE 2. HORIZONTAL RESOLUTION

	Percent	Cumulative Percent
1 NM	25.0	25.0
2 NM	40.0	65.0
3 NM	25.0	90.0
5 NM	10.0	100.0

TABLE 3. VERTICAL RESOLUTION

	Percent	Cumulative Percent
500 Ft	22.5	22.5
1000 Ft	62.5	85.0
2000 Ft or greater	15.0	100.0

5.2 PART 121 DISPATCHERS.

Four Alaska Airlines Dispatchers were interviewed and three dispatchers responded to surveys. Dispatcher survey responses are summarized in appendix E and interview responses are summarized in appendix G. The Alaska Airlines Dispatch office currently has the NCAR terrain induced turbulence research display. Dispatchers use this information operationally.

5.2.1 Wind Information Currently Available.

In addition to the NCAR display, dispatchers obtain surface winds from the NWS and Aviation Routine Weather Reports (METAR) and winds aloft information from the NWS. Northwest Airlines turbulence plots and Pilot Reports (PIREP) are also utilized.

5.2.2 Wind Related Aviation Concerns in Juneau Area.

Dispatchers 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, Fox, and RNP Channel Departures as these departures are governed by the Part 121 FAA Operations Specification (see paragraph 5.1.2). Dispatchers have additional concerns with the winds as they impact airspeed, which, in turn, impacts the weight of the aircraft.

Wind speed, direction, and gusts from Eagle Crest, Mt. Roberts, and Sheep Mountain impact dispatcher tasks as listed below:

a. Flight Plan Preparation:

    1. Plan additional fuel for routing, and
    2. Plan for holding times.

b. Monitor Weather:

    1. Plan for holding times,
    2. Plan for diversions, and
    3. Watch for frontal passages, which could cause windshifts.

c. Flight Scheduling/Cancellations:

    1. Delay flights if winds are close to the operations specification limits, and
    2. Cancel flights if winds exceed operations specification limits.

d. Weather Updates to Pilots:

    1. Windshifts indicate changes in weather trends,
    2. Warn pilots of possible turbulence,
    3. Advise pilots regarding best approach or departure,
    4. Provide wind information, and
    5. Plan alternate.

Surface winds were of greatest concern for the airport runways, Coghlan Island, and Lemon Creek. Windshear was of concern for Coghlan Island and Lemon Creek, while low-level turbulence was a concern around Douglas Island, Taku Inlet, and the Gastineau Channel. Winds aloft were of the greatest concern for Lynn Canal, Marmion Island, and the Gastineau Channel. Specific altitudes were not noted for these areas.

5.2.3 Types of Wind Information That Would Be Useful.

Dispatchers indicated that wind information for Coghlan Island and at various altitudes throughout the Gastineau Channel would be useful. Additionally, most dispatchers noted that winds above 5000 feet would be of use, specifically for:

a. Lynn Canal,
b. Gastineau Channel,
c. Sisters Island,
d. Marmion Island,
e. Admiralty Island, and
f. Taku Inlet.

5.2.4 Wind Information Accessibility.

Dispatchers indicated that the current NCAR terrain induced turbulence research display and the Internet page was satisfactory.

6. CONCLUSIONS.

The user needs analysis was completed for Part 121 Pilots and Dispatchers. These users currently have access to the Juneau Terrain Induced Turbulence Project wind data. The importance of wind information varied across user groups. Specific conclusions for each of the user groups are listed below.

a. Part 121 pilots are most impacted by the operations specification. If the winds are within limits, the pilots will use the Required Navigation Performance (RNP) Channel departure as well as the turning departures; however, if the winds exceed limits, these departures will not be used. Pilots are most impacted by the winds as they have to change/cancel/delay departures and arrivals if the winds are not within limits. Additionally, takeoff weights need to be modified when departure routes are modified. Pilots indicated they are concerned most about windshear and turbulence in the vicinity of the airport (i.e., Engineer's Cut, Lemon Creek, Fox), in the Gastineau Channel, and near Taku Inlet. Pilots were also concerned about windshear and turbulence encountered from Sister's Island to Barlo Cove to Coghlan Island on the Localizer Directional Approach (LDA) to Runway 8. Additional wind information for these areas was requested.

b. Due to the limitations on Part 121 carriers, the dispatchers are impacted by the operations specification as well. Dispatchers must plan for additional fuel, holding times, diversions, and flight cancellations when the winds are near or exceeding the operations specifications limits. Additional wind information was requested near Coghlan Island and above 5000 feet at various locations near Juneau.

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 Automated Terminal Information System (ATIS) and Very High Frequency (VHF) Voice for Phase 3 data dissemination to Part 121 pilots.

c. Utilize the information gathered regarding areas of concern to configure research flights. Data collected in these areas may aid in understanding windshear and turbulence hotspots around the Juneau International Airport (PAJN).

d. Begin to assess Phase 3 requirements for pilots and dispatchers.

8. ACRONYMS AND ABBREVIATIONS.

AFSS	Automated Flight Service Station
AIRMET	Airmen Meteorological Statement
ALPA	Airline Pilot Association
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
FAR	Federal Air Regulations
IFR	Instrument Flight Rules
kn	knots
LDA	Localizer Directional Approach
nmi	nautical miles
METAR	Aviation Routine Weather Report
NCAR	National Center for Atmospheric Research
NWS	National Weather Service
PAJN	Juneau International Airport
PIREP	Pilot Report
RCO	Remote Communication Outlet
RNP	Required Navigation Performance
SIGMET	Significant Meteorological Statement
TAF	Terminal Area Forecast
VFR	Visual Flight Rules
VHF	Very High Frequency
WHIS	Wind Hazard Information System

APPENDIX A

PART 121 PILOT SURVEY

FAR Part 121 Pilots
Juneau Wind Hazard Information System Project
User Needs Survey

March 8, 1999

Prepared by:

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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, Airline Dispatchers, and National Weather Service Forecasters.

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. Once the surveys are complete, FAA Technical Center personnel will conduct interviews with a subset of users. 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 Juneau Wind Hazard Information System. All of your responses will remain confidential and anonymous.

If you would like to participate, please fill out the survey and return it in the self-addressed, stamped envelope provided.

Surveys should be mailed to:

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

USER NEEDS QUESTIONS

Please provide the following contact information:

Name (Optional): _____

Title: _____

Phone Number (Optional): _____

E-Mail Address (Optional): _____

1. What type of aircraft do you operate into or out of Juneau Airport? **(Mark all that apply)**

   ☐ 737-200
   ☐ 737-400
   ☐ Other _____

2. Estimate the number of times per month you fly into or out of Juneau Airport during peak season (May – September)? _____

3. Estimate the number of times per month you fly into or out of Juneau Airport during off-peak season (October - April)? _____

4. What weather information do you currently obtain prior to takeoff and departure from Juneau Airport? Weather information could include but is not limited to METARs, AIRMETs, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, obtain the PAJN METAR from Alaska Airlines Dispatch, which is updated hourly.

   Please enter one type of weather information in each row.

Weather Information Obtained	**Provider (e.g., Dispatch, Air Traffic, ATIS, NWS, Internet, etc...)**	**How current is the information? (If known)**

USER NEEDS QUESTIONS

5. What weather information do you currently obtain prior to approach and landing at Juneau Airport? Weather information could include but is not limited to METARs, AIRMETs, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, obtain the PAJN METAR from Alaska Airlines Dispatch, which is updated hourly.

   Please enter one type of weather information in each row.

Weather Information Obtained	Provider (e.g., Dispatch, Air Traffic, ATIS, NWS, Internet, etc...)	How current is the information? (If known)

6. Are you qualified to use RNP arrivals at Juneau Airport?

   ☐ Yes
   ☐ No

   If yes, have you encountered turbulence or windshear in the Gastineau Channel using the RNP arrival? Please provide detailed information. _____

   _____

   _____

   At what altitude(s) was the turbulence or windshear encountered? _____

7. Are you qualified to use RNP departures at Juneau Airport?

   ☐ Yes
   ☐ No

   If yes, have you encountered turbulence or windshear in the Gastineau Channel using the RNP departure? Please provide detailed information. _____

   _____

   _____

   At what altitude(s) was the turbulence or windshear encountered? _____

USER NEEDS QUESTIONS

8. Has the RNP arrival and/or departure changed the need for wind information? How?

_____

_____

_____

9. 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.

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

10. For each of the phases marked in Question #9, describe how wind speed, wind direction, and wind gust information would be useful (e.g., cancel operation, avoid turbulent areas, change flight path, etc...)

Pre-Takeoff - _____

_____

Takeoff/Departure - _____

_____

Approach/Landing - _____

_____

11. Please mark all of the following that have an impact on your operations in the Juneau area (Mark all that apply).

- ☐ Surface Winds
- ☐ Windshear
- ☐ Low-level Turbulence
- ☐ Winds Aloft
- ☐ Other _____

USER NEEDS QUESTIONS

12. For each of the types of wind marked in Question #11, please indicate whether the problem is specific to an area or region and what altitudes are most impacted.

Wind Problem	Specific to Area/Region? (e.g., Taku Inlet, Gastineau Channel)	Specific to altitude? (e.g., 3000 feet in Gastineau Channel)	Would additional wind information provide benefit? Please explain.
Surface Winds		**Not Applicable**	
Windshear			
Low-Level Turbulence			
Winds Aloft			
Other			

13. Would wind information above 5000 feet provide benefit to flight operations in the Juneau area?

☐ Yes
☐ No

If yes, would winds above 5000 feet be beneficial for any specific area or region (e.g., Taku Inlet, Gastineau Channel)? Please explain. _____

_____

_____

How would you like the winds information to be displayed (e.g., winds at 1000 180/25, graphical, etc...)? _____

_____

14. Are there any areas (e.g., Lemon Creek, Gastineau Channel) where, in your opinion, the lack of current wind information poses a threat to flight safety? If yes, please identify the area and explain.

_____

_____

_____

USER NEEDS QUESTIONS

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

☐ Yes
☐ No

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

_____

_____

_____

JUNEAU WIND HAZARD INFORMATION SYSTEM QUESTIONS

The Juneau Wind Hazard Information System **may** have the capability to accurately determine the level of terrain induced wind disturbances near the Juneau International Airport. These disturbances often consist of windshears (loss/gain of airspeed) and turbulence. Assuming the Juneau Wind Hazard Information System could provide information regarding these types of wind disturbances, please answer the following questions.

16. What type of wind disturbance information would you want presented?

☐ Windshear measures
☐ Turbulence measures
☐ Both windshear and turbulence measures

17. How would you like turbulence measures presented?

☐ Standard terminology (light, moderate, severe) relative to a standard aircraft
☐ 6-Level numeric scale under consideration by ICAO

If you marked Standard Terminology, what type of aircraft should be used as the standard? _____

18. For a given flight path (i.e., Fox Departure), please mark which information would provide utility. **(Mark all that apply).**

☐ Mean windshear/turbulence intensities
☐ Minimum windshear/turbulence intensities
☐ Maximum windshear/turbulence intensities

JUNEAU WIND HAZARD INFORMATION SYSTEM QUESTIONS

19. In order to provide utility, what is the desired spatial resolution needed for a wind disturbance product: **(Mark only one in each column)**

In Horizontal	In Vertical
☐ 1 NM	☐ 500 Feet
☐ 2 NM	☐ 1000 Feet
☐ 3 NM	☐ 2000 Feet or greater
☐ 5 NM or greater	

20. How would you like to obtain the wind disturbance information? **(Mark all that apply)**

☐ ATIS
☐ Datalink
☐ Dispatch
☐ VHF Voice (similar to ASOS)
☐ Other _____

Which are the **TWO** most desirable methods of data dissemination? _____
_____

21. Please provide any additional comments, concerns, or suggestions regarding wind information for the Juneau area. If you suggest providing additional information, please include what area(s) 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 Juneau Wind Hazard Information 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 at the beginning of the survey.**

APPENDIX B

DISPATCHER SURVEY

Airline Dispatch
Terrain Induced Turbulence Project
Juneau User Needs Survey

February 22, 1999

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, Airline Dispatchers, 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 for the Juneau area. Once this information is gathered, FAA Technical Center personnel will conduct interviews with a subset of users. 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 Juneau Wind Hazard Information 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 Dave Higgins or mail 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. Estimate the number of Juneau flights per week you are responsible for during peak season (May-Sept.)? _____

2. Estimate the number of Juneau flights per week you are responsible for during off peak season (Oct-Apr.)? _____

3. What weather information do you currently obtain **prior to filing a flight plan for Juneau**? Weather information could include but is not limited to METARs, AIRMETs, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, obtain the PAJN METAR from NWS, which is updated hourly. In each row, please enter one type of weather information.

Weather Information Obtained	Provider (e.g., Met. Dept., ATIS, ATCSCC, NWS, Internet, etc...)	How current is the information? (If known)

Juneau Terrain Induced Turbulence User Needs Survey

4. What weather information do you currently obtain **to monitor Juneau conditions for flight plan updates or pilot weather advisories**? 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 NWS, which is updated hourly. In each row, please enter one type of weather information.

Weather Information Obtained	Provider (e.g., Met. Dept., ATIS, ATCSCC, NWS, Internet, etc...)	How current is the information? (If known)

5. 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.

- ☐ Flight Plan Preparation
- ☐ Monitor Weather
- ☐ Flight Scheduling/Cancellations
- ☐ Weather Updates to Pilots

Continue on next page

Juneau Terrain Induced Turbulence User Needs Survey

6. For each of the tasks marked in Question #5, 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...).

Flight Plan Preparation - _____

_____

Monitor Weather - _____

_____

Flight Scheduling/Cancellations - _____

_____

Weather Updates to Pilots - _____

_____

7. 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	_____

8. If a particular problem and/or region were indicated in Question #7, would additional wind information in those regions provide benefit? Please explain.

_____

_____

_____

_____

Juneau Terrain Induced Turbulence User Needs Survey

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. 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 area and explain.

11. 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 Juneau Wind Hazard Information 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

Alaska Airlines Pilot Interview Questions

1. How many times do you fly into JNU per month?
2. What weather do you obtain for JNU prior to takeoff?
3. What weather do you obtain for JNU prior to landing?
4. What impact does windshear and low-level turbulence have on your JNU operations?
5. How do you utilize the Eagle Crest, Mount Roberts, and Sheep Mountain winds for arrivals? What decisions/issues are you considering with regard to winds for arrivals?
6. How do you utilize the Eagle Crest, Mount Roberts, and Sheep Mountain winds for departures? What decisions/issues are you considering with regard to winds for departures?
7. At what point in the flight do you request JNU wind information?
8. Would you prefer to obtain the winds a different way (i.e., datalink, VHF Voice – similar to ASOS)?
9. Has RNP changed your need for wind information in JNU?
10. Have you encountered windshear or turbulence in the Gastineau Channel on arrival or departure? Are there any specific altitudes that are more turbulent than others are?
11. Is there any particular area around JNU that is more susceptible to windshear? Is this at any specific altitude?
12. Is there any particular area around JNU that is more susceptible to turbulence? Is this at any specific altitude?
13. Would winds above 5000 feet in JNU terminal/departure area be useful? Why?
14. Is there any location where the lack of wind information poses a threat to flight safety?
15. Have you experienced any turbulence-related incidents in the JNU area? Is yes, please explain the incident.
16. If we could understand wind flow information and create a warning product what would you want to see:
    a. Windshear intensities, turbulence intensities, or both
    b. Standard terminology or proposed ICAO 6-level intensities
    c. Mean, minimum, or maximum intensities presented.

Alaska Airlines Dispatcher Interview Questions

1. What wind-related issues are of concern when planning a flight to or from Juneau International Airport?

2. How do you currently use Eagle Crest, Sheep Mountain, and Mt. Roberts winds for dispatch operations?

3. Do you interact with your Juneau Operations Agents regarding wind information for flights? How often do you interact? What is the nature of the interaction?

4. Is the RNP used for arrivals as well as departures?

5. Do you utilize mountaintop winds for RNP arrivals and departures? Do you have specific concerns regarding the Mt. Roberts and Sheep Mountain winds when determining which approach/departure to use?

6. When do you issue Juneau mountaintop winds information to the pilot?

7. Do pilots request Juneau mountaintop winds during flight?

8. How is payload impacted when using runway 8?

APPENDIX D

PART 121 PILOT SURVEY SUMMARY

1. What type of aircraft do you operate into or out of Juneau Airport? **(Mark all that apply)**

   ☐ 737-200 **(11 out of 45)**
   ☐ 737-400 **(34 out of 45)**

2. Estimate the number of times per month you fly into or out of Juneau Airport during peak season (May – September)? **(Average = 7.75 [n=45])**

3. Estimate the number of times per month you fly into or out of Juneau Airport during off-peak season (October - April)? **(Average = 7.28 [n=45])**

4. What weather information do you currently obtain prior to takeoff and departure from Juneau Airport? Weather information could include but is not limited to METARs, AIRMETs, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, obtain the PAJN METAR from Alaska Airlines Dispatch, which is updated hourly.

   Please enter one type of weather information in each row.

Weather Information Obtained	**Provider (e.g., Dispatch, Air Traffic, ATIS, NWS, Internet, etc...)**	**How current is the information? (If known)**
METARs, SIGMETs, AIRMETs	Dispatch	Within 2 hours
Winds Aloft	Dispatch	Within 2 hours
Airport weather and winds	Dispatch, ATIS, FSS	Within 1 hour
Mountain Top winds	Alaska ops, Internet, Dispatch	Less than 10 minutes
Turbulence plots	NWA, Dispatch	
PIREPs	Dispatch, Enroute weather	As reported
Wind Profiler	Alaska ops	Real-time
Ceiling and Visibility	Dispatch, ATIS, FSS	
TAF	Dispatch	
Area Forecasts	Dispatch	2+ hours
500mb graphics and Significant Weather Progs	Anchorage NWS, Internet	Hourly
General Weather Picture	The Weather Channel	
Visual Cues	Self	Real-time

5. What weather information do you currently obtain prior to approach and landing at Juneau Airport? Weather information could include but is not limited to METARs, AIRMETs, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, obtain the PAJN METAR from Alaska Airlines Dispatch, which is updated hourly.

Please enter one type of weather information in each row.

Weather Information Obtained	**Provider (e.g., Dispatch, Air Traffic, ATIS, NWS, Internet, etc...)**	**How current is the information? (If known)**
METARs, SIGMETs, AIRMETs	Dispatch, Alaska ops radio	Within 2 hours
Winds Aloft	Dispatch	Within 2 hours
Airport weather and winds	Dispatch, ATIS, FSS, ATC	Within 1 hour
Mountain Top winds	Alaska ops	Less than 10 minutes
Turbulence plots	NWA, Dispatch	
PIREPs	Dispatch, Enroute weather	As reported
Ceiling and Visibility	Dispatch, ATIS, FSS	
Clouds and visibility if in the "cut"	Tower, Alaska ops	
Local observations in the "cut"	Alaska ops, Tower	
General Weather	The Weather Channel, Internet	Continuously

6. Are you qualified to use RNP arrivals at Juneau Airport?

☐ Yes **(31 out of 45)**
☐ No **(14 out of 45)**

If yes, have you encountered turbulence or windshear in the Gastineau Channel using the RNP arrival? At what altitude? Please provide detailed information.

User 1: Light turbulence, moderate maybe once. Occurs around 4000 feet on arrivals.

User 2: No.

User 3: No.

User 4: None to date.

User 5: No.

User 6: Light chop only from 4000 to 1000 feet on arrivals.

User 7: Nothing more than light turbulence on arrivals.

User 8: No.

User 9: Yes. Turbulence associated with Taku winds, mostly from Taku Inlet to the City of Juneau. It occurs slightly above mountain peaks.

User 10: No.

User 11: Not so far on arrival.

User 12: No turbulence due to high min restrictions.

User 13: No.

User 14: Yes. Light turbulence on two occasions this past winter between 2000 and 3000 feet on arrival.

User 15: Light turbulence on approach between 4000-2000 feet.

User 16: No.

User 17: Yes. Light turbulence abeam downtown JNU with strong winds from north on arrivals.

User 18: Yes. Light chop only on arrivals between 3000 to 4000 feet.

User 19: Yes. Light turbulence with winds from southeast between 2000 and 5000 feet on arrivals.

User 20: No.

User 21: No.

User 22: No.

User 23: No.

User 24: No.

User 25: Arrivals -- Chop up to light turbulence, but no more. With the winds out of the north, there is usually light turbulence in the channel on arrival. There is a 15-knot restriction, which does not allow RNP arrivals through the Gastineau Channel. This restriction is a good idea and seems to work out pretty well, resulting in nor more than light turbulence during the RNP 26 approach.

User 26: Yes. Nothing greater than light turbulence from 6000 to 2000 feet on arrivals.

User 27: Yes. Turbulence usually light due to wind restrictions at the Sheep Mtn., Mt. Roberts, and Eagle Crest anemometers. Usually turbulent at 4000 feet on arrival.

User 28: No.

User 29: Arrivals -- Yes, if Sheep Mtn winds are out of 340-020 degrees in excess of 18 kts up to limit of 35 kts. You can anticipate Taku winds off Taku Glacier and depending on intensity, you will need to bump up ref speeds at least 10 kts to 20 kts. Most intense is just above ridgeline on north side of Gastineau Channel continuing until you're west of Douglas Bridge. It is also intense abeam Taku Inlet (normally, we are 6000 – 7000 feet AGL here). We also get hit pretty good when abeam the valley between Mt. Roberts and Mt. Juneau just west of the Mt. Roberts anemometer. Our RNP to 26 arrival path takes us laterally abeam Sheep Mountain and Mt. Roberts anemometers. You can look out the wind and see them. They are very good indicators of what to expect. You can also look at the water and get a lot of information about what to expect.

User 30: Not really bad on arrival. The 8 times I have done the arrival, the mountain top wind limits have seemed to preclude any turbulence.

User 31: No.

User 32: No.

User 33: Yes. Just turbulence on arrivals around 5000 feet and below.

User 34: No.

User 35: No.

User 36: No.

User 37: No.

User 38: No.

User 39: No.

User 40: Light turbulence only in the Gastineau Channel between 3000 and 5000 feet.

User 41: No.

User 42: Light at best.

User 43: No.

User 44: No.

User 45: No.

7. Are you qualified to use RNP departures at Juneau Airport?

☐ Yes **(31 out of 45)**
☐ No **(14 out of 45)**

If yes, have you encountered turbulence or windshear in the Gastineau Channel using the RNP departure? At what altitude? Please provide detailed information.

User 1: Light turbulence, moderate maybe once. Occurs between 0-5000 on departures.

User 2: No.

User 3: No.

User 4: None to date.

User 5: No.

User 6: Light chop only from 1000 to 4000 feet on departures.

User 7: Nothing more than light – consistent through mid-level climb (i.e., 10-17,000 feet) on departure

User 8: No.

User 9: Yes. Turbulence associated with Taku winds, mostly from Taku Inlet to the City of Juneau. It occurs slightly above mountain peaks.

User 10: No.

User 11: Light turbulence passing ridgeline around 3000-4000 feet.

User 12: No turbulence due to high min restrictions.

User 13: No.

User 14: Yes. Light turbulence on two occasions this past winter between 1000 and 3000 feet on departure.

User 15: On departure, from 100-200 degrees it takes lost of wind to make turbulence. 40-50 kts I have experienced light chop in the climb through about 2500 with the inception of the current wind restrictions. While when wind is from 340-040 degrees, turbulence can be stronger. When winds are from 080-180, turb is usually between 1000-3000 feet while when it's from 340-040 it is usually from surface to 4000 feet.

User 16: No.

User 17: Not much on departures.

User 18: Nothing much on departures.

User 19: Yes. Very light turbulence with winds from southeast on departures.

User 20: No.

User 21: No.

User 22: No.

User 23: No.

User 24: No.

User 25: Departures—Very little turbulence. The difference between arrival and departure turbulence experiences (with the same wind) is due to the fact that on departure our climb angle greatly exceeds our descent angle on arrival. By three or four minutes after departure, we usually have climbed through 12,000 feet MSL. The net result is that we are exposed to the turbulent air for a much shorter time period.

User 26: Yes. Occasional light turbulence from surface to 6000 feet on departures.

User 27: Yes. Turbulence usually light due to wind restrictions at the Sheep Mtn., Mt. Roberts, and Eagle Crest anemometers. Usually turbulent at 4000 feet on departure.

User 28: No.

User 29: Departures – Normally we use maximum takeoff power for Marmion departure and clear ridgeline prior to Douglas Bridge. But if Sheep Mtn winds are high out of the north, you can expect turbulence up through 8000-9000 feet just like the arrivals. Turbulence is most severe between 3000 and 6000 feet.

User 30: On departure, you get light to occasional moderate turbulence around 3000-4000 feet.

User 31: No.

User 32: No.

User 33: No.

User 34: No.

User 35: No.

User 36: No.

User 37: No.

User 38: No.

User 39: No.

User 40: Light turbulence only in the Gastineau Channel between 3000 and 5000 feet.

User 41: No.

User 42: Light at best.

User 43: No.

User 44: No.

User 45: No.

8. Has the RNP arrival and/or departure changed the need for wind information? How?

User 1: Yes. Need more detailed winds off airport

User 2: Yes. Use of autopilot to lower altitudes and different missed approach routes.

User 3: No answer

User 4: Yes. The unique terrain considerations of PAJN apparently warrant the need under certain weather conditions for wind information due to mechanical turbulence

User 5: No, same as Lemon Creek departure.

User 6: Yes. Greater need for wind in the JNU downtown area for complete picture.

User 7: RNP procedures mandate obtaining wind information

User 8: No Answer.

User 9: Yes, requirements for wind in the channel.

User 10: No answer.

User 11: Yes, definitely. Need real time wind information that will or will not indicated terrain related turbulence when arrival/departure through the Gastineau Channel.

User 12: No answer.

User 13: No answer.

User 14: The requirement for utilizing the RNP procedures is contingent upon the wind data available for the surface and three anemometers. I am used to it now and "need" this information to make decisions on my approach and departure and overall planning.

User 15: The downtown Roberts and Sheep Mountain winds let you know how your ride will be further down the channel. Eagle Crest is a good turbulence indicator for near the airport.

User 16: No answer.

User 17: No.

User 18: Requirement for ridge wind read-outs. This is required but I use them even if we are not using RNP.

User 19: Yes, we have wind direction and velocity limitations for the RNP procedures. The amount of information we have now is very good.

User 20: Yes. We must have it to fly in the channel.

User 21: It is required.

User 22: No answer.

User 23: No answer.

User 24: Because of the approaches in terrain, the wind information has become more valuable.

User 25: Obviously, regulations require that we get the "hill top" anemometer wind readings prior to initiating any RNP arrival/departure. This amount of wind information along with the airport winds is adequate.

User 26: Yes, need to know if a Taku wind is blowing when flying through the channel.

User 27: Yes, any departure or arrival should consider wind direction and velocity when descending down Gastineau Channel. I think the 35 kt restrictions on the hill and 25 kt at the airport are too restrictive. Under steady wind conditions I suggest 40 kt hill and 35 kt at airport.

User 28: Yes, wind information very necessary for arrival/departures using the channel.

User 29: Yes, our FMS is programmed to give us a 5 kt wind correction on our reference speeds. If we fly below .3 RNP (i.e., .2 or .15) we have to have autopilot coupled. The auto throttles do not correct quickly enough in turbulence and it will disengage our "vnav path" which could cause us to go missed approach if inside of FAF. By knowing what turbulence to expect, we can bump the correction up to as high as +20. If we lose vnav path guidance outside of FAF, we can continue but it takes several keystrokes and heads down in the cockpit to regain our path at a critical time and low altitude on approach.

User 30: Not changed it. We always want/need to know the wind everywhere. It has provided much more information than we used to have. I personally would like to see a data link to the airplane similar to what you can get on the internet.

User 31: No.

User 32: No.

User 33: Yes, due to the local phenomenon of Taku winds and frontal passages along with the very complex terrain induced turbulence, the wind information is a god send to have.

User 34: No answer.

User 35: Yes, we must know what the winds are doing on the mountain peaks and in the Gastineau Channel.

User 36: Yes, need channel winds for ride information.

User 37: No answer.

User 38: No answer.

User 39: No answer.

User 40: Yes, prior to RNP, arrivals and departures down Gastineau Channel were in "VFR Conditions". More and better wind information provides for more informed and better approach and departure planning and execution.

User 41: No answer.

User 42: Yes, need wind information for channel now – before the channel wasn't that important.

User 43: Yes, we must have the hill winds for RNP ops.

User 44: No answer.

User 45: No answer.

9. 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.

   ☐ Pre-Takeoff **(44 Yes, 1 No)**
   ☐ Takeoff and Departure **(39 Yes, 6 No)**
   ☐ Approach and Landing **(41 Yes, 4 No)**

10. For each of the phases marked in Question #9, describe how wind speed, wind direction, and wind gust information would be useful (e.g., cancel operation, avoid turbulent areas, change flight path, etc...)

Pre-Takeoff - Change departure, Lower takeoff weights, Cancel departure, Suspect where turbulence will be, Plan departure to minimize turbulence, Don't go up channel, Choose alternate departure procedure, Delay departure, Change takeoff procedure, Advise passengers and crew about turbulence, Can we legally do it? If so is it wise to do, A good model to predict turbulence with winds of 15Kts or greater, Headwind component would preclude cancel flights, Load planning, Modify vertical flight path planning, If Mt Roberts or Sheep Mtn are over 25 kts from 340-040 degrees then not real happy about going down the channel, Amount of rotor turbulence off of Douglas Island, Determine whether or not to climb faster to avoid turbulence, Which runway to I want use, How to minimize turbulence,

Takeoff/Departure - Different departure procedure, Cancel departure, Lower takeoff weights, Avoid turbulent areas, Change flight path, Don't go up channel, Based on winds and turbulence reports do we really want to do departure, There are times of 25 kt winds down channel and departure is smooth and other times when 5-10 kt winds with moderate turbulence, Eagle Crest gives good indicator of turbulence right after takeoff, How to minimize turbulence,

Approach/Landing - Change arrival direction, Postpone arrival, Use different arrival, Cancel approach, Landing runway decision, Downwind height decision, Avoid turbulent areas, Don't go up channel, Choose alternate arrival path, Change arrival procedure, Select flaps setting, The only instance where cancel operations due to winds is at night where the restriction to visibility and ceiling for departure are affected precluding a tailwind, Fuel planning, Lets you know how much shift in wind on approach, Big crosswind moving to head wind closer to airport, Windshear near Coghlan Island, Determine whether or not to stay at higher altitude longer to avoid turbulence on descent,

11. Please mark all of the following that have an impact on your operations in the Juneau area (Mark all that apply).

- ☐ Surface Winds **(44 Yes, 1 No)**
- ☐ Windshear **(38 Yes, 7 No)**
- ☐ Low-level Turbulence **(44 Yes, 1 No)**
- ☐ Winds Aloft **(28 Yes, 17 No)**
- ☐ Other _____

12. For each of the types of wind marked in Question #11, please indicate whether the problem is specific to an area or region and what altitudes are most impacted.

Wind Problem	Specific to Area/Region? (e.g., Taku Inlet, Gastineau Channel)	Specific to altitude? (e.g., 3000 feet in Gastineau Channel)	Would additional wind information provide benefit? Please explain.
Surface Winds			
	Channel/Cut		Wind shift from one side of cut to other
	Juneau Terminal Area		No
	Gastineau	3000 feet	No
	Runway		Adequate
	Runway and Hills		
	Airport		
	Winds favoring RWY 8 require higher C&V		No
	Taku Inlet, Gastineau Channel, Coghlan, Lemon Creek		Planning arrival and departure paths
	Gastineau, Taku, Lynn Canal		Decision to depart down channel with headwind or tailwind to west
	Immediate airport area		Wind readouts at both ends of runway
	Approach end		Sufficient now
	Cut on short final		No.
	Airport area		
	Airport		
	Near the city, Lemon Creek, Mendenhall Peninsula		A wind profiler in the Cut would be useful.
	Lemon Creek, Mendenhall Peninsula		Have tower report these winds if asked
	Airport and RWY		
	Airport		No
	Airport		
Windshear			
	Runway environment	Surface to 3000 feet	More anemometers in the airport area
	Gastineau/Taku	7000 and below	Yes, with planning
	Gastineau	1000 to 6500 feet	Yes in order to see possible windshear before departure
	Gastineau	3000 feet	
	All areas	Low altitude	Yes
	Lynn Canal	8000 feet to surface	Yes, current wind real-time
	Gastineau	5000 feet to surface	Yes, current wind real-time
	Gastineau	Below 5000 feet	

Wind Problem	Specific to Area/Region? (e.g., Taku Inlet, Gastineau Channel)	Specific to altitude? (e.g., 3000 feet in Gastineau Channel)	Would additional wind information provide benefit? Please explain.
Windshear	In the Cut to RWY 8	500 to 1000 feet	Help anticipate windshear and windshift
	Airport area through channel	Surface to 5000	
	Any	All	Windshear info required to determine whether safe or not
	MDB cut area, Lemon Creek, Taku, Coghlan	Surface to 3000 feet	Performance for selection reference
	Abeam Portland Island and approaching Coghlan Island	From 2000 feet down to about 800 feet	Maybe put something on Shelter or Portland Island to anticipate shear zone
	The cut and near Barlo on the LDA	About 3400 down to 700 feet	Yes, to all 3. The most significant windshifts are occurring. Often can have 80-90 kt tailwind on LDA and shears to 20 kts in vicinity of Barlo or farther in
	Anywhere	3000-4000 feet	
	Channel	Up to 4000 feet	Turbulence prediction
	Climbing and descending	Below 10000 feet	Know wind direction and velocity changes
	Fox Departure profile	800 to 3000 feet	
	Between the Cut and RWY	Around 300 feet	Wind profiler
	Near Eagle Crest	1000-2000 feet	Wind profiler
	Airport area, Fox Departure	Within 2000 AGL to 5000 AGL	Wind profiler would work great
	Through cut on short final	500 feet and below	Perhaps wind at Coghlan Island
	Any altitude, especially low to ground	All Altitudes	Areas to avoid
	Takeoff and landing path	1500 AGL and below	Wind profiler
	Taku Inlet, Gastineau, Barlo Cove	Taku about 5000 feet Gastineau and Barlo between 3000-5000 ft	Better descent planning and route choice
	All areas	5000 feet to surface	Certain directions of wind affect certain areas
	All areas of climb and descent	10000 and below	Yes, where is windshear?
	Lemon Creek, Gastineau, Auke Bay	2000 and Below	Would know better what to expect during turn

Wind Problem	Specific to Area/Region? (e.g., Taku Inlet, Gastineau Channel)	Specific to altitude? (e.g., 3000 feet in Gastineau Channel)	Would additional wind information provide benefit? Please explain.
Low-Level Turbulence			
	Channel/Cut		
	Gastineau/Taku	7000 and below	Yes, with planning
	Gastineau/ Cut	1000 to 6500 feet	Windshear before landing
	Gastineau	3000 feet	
	All areas		Yes
	Lynn Canal	8000 feet to surface	Yes, current wind real-time
	Gastineau	5000 feet to surface	Yes, current wind real-time
	Gastineau	Below 5000 feet	
	Gastineau and Fox Departure	Surface to 3000 feet	Help to determine whether to do Fox.
	Airport area through channel	Surface to 5000	
	Strong south winds make Gastineau hazardous	Under 9000 feet	Winds near the east end of the channel would help get the big picture
	Gastineau, Cut, Airport	Surface to 3000 feet	On approach, plans to avoid turbulence
	Gastineau, Lynn Canal	5000 feet and below	Passenger comfort, flight attendant safety
	Lynn Canal, Saginaw Channel, Favorite Channel	From 4000 feet down to about 1500 feet	Yes, help us to anticipate the turbulence
	Areas downwind of Douglas Island and near Lynn and Barlo	Below about 6000 to surface depending on winds	Most turbulence on LDA from Barlo to Coghlan.
	Gastineau	0-5000 feet	The operational limits we have now preclude any bad turbulence
	Airport area, Lemon Creek	Surface to 1500 feet	
	Airport	Below 1500	Mechanical Turbulence from Terrain
	Lynn Canal to Marmion Island	Below 7000 feet	
	Between the Cut and RWY	Around 300 feet	Wind profiler
	Near Eagle Crest	1000-2000 feet	Wind profiler
	Taku/Gastineau/Barlo Cove	To 4000 feet AGL	Yes, provide enough information to impact approach path selection
	Through cut on short final	500 feet and below	Perhaps wind at Coghlan Island
	Airport area and in Channel	Surface to 10000 feet	

Wind Problem	Specific to Area/Region? (e.g., Taku Inlet, Gastineau Channel)	Specific to altitude? (e.g., 3000 feet in Gastineau Channel)	Would additional wind information provide benefit? Please explain.
Low-level Turbulence	Lemon Creek and Gastineau	6000 MSL and below	Wind Profiler
	Taku Inlet, Gastineau, Barlo Cove	Taku about 5000 feet Gastineau and Barlo between 3000-5000 ft	Better descent planning and route choice
	Channel and on final approach	5000 feet and below	
	All areas of climb and descent	10000 and below	Yes, where is Turbulence?
Winds Aloft			
	Cordova, Yakutat, Sisters Island	24000 to 35000 at cruise	Yes, with planning
	Gastineau	Ridge height	Turbulence before departure and arrival
	All areas	Airways	Adequate
	Sisters to Lynn Canal	5000 to 8000 feet	Excessive tailwind can make approach difficult
	Barlo to Coghlan	5000 to 1000	Excessive tailwind can make approach difficult
	PAJN area	No	We get current SA from dispatch
	Taku area to Gastineau	3000 feet and up	
	Fairweather Range	Over 15000 feet	Local Turbulence
	On approach to LDA08/RNP26	From 12000 to surface	Yes, better profiler descents.
	Airport area and in Channel	3000 to 7000 feet	Used to predict turbulence and windshear
	Sisters	Surface to 37000 feet	Better descent planning

13. Would wind information above 5000 feet provide benefit to flight operations in the Juneau area?

☐ Yes **(26 out of 42)**
☐ No **(16 out of 42)**

If yes, would winds above 5000 feet be beneficial for any specific area or region (e.g., Taku Inlet, Gastineau Channel)? Please explain.

User 1: No.

User 2: Descent planning, safety, consideration of passengers and flight attendants.

User 3: No.

User 4: No.

User 5: Yes. Gastineau Channel to Stephens Passage needs winds aloft information for turbulence.

User 6: Yes. Lynn Canal – SSR to Lynn for the approach.

User 7: Not more in Juneau than anywhere else.

User 8: Yes. Sisters Island to Lynn Int. to Barlo

User 9: Yes. Would be useful in determining if turbulence can be anticipated in the channel.

User 10: No.

User 11: Only if significant change in direction and/or velocity is indicated.

User 12: Yes. Taku Inlet, Lynn Canal, Gastineau Channel, We can usually guess what kind of ride to expect on approach to runway 8 based on our actual winds aloft. We guess what kind of ride to expect to 26 I look for any visible signs along ride in channel.

User 13: Yes. In Taku Inlet and Gastineau Channel.

User 14: Yes. Winds at 5000 feet would be nice at Taku Inlet and Barlo Point area. Above this level would not be that much of a concern. The critical phase of flight is about ousr.

User 15: No.

User 16: Yes. Points along LDA to 26 but I would guess for RNP approaches down the channel would be useful as well.

User 17: Yes

User 18: No.

User 19: No.

User 20: No.

User 21: No Answer.

User 22: No.

User 23: No.

User 24: Yes. Any additional information is helpful for planning purposes.

User 25: It's really already available through the combined use of our wind readouts in the cockpit and the winds aloft forecast.

User 26: Yes. In channel we need to know mechanical turbulence from terrain.

User 27: Yes. 5000 to 7000 feet for the Gastineau Channel would help predict turbulence on RNP operations, also bridge departures.

User 28: No.

User 29: No.

User 30: Yes. Again, over Chilkat mountains and entrance to Taku Inlet

User 31: Yes.

User 32: No Answer.

User 33: Yes. Salsbury ridge and Barlo cove area

User 34: No.

User 35: Yes. Knowing winds at 1500, 3000, and 5000 over the Douglas Bridge and at the Taku arm would be valuable.

User 36: Yes. Knowing what the gusts and turbulence are in the Taku Inlet would be useful.

User 37: No.

User 38: No.

User 39: Yes. In Gastineau Channel.

User 40: Yes. Sisters Island winds probably OK. Most of year, Taku, Gastineau, and Lynn Canal winds important with high pressure over Canada with low over Gulf of Taku.

User 41: No.

User 42: Yes. Any wind information at or below the tops of terrain would help in determining turbulence and descent planning.

User 43: Yes. All areas of climb and descent path.

User 44: Yes. Gastineau Channel and Bridge Departure.

User 45: Yes. Taku Inlet and Gastineau channel area.

How would you like the winds information to be displayed (e.g., winds at 1000 180/25, graphical, etc...)?

User 1: 3 digit speed in tabular format as in first example

User 2: first example

User 4: graphical

User 5: first example

User 6: first example

User 8: first example

User 9: first example

User 12: first example

User 13: first example

User 14: Either way is fine.

User 16: first example

User 17: I would like a picture with wind arrows and shaded/circled areas of anticipated turbulence based on historical data.

User 22: first example

User 33: Eagle Crest 1000 MSL / 1825
Eagle Crest 2000 MSL / 1938

User 35: A graphic wind arrow display or isotachs conveys more information than a data printout. A video display of "live" data would tell us a great deal.

User 36: first example.

User 39: first example.

User 40: first example.

User 41: first example.

User 43: Graphical.

User 44: Magnetic is more useful than true.

User 45: Text.

14. Are there any areas (e.g., Lemon Creek, Gastineau Channel) where, in your opinion, the lack of current wind information poses a threat to flight safety? If yes, please identify the area and explain.

User 1: Lemon Creek, down wind, airport vicinity, cut [on approach to runway 8]

User 2: No.

User 3: No.

User 4: No.

User 5: No.

User 6: No.

User 7: No.

User 8: None.

User 9: Don't think there are "threats" to safety, but wind information at Lemon Creek and in the channel and through the cut would be useful.

User 10: No.

User 11: No. With anemometers in place there is plenty of information.

User 12: No.

User 13: Douglas, Gastineau Channel

User 14: Yes. Winds aloft at 2000 to 5000 feet would be nice to have from an area of the Taku Inlet to Barlo Point inclusive. The lack of such information however is not a threat to safety. I would just be nice to have.

User 15: No.

User 16: I wouldn't mind seeing something near the cut on the LDA but I don't thing it is a safety issue. Any more information would enhance safety and greatly aid in planning but I feel with the current situation, it is definitely safe as is.

User 17: No.

User 18: No.

User 19: No.

User 20: Lemon Creek departure should have winds in Lemon Creek area.

User 21: No Answer.

User 22: Personally, I could never justify asking for even more wind information for Juneau when all we have are old hourly or unreliable AWOS/ASOS readings at so many other Alaska airports with potential for much of the same mechanical turbulence.

User 23: No.

User 24: No.

User 25: No.

User 26: No Answer.

User 27: No.

User 28: No Answer.

User 29: Turbulence over Lynn Canal has always been significant but you can get an idea about that from the 6000 feet winds on the winds aloft. Many times you'll see a shear (direction change) at the 6000 feet level which is somewhat close to the altitude we are at when flying abeam Lynn Canal on the LDA approach to 8. Also Lemon Creek wind information would be helpful for Fox departures.

User 30: Well yes, but its in Ketchikan not Juneau.

User 31: No.

User 32: No.

User 33: I feel the current anemometer, LIDAR, profiler suite is fine, it would be very helpful to have better/real-time access to the information generated by these instruments.

User 34: No Answer.

User 35: Over airport/Lemon Creek area up to 5000 feet. Gastineau Channel over Douglas Bridge and at Taku arm up to 5000-7000 feet.

User 36: No Answer.

User 37: No.

User 38: There is a lot more information than ever before. If we had the wind profiler providing low level shear information in the terminal area, safety would be enhanced.

User 39: No Answer.

User 40: No. Current wind restrictions are very conservative. Worst turbulence I have experienced with current restrictions is light turbulence. Could raise the wind limits and still maintain conservative safety/turbulence restrictions.

User 41: No.

User 42: No.

User 43: No.

User 44: No Answer.

User 45: No.

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

☐ Yes **(7 out of 45)**
☐ No **(38 out of 45)**

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

User 11: Yes. Moderate plus turbulence on approach and departure – Lynn Canal exists to MDB to arom (?) – Fox departure wind from Eagle Crest direction.

User 12: Anyone who has flown consistently will have his or her stories. On arrival winds reported at 090/15G25 yet on approach, huge gain and loss of airspeed of 25 knots while at 4000 to 1000 feet. Other times some winds are nothing. Another is calm winds at airport, depart down channel and moderate to sever turbulence at the ridge by the Douglas Bridge. Fox departure with airspeed gain or loss of 15 knots in the turn. These have all happened more times than I care to remember. Turbulence on approach

to Ketchikan where we could not see instrument panel it was shaking so badly, yet you knew it would be calm winds below 500 feet at airport.

User 13: Yes. Fox Departure – light to moderate turbulence between 500 and 3000 feet.

User 14: Yes. Moderate turbulence from sisters Island all the way down to Coghlan Island (8000 feet to 1000 feet). This is not all that unusual. Perhaps once every year or so. Also light turbulence in Gastineau Channel for runway 26 arrival and 8 departures. Have experienced +/- 15kts windshear on RWY 8 approach 1500 feet down to 600 feet [this is over cut area].

User 16: Yes. Nothing that required reports, but significant moderate turbulence and +/- 20kt or more windshear doing Lemon Creek departures.

User 26: Yes. CAT (Clear Air Turbulence?) in channel before we had wind information in the airplane and only winds aloft forecast.

User 27: No specific incidents; however, significant airspeed changes during Lemon Creek and Fox departures are not uncommon and can be minimized by anticipating. Hill winds are a good source of information to help predict turbulence.

User 33: After flying 9 straight years of southeast Alaska on the 737-200, I have had multiple events. The most prone areas to be avoided on certain weather systems tended to be Taku Winds and Fox/Lemon Creek departures during frontal passages.

JUNEAU WIND HAZARD INFORMATION SYSTEM QUESTIONS

The Juneau Wind Hazard Information System **may** have the capability to accurately determine the level of terrain induced wind disturbances near the Juneau International Airport. These disturbances often consist of windshear (loss/gain of airspeed) and turbulence. Assuming the Juneau Wind Hazard Information System could provide information regarding these types of wind disturbances, please answer the following questions.

16. What type of wind disturbance information would you want presented?

- ☐ Windshear measures **(2 out of 44)**
- ☐ Turbulence measures **(5 out of 44)**
- ☐ Both windshear and turbulence measures **(37 out of 44)**

17. How would you like turbulence measures presented?

- ☐ Standard terminology (light, moderate, severe) relative to a standard aircraft **(24 out of 42)**
- ☐ 6-Level numeric scale under consideration by ICAO **(18 out of 42)**

If you marked Standard Terminology, what type of aircraft should be used as the standard? **B737, Commercial passenger aircraft, 10,000 LB aircraft, DC-9, MD-80, Transport category aircraft**

18. For a given flight path (i.e., Fox Departure), please mark which information would provide utility. **(Mark all that apply).**

☐ Mean windshear/turbulence intensities	**(10 out of 45)**
☐ Minimum windshear/turbulence intensities	**(0 out of 45)**
☐ Maximum windshear/turbulence intensities	**(11 out of 45)**

Mean and Max intensities	**(12 out of 45)**
Min and Max intensities	**(9 out of 45)**
Min, Max, and Mean intensities	**(3 out of 45)**

19. In order to provide utility, what is the desired spatial resolution needed for a wind disturbance product: **(Mark only one in each column)**

In Horizontal		In Vertical	
☐ 1 NM	**(10 out of 40)**	☐ 500 Feet	**(9 out of 40)**
☐ 2 NM	**(16 out of 40)**	☐ 1000 Feet	**(25 out of 40)**
☐ 3 NM	**(10 out of 40)**	☐ 2000 Feet or greater	**(6 out of 40)**
☐ 5 NM or greater	**(4 out of 40)**		

20. How would you like to obtain the wind disturbance information? **(Mark all that apply)**

☐ ATIS	**(24 Yes, 21 No)**
☐ Datalink	**(21 Yes, 24 No)**
☐ Dispatch	**(23 Yes, 22 No)**
☐ VHF Voice (similar to ASOS)	**(27 Yes, 18 No)**
☐ Other _____	

Which are the **TWO** most desirable methods of data dissemination?

User 1: ATIS, Dispatch/Ops

User 2: VHF Voice, Dispatch/Ops

User 3: ATIS, Dispatch/Ops

User 4: ATIS, VHF Voice

User 5: ATIS, ASOS

User 6: Datalink, ATIS

User 7: ATIS

User 8: ATIS, Datalink

User 9: Datalink, VHF Voice

User 10: ATIS, Datalink

User 11: ATIS, Datalink

User 12: Dispatch/Ops, VHF Voice

User 13: Dispatch/Ops, ATIS

User 14: Dispatch/Ops, VHF Voice

User 15: VHF Voice

User 16: ATIS, AFSS

User 17: Datalink

User 18: Datalink, Dispatch/Ops

User 19: Dispatch/Ops, VHF Voice

User 20: Datalink, VHF Voice

User 21: Dispatch/Ops, VHF Voice

User 22: Dispatch/Ops, VHF Voice

User 23: ATIS, Dispatch/Ops

User 24: ATIS, Dispatch/Ops

User 25: VHF Voice, ATIS

User 26: ATIS, Dispatch/Ops

User 27: Dispatch/Ops

User 28: Datalink, VHF Voice

User 29: ATIS, VHF Voice

User 30: VHF Voice, Datalink

User 31: VHF Voice

User 32: Dispatch/Ops, VHF Voice

User 33: Datalink, VHF Voice

User 34: ATIS, Dispatch/Ops

User 35: Datalink, Ops, VHF Voice

User 36: ATIS, Dispatch

User 37: ATIS, VHF Voice

User 38: Dispatch, VHF Voice

User 39: VHF Voice, Live person

User 40: Datalink, ATIS

User 41: ATIS, Dispatch

User 42: Datalink, ATIS

User 43: Datalink, VHF Voice

User 44: Dispatch, ATC

User 45: Datalink, VHF Voice

21. Please provide any additional comments, concerns, or suggestions regarding wind information for the Juneau area. If you suggest providing additional information, please include what area(s) you would like the information for, when you would want the information, and how you would like to obtain that information.

User 1: None.

User 2: None.

User 3: None.

User 4: None.

User 5: Wind from Federal Building would be useful.

User 6: At the present, we have more information for Juneau than we have ever had. Real-time wind information available to the pilot in the cockpit would be helpful. Calling operations for the wind is cumbersome during busy phases of flights.

User 7: With the abundance of required information, any additional information may be superfluous, and further complicate operations.

User 8: None.

User 9: None.

User 10: I would like additional windshear and turbulence information; however, no more limiting operations, or maximum windshear/turb. Limitations that curtail operations. There is already an excessive amount of wind information to be gathered and processed to determine if we are "legal" to operate.

User 11: None.

User 12: Consider turbulence more important than wind. As I've said above there are plenty of instances of huge wind and no turbulence and no wind and huge turbulence. Turbulence usually affects my decision making more than wind especially in departure.

User 13: I personally like going to our ops in Juneau or Seattle and looking at the computer monitors. You can get a sense of real time winds and turbulence.

User 14: The 35 kt restriction for our operations on RNP procedures is too conservative based on my experience. It should be moved up to 40 to 45 kts.

User 15: Getting remote winds from ASOS type setup would be much easier in my opinion.

User 16: None.

User 17: None.

User 18: None.

User 19: I have done RNP operations in the Gastineau Channel many times with the winds on the hills (i.e., Eagle Crest, Mt. Roberts, Sheep Mtn) at or near their limits with nothing more than light turbulence. Our current information level is good.

User 20: None.

User 21: None.

User 22: I would be concerned that additional wind information in Juneau would eventually equate to even more restrictions to our operation there, even if that wasn't the intent.

User 23: I believe the level of information available currently is sufficient for Non-RNP ops.

User 24: None.

User 25: At some point more information is just clutter. Also it is important that any "forecast" turbulence or windshear information be accurate on a consistent basis; otherwise, if this new information proves inaccurate or too conservative, then it may actually have a negative impact on Juneau Operations.

User 26: Having wind information in the airplane and from the existing sites has greatly increased the awareness flying into and out of Juneau.

User 27: I support the concept of the wind hazard information system. I believe the wind limits placed on our operations should be studied, with input from pilots, adjusted and updated.

User 28: None.

User 29: Wind information in the cut would be helpful. I've seen wind direction change 270 degrees from just outside the cut to touchdown.

User 30: I would like to see wind profilers on the Chilkat mountains and preferably a means to obtain wind information at altitude in that area.

User 31: None.

User 32: None.

User 33: I am concerned this questionnaire might be too lengthy for most crews, therefore, I anticipate reluctance on time taken to adequately fill in the information.

User 34: None.

User 35: We need to know both the lateral and vertical wind distributions from the airport down the channel to the Taku arm. If we can determine what the winds are doing at the center of the channel from the surface to 7000 feet, we could determine windshear and turbulence. We are now handicapped because we have only a few surface observations. A strong wind blowing parallel to the channel can produce little turbulence, while light winds perpendicular to the channel can create moderate/severe turbulence. Something such as a Doppler radar could probably scan the channel and determine wind direction and velocity at a number of altitudes (a couple of well-placed vertical wind profilers might provide similar data). Even with mathematical wind models, I do not think we will be able to determine an accurate picture of the winds in mid-channel by surface based observations. We need to measure the winds above the surface down the length of the channel.

User 36: None.

User 37: None.

User 38: In the terminal area, I'm not sure what form the wind information system would be reported, but if consideration could be given to an "alert" type of reporting (one that will only report turbulence moderate or greater and windshear in excess of 10 kts) it would help us to target the problem area and manage workload. If there is a lengthy report of wind/turbulence information that we have to sift through each time we operate in or out of JNU, we can be faced with time constraints. Give us only information we need to be concerned with. This system could be a big benefit to us.

User 39: Too few people are working too many frequencies. Too many times we are forced to "stand by" while the radio works another airplane hundreds of miles away.

User 40: Wind information we have now works well. As a pilot, always like more and better information (need to assume at a reasonable cost). If more information permits less restrictive environment, I am all for it. Get us good information and then let us do our job! Thanks.

User 41: None.

User 42: None.

User 43: Wind information for the JNU airport and surrounding area should be available on a real-time basis (ASOS). At KTN [Ketchikan], YAK [Yakutat] and SIT [Sitka] for arrivals into JNU.

User 44: None.

User 45: None.

APPENDIX E

DISPATCHER SURVEY SUMMARY

Juneau Terrain Induced Turbulence User Needs Survey

1. Estimate the number of Juneau flights per week you are responsible for during peak season (May-Sept.)? **30, 60, 14**

2. Estimate the number of Juneau flights per week you are responsible for during off peak season (Oct-Apr.)? **25, 40, 8**

3. What weather information do you currently obtain **prior to filing a flight plan for Juneau**? Weather information could include but is not limited to METARs, AIRMETs, SIGMETs, Ceiling and Visibility, Winds Aloft, Surface Winds, etc... For example, obtain the PAJN METAR from NWS, which is updated hourly. In each row, please enter one type of weather information.

Weather Information Obtained	**Provider (e.g., Met. Dept., ATIS, ATCSCC, NWS, Internet, etc...)**	**How current is the information? (If known)**
METAR, SIGMETs, AIRMETs CWA	NWS	METAR -- hourly AIRMET/SIGMET—6 hours
TAF, Area Forecast	NWS	TAF – every 6 hours Area Forecast – 8 hours
Juneau Anemometer wind observations	NCAR	Almost instantly
Turbulence Plot	Northwest Airlines	Hourly
Surface winds	Internet	2 minutes
Pireps	NWS	As available
Company Pireps	Alaska Airlines pilots	
Notams	NWS	Current

4. What weather information do you currently obtain **to monitor Juneau conditions for flight plan updates or pilot weather advisories**? 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 NWS, which is updated hourly. In each row, please enter one type of weather information.

Weather Information Obtained	Provider (e.g., Met. Dept., ATIS, ATCSCC, NWS, Internet, etc...)	How current is the information? (If known)
METAR, SIGMETs, AIRMETs CWA	NWS	METAR -- hourly AIRMET/SIGMET—6 hours
TAF, Area Forecast	NWS	TAF – every 6 hours Area Forecast – 8 hours
Juneau Anemometer wind observations	NCAR	Almost instantly
Company Pireps	Alaska Airlines pilots	
Enroute flight advisories	NWS	
Surface winds	Internet	2 minutes
Pireps	NWS	As available

5. 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.

☐ Flight Plan Preparation	**(2 out of 3 Dispatchers)**
☐ Monitor Weather	**(3 out of 3 Dispatchers)**
☐ Flight Scheduling/Cancellations	**(2 out of 3 Dispatchers)**
☐ Weather Updates to Pilots	**(3 out of 3 Dispatchers)**

6. For each of the tasks marked in Question #5, 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...).

Flight Plan Preparation	-Plan additional fuel, holding time -If winds are frontal out of the west
Monitor Weather	-Wind direction could indicate possible changes in weather, i.e., frontal passage, altimeter/pressure changes -Plan holding time, divert plans -Important for wind shift and divert plans
Flight Scheduling/Cancellations	-Winds would be considered when deciding if flight should takeoff for Juneau, or cancel, or delay -Delay or cancel flight -Delays or cancellations due to winds when they are easterly and above 25 kts.
Weather Updates to Pilots	-Would indicate weather trends, warn pilots of possible turbulence and best direction to land/takeoff -Provide wind information prior to departure, enroute for approach plan and possible alternate -Provide wind information

7. 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
Surface Winds	**(3 out of 3)**	Airport, Runway, Coghlan Island, Lemon Creek
Windshear	**(2 out of 3)**	Coghlan Island, Lemon Creek
Low-level Turbulence	**(2 out of 3)**	Douglas Island, Taku Inlet, Gastineau Channel
Winds Aloft	**(3 out of 3)**	Lynn Canal, Marmion Island, Gastineau Channel
Other – SIGMETs/PIREPs	**(1 out of 3)**	

8. If a particular problem and/or region were indicated in Question #7, would additional wind information in those regions provide benefit? Please explain.

   User 1: I believe current wind information is adequate.

   User 2: Coghlan Island is the Missed Approach Point for the Juneau LDA Approach to RWY 8.

   User 3: Yes, at different altitudes (5000 and 10,000 feet) through the Gastineau Channel.

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.

   User 1: I believe wind information around 5000 feet or so would be helpful in Lemon Creek and Gastineau Channel.

   User 2: Lynn Canal, Sisters Island, Marmion Island, Admiralty Island, Taku Inlet

   User 3: The Gastineau Channel for arrivals and departures.

10. 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 area and explain.

    User 1: No.

    User 2: Taku Inlet, Gastineau Channel, Auke Bay. These areas affect the approach and departure phases of flights to and from the Juneau Airport.

    User 3: No.

11. 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.

    User 1: I believe our current wind information is adequate and a huge improvement in running a safe Juneau operation.

    User 2: More anemometers in the vicinity...

    User 3: The 5000 foot level through the channel would be helpful (wind information).

APPENDIX F

PART 121 PILOT INTERVIEW RESPONSES

Interviews are organized according to the jumpseat flights taken by ACT-320 personnel. Jumpseat1 refers to the arrival flight in which a RNP arrival was flown while Jumpseat2 refers to the departure flight in which a VFR Bridge departure was flown. Two pilots were interviewed during Jumpseat1 and one pilot was interviewed during Jumpseat2.

1. **How many times do you fly into JNU per month?**

Jumpseat1: Captain – 3 times per month, First Officer – 10 times per month

Jumpseat2: Captain – 7 to 8 times per month

2. **What weather do you obtain for JNU prior to takeoff?**

Jumpseat1: Get mountaintop winds, surface winds, and ceiling and visibility from Juneau Ops Tower.

Jumpseat2: Normal pilot brief from dispatch.

3. **What weather do you obtain for JNU prior to landing?**

Jumpseat1: ATIS, surface winds, mountaintop winds. If winds are close to operations specification, they will ask for winds well in advance of landing to prepare for an alternative landing configuration.

Jumpseat2: If RNP, request mountaintop winds as well as ATIS and airport winds.

4. **What impact does windshear and low-level turbulence have on your JNU operations?**

Jumpseat1: If winds are within limits, they have fairly little impact other than bumpy rides.

Jumpseat2: Other than operations specifications, not that much. Monitor traffic and use more as a caution.

5. **How do you utilize the Eagle Crest, Mount Roberts, and Sheep Mountain winds for arrivals? What decisions/issues are you considering with regard to winds for arrivals?**

Jumpseat1: If winds are out of limits, they will not land so they don't get stuck in Juneau. Additionally if winds are out of limits, they can not use the RNP approach.

Jumpseat2: Look for Taku winds. Always monitor. Can tell if there is going to be some turbulence but really use most often if we are doing an RNP.

6. **How do you utilize the Eagle Crest, Mount Roberts, and Sheep Mountain winds for departures? What decisions/issues are you considering with regard to winds for departures?**

Jumpseat1: No major decisions outside of the operations specifications. Is it legal and safe to depart given the assigned departure?

Jumpseat2: Use for operations specification, but also to see what to expect with regard to turbulence. The channel can get really bumpy.

7. At what point in the flight do you request JNU wind information?

Jumpseat1: We get them in our briefing packages, then request them from Seattle Dispatch about 40 minutes out and then again from the Juneau Operations Tower just before landing sequence starts.

Jumpseat2: Get them in briefing packages, then call over Ketchikan and again just before landing sequence.

8. Would you prefer to obtain the winds a different way (i.e., datalink, VHF Voice – similar to ASOS)?

Jumpseat1: From dispatch so you can do it before you get into the Juneau area. Too much workload once you get there.

Jumpseat2: Would like to see it from ACARS down the road.

9. Has RNP changed your need for wind information in JNU?

Jumpseat1: If anything, it has increased the need for wind information especially since the RNP wind restrictions are from any direction.

Jumpseat2: What they currently give is good. Nothing has really changed.

10. Have you encountered windshear or turbulence in the Gastineau Channel on arrival or departure? Are there any specific altitudes that are more turbulent than others are?

Jumpseat1: Winds are normally calm. However, it can be rough from 1000 to 8000 feet on departures down the channel. When using LDA to RWY 8, Outer Point area is usually rough around 1000 feet.

Jumpseat2: Light turbulence with a strong east wind, Variable winds starting at about mountaintops. Climbout can be a little rough but you are okay once you get above mountaintops.

11. Is there any particular area around JNU that is more susceptible to windshear? Is this at any specific altitude?

Jumpseat1: You are really susceptible to windshear and turbulence on the Fox departure around 2000-4000 feet when you are belly up on the turn.

Jumpseat2: Nothing specific.

12. Is there any particular area around JNU that is more susceptible to turbulence? Is this at any specific altitude?

Jumpseat1: See #11.

Jumpseat2: The Fairweather Mountains have some turbulence associated with them.

13. Would winds above 5000 feet in JNU terminal/departure area be useful? Why?

Jumpseat1: Would be useful on Fox and Lemon Creek Departures as well as down the channel. Would help to determine how much turbulence they are going to encounter.

Jumpseat2: Profiler data would be useful on the Fox Departure.

14. Is there any location where the lack of wind information poses a threat to flight safety?

Jumpseat1: No threat to flight safety really.

Jumpseat2: Not really.

15. Have you experienced any turbulence-related incidents in the JNU area? Is yes, please explain the incident.

Jumpseat1: While flying a Part 91 out of Juneau, used a Fox Departure and experienced significant turbulence on the turn from about 2000-4000 feet all the way around the corner.

Jumpseat2: No.

16. If we could understand wind flow information and create a warning product what would you want to see:

d. Windshear intensities, turbulence intensities, or both
e. Standard terminology or proposed ICAO 6-level intensities
f. Mean, minimum, or maximum intensities presented.

Jumpseat1: Would like windshear and turbulence intensities using ICAO levels presenting minimum and maximum intensities along the route of flight.

Jumpseat2: Both windshear and turbulence intensities using standard terminology for a 737 presenting all intensities at specific locations.

APPENDIX G

DISPATCHER INTERVIEW RESPONSES

1. **What wind-related issues are of concern when planning a flight to or from Juneau International Airport?**

User 1: I look at the operations specification and compare that to Juneau weather. If the anemometers are well within limits, I don't worry about it. If the are over limits, I plan to over fly Juneau or ferry the aircraft out of Juneau. If winds are gusting and are close to the limits, we may wait to see if the winds will subside long enough to get the aircraft off. Lots of times when winds are close and the pilot decides to go, the pilot says that the turbulence was not really that bad. We don't have many ferry (non-revenue) flights out of Juneau because we don't let them land if we don't think they will get back out.

User 2: We watch the winds carefully. Most pilots will call over Ketchikan to see if the winds are okay to land in Juneau. Rule of thumb is that if the winds are just over the maximums, you can wait it out a little and they will die down enough to get in. We also use the winds to determine payload for flights especially if we have a tailwind.

User 3: The Ops spec, turbulence, and windshear. We need to get our planes out of there and be able to put as much payload on as possible.

User 4: I examine the mountaintop winds to see what the winds are doing and how it is going to restrict the departures. If the departure has restrictions then I may have to deal with payload issues.

2. **How do you currently use Eagle Crest, Sheep Mountain, and Mt. Roberts winds for dispatch operations?**

User 1: We use it for the operations spec and for the considerations listed in previous question.

User 2: We use the mountaintop winds to see if the winds are within specification.

User 3: We use them for the ops spec, but I also use them to see if there is going to be turbulence in the area. Things get bumpy over the engineer's cut and Mendenhall Glacier can cause some windshear to occur in that area.

User 4: To see how the operations specification

3. **Do you interact with your Juneau Operations Agents regarding wind information for flights? How often do you interact? What is the nature of the interaction?**

User 1: If the winds are close, we talk about the winds. It really depends on the departure. The Juneau tower makes the call as to which departure to use.

User 2: If the winds are high, we interact a lot. We work together to set up different scenarios. Usually we will work the worst case scenario and plan for that. We hope we get surprised and can increase our payload limits later.

User 3: Talk with them if the winds are close.

User 4: If the winds are gusting or close to the limits, we will call them.

4. Is the RNP used for arrivals as well as departures?

User 1: Yes.

User 2: Yes

User 3: Yes

User 4: Yes

5. Do you utilize mountaintop winds for RNP arrivals and departures? Do you have specific concerns regarding the Mt. Roberts and Sheep Mountain winds when determining which approach/departure to use?

User 1: We use the mountaintop winds for both arrivals and departures. If the airport winds are below 25 knots, the arrivals are not recommended if the winds at Mt. Roberts are greater than 15 knots from 340 – 030 degrees. Every morning we check the satellite to see if the RNP is within limits. Pilots get this information in their briefing package and they may also call in just prior to planning their approach.

User 2: We use the winds for both. Basically trying to see how hard the Taku's are blowing.

User 3: RNP arrivals are preferred if the crew is qualified. RNP departures are also preferred if the crew is qualified. Due to weights, 26 is a preferred departure as well; however, there is a point when due to tailwinds you can take less weight on 26 than you could on an RNP.

User 4: We need to be concerned about mountaintop winds for both RNP arrivals and departures.

6. When do you issue Juneau mountaintop winds information to the pilot?

User 1: The pilot gets the winds in his briefing package and then calls us when about 45 minutes out. The pilot also calls the Juneau Operations Tower once they are within range.

User 2: We issue winds upon request or if major things change with the winds. We really watch the winds if the are gusting on the ground or near the mountaintop limits.

User 3: In briefing package and about 40 miles out of Juneau.

User 4: Yes. In briefing packages and we give them the winds if they call in.

7. Do pilots request Juneau mountaintop winds during flight?

User 1: Pilots often call to get winds about 45 minutes out. Sometimes they will just wait to talk with Juneau Operations Tower once they are within range.

User 2: Pilots will get the winds in their briefing packages and will then call the Juneau Operations Tower or dispatch closer to landing.

User 3: Yes.

User 4: Yes.

8. How is payload impacted when using runway 8?

User 1: Payload is not necessarily impacted by which runway is used but by which departure is used. Each departure has a payload limit. The Fox Departure has a light payload limit meaning less cargo, fuel, and/or passengers can be put on. A VFR bridge departure has high payload limits meaning more weight can be put on the aircraft. If the winds are restricting operations to runway 8, payload may be a factor if the departure changes from a VFR bridge to a Fox Departure. Then the airline loses significant payload. If they were already loaded, then bags, passengers, or fuel would have to come off the aircraft to make up the difference.

User 2: Once you choose a specific departure, the payload is set.

User 3: Payload is always a problem in Juneau. Ops agents in Juneau will always call and ask for more weight if they can get it. It just depends on which departure you use. Each has it's own weight restrictions.

User 4: Payload can be a factor depending on which departure is being used.

Additional general questions were asked during the visit in order to support the Cost Benefits analysis. The following questions are answered in general and are not summarized according to individual responses.

1. Percent of flights that utilize Runway 8 during the peak season (May-Sept.)?

None of the Alaska Airlines dispatchers or operations agents interviewed knew the answer to this question.

2. Percent of flights that utilize Runway 8 during the off-peak season (Oct.-Apr.)?

None of the Alaska Airlines dispatchers or operations agents interviewed knew the answer to this question.

3. **Are all B737-400 crews that fly in and out of Juneau certified for RNP? If not, what percentage is certified?**

Only about 50% of the B737-400 crews are certified.

4. **Is it expected that Alaska Airlines will seek approval for the B737-200C fleet to use RNP?**

It is currently unknown whether or not Alaska Airlines will seek approvals for their B737-200C fleet.

5. **Are there wind conditions that prohibit use of the RNP?**

RNP departures are restricted by 35 kt mountaintop winds and 25 kt airport surface winds regardless of direction.

6. **Are there weather conditions in the Gastineau Channel that would make turning departures more preferable than RNP departures? If so, please explain. How frequently do these occur?**

Most indicated that RNP departures are preferred over turning departures if the winds are favorable. However, one individual indicated that when the Taku winds are prevalent, the turning departures would be favorable to RNP. Specific details could not be obtained regarding this preference.

7. **How frequently is aircraft payload a factor when departing Runway 8?**

Each departure route has it's own payload limits. Turning departures are allowed significantly less payload than Gastineau Channel and Runway 26 departures (depending on amount of tailwind).