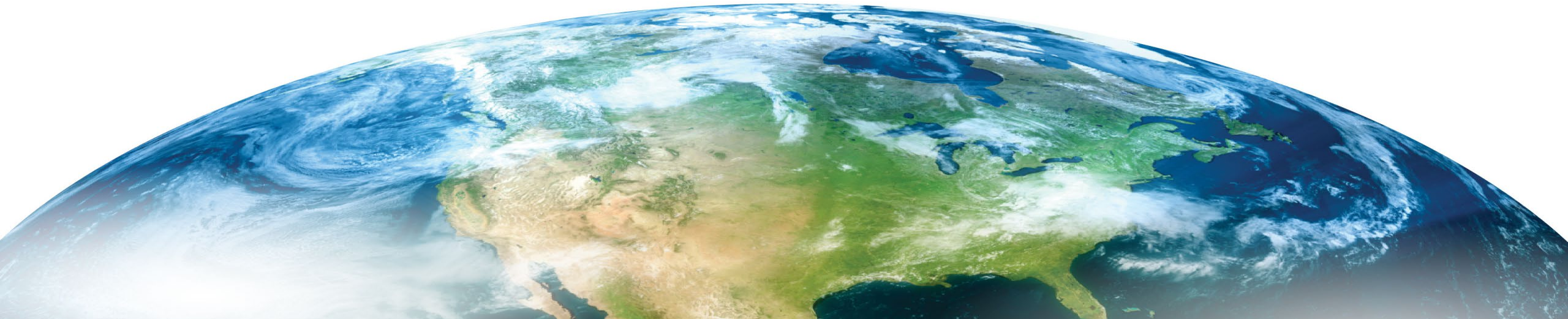




Next**GEN**

Cloud Ceiling Observations User Needs Assessment Results

Presented to: Jenny Colavito
By: FAA AWDE Services, ANG-C63
Date: March 18, 2020



Topics

- **Introduction**
- **Background and Objectives**
- **Cognitive Walkthrough Approach**
- **Results**
- **Conclusions**
- **Recommendations**



Introduction



Introduction

- The 2018 Aircraft Owners and Pilots Association Report stated that restricted Ceiling and Visibility (C&V) conditions contributed to a disproportionately high rate of fatal General Aviation (GA) accidents.
 - Majority of weather accidents were caused by Visual Flight Rules (VFR) flights into Instrument Meteorological Conditions (IMC).
 - Majority of accidents occurred because pilots were unaware of hazardous weather conditions prior to departure.
- ANG-C61 funded the Aviation Weather Demonstration and Evaluation (AWDE) Services team to conduct an assessment to determine the need for additional ceiling observations in Alaska.
- AWDE Services team conducted focus groups to determine the operational need for additional ceiling observations in remote Alaska locations.



Background and Objectives



Background

- Alaska has the highest ratio of plane owners to residents.
- The Alaska state's transportation department stated about 82% of Alaska communities aren't connected to road systems.
- According to the March 2019 FAA Alaskan Region Aviation Fact Sheet, Alaska has 394 public use airports and 761 recorded landing areas (private, public, and military).
- C&V conditions cause significant safety impacts and contribute to a disproportionately high rate of GA accidents. (Geske, 2018).
- Traditional weather observations, such as radars, in Alaska are widely dispersed.
- Pilots and meteorologists fill in the gaps by using the closest weather cameras, weather observers, and previous knowledge and experience with the terrain and weather trends.

Geske, R. (2018) 27TH JOSEPH T. NALL REPORT General Aviation Accidents in 2015, AOPA Air Safety Institute.



Objectives

- Determine the issues associated with not having ceiling observations in planned areas of departing, arriving, or flying.
- Determine the operational impact of supplemental ceiling data vs. certified ceiling observations.
- Identify the need for additional ceiling observations in Alaska and in particular, what geographic locations where observations are most needed.



Focus Group Approach



Participants and Locations

- October 7th Anchorage, Alaska
 - 2 Part 135 Pilots
 - 1 Part 135 Pilot & Director of Operations
 - 2 General Aviation Pilots
 - 2 FAA Retired FAA Flight Services
 - 2 Team members from the FAA Alaska Camera Program
- October 8th Anchorage, Alaska
 - 2 Weather Forecasting Office Meteorologists
 - 1 Part 135 Pilot
 - 2 General Aviation Pilots
- October 9th Anchorage, Alaska
 - 1 Part 135 Chief Pilot
 - 1 Regional Aviation Meteorologist
 - 1 Meteorologist in Charge
 - 3 AAWU Meteorologists
 - 1 AAWU Science and Operations Officer
 - 1 Test Bed and Proving Ground Meteorologist
- October 10th Juneau, Alaska
 - 4 Part 135 Pilots
 - 1 Part 135 Pilot and Director of Operations
- October 11th Juneau, Alaska
 - 1 Part 135 Pilot and Director of Operations
 - 4 FAA Flight Services
- October 24th WebEx hosted at the WJHTC
 - 1 Part 121 Pilot



Participant Summary

Total	# of participants completed form	User Group	Primary Geographic Flying Region	Average Flight Hours
11	6	Part 135	Western, Southeast, Southwest, South, North, South Central	56,583
1	0	Part 121	Statewide	737 Pilot
4	4	GA Pilot	South Central, Interior, South Central, North Slope	8,900
2	2	WFO	--	
2		FAA Camera Program*	--	
7		AAWU*	--	
6		FAA Flight Services*	--	
34		Total		

**Note: Demographic questionnaires and participant questionnaires were not given to FAA Flight Services and Camera Program participants or AAWU Meteorologists.*



Approach

- Cognitive walkthroughs were conducted with multiple participants in attendance.
- Each cognitive walkthrough consisted of:
 - The AWDE Team providing a background and purpose of the focus group, evaluation, protocols, and participants expectations.
 - Two scenarios for GA, Part 121, and Part 135 pilots:
 - Participants were asked to consider planning a flight when cloud ceiling observations are not available en route or at the destination.
 - Participants were asked to consider planning for a flight using certified and uncertified ceiling observations.
 - Two scenarios for AAWU and WFO meteorologists and FAA Flight Services focused on completing planning forecasts, briefing pilots, and other job responsibilities when:
 - Cloud ceiling observations are not available.
 - Uncertified ceiling observations are available.
- During the scenarios, participants were asked what issues are associated with not having ceiling observations and how often ceiling observations are not available.



Approach

- During the scenarios, the AWDE team collected data using Structured Interview Questions which:
 - Allowed participants to provide comments regarding the need for cloud ceiling observations for decision making.
 - Focused on determining:
 - Information needed to support decisions when flying visual flight rules (VFR) or instrument flight rules (IFR),
 - How often ceiling observations are not available, and
 - How uncertified ceiling observations would be used for IFR and VFR pilots.
- After completion of the two scenarios, participants completed a questionnaire.
 - 5-point Likert scale rating was used (5-Strongly Agree, 4-Agree, 3-Neither Agree/Disagree, 2-Disagree, and 1-Strongly Disagree).
 - Space for additional comments was provided.



Results



Questionnaire Results



Cloud Ceiling Questionnaire Results

Question	Part 135 Pilots (N=7) Mean	GA Pilots (N=5) Mean	WFO Meteorologists (N=3) Mean	Overall (N=15)
1. I encounter issues due to not having ceiling observations in planned areas of departing, arriving, or flying in Alaska.	4.0	5.0	4.7	4.5
2. Supplemental ceiling observations (not certified by the FAA) would be beneficial to me, assuming that no METAR is available.	4.6	5.0	5.0	4.8
3. Supplemental ceiling observations that are not certified by the FAA would impose significant limitations on my ability to use the information for operational decision making verses having a certified METAR.	3.0	2.4	1.7	2.5

Part 135 Pilots stated the inability to land IFR using supplemental ceiling observations resulted in a “Borderline” response. GA Pilots and WFO meteorologists would not have limitations to use supplemental ceiling observations in decision making.



Cloud Ceiling Questionnaire Results

Please list the **locations** where you have the **greatest need for additional ceiling observations**. Please stratify your response by areas that require a METAR and those that would benefit from a supplemental ceiling observation (not certified by the FAA).

Key locations that need additional ceiling observations that must be certified due being a designated IFR approach/landing.
Central
Healy
Kake (TAF)
Whittier
Airports with IFR approaches. (21 in state with no weather currently)

Key locations that need additional ceiling observations that can be supplemental.	
Alaska Peninsula	McCarthy
Alaska Range Passes	Port Alexander
Big River Lakes	Prince William Sound
Bristol Bay Area/Iliamna Area	Susitna Valley
Cantwell	Skwentna
Copper River Basin	Sheep Mountain
Elfin Cove	Taku Inlet
Farewell	Tok
Grave Point	West Side of Cook Inlet
Kodiak Island	Western Alaska
Kuskokwim Valley (Ariak Area)	Mountain Passes and other locations with weather cameras



Questionnaire Comments

Question 3- Supplemental ceiling observations that are not certified by the FAA would impose significant limitations on my ability to use the information for operation decision making versus having a certified METAR.

- (GA pilot) There are no issues or limitations using supplemental ceiling observations.
- (GA pilot) Supplemental ceiling observations are needed along VFR routes.
- (GA pilot) Limitations are an issue when flying IFR because supplemental information can not be used for landing at IFR designated airports.



Structured Interview Question Results



Question 1

If you are planning a flight to, from, or through a location that does not have a ceiling observation (i.e. no METAR or missing ceiling in the METAR), how does that affect your decision making?

- Overall, for all pilot participants, not having ceiling observations reduces safety and increases risk. Critical decisions are made, on a daily basis, not having complete and specific weather conditions during departure, en route, and the destination.
- GA and Part 135 Pilots:
 - Determining routes and altitudes to fly are based on the following:
 - For IFR flights, often times if ceiling observations do not exist, pilots will determine to file a VFR route and “take a chance” to fly the route without knowing the ceiling conditions.
 - Pilots with IFR rating and capabilities will file a flight plan to the closest IFR location with observations, determine the weather conditions at the VFR location, then “take a chance” and proceed to the intended destination.
 - Pilots will determine safe routes and altitudes based on issued PIREPs.
 - If weather conditions are not improving, pilots will make more frequent calls to FAA Flight Services to get an updated forecast.



Question 1 (Continued)

- GA and Part 135 Pilots go-no-go decisions are based on the following:
 - If IFR conditions exist and ceiling observations are not available, the pilot can not depart. Therefore, a no-go decision must be made.
 - For pilots flying VFR with no IFR capabilities, the pilots will leverage weather sources such as PIREPs, area forecasts, and the cameras “closest” to the route and destination to determine weather conditions.
 - These sources provide a high level operating picture of weather conditions in the location(s) that do not have observations.
 - A go-no-go decision will be made based on the high level operating picture of weather in the surrounding areas.
 - Assumptions are typically made when leveraging the “closest” weather observations which are not located on the route or a the destination. The assumptions are based on:
 - Prior knowledge of the location such as the terrain,
 - Prior knowledge of the weather trends, and
 - Prior knowledge of how the weather forms.
 - Until a PIREP(s) has been issued to determine weather conditions, pilots will decide to delay departure.



Question 1 (Continued)

- AAWU and WFO Meteorologists
 - When observations are not available meteorologists make decisions based on conceptual models, historical data and past experience versus numerical data.
 - When C&V observations are not available, meteorologists place a higher value on wind in decision making by interpolating the trend in the ceiling and visibility by looking at the wind up slope and down slope.
- Part 121 Pilot
 - Flies a 737 for a major airline and does not fly to locations that do not have C&V information, therefore there are no results for the Part 121 pilot.



Question 2

What are the issues associated with not having ceiling information at departure, en route and arrival in IFR and VFR conditions?

- GA and Part 135 Pilots:
 - Overall, the major issue associated with not having ceiling observations, for all phases of flight, are reduced safety and increased risk.
 - Pilots are taking more risk and often fly into unknown weather conditions which may result in an accident.
 - Pilots are not able to make the “best” decisions based on weather conditions that are more than 10 miles away due to the varying conditions in weather.
 - Pilots will file IFR to a location with ceiling observation near the intended destination, cancel the flight plan mid-route, and land at the intended destination VFR.
 - Pilots will land VFR if the C&V does not support an IFR landing.
 - Flights are often cancelled due to inability to depart or land at intended destinations. Cancelled flights may impact the following:
 - Transporting and providing medical services to patients,
 - Transporting goods and services, such as food and package deliveries,
 - Transporting students to and from school events, and
 - The response time for law enforcement.
 - VFR pilots flying into IMC.



Question 2 (Continued)

- AAWU and WFO Meteorologists
 - Weather forecast may not reflect current weather conditions due to meteorologists basing the forecast on trends and historical data.
 - WFO meteorologists stated when equipment is broken, the cost to charter a flight to a crew to the location is expensive, therefore, it is important to have the C&V observations to transport people and equipment commercially.
- FAA Flight Services
 - Workload increases due to increased calls from pilots for additional weather information leading to the need to solicit PIREPs and gain information for the GA and Part 135 pilots.
- Part 121 Pilot
 - Flies a 737 for a major airline and does not fly to locations that do not have C&V information, therefore there are no results for the Part 121 pilot.



Question 3

How often do you encounter not having ceiling observations at the following phases of flight (Departure, En Route, Arrival)? How often do you encounter the issues mentioned in question 2?

All Participants stated not having ceiling observations occurs on a daily basis. Common routes and destinations lack weather observations which increases risk and reduces safety. However, due to the necessity of flying to transport people and goods, pilots leverage as many weather sources available closest to the routes and/or destination to form the “best” weather picture possible. Due to the uncertainty in weather, conditions further away from the observations are estimates which may results in accidents, turn-arounds, or reroutes.



Question 4

If ceiling information is not available in the METAR, what alternate sources or methods do you use to obtain ceiling information? How much do you trust the alternate source?

Participant (s)	Source	Level of Trust/Reason
All	FAA and 3 rd Party Weather Cameras	Weather cameras are a trusted source of ceiling observation. All participants agreed being able to “see” the weather conditions at the destination and along the route provide confidence in decision making.
All	AAWU Nightly Weather Program	Participants stated the AAWU nightly weather program as a trusted source of weather information due to the fact that the AAWU meteorologists are Alaska weather experts.
All	Radio Frequencies	Pilots trust other pilots to provide information on hazards along routes.
All	Weather Applications (computer/mobile device)	Trust in weather application varies depending on the validation of the performance of the application. Windy and Foreflight are trusted by the aviation community.
All	Crowd Sourced Weather/MESONET	Trust greatly depends on the source of the data. Crowd sourced data is viewed as a supplemental source and some data points may not be accurate.
All	Marine Forecast and Buoy Information	Trusted and validated to be a strong predictor of weather near the coastline.



Question 4 (Continued)

Participant (s)	Source	Level of Trust/Reason
All	Weather Observers	Trust in weather observers varies from observer to observer. Pilots factor in the knowledge of the observer and if the observer or town needs a cargo delivery or other service.
All	PIREPs, AIRMETs, SIGMETs	All participants trust PIREPs, AIRMETs and SIGMETs but factor in difference in airplane equipment, changing weather conditions and flight rules into decision making.
AAWU/WFO	Satellite	Meteorologists trust satellite data as satellites are a standard tool used by meteorologists.
AAWU/WFO	Buffkit	Trusted by meteorologists and used by the National Weather Service to provide a high resolution vertical profile of atmospheric conditions.
AAWU/WFO	Wind, up slope and down slope	Wind measurements are a trusted weather observation. Meteorologists use wind information to determine cloud formation and movement.
AAWU/WFO	Conceptual models	Meteorologists use multiple conceptual models. Trust in the models are dependent on forecast time and bias in the model, models are information but not absolute truth.



Question 4

How does this supplemental information affect your decision making?

- GA and Part 135 Pilots
 - Additional information increases confidence in decision making.
 - Communicating with a weather observer or a person at the arrival airport aids pilots in making go/no decisions, access to runway conditions and ideal landing direction.
 - Combining weather camera data with other information helps in making go-no-go decisions.
 - Determining trends in weather helps to determine the big picture to identify if both the flight and return trip to the home airport are possible.
- AAWU and WFO Meteorologists
 - The supplemental information gives meteorologists more assurance in the weather information briefed by filling in missing information and provide a big picture view of the current and forecasted weather.
 - Supplemental information can be used to manually correct automated observations so meteorologists can have confidence in the data briefed.
- FAA Flight Services
 - Supplemental observations provide additional information for FAA Flight Services to brief pilots, which provides more merit to the forecasted information.



Question 5

If you were given ceiling observations from an uncertified data source, how would you use that information?

- All groups
 - Would use the uncertified data source as additional information. Performance validation of the uncertified data source was important to all participants.
- AAWU and WFO meteorologists
 - Would use uncertified data as another source of data to see trends and determine the forecast.
 - After performance of the uncertified data source is validated, would use data points to brief pilots.
- FAA Flight Services
 - Would use the information to provide and develop weather briefings.



Question 6

What limitations would uncertified observations pose versus certified observations?

- GA and Part 135 Pilots
 - VFR pilots do not have limitations with uncertified observations and would use uncertified observations to make go-no-go decisions.
 - IFR pilots can not use uncertified observations to file, depart, and land IFR.
- WFO Meteorologists
 - Can not use uncertified observations to write a TAF otherwise would use the uncertified observations to help determine weather conditions.
- AAWU Meteorologists
 - No limitations, uncertified or certified observations are data that will be used to help determine weather conditions.
- FAA Flight Services
 - FAA Flight Service can use approved uncertified observations to aid in developing weather briefings.



Question 7

What operational issues would you encounter with an uncertified ceiling observations at departure, en route and arrival?

- GA and Part 135 pilots flying VFR would not have any operational issues.
- Inability to get goods and services to people in need due to IFR Part 135 pilots not able to depart and land IFR using uncertified ceiling observations.
- WFO meteorologists can not write a TAF using uncertified ceiling observation and would need to NIL (no items listed) the TAF site. TAFs can only be written using certified ceiling observations.



Question 8

In which geographical locations do you feel ceiling observations are needed the most? Why?

- Participants stated the mountain passes need additional ceiling information because weather conditions may be available at both ends of the pass but not in the middle, which causes a choke point for pilots and impacts safety.
- Airports throughout the region have IFR approaches, however, some of these airports do not have weather observations which prevents pilots from filing, departing and landing IFR.
- Common VFR flight routes need ceiling observations to allow pilots to fly the safest route and altitude.



Question 8- Locations

In which geographical locations do you feel ceiling observations are needed the most?

Atigun Pass

Bethel

Brooks Range

Cape Spencer

Chenega

Chitna

College Fjord

Cook Inlet (West Side)

Copper River Zone

Dead Man's Reach

Elfin Cove

Healy

Howard Pass

Kake

Kassan

Kodiak Island

Kuskokwim Valley

Lake Clark Pass

Lynn Canal

Lituya

Merrill Pass

McCarthy

McKinley Park

Misty Fjords

Naked Island

Pelican

Port Alexander

Portage Pass

Prince Edward Island

Prince William Sound

Sisters Island

Snettisham

St. James Bay

Taku Point/Taku Inlet

Tatitlek

Tenakee

Yakataga

Note: This **IS NOT** a comprehensive list due to time restraints during interviews.

Question 9

What additional observations do you need in these locations?

- Ceiling
- Visibility (including visibility for smoke)
- Cloud types, bases and tops
- Precipitation
- Temperature and surface temperature
- Dew point
- Ability to view historical data for ceiling and visibility



Conclusions and Recommendations



Objective 1

Determine the issues associated with not having ceiling observations in the areas where they plan to take-off, land, or fly.

- Controlled flight into terrain (CFIT) accidents occur often in the passes because weather observations are not available throughout the pass which may force the pilot to turnaround at a choke point along the route.
- IFR pilots can not file, depart or land IFR legally without ceiling information and are forced to land VFR or face violation.
- Encountering C&V issues en route forces pilots to return to departure airport or deviate to an alternate site depending on fuel allowance.
- Part 135 business operators have contracts to get goods and services to people in remote areas. Lack of ceiling observations infringe on the business responsibility to keep customers happy and pilots safe.



Objective 1 (Continued)

- Medical transportation flights and air ambulances fly at short notice to get patients to medical facilities. Delay in departure, due to lack of ceiling observations, can limit valuable time to save a patient's life.
- Due to lack of ceiling observations, police response may be delayed, resulting in difficulty to enforce laws.
- TAFs can not be written without certified ceiling information, therefore, locations do not have a TAF.



Objective 2

Determine the operational impact of supplemental ceiling data vs. certified ceiling observations.

- All participants would benefit from supplemental ceiling data.
- Participants all agreed more data is needed in Alaska and could be uncertified or certified.
- Trust in supplemental ceiling data would develop over time and be used similarly to certified observations.
- GA and Part 135 pilots flying VFR would use both certified and uncertified data to make go-no-go decisions, plan routes and select altitudes.
- GA and Part 135 IFR pilots would use the certified and uncertified data for making go-no-go decisions, planning routes and altitudes but can only use certified ceiling information to file, depart and land IFR.



Objective 2 (Continued)

Determine the operational impact of supplemental ceiling data vs. certified ceiling observations.

- AAWU meteorologists would use uncertified ceiling information as additional data to form a complete weather forecast for all areas.
- The WFO meteorologists would use the supplemental data as additional information, however, certified ceiling information is needed to write a TAF.
- FAA Flight Services can use approved uncertified ceiling data to aid in developing weather briefings for pilots.



Objective 3

Identify the need for additional ceiling observations in Alaska and in particular, what geographic locations where observations are most needed.

- C&V observations are needed through out the mountain passes, particularly at the entrance, middle, and end, to prevent CFIT accidents which occur when pilots fly into unexpected low visibility conditions in the middle of a mountain pass and do not have room to turn around.
- C&V observations are needed in rural Alaska to get food, medical equipment and other supplies to residents in a timely manner and when needed.
- Police, medical services and schools use airplanes to provide necessary transportation and need C&V observations to safely transport people.
- IFR pilots land VFR when C&V observations are not available to land IFR legally, even when conditions do not support a VFR landing.



Objective 3 (Continued)

Identify the need for additional ceiling observations in Alaska and in particular, what geographic locations where observations are most needed.

- The locations which need additional C&V observations include:
 - Mountain pass routes to reduce CFIT accidents.
 - The most traveled VFR routes where weather observations are 20 to 50 miles apart and the weather conditions vary greatly.
 - Airports with IFR approaches without ceiling and visibility information which will allow pilots to land IFR legally.
- The consensus from all the participants is that additional ceiling and visibility observations are needed throughout Alaska to reduce risk and increase safety.



Recommendations



Recommendations

- Assess the feasibility of providing more C&V weather observations, certified or uncertified, throughout Alaska to:
 - Reduce risk and increase safety for all pilots.
 - Provide a complete weather forecast for all geographic areas.
 - Help provide more efficient and adequate services, such as medical and law enforcement, to all geographic areas.
- Recommend defining an implementation strategy to provide certified weather observations at airports with IFR approaches, reducing the need to risk safety by flying VFR when conditions are IFR.

