



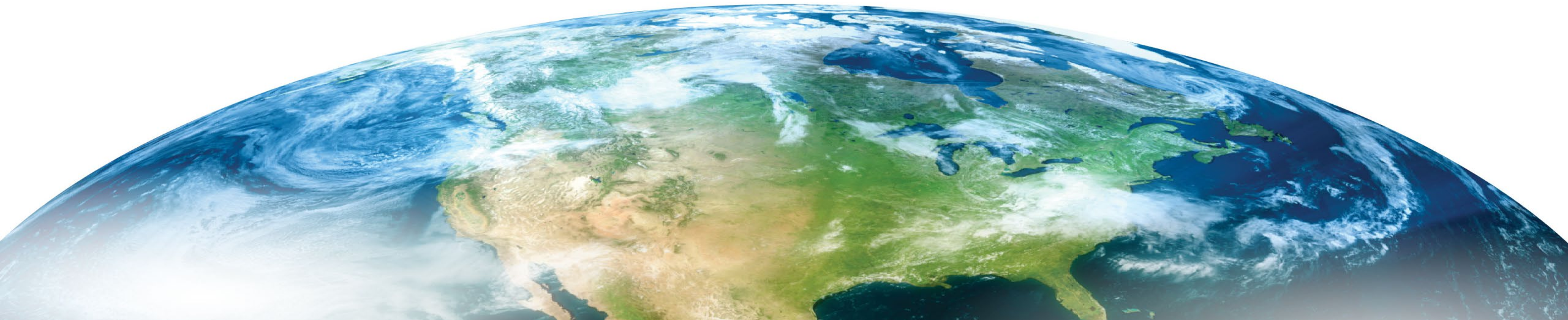
Next**GEN**

Icing Product Alaska-Diagnosis Cognitive Walkthrough Interview Results

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Date: January 2020



Topics

- Introduction
- Background and Objectives
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Introduction



Introduction

- ANG-C61 funded research and development focused on improving icing products to support aviation in Alaska.
- The Aviation Weather Research Program (AWRP) funded the National Center for Atmospheric Research (NCAR) In-Flight Icing Product Development Team (IFIPDT) to develop an icing diagnosing and forecasting product.
- The Aviation Weather Demonstration & Evaluation (AWDE) Services team (ANG-C63) was tasked to gather user input regarding the suitability and usability of the Icing Product Alaska (IPA) Diagnosis (IPA-D) product.



Background and Objectives



Icing Product Alaska

- IPA is capable of diagnosing, forecasting and displaying icing probability, severity, and super-cooled large drop potential.
- The forecast product was fielded as experimental and to date has received positive feedback for the product's operational usefulness and suitability by several user groups, including the Alaskan Aviation Weather Unit (AAWU).
- The current assessment focused on determining the operational environment and potential use of the IPA-D product.
- AWDE was tasked to conduct exploratory interviews with several user groups to obtain user feedback to support the development of use cases.
- The use cases will be used as the foundation for developing the IPA-D Concept of Operations (CONOPS).



Objectives

- Determine if IPA-D provides operational decision-making support for the AAWU Meteorologist, Part 135/121 Pilots and Dispatchers, and GA Pilots located in the Alaska region.
- Develop use cases based on participant feedback regarding the product's support for operational decision-making.
- Provide on-going support for the CONOPS development.



Cognitive Walkthrough 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 Flight Services
 - 2 Team members from the FAA Alaska Camera Program
 - October 8th Anchorage, Alaska
 - 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
 - 1 General Aviation Pilot
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Participant Summary

Total	# Completed Questionnaire	User Group	Primary Geographic Flying Region	Aircraft Certified for Icing		Average Flight Hours	Formal Training for Icing Products		How Often Icing is used for Decision Making (# of responses in parenthesis)
				Yes	No		Yes	No	
11	6	Part 135	Western, Southeast, Southwest, South, North, South Central	4	1	56,583	4	2	(3) Sometimes (2) Rarely (1) Never
1	1	Part 121	Statewide						
5	4	GA Pilot	South Central, Interior, South Central, North Slope	0	4	8,900	2	2	(1) Often (2) Sometimes (1) Rarely
2		FAA Camera Program*	--	--	--	--	--	--	--
7		AAWU*	--	--	--	--	--	--	--
6		FAA Flight Services*	--	--	--	--	--	--	--
32		Total							

**Note: Demographic questionnaires and product questionnaires were not given to FAA Flight Services and Camera Program participants or AAWU Meteorologists because the questionnaires focused on pilot flight planning.*



Approach

- Cognitive walkthroughs were conducted with multiple participants in attendance.
- Each cognitive walkthrough consisted of:
 - A description of IPA-D, evaluation, protocols, and participants expectations.
 - Completion of a demographic questionnaire to gather data about flight experience, training, and icing products used.
 - Two scenarios for pilots:
 - Participants were asked to consider planning a flight when icing conditions are present; however, those conditions were not expected to have a significant impact on the flight.
 - Participants were asked to consider planning for a flight expected to encounter severe icing conditions which are expected to have a significant impact on the flight.
 - For the AAWU Meteorologists and FAA Flight Services scenarios focused on operational tasks performed when icing conditions are present.
- During the scenarios, participants were asked to walk through each step in the decision making process while planning a flight.



Approach Continued

- During the scenarios, the AWDE Team collected data using Structured Interview Questions which:
 - Allowed participants to provide comments regarding the use of IPA-D for strategic decision making.
 - Focused on information used to support decisions, utility of forecast characteristics, and any additional information participants wanted to make available.
- After completion of the two scenarios and interacting with the products, pilot 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



IPA-D Questionnaire Results

Question <small>(Strongly Agree=5, Agree=4, Neither Agree nor Disagree=3, Disagree=2, Strongly Disagree=1)</small>	Part 135 Pilot (N=6) Mean	GA Pilot (N=4) Mean	FAA Camera Team (N=2) Mean
1. IPA-D information would be suitable for use in my operational environment.	4.67	4.5	5
2. IPA-D information would provide a consistent view of icing conditions over the Alaskan region.	4.33	4.5	5
3. IPA-D information would help reduce the risk of flying into icing conditions.	4.83	4.5	5
4. IPA-D would provide improved icing information in a timely manner to support safe and efficient routes in the Alaskan region.	4.67	4.25	4
5. IPA-D information would allow you to proactively plan and execute efficient icing-related route deviations and reroutes.	4.33	4.5	5
6. IPA-D information would help decrease risk along flight routes associated with icing conditions.	4.5	4.25	5
7. IPA-D information would improve situational awareness of icing coverage and severity.	4.67	4.67	4



IPA-D Questionnaire Results

Question <small>(Strongly Agree=5, Agree=4, Neither Agree nor Disagree=3, Disagree=2, Strongly Disagree=1)</small>	Part 135 Pilot (N=6) Mean	GA Pilot (N=4) Mean	FAA Camera Team (N=2) Mean
8. IPA-D information would support the identification of areas with icing conditions.	4.67	5	5
9. IPA-D information would provide more time to develop and implement flight plans.	4	4.67	4
10. IPA-D information would help predict flight routes.	4	4.67	5
11. Using IPA-D would reduce my risk associated with icing.	4	4.33	5
12. IPA-D would aid me in my flight planning decision making.	4.33	5	4
13. The information IPA-D provided sufficiently supported my decision making process.	3.67	4.67	4
14. I would use IPA-D on a daily basis for flight planning.	4.33	4.33	4
15. I would use both IPA-D and IPA-F together to help inform go-no-go decisions.	4.5	5	4

Part 135 Pilots stated the inability to give IPA-D a higher rating for providing sufficient support in decision making is due to the inability to validate the analysis over time.



Questionnaire Comments

- (Part 135) The 0-2 hour forecast is just as useful and in many situations more useful, than the extended forecasts because all flights are less than two hours.
- (GA Pilot) The 0-2 hour forecast would definitely help with go-no-go decisions.
- (All) The product needs a better zoom capability that provides the capability to stay zoomed in within an average of about a 100 mile radius around routes.
- (All) The term “heavy” should be changed to “severe”, severe is the term used in PIREPs and has a significant meaning with regards to its impact on the aircraft.
- (All) The definitions for severity (trace, light, moderate, and heavy) need to be well defined.
- (All) The product should display channels and passes.
- (All) The product needs a legend for SLD.



Structured Interview Question Results



Question 1A

What specific icing information is most important for go-no-go decisions?

- Part 135 Pilots*:
 - Freezing level
 - Super cooled large droplets
 - Freezing rain
 - Moderate to severe icing
 - Severity and duration
 - Soft rime ice
 - Clear ice
 - Surface temperatures
- Part 121 Pilot:
 - Icing is not a factor for go-no-go decisions (flies a 737 aircraft)
- GA Pilots:
 - Any potential for icing (Trace Icing)
 - Severity
 - Freezing level
 - Freezing rain

**Part 135 Pilots are not making go-no-go decisions based on icing but are making route and altitude decisions based on icing severity and duration*

Question 1B

How far in advance is icing information viewed?

- Part 135 Pilots:
 - Overall, anything beyond a 6 hour icing forecast is not reliable.
 - Icing information is reviewed 2-3 hours before flights.
- Part 121 Pilot: Flies a 737 aircraft, fully equipped for icing conditions. However, when icing equipment is damaged or not working properly, to ensure Master Minimum Equipment List (MMEL) standards are met, icing severity will be viewed.
- GA Pilots:
 - Forecasts are viewed a week out to check for trends and possibilities of icing.
 - Icing information is viewed at least 24 hours prior to flight to look at trends.
 - Icing information is reviewed 0-3 hours before flights.



Question 1C

How often are flights taken within 2-3 lead times?

- Part 135 Pilots:
 - A schedule of flights (e.g., FedEx and USPS) are typically posted approximately a week in advance, therefore, the 2-3 hour lead times does not occur.
 - Depending on the season (e.g., tourists, hunters) lead times of 2-3 hours prior to a flight occurs several times a day.
- Part 121 Pilot: Routine schedules are in place for the commercial airline, therefore, 2-3 hour lead times do not occur.
- GA Pilots:
 - 2-3 hour lead times occur for emergency purposes.
 - Typical flights are planned almost a week in advance.



Question 2

What is your threshold, related to icing, for go-no-go decisions?

- Part 135 Pilots:
 - Severity (moderate) and duration are factors because pilots need to know how severe the icing is and how long the icing will be a factor.
 - The freezing level is critical to know so pilots can determine safe flight altitudes.
- Part 121 Pilot:
 - Icing information will be viewed if icing equipment is not working properly, this is in accordance with the MMEL.
 - The icing information would be used to determine the severity and location.
- GA Pilots:
 - Any potential for icing and freezing rain is a concern.
 - Freezing level is critical so pilots can make the decision to stay at a lower altitude than the freezing level because most aircraft are not equipped to deal with any icing conditions.
 - The Severity + SLD and Probability plots would be used in conjunction with one another for go-no-go decisions.



Question 3

How often do you use icing information to determine estimated departure time (EDT) and route?

- Part 135 Pilots:
 - IPA would provide the capability to see icing conditions along the route and at destination allowing pilots to determine the optimal altitude and route for flying.
 - During the Winter, Fall and cloudy days, icing information is consistently viewed starting the night prior to the flight through departure.
 - Icing severity conditions provide pilots the information to determine the need to take alternate routes and/or fly at different altitudes, which may result in adding more gas prior to take-off.
- Part 121 Pilot: Flying a 737 aircraft, fully equipped, icing is not a deciding factor for ETD or route.
- GA Pilots:
 - Icing information is continuously monitored because aircraft are not equipped to deal with icing conditions.
 - Icing information provides pilots the information to determine the need to take alternate routes, fly at lower altitudes, and/or stay grounded.



Question 4

Would you use IPA-D, routinely, to aid in go-no-go decision making? If so, how and when would you use IPA-D? If not, why?

- Part 135 and GA Pilots stated IPA-D:
 - Would be used as a standard go-to product for supplemental icing information.
 - Would be used as supplemental information along with other weather products.
 - Would be consistently used to view icing conditions 0-3 hours prior to departure.
 - Would be used to determine icing conditions along routes and destination.
 - Would aid in determining routes and safe altitudes.
 - Would aid GA Pilots in making go-no-go decisions.
 - Would aid Part 135 Pilots in determining the best location to increase altitude to get out of more severe icing conditions.
 - Would aid Part 135 Pilots to determine if flying VFR or IFR.



Question 5

If you could change the IPA-D product in any way, what would you change/add? How would those changes support your decision-making?

- Part 135, GA Pilots, FAA Camera Team:
 - Add freezing level(s)
 - Enhance the zoom capability to zoom into specific locations surrounding routes.
 - Add overlays such as:
 - PIREPs, SIGMETs, and AIRMETs
 - Channels and passes
 - Airports
 - Major Cities
 - Add temperature
 - Add surface temperature
 - Add SLD legend
 - The term Heavy should be Severe, this is consistent with the terminology used and what is used in the PIREPs.
 - Provide clear and concise definitions for icing terminology (trace, light, moderate, and heavy)



Question 5 Continued

If you could change the IPA-D product in any way, what would you change/add? How would those changes support your decision-making?

- AAWU Meteorologists:
 - Add freezing level(s)
 - Add sector and FIR boundaries
 - Add overlays such as:
 - PIREPs
 - Jet routes
 - Major airports
 - FAA runway identifiers
 - Channels and passes
 - Vertical layers should be available in the following buckets:
 - 1000-5000
 - 6000-10000
 - 11000-15000
 - 16000-20000
 - 21000-25000
 - The term Heavy should be Severe, this is consistent with the terminology used and what is used in the PIREPs.



Question 5 Continued

If you could change the IPA-D product in any way, what would you change/add? How would those changes support your decision-making?

- FAA Flight Services:
 - For use IPA would have to be integrated into OASIS
 - Add freezing level(s)
 - Enhance the zoom capability to zoom into specific locations surrounding routes.
 - Add overlays such as:
 - PIREPs
 - Major airports
 - FAA runway identifiers
 - Channels and passes
 - Clouds
 - Temperature
 - The term Heavy should be Severe, this is consistent with the terminology used in products such as PIREPs.



Conclusions and Recommendations



Objective 1

Determine if IPA-D provides operational decision-making support for AAWU Meteorologist, Part 135/121 Pilots and Dispatchers, and GA Pilots located in the Alaska region.

- All participants (Part 135 Pilots, Part 121 Pilots, GA Pilots, AAWU Meteorologists, and FAA Flight Services) providing feedback stated IPA-D would be used in an operational environment.
- Specifically, participants stated the 0-2 hour forecast is ideal for several reasons highlighted below:
 - Many flights are on-demand, with little notice.
 - Many flights, roundtrip, are less than 3 hours.
 - Capability to see very specific icing conditions which may result in safer flying.
- All participants stated a preference for the Severity + SLD and Probability Plots.
 - AAWU Meteorologists stated a need to ensure users are not overloaded with data and given too many options.
 - Pilots stated a need to keep information simple and easy to use.



Objective 2

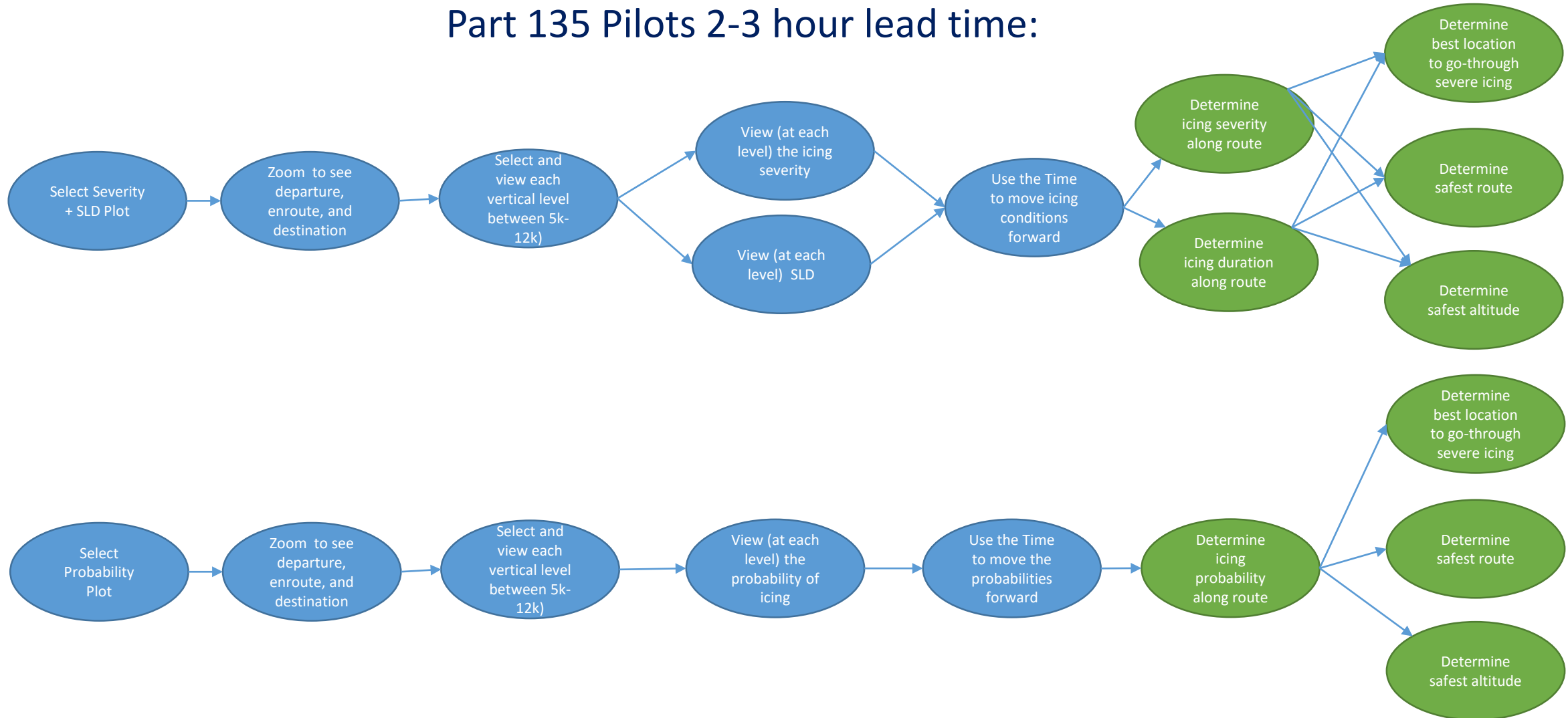
Develop use cases for the participants that IPA-D operationally provides support for decision-making

- Uses cases will be developed for the following user groups:
 - Part 135 Pilots
 - GA Pilots
 - AAWU Meteorologists
 - FAA Flight Services
- One draft Use Case for Part 135 Pilots is located on the next slide.



Part 135 Pilot Use Case

Part 135 Pilots 2-3 hour lead time:



Recommendations

- The IPA-D product was operationally useful for all user groups involved (Part 135 Pilots, Part 121 Pilots, GA Pilots, FAA Camera Team, AAWU Meteorologists, and FAA Flight Services), recommend deploying the IPA products as supplemental data for icing diagnosis and forecast information.
- For pilots and FAA Flight Services, operational use primarily consisted of the Severity + SLD and Probability plots, recommend removing the other 3 plots: Severity, Severity (Prob > 25%), and Severity (Prob > 50%). This would aid in reducing:
 - Operational workload and
 - Mental gymnastics in interpreting and consolidating multiple data displays.
- Recommend conducting a 2-4 week data collection period to further define operational use for Part 135 Pilots, GA Pilots, AAWU Meteorologists, and FAA Flight Services.



Next Steps



Next Steps

- Conduct a 2-4 week operational evaluation with select Part 135 Pilots, Part 135 Dispatchers, and GA Pilots to gather additional feedback focused on the operational use of IPA-D
- Develop use cases for:
 - Part 135 Pilots
 - GA Pilots
 - AAWU Meteorologists
 - FAA Flight Services
- Aid in the development of the IPA-D Concept of Operations (CONOPs).

