



Winter Weather Aviation Hazards

**Fort Worth Center Weather Service Unit
National Weather Service**



Winter Weather Presents Unique Hazards

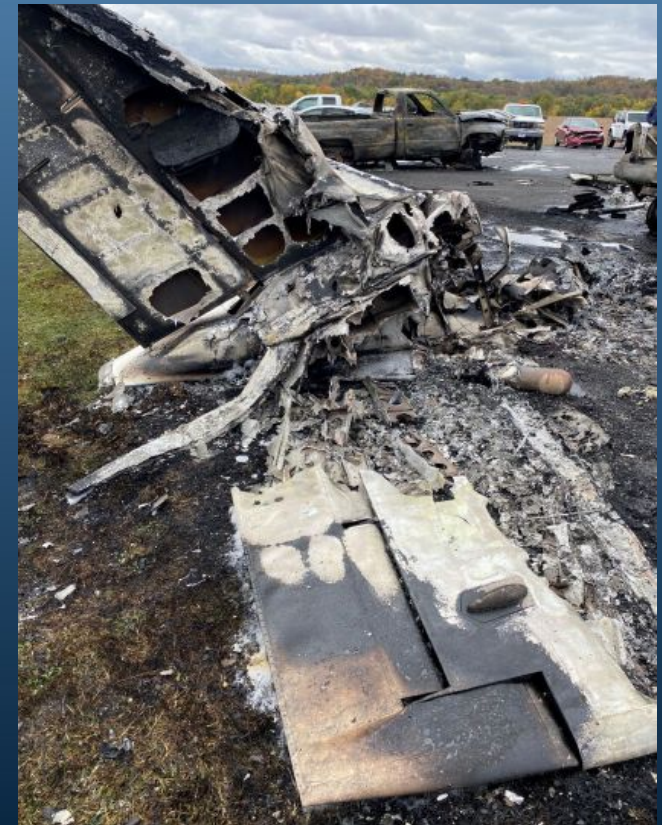


SWA Flight 1248, 2005

Source: NTSB (<https://www.nts.gov/investigations/AccidentReports/Reports/AAR0706.pdf>)

N515GK, 2022

Source: NTSB (<https://data.nts.gov/Docket?ProjectID=106151>)





Winter Weather Hazards



Outline of Topics We Will Cover:

- **Turbulence**
 - **CAT (Clear Air Turbulence, Jet-stream induced)**
- **Winter Precipitation Types**
- **Icing**
 - **Severity**
 - **Types**
- **Low Cloud Ceilings**
- **Fog**
- **Wind Shear**
- **AIRMETs/SIGMETs/CWAs/PIREPs**
- **Emergency Flight Assistance**



Controller Requirements



- Advise pilots of hazardous weather that may impact operations within 150NM of their sector or area of jurisdiction.
- Solicit PIREPs when requested or when one of the following conditions exists or is forecast:
 - Ceilings at or below 5,000 feet
 - Visibility at or less than 5 miles
 - Thunderstorms or related phenomena
 - Turbulence of moderate degree or greater
 - Icing of light degree or greater
- Issue pertinent information on observed/reported weather and chaff areas...

Excerpts from 7110.65V Ch. 2-6

Why This Training?

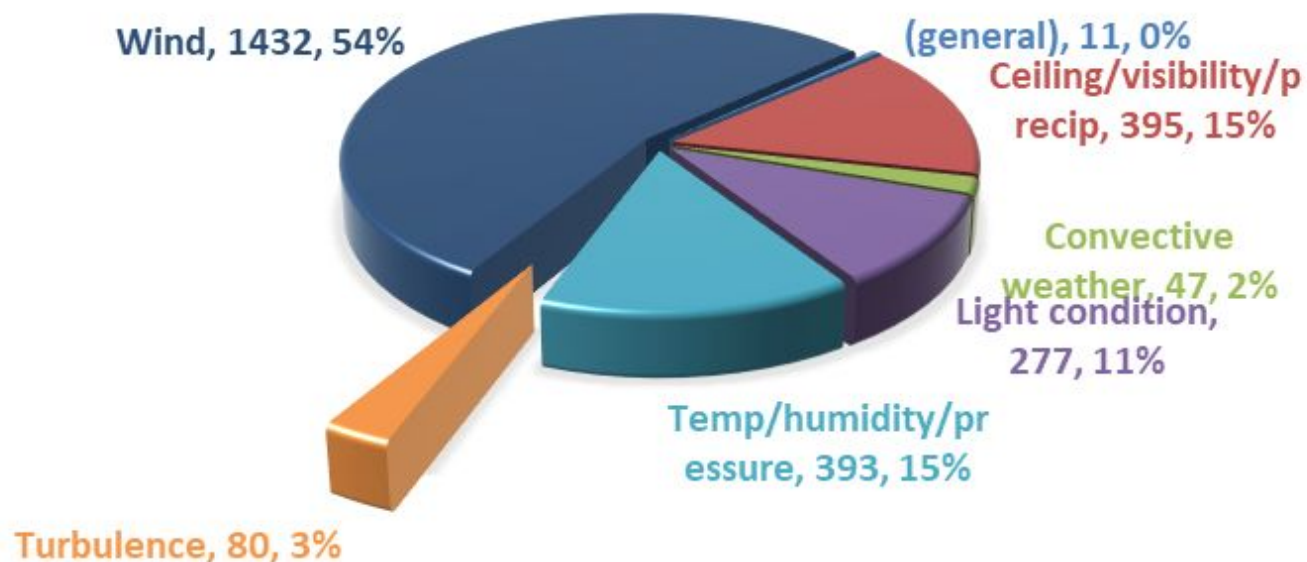
Part 121 Accidents and Fatalities by Weather-Related Findings and Year, 2013-2018									
	<i>Weather-Related Accidents</i>			<i>All Accidents</i>			<i>% Weather-Related</i>		
Year	Accidents	Fatal Accidents	Fatalities	Accidents	Fatal Accidents	Fatalities	Accidents	Accidents	Fatalities
Total	61	1	2	182	3	10	34%	33%	20%
Part 135 Accidents and Fatalities by Weather-Related Findings and Year, 2013-2018									
	<i>Weather-Related Accidents</i>			<i>All Accidents</i>			<i>% Weather-Related</i>		
Year	Accidents	Fatal Accidents	Fatalities	Accidents	Fatal Accidents	Fatalities	Accidents	Accidents	Fatalities
Total	84	22	61	263	52	138	32%	42%	44%
General Aviation Accidents and Fatalities by Weather-Related Findings and Year, 2013-2018									
	<i>Weather-Related Accidents</i>			<i>All Accidents</i>			<i>% Weather-Related</i>		
Year	Accidents	Fatal Accidents	Fatalities	Accidents	Fatal Accidents	Fatalities	Accidents	Accidents	Fatalities
Total	1750	385	730	7510	1364	2329	23%	28%	31%
Grand Total	1895	408	793	7955	1419	2477	24%	29%	32%

Source: NTSB



Turbulence

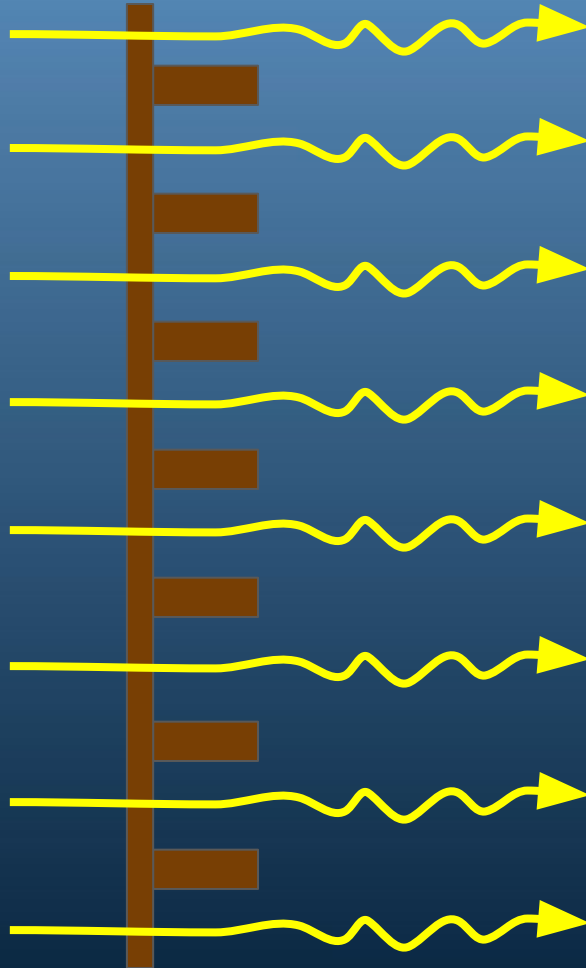
NTSB AVIATION WEATHER FINDINGS 2013-2018





Turbulence

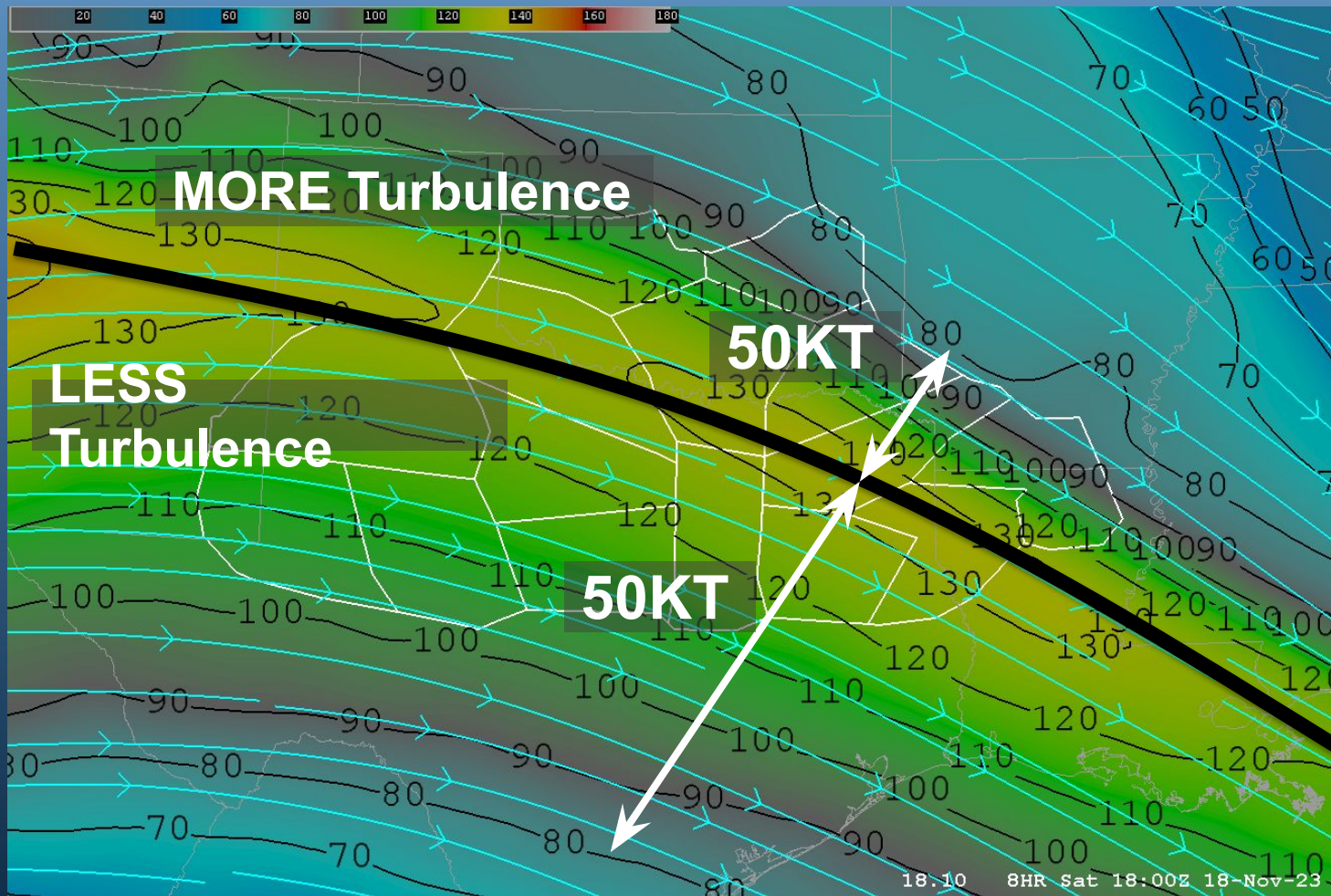
Like fluid flowing through a grid



- **Mechanical**
 - Not common across ZFW
- **Clear Air Turbulence (CAT)**
 - Most common inside ZFW
 - Caused by wind shear within jet stream
 - Abrupt changes in wind speed and/or direction



Example 1 : Jet Stream Turbulence Traversed Head-On



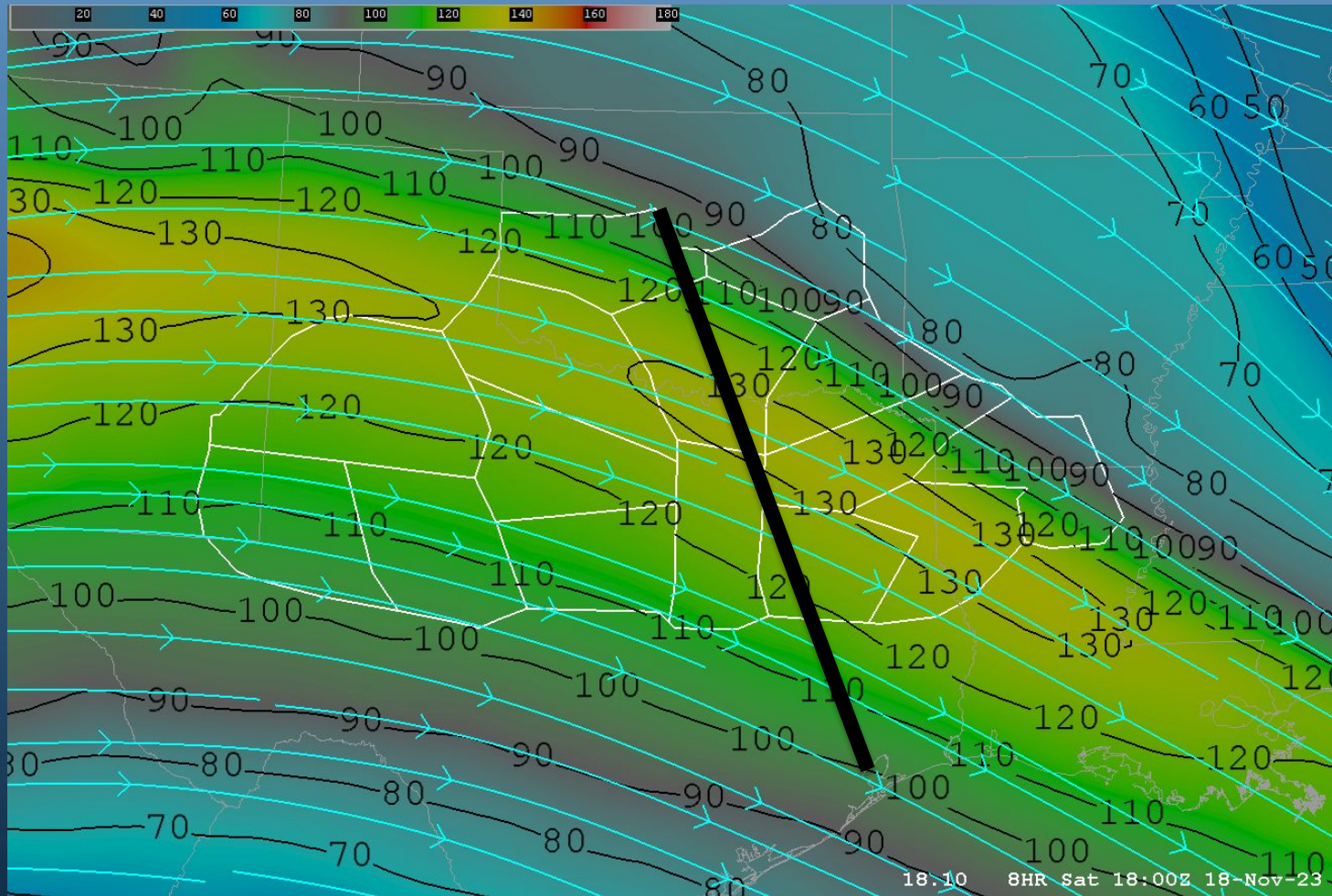
W

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E



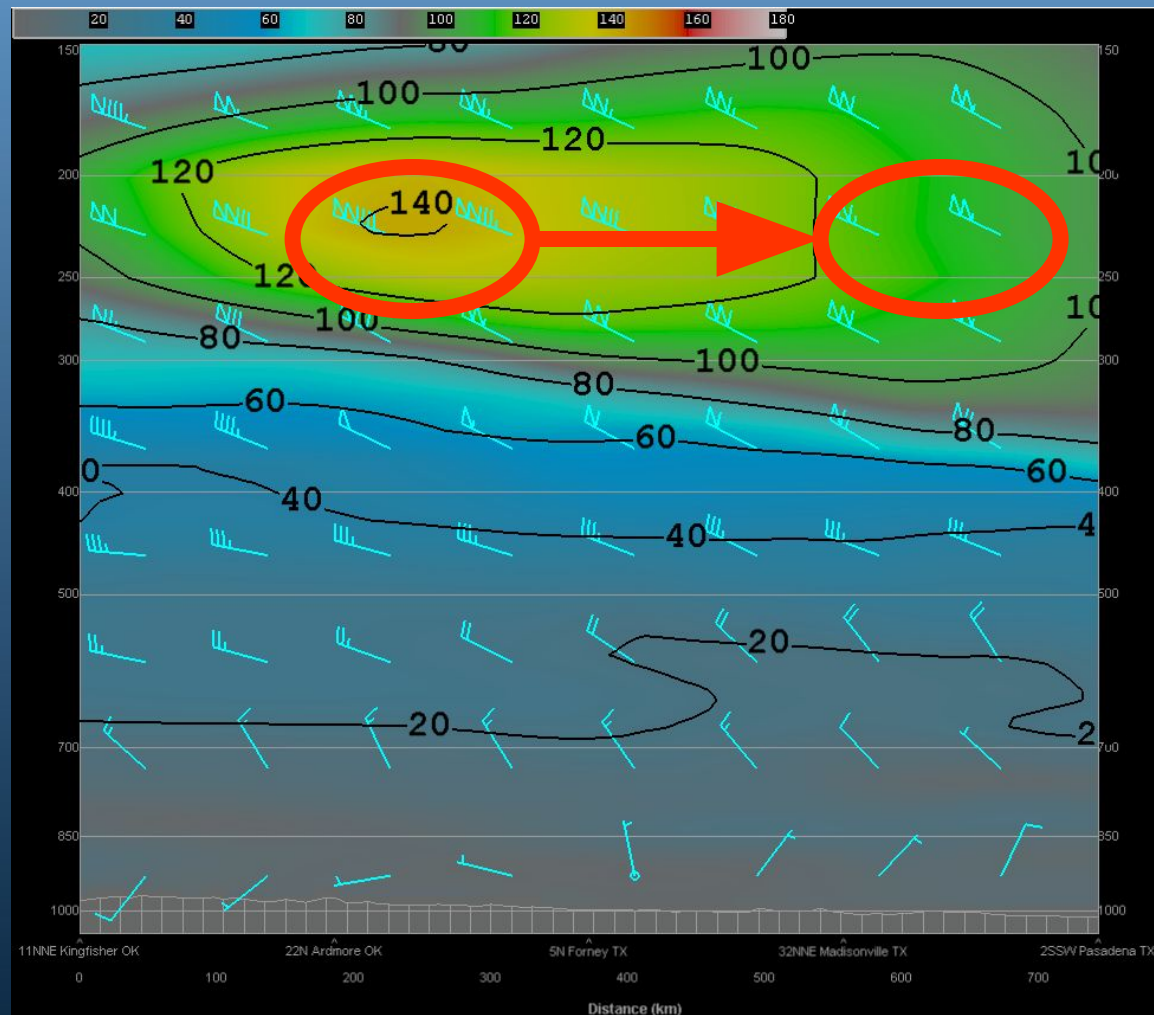
Example 2 : Jet Stream Turbulence Traversed Crosswise



18 Nov 2023



Example 2: Jet Stream Turbulence Traversed Crosswise



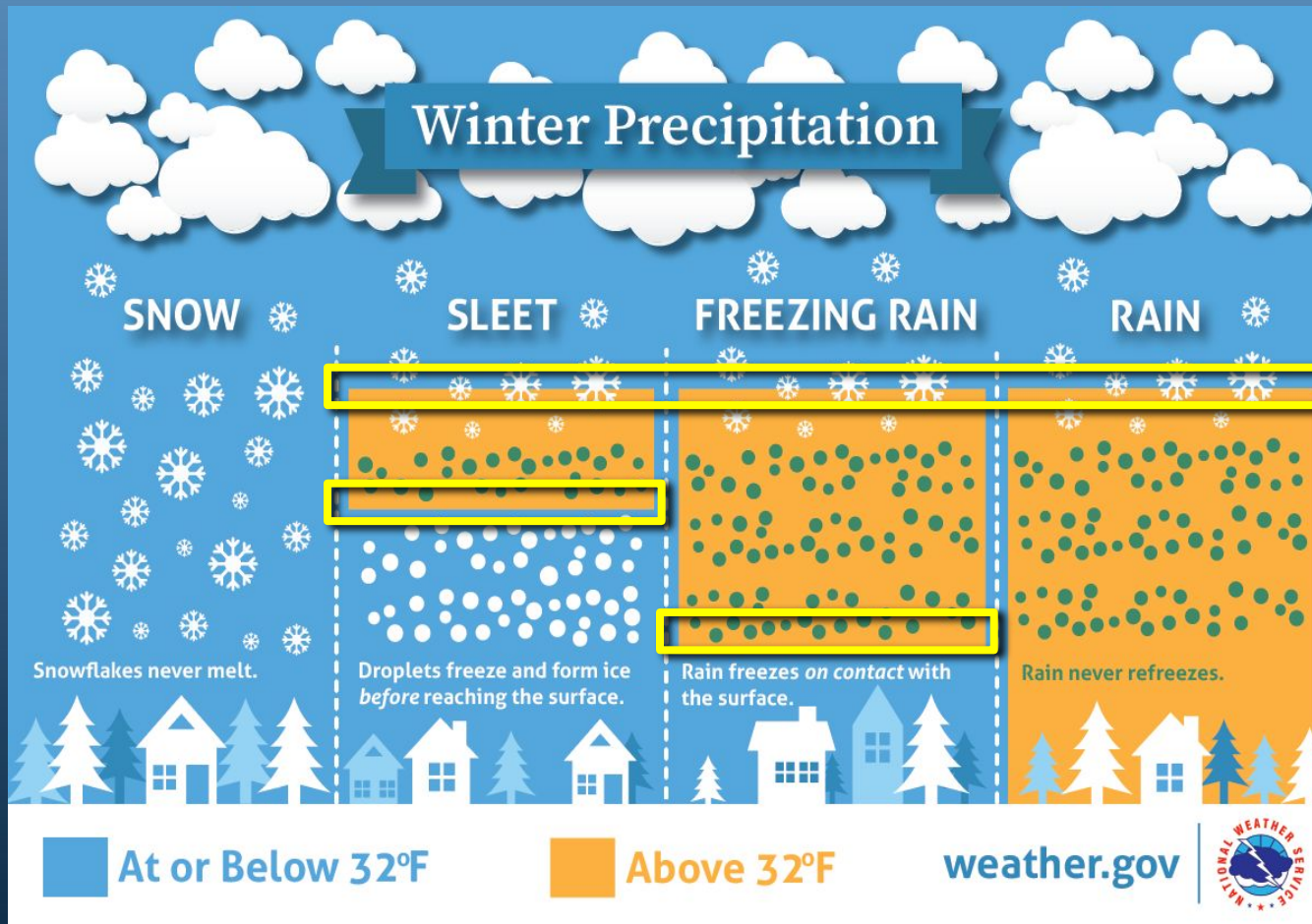
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Winter Precipitation Types and Icing Concerns



Yellow Boxes:

- Freezing levels where highest icing threat exist

Note:

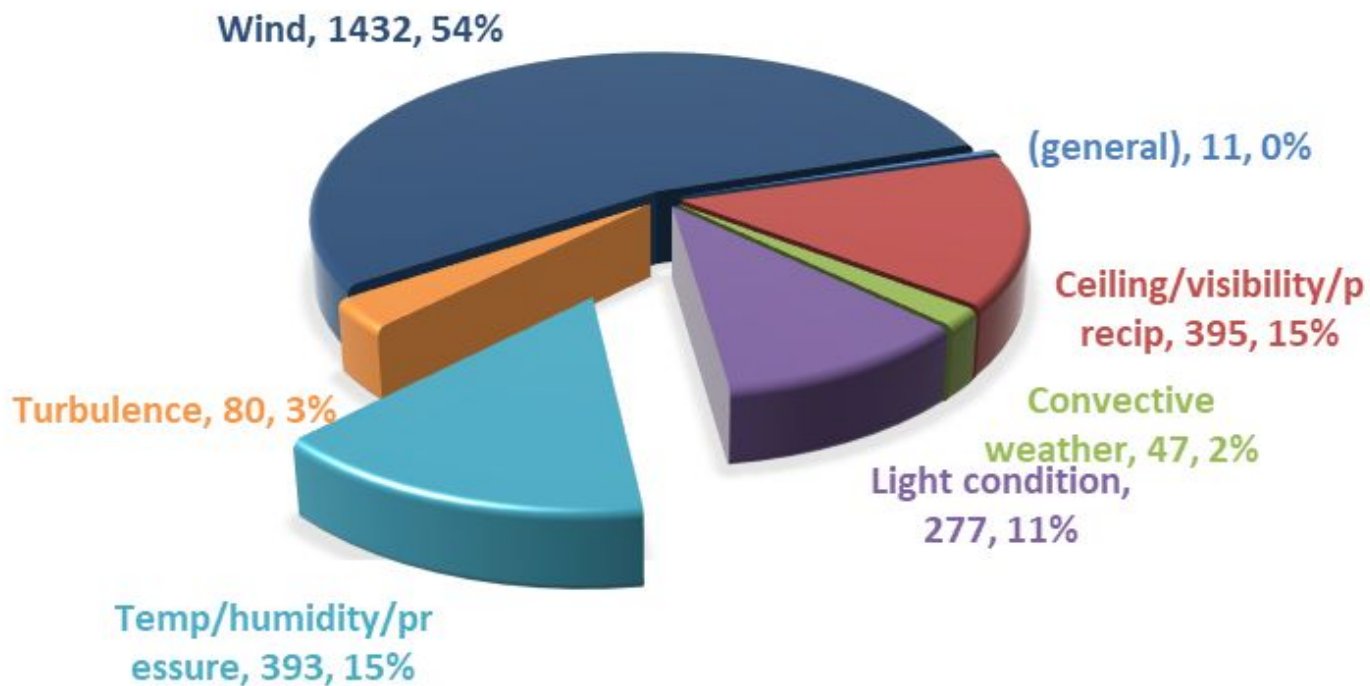
- Multiple freezing levels for Sleet and Freezing Rain - **high icing risk!**



Icing



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Icing



Source: Federal Aviation Administration (<https://www.faa.gov/nextgen/programs/weather/awrp/ifi>)



Aircraft Icing Severity



- **Trace** - Ice becomes perceptible. Deicing equipment not used unless encountered longer than 1 hour.
- **Light** - Ice accumulation problematic if encountered longer than 1 hour. Deicing equipment restricts most accumulation.
- **Moderate** - Ice accumulation causes hazardous conditions in short encounters (<30 minutes). Use of deicing equipment or flight diversion is necessary.
- **Severe** - Ice accumulation is such that deicing equipment fails to reduce or control hazard. Immediate flight diversion is necessary.



Icing Type



Clear Ice

- -2° to -10° C
- Freezing precipitation in cumuliform clouds



Source: NWS WFO Lubbock

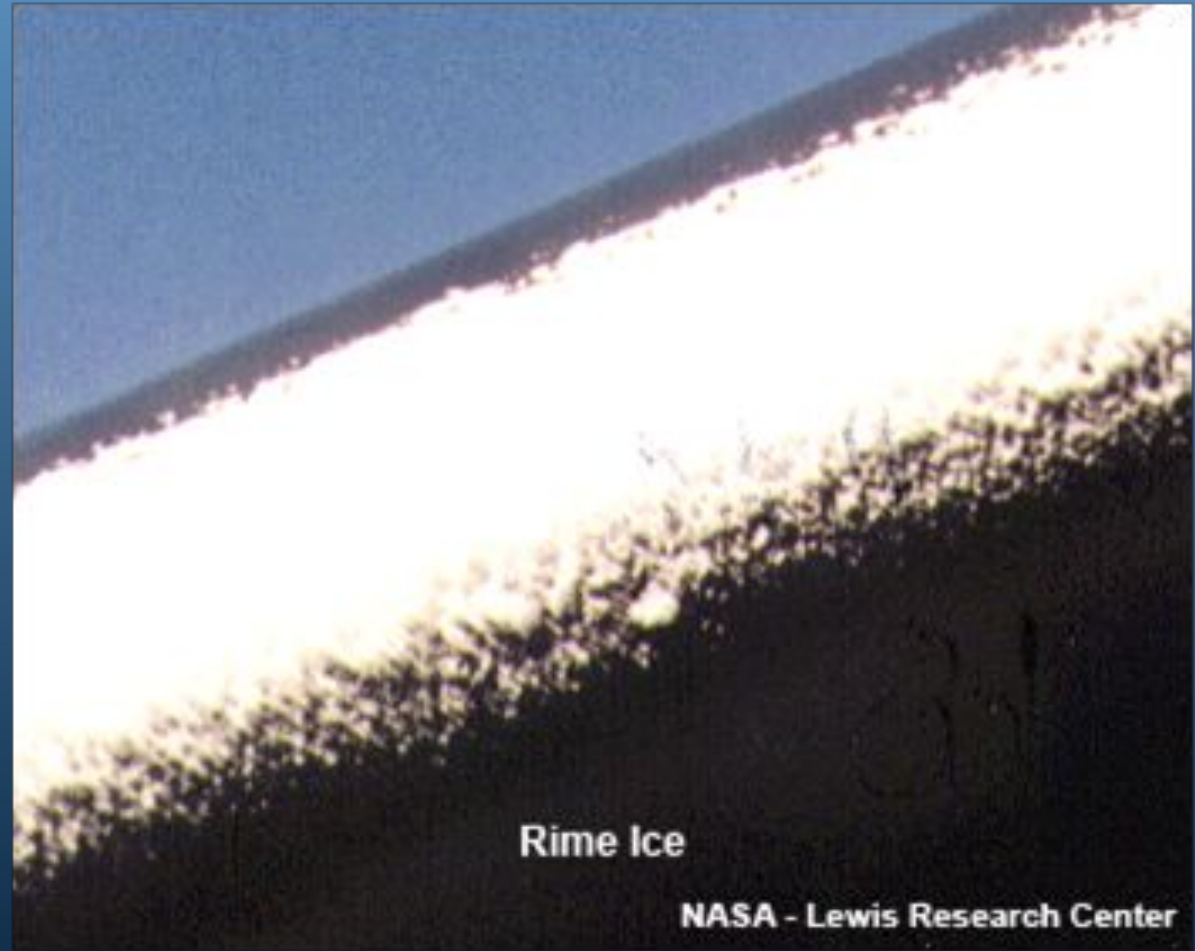
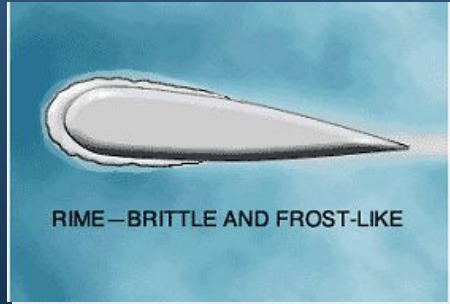


Icing Type



Rime Ice

- -2° to -22° C
- Light snow or dense cloud cover



Source: NWS CWSU Memphis (https://www.weather.gov/zme/safety_ice)

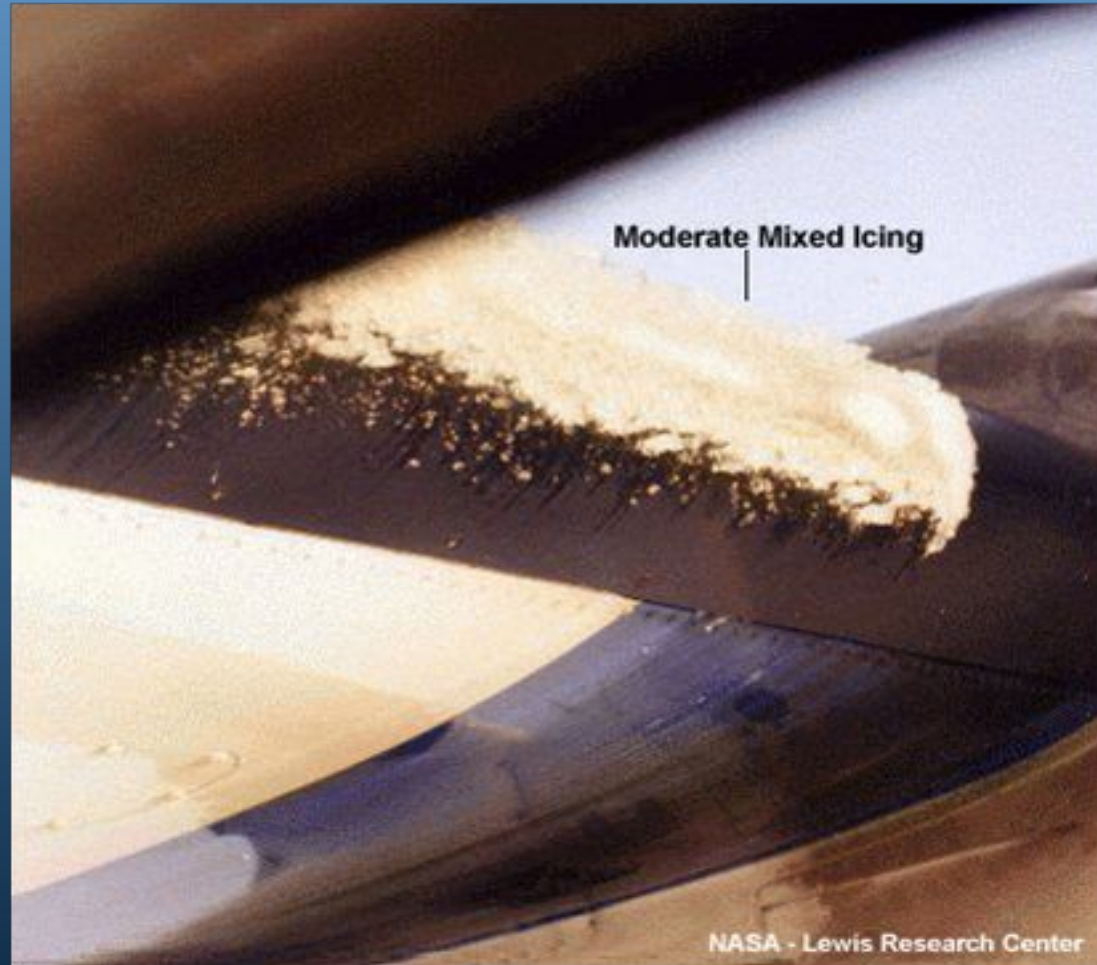


Icing Type



Mixed Ice

- -2° to -16° C
- Moderate or heavy snow with clouds

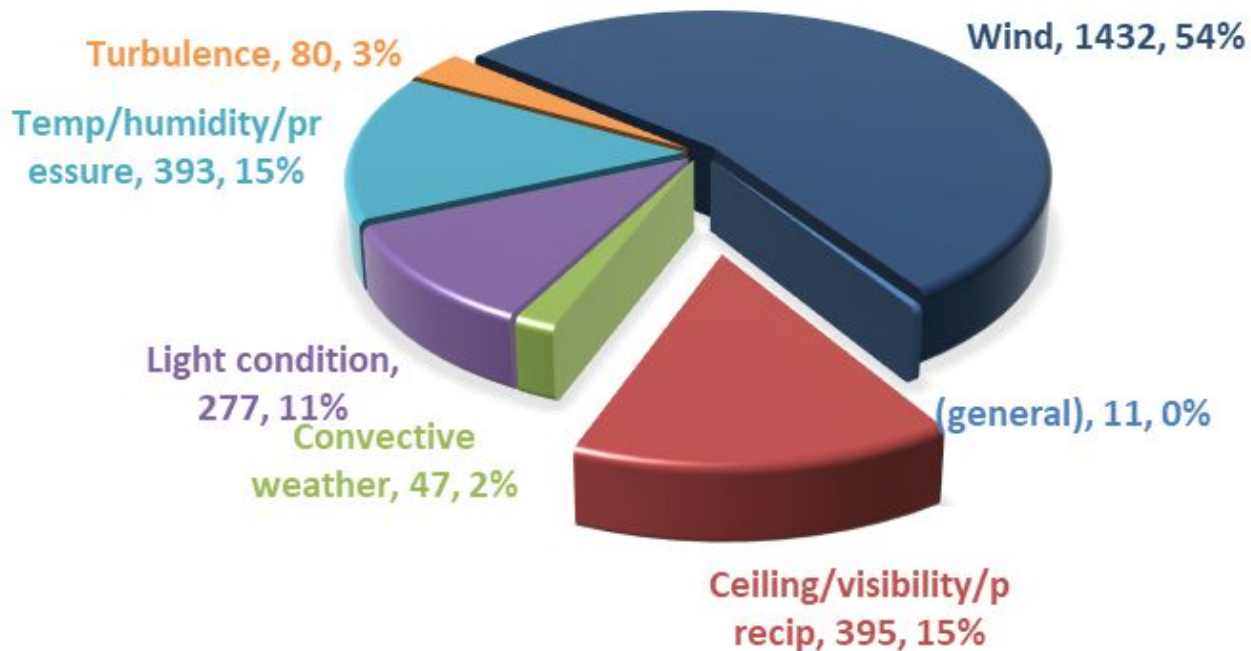


Source: NWS CWSU Memphis (https://www.weather.gov/zme/safety_ice)



IFR

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Not mutually exclusive. Total number of visibility/ceiling citations = 402.

Source: NTSB Aviation Accident and Incident Database



Low Cloud Ceilings



- **Ceilings can change rapidly**
- **Reduce Airport Arrival Rates**

**Ceiling Minimums
Vary at Different
Airports**






Fog



© 2008 Roger Edwards

DFW Fog Event 2008

A photograph of an airplane on a runway, completely obscured by thick fog. The plane is a large commercial jet, and the fog is so dense that only the tail and part of the fuselage are visible. The runway and surrounding area are also shrouded in fog, creating a very low-visibility environment.

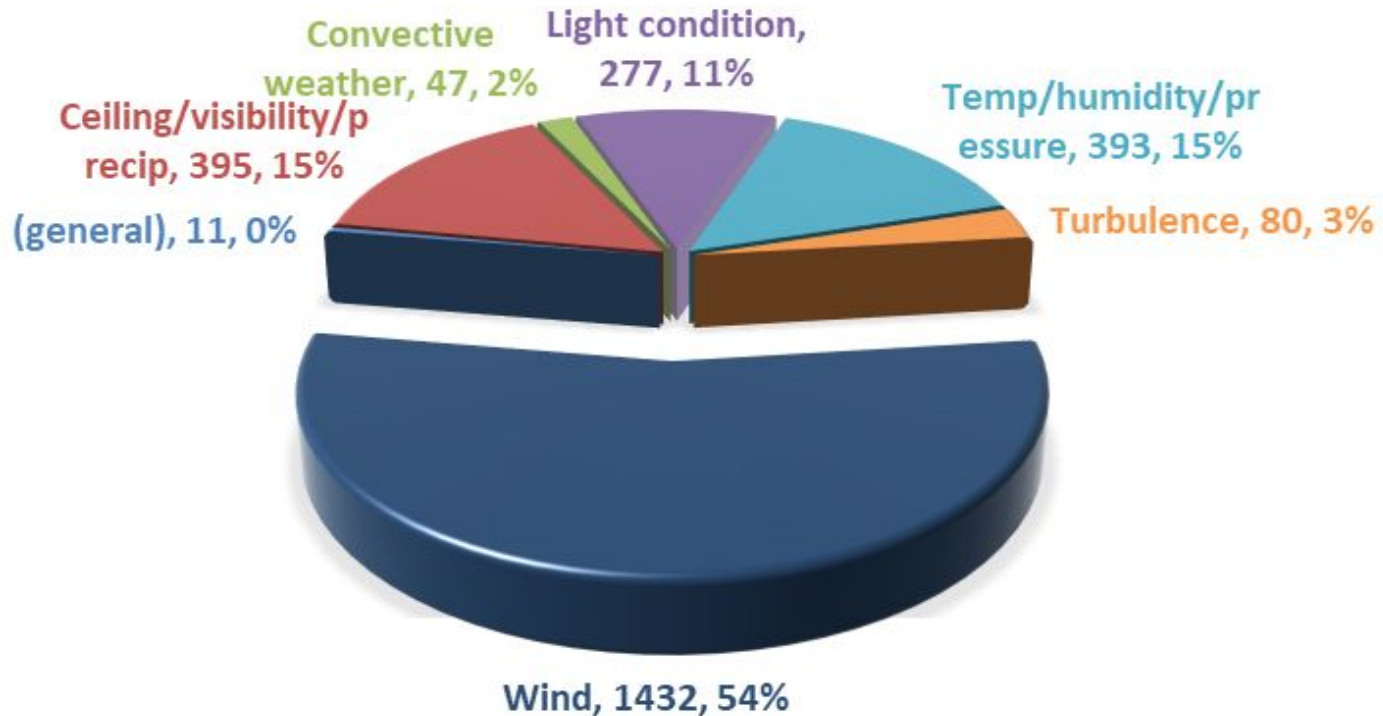
**Visibility
Minimums Vary at
Different Airports**



Wind



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Low-Level Wind Shear



- Cold Fronts
- Inversions





AIRMETs and SIGMETs



- **AIRMET (Airmen's Meteorological Information)**
 - ✓ **ADVISES e.g. MOD TURB/ICE/MULTIPLE FRZ LEVELS**
 - ✓ Issued by NWS Aviation Weather Center
 - ✓ Every 6 hours
 - ✓ Plotted on WARP

- **SIGMET (Significant Meteorological Information)**
 - ✓ **WARNS e.g. SEV TURB/ICE**
 - ✓ See SIGMET button on EDST
 - ✓ Issued by NWS Aviation Weather Center
 - ✓ Plotted on WARP



Center Weather Advisories



- CWA's (Center Weather Advisories)

- ✓ **ADVISE** potential hazards / **WARN** new hazards

- ✓ e.g. LIFR CONDS, SEV TURB, SEV ICE, Clear Ice (Light or greater intensity), Freezing Precipitation

- ✓ Issued by NWS Center Weather Service Unit

- ✓ Plotted on WARP



Importance of PIREPs



- Provide verification of forecasted hazards
- May change the forecast product, e.g. a Center Weather Advisory, AIRMET or SIGMET.

Help us help you!

PIREP FORM	
Pilot Weather Report → = Space Symbol	
3-Letter SA Identifier	
1. UA →	UUA →
	Routine Report Urgent Report
2. /OV →	Location:
3. /TM →	Time:
4. /FL	Altitude/Flight Level:
5. /TP →	Aircraft Type:
<i>Items 1 through 5 are mandatory for all PIREPs</i>	
6. /SK →	Sky Cover:
7. /WX →	Flight Visibility and Weather:
8. /TA →	Temperature (Celsius):
9. /WV →	Wind:
10. /TB →	Turbulence:
11. /IC →	Icing:
12. /RM →	Remarks:

FAA FORM 7110-2 (1-85) Supersedes Previous Edition Electronic Version (Adobe)



What can the CWSU meteorologist do to help?



The CWSU meteorologist will immediately lend support to the safety of the operation and can assist with the following:



Ceilings

The meteorologist will help guide aircraft towards the best direction or altitude.

Evaluation of PIREPs, METARs, estimated cloud bases/tops, and satellite imagery



Emergency Landings

The meteorologist quickly views METARs in the area of the aircraft and can provide viable options to land.

Note: The CWSU will not know which airport is open/runway length viable, but they can provide options that have sufficient weather conditions



Icing

The meteorologist can help guide aircraft towards best direction or altitude.

Evaluation of PIREPs, estimated freezing levels, and radar.



**We're a resource for you;
please use us!**

**Next time you come on shift
or return from a break,
stop in and check on the
weather in and around your
sector.**

Questions?