



NTSB Weather Related Accidents

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Friends and Partners in Aviation Weather

NTSB – Who We Are & Mission

Independent Federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation – railroad, highway, marine and pipeline.

- Determine probable cause of accidents and issue safety recommendations aimed at preventing future accidents.
- Carry out special studies concerning transportation safety and coordinate resources of the Federal Government and other organizations to provide assistance to victims and their family members.



Mission

Making transportation safer by conducting independent accident investigations, advocating safety improvements, and deciding pilots' and mariners' certification appeals.

U.S. Civil Aviation Accident Summary for 2022

	Total	Fatal	Fatalities	Flight Hours	Accidents per 100,000 hr	Fatal Rate 100,000 hr
Part 121 Air Carriers	20	1	1	17,972,372	0.112	0.0006
Part 135 Commuter & On-Demand Carriers	53	5	18	4,835,934	1.096	0.103
General Aviation	1,205	214	339	22,542,999	5.336	0.945

U.S. Civil Aviation	1,277 	220 	358
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Significant fatal events not weather related.

Part 121 Fatal Accident: DCA23LA109 – Montgomery, AL; Ramp personnel fatal event.

Part 135 Major Accident: DCA22MA192 – Freeland, Washington; DHC-3 LOC-I seaplane (F10)
 CEN23FA071 – Galliano, LA; Bell 407 GOMEX (F4)

Part 121 Weather-Related Accidents 2008-2022

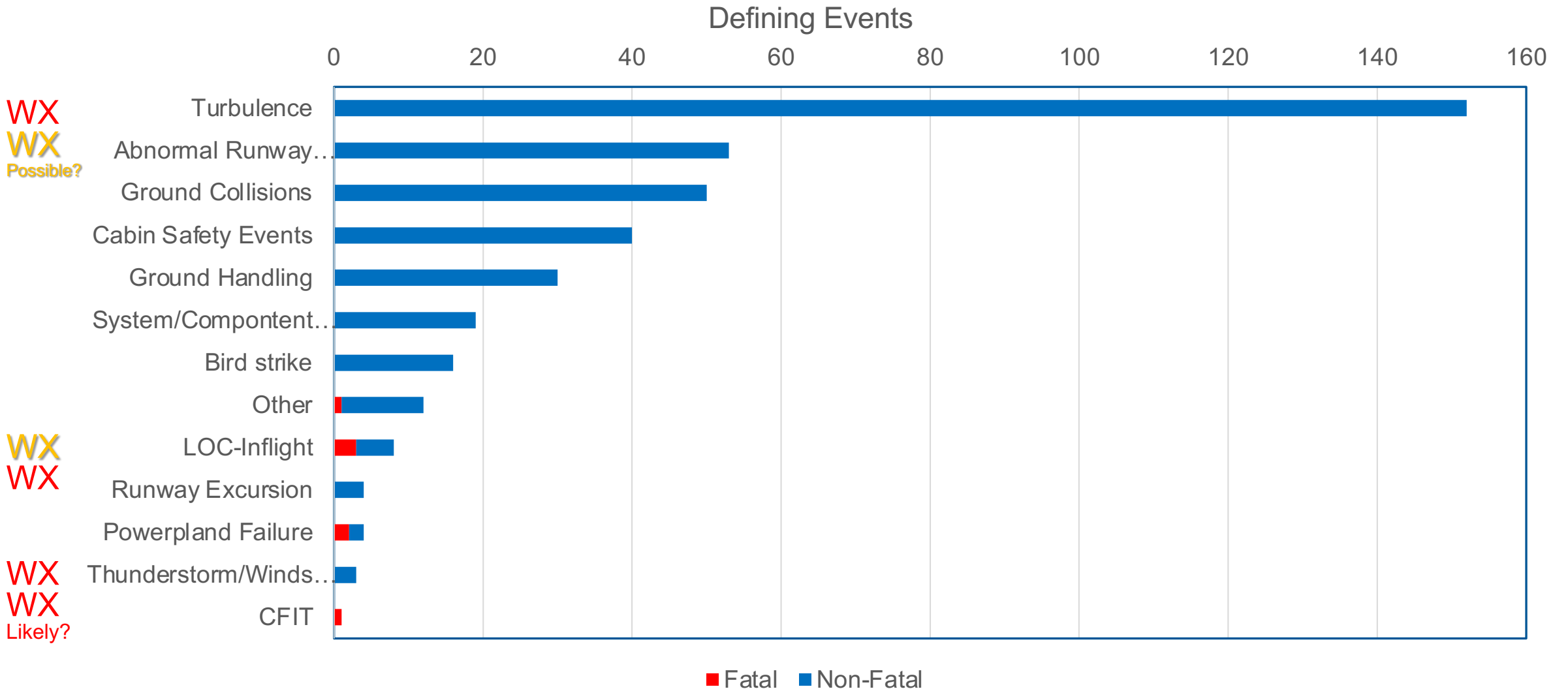
	Weather-Related	Non-Weather Related	Total	Weather-Related Percentage
Accidents	164	256	420	39%
Fatal Accidents	3	8	11	27%

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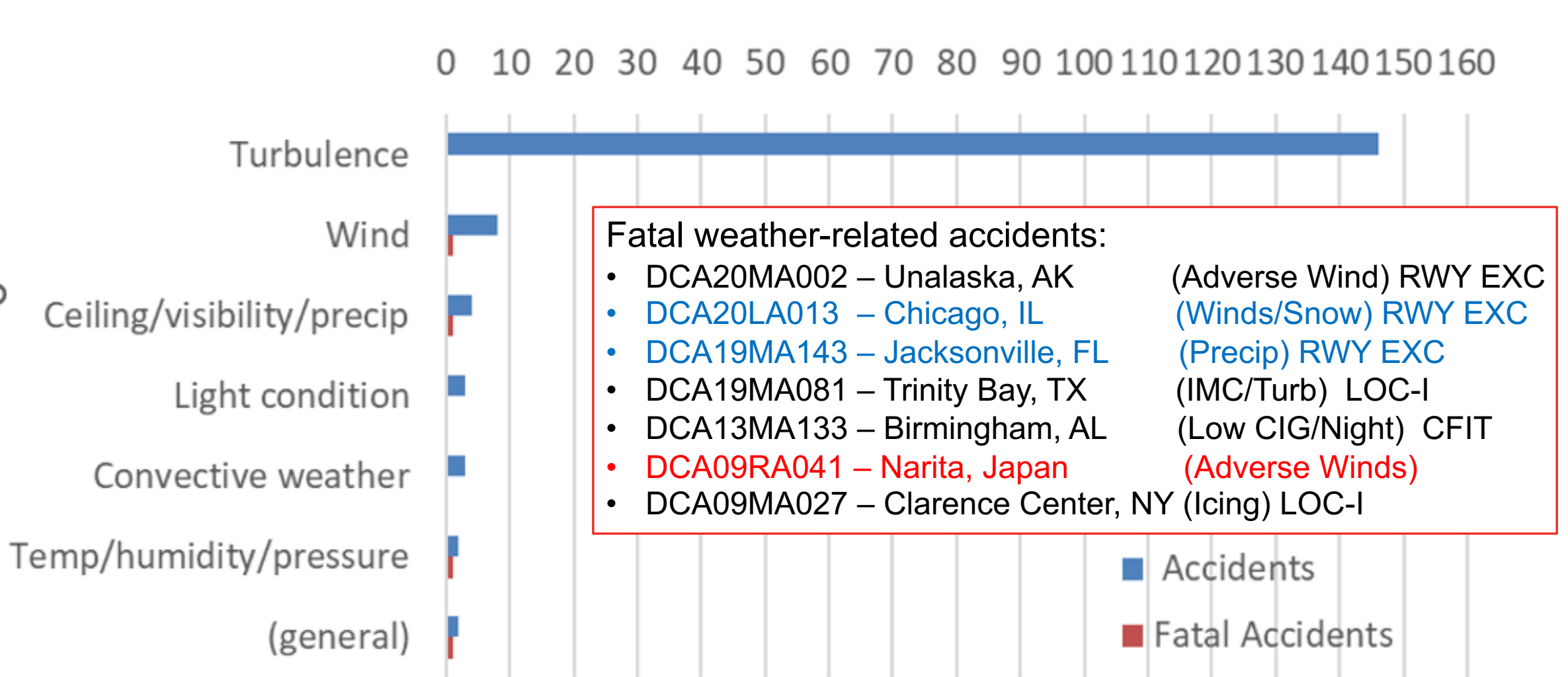
NTSB will examine the: **Man – Machine – Environment**
Weather as a causal factor

- “Weather-Related” are those for which a weather-related finding was listed for the aircraft operation under 14 CFR Part 121. Weather-related findings include temperature, humidity, pressure, high density altitude, conducive to structural ice, turbulence, convective weather, wind (sudden wind shift, tailwind, windshear, variable wind, updrafts/downdrafts, crosswind, gusts, dust devils), ceiling & visibility, precipitation, and light conditions.

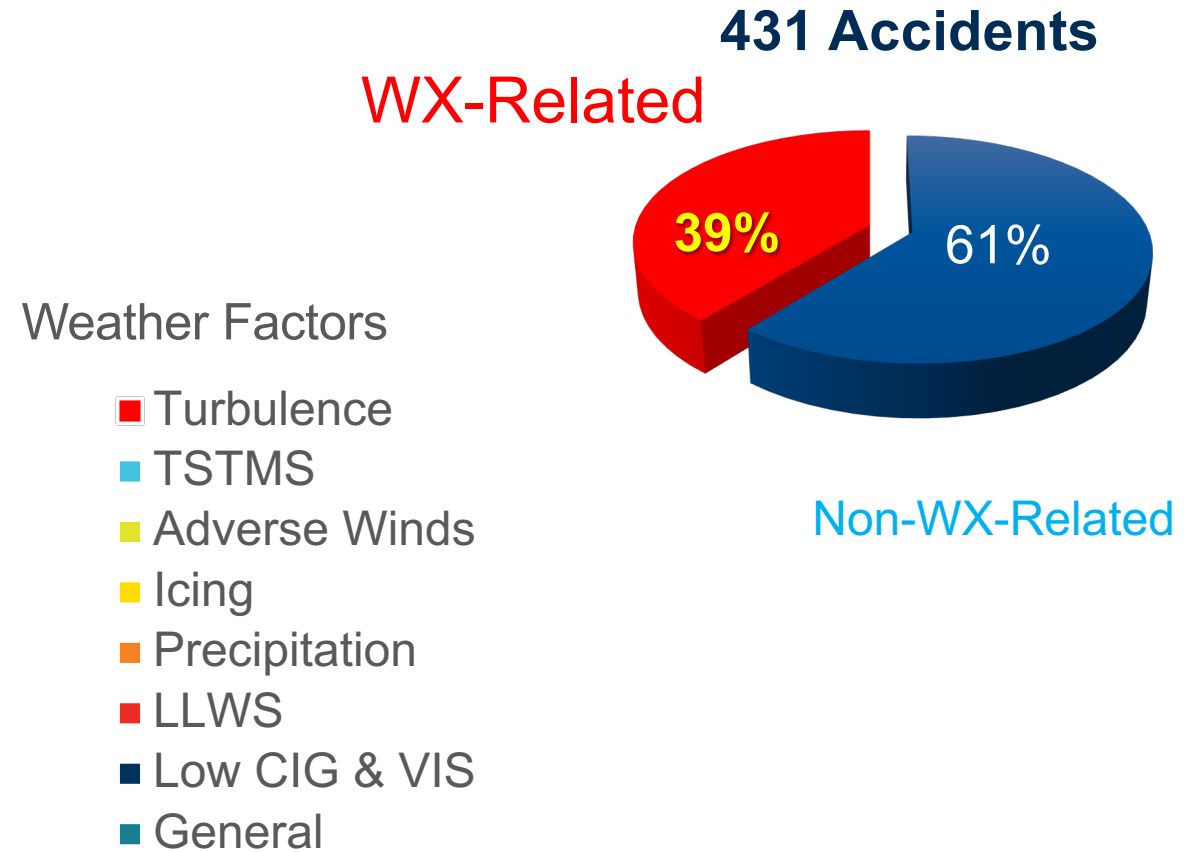
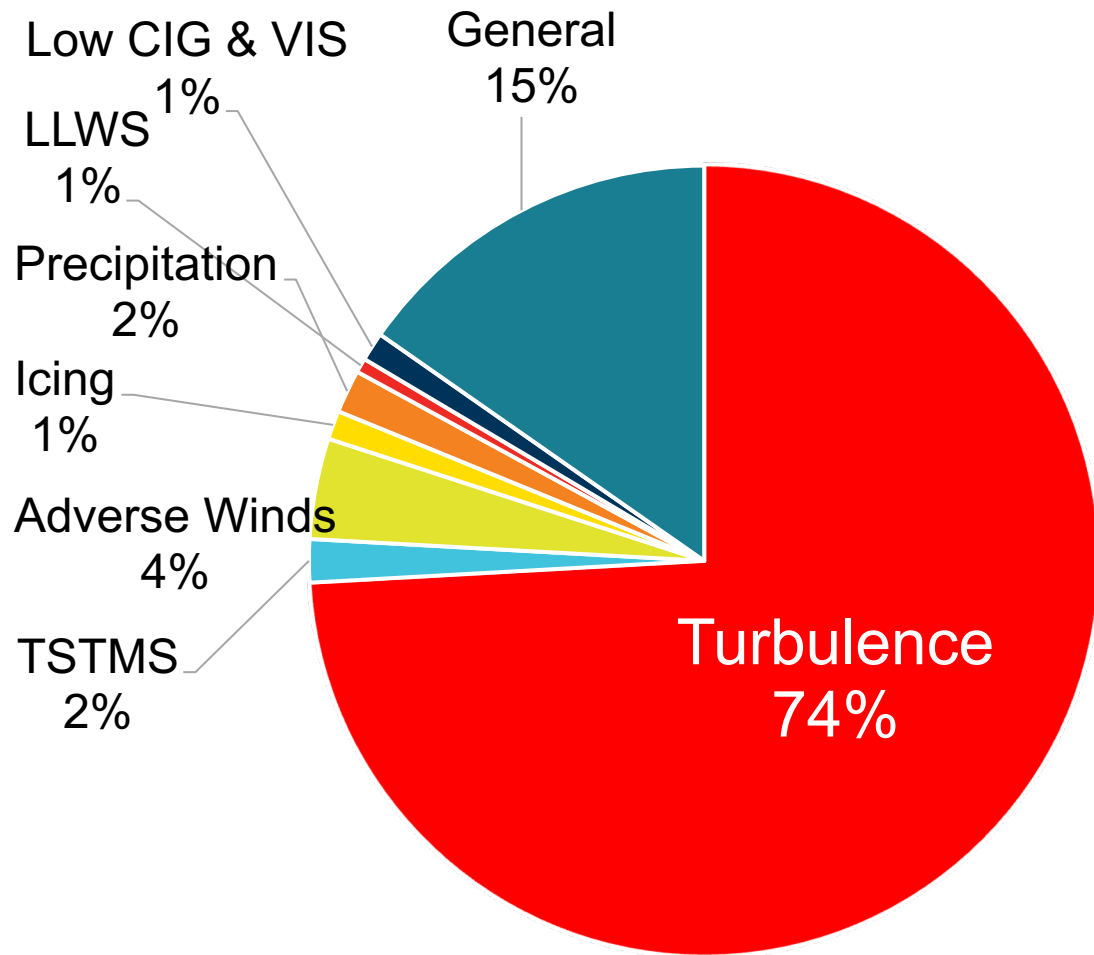
Part 121 Defining Events 2008-2022



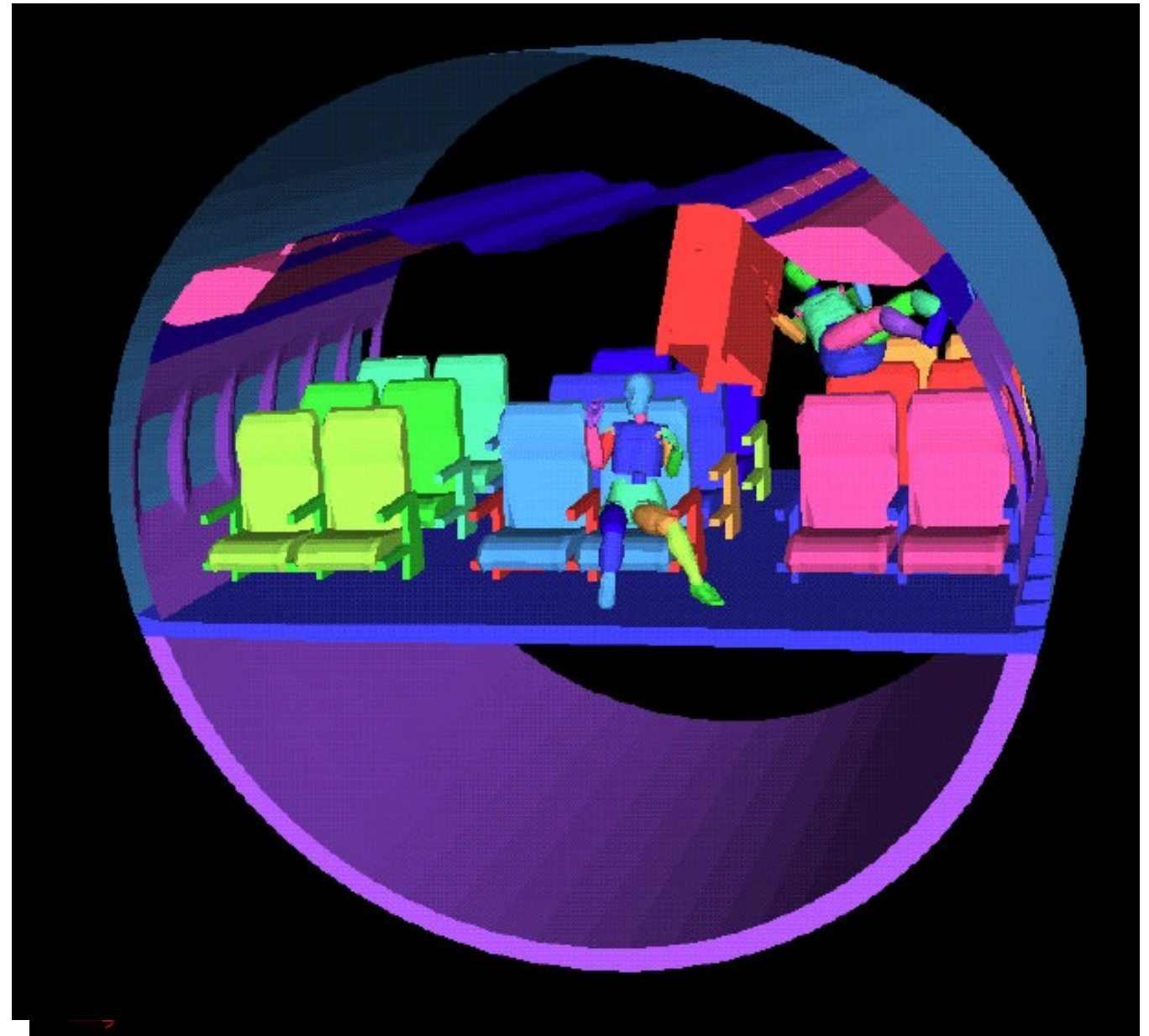
Part 121 Accidents by Weather-Related Findings 2008-2022



Part 121 Air Carrier Weather-Related Accidents: 2008-2022



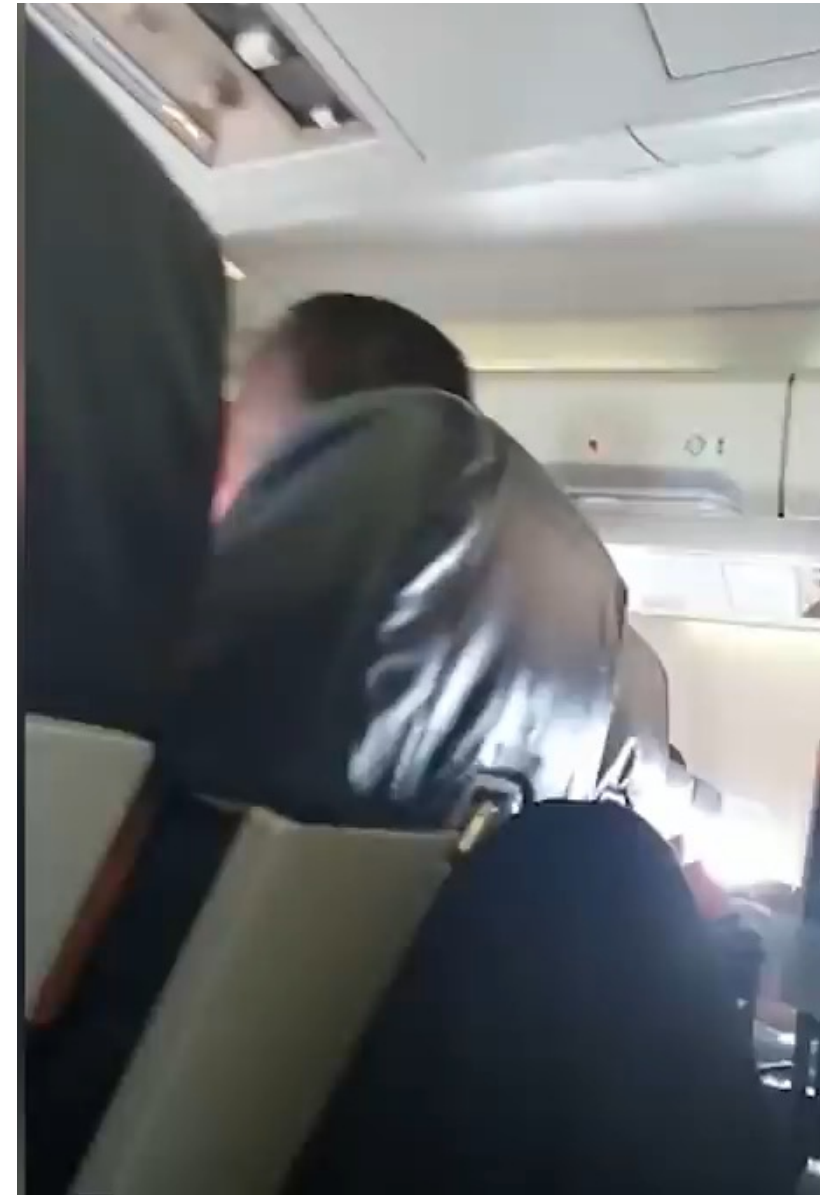
Turbulence has caused more serious injuries to passengers & flight attendants than any other class of accident



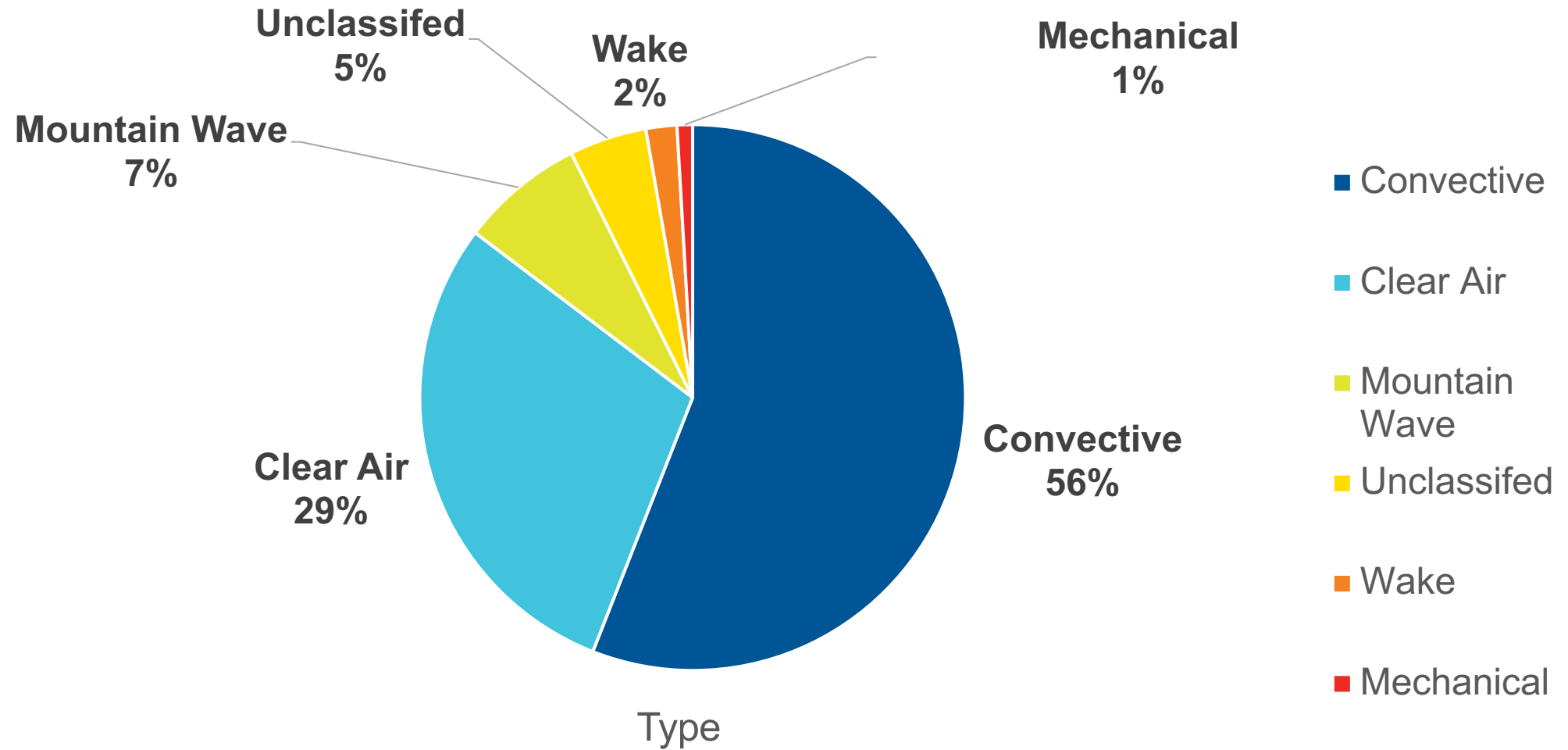
Severe Turbulence Encounter

ALK Airlines B737-300 from Kosovo to Switzerland on June 16, 2019 enroute at FL340 while deviating around thunderstorms encountered severe turbulence causing injury to 10.

Note - Not a NTSB listed event, example of what it is like to be along for the ride!

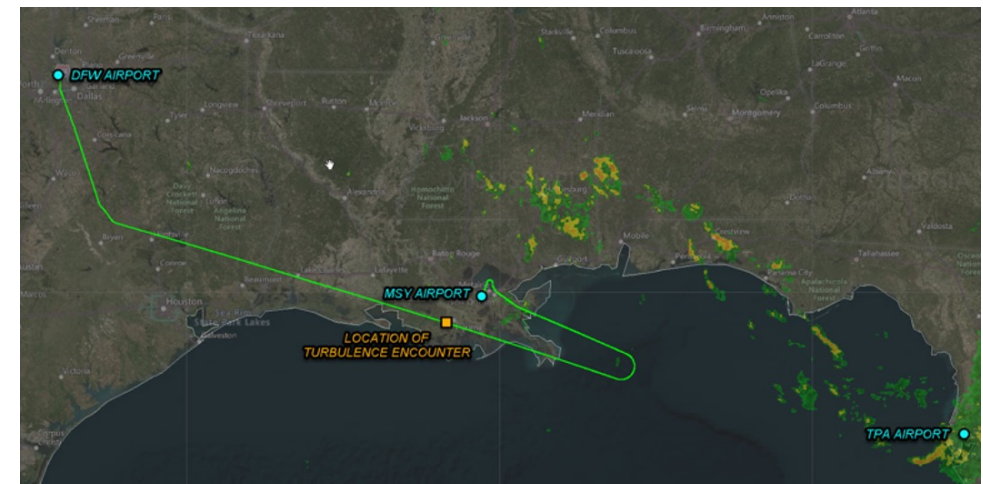


Turbulence Type or Cause from 2008-2017

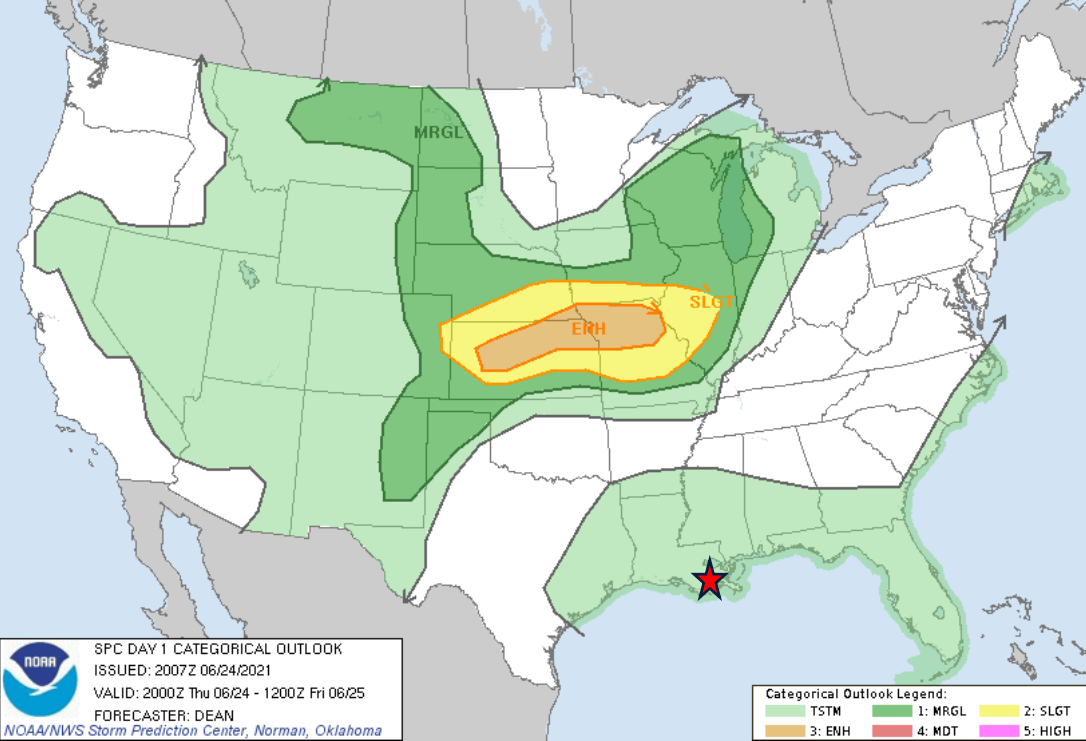


DCA21LA164 – New Orleans, LA June 25, 2021 @ 0130Z

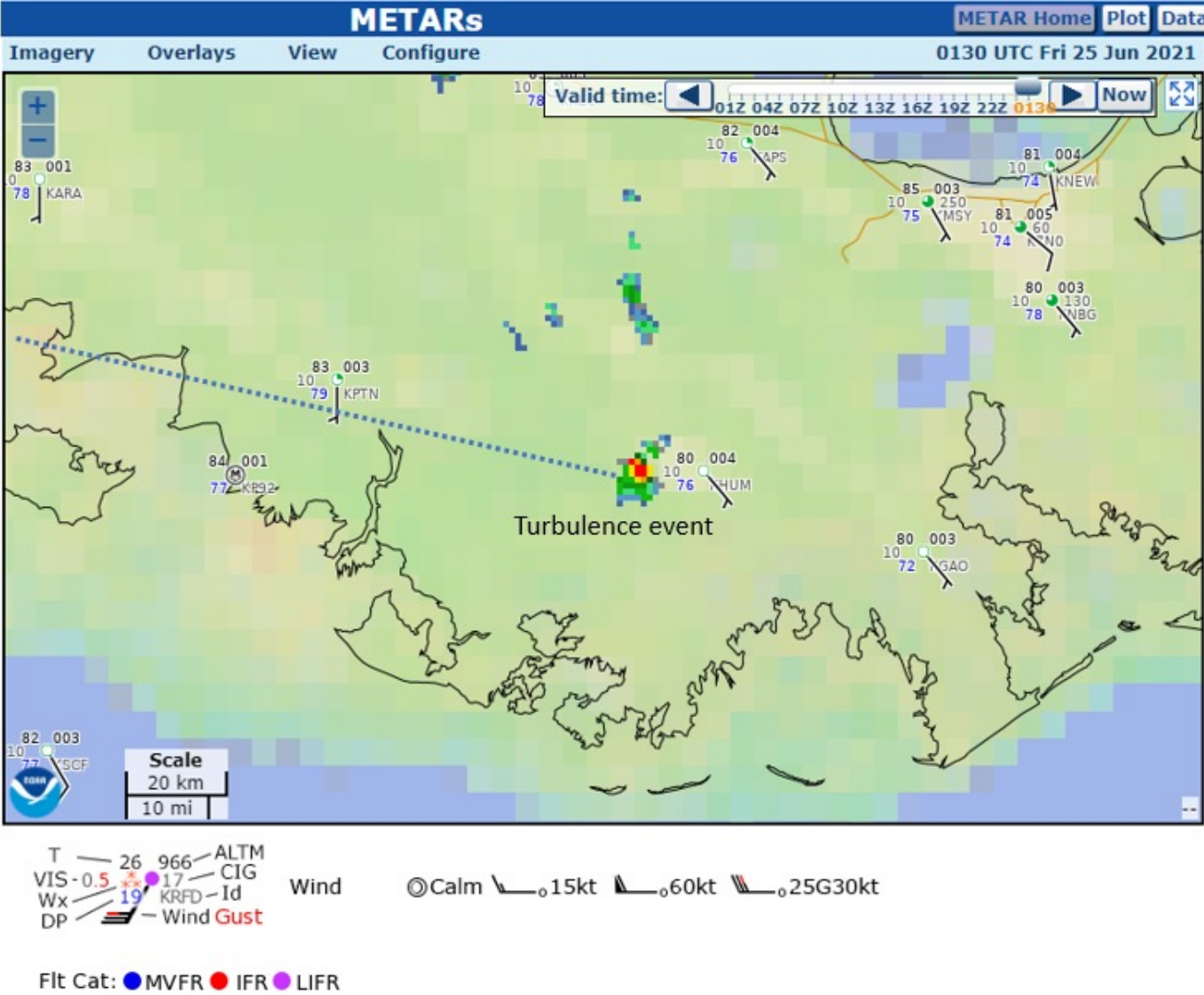
- Scheduled Part 121 flight DFW-TPA
- A321 enroute @ FL310 in day VMC “smooth” conditions
- Seat belt sign-off, beverage service just completed
- Encountered sudden single jolt of severe turbulence; autopilot disconnect, aircraft rolled 30°, with 300 ft altitude deviation
- 1 FA thrown to ceiling fractured & 10 PAX not belted reported minor injuries
- PIC declared medical emergency & diverted to KMSY
- Convective SIGMET current for area TSTMS tops above FL450, moving 26020KT



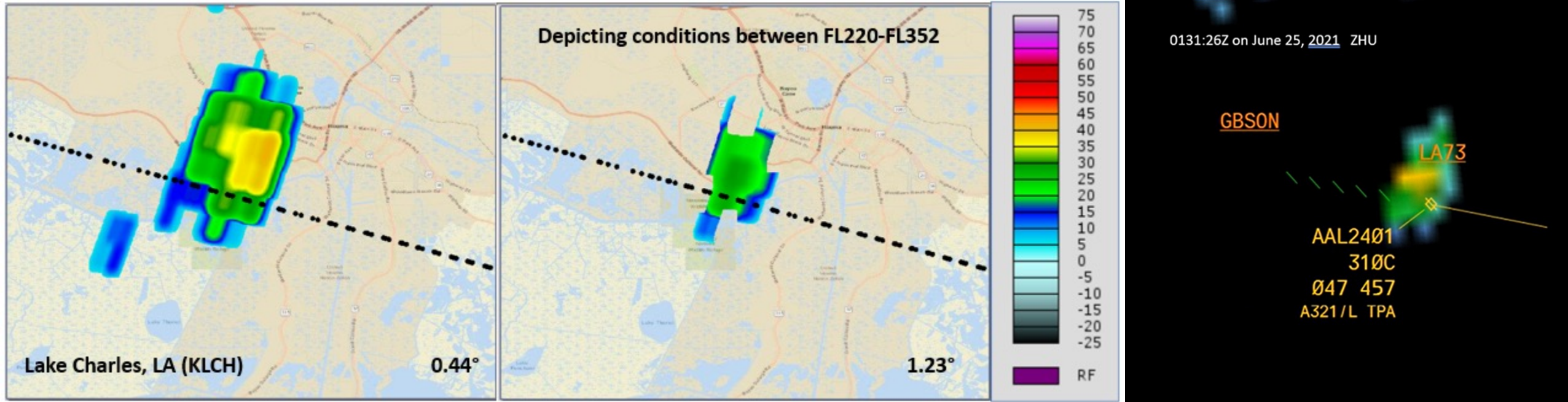
DCA21LA164 – New Orleans, LA



- Entire southeast and mid-Atlantic coast with a chance of general airmass type TSTMS.



DCA21LA164 – New Orleans, LA



- Review of the closest NWS WSR-88D depicted a rapidly developing area of echoes of 45-50 dBZ develop under the flight path with echoes of 30 dBZ reaching the flight level.
- Flight had WX radar turned off at the time, before entering cloud
- ATC did not provide weather advisories (layer CREF High on left)

NTSB Turbulence Safety Issues

- Improve PIREP gathering, sharing, dissemination & reporting
- Improve access to EDR data and in situ observations
- Improved resolution and modeling of turbulence advisories & products
 - Frequent updated, short-term turbulence nowcast (GTG-N)
 - Total lightning & hail potential also useful identifying severe convective areas
 - AIRMETs too large, limited value to ATC and Part 121 operations
- Seat belt use reduces the risk of serious injury
 - Having flight attendants seated during additional portions of the descent phase
 - Child Restraint Systems (CRS) use
- Update Advisory Circular 120-88A “Preventing Injuries Caused by Turbulence”



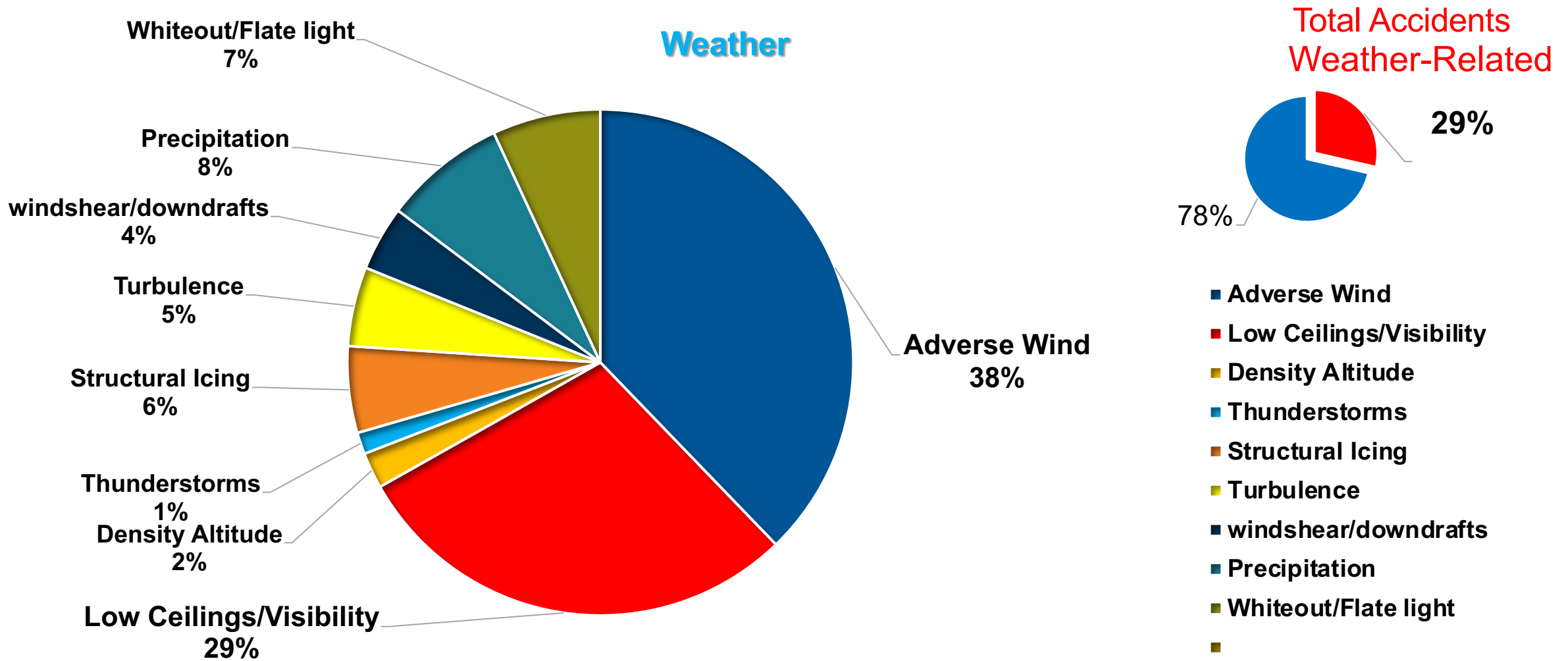
Part 135 Weather-Related Accidents 2008-2022

	Weather-Related	Non-Weather Related	Total	Weather-Related Percentage
Accidents	197	492	689	29%
Fatal Accidents	56	82	138	41%

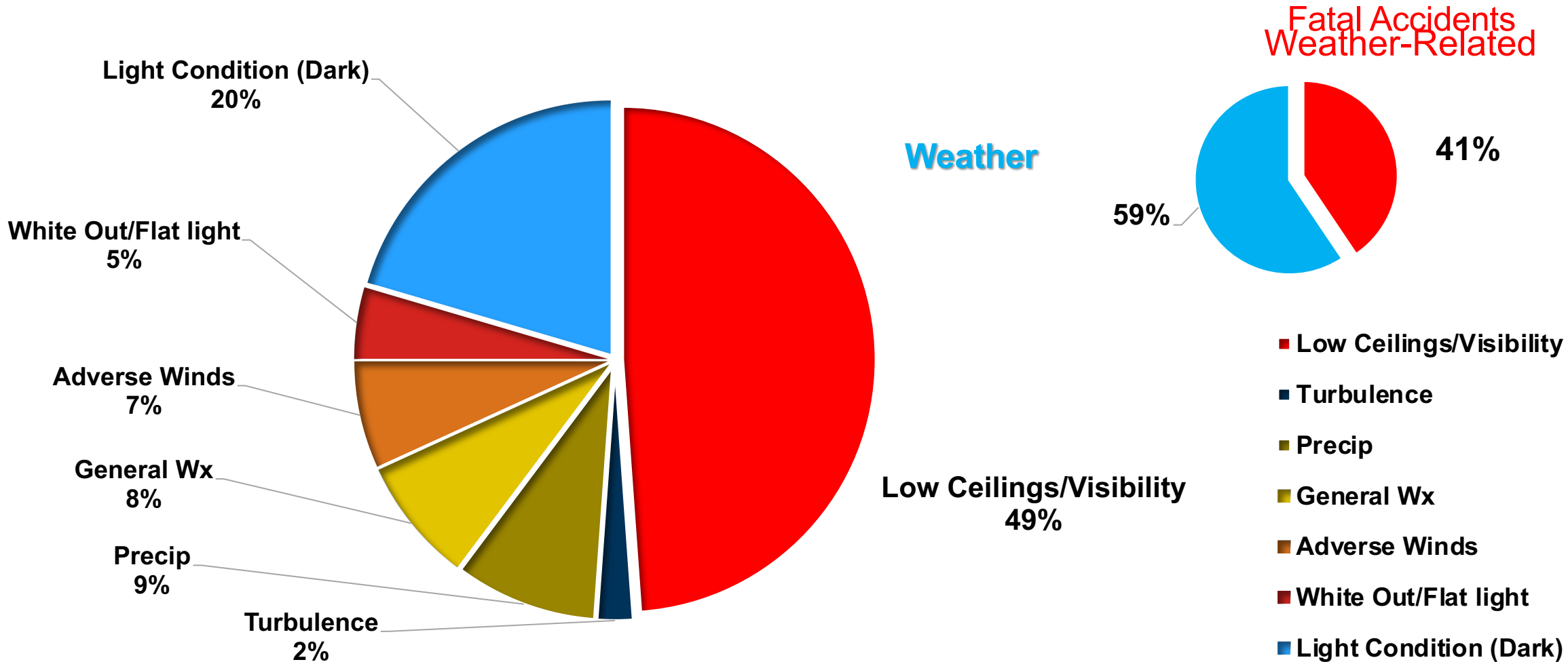
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- “Weather-Related” are those for which a weather-related finding was listed for the aircraft operation under 14 CFR Part 135. Weather-related findings include temperature, humidity, pressure, high density altitude, conducive to structural ice, turbulence, convective weather, wind (sudden wind shift, tailwind, windshear, variable wind, updrafts/downdrafts, crosswind, gusts, dust devils), ceiling & visibility, precipitation, and light conditions.

Part 135 – Weather-Related Accidents, 2008-2022

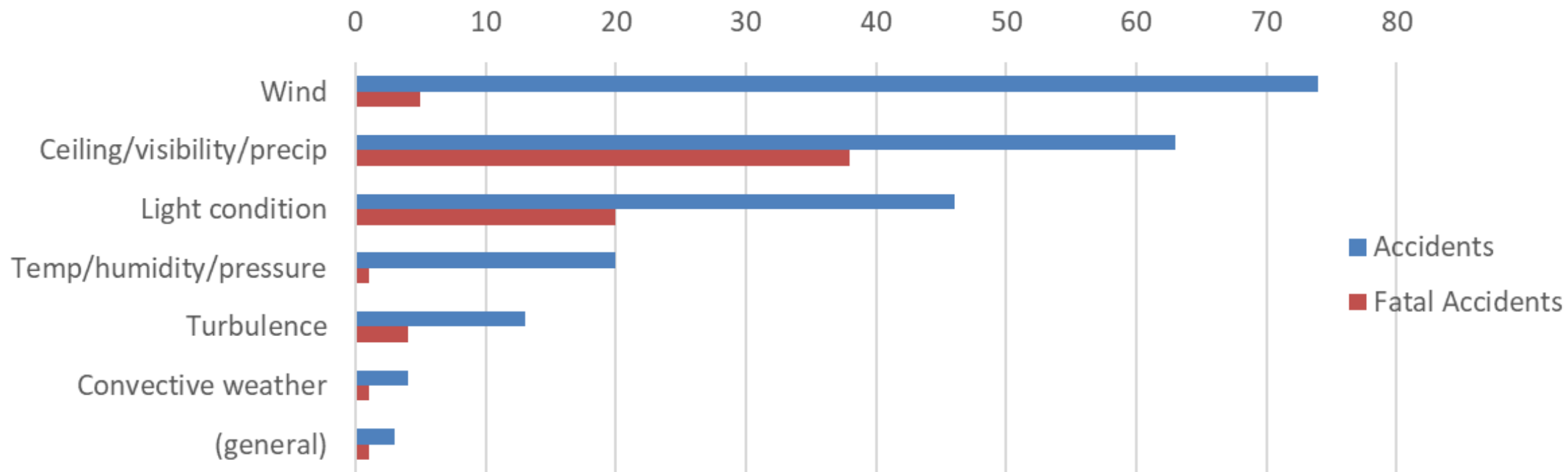


Part 135 – Fatal Weather-Related Accidents, 2008-2022



Low ceilings & Visibility – includes below minimum conditions, fog, obscurations and clouds

Part 135 Accidents by Weather-Related Finding Category, 2008-2022



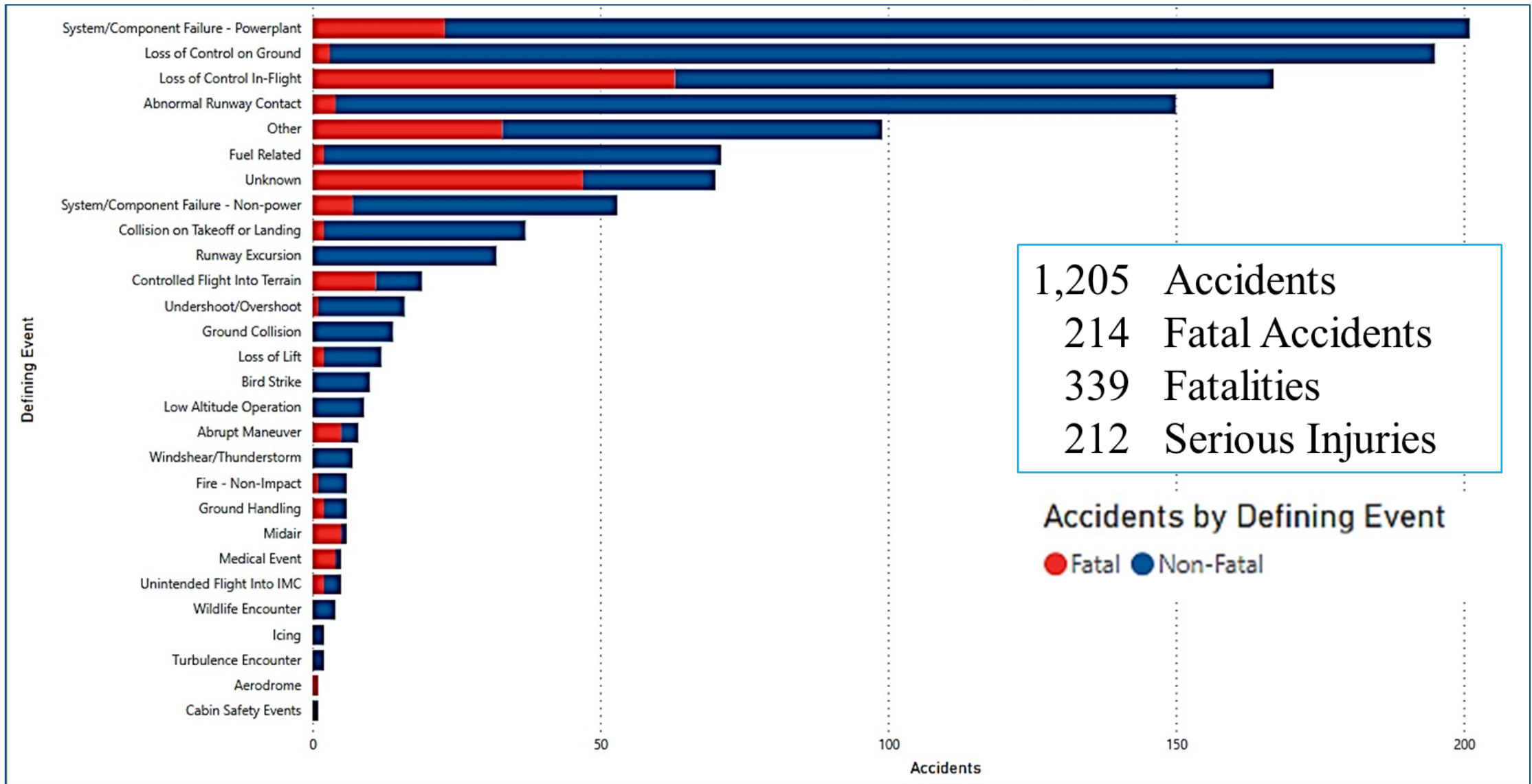
Part 135 Fatal Weather-Related Accidents

- AN21FA069 – Ketchikan, AK Aug. 5, 2021 DHC-2 F6
Sightseeing, VFR into IMC, resulting in controlled flight into terrain (CFIT)
- ANC20FA017 – Tuntutuliak, AK Feb. 6, 2020 PA-32R
F5
VFR into IMC, flat light conditions and CFIT
- DCA20MA059 – Calabasas, CA Jan. 26, 2020 Sikorsky S-76
F9
VFR into IMC, spatial disorientation
- CEN19FA185 – Brainerd, MD June 28, 2019 Augusta A109 F2/S1
HEMS night IMC, spatial disorientation
- WPR18MA087 – Peach Springs, AZ Feb. 10, 2018 EC-10 F5/S2

Part 135 Fatal Weather-Related Accidents

- CEN17FA168 – Amarillo, TX April 28, 2017 PC-12 F3
Air Ambulance flight, Night IMC & turbulence, spatial disorientation
- ERA17FA066 – Camilla, GA Dec. 5, 2016 Fairchild SA-227 F1
Cargo night flt into adverse WX, spatial disorientation, LOC, inflight breakup
- ANC16FA017 – Angoon, AK April 8, 2016 C206 F3/S1
Chartered flight VFR-IMC, stall & spin
- WPR16FA037 – McFarland, CA Dec. 10, 2015 Bell B407 F4
HEMS flight night VFR into IMC, loss of control
- CEN16MA036 – Akron, OH Nov. 10, 2015 BAE 125 F9
Unstable approach in IMC impact with terrain

Part 91 General Aviation Defining Events 2022



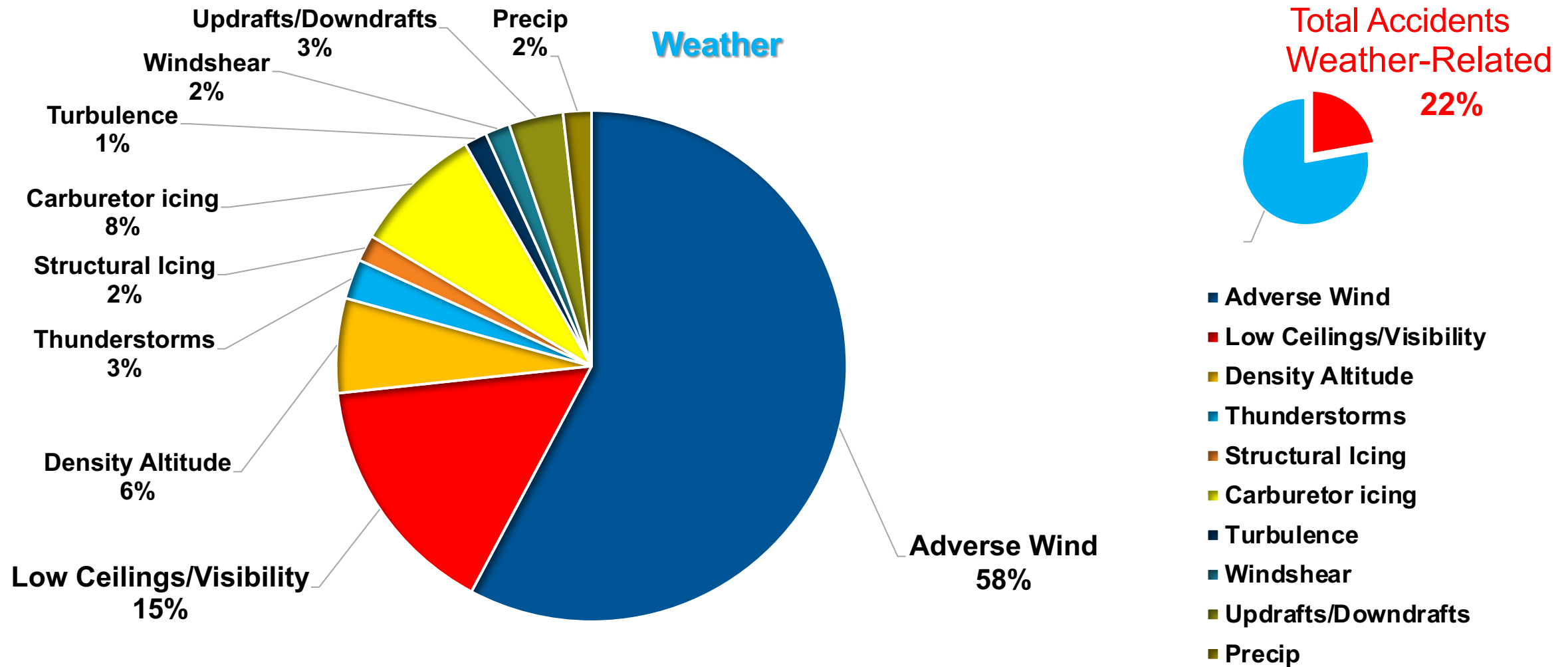
Part 91 Weather-Related Accidents 2008-2022

	Weather-Related	Non-Weather Related	Total	Weather-Related Percentage
Accidents	4,341	15,197	19,538	22%
Fatal Accidents	990	2,586	3,576	28%

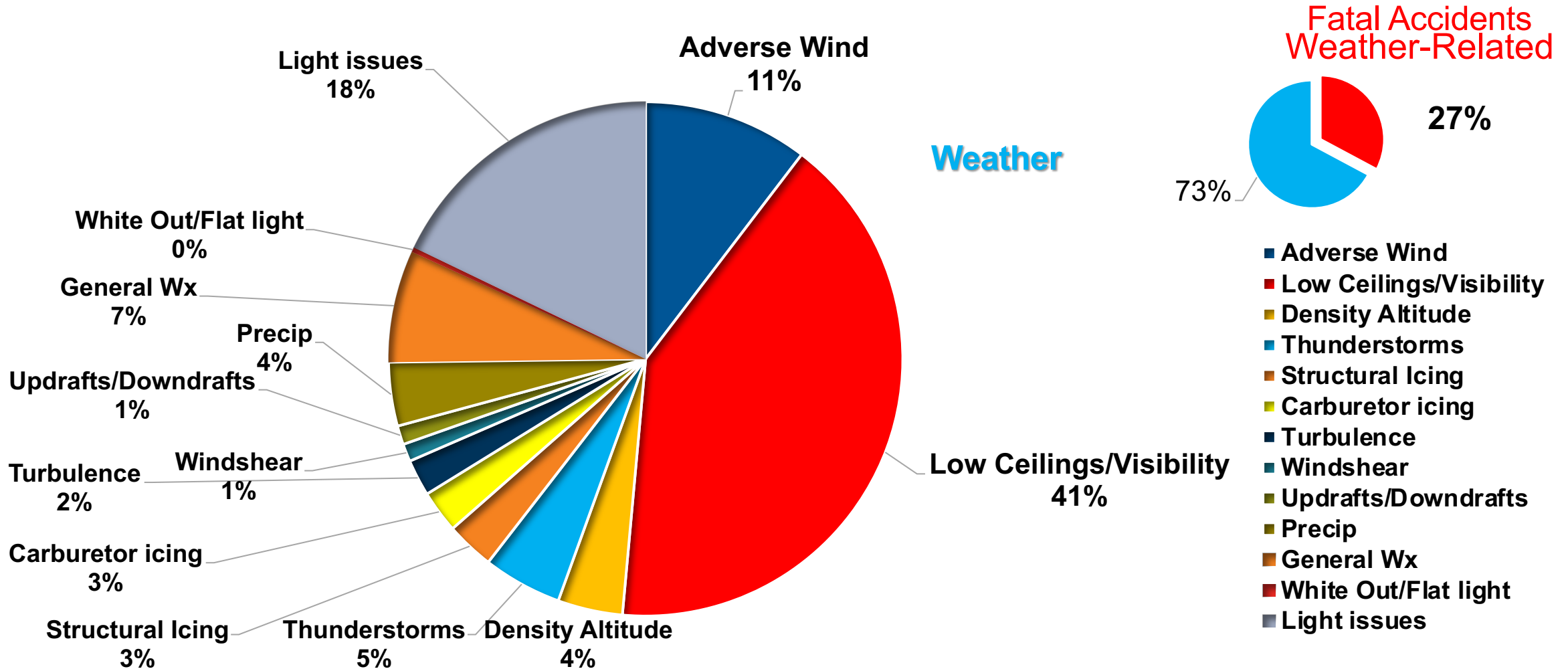
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GA – Weather-Related Accidents, 2008-2022



GA- Fatal Weather-Related Accidents, 2008-2022



Icing Related Events

CEN20LA028 – Detroit, MI
BAE 125-800A, N469RJ
December 3, 2019 @ 0833 EST (1333Z)

- Part 135 repositioning flight
- From: Willow Run (YIP) to Detroit (DET), MI (~25nm)
- Pilots: both ATR with excess of 16,000 hr
- Obtained local conditions, no official briefing & filed IFR flight plan.
- *METAR KDET 031253Z 26008KT 10SM OVC011 M01/M03 A2987 RMK AO2 T10111028=*
- ILS approach RWY 33; used standard Vref 138kt for their weight
- On descent picked up icing in clouds, turned on TKS system, broke out of clouds at 1,000 ft. Over runway in flare the right wing “dropped” and stalled, hitting hard on right wing.
- Pilot indicated no stick shaker; while non-flying pilot felt it after the event. CVR confirmed pilot’s statements.
- Aircraft substantial damage; pilots unhurt.

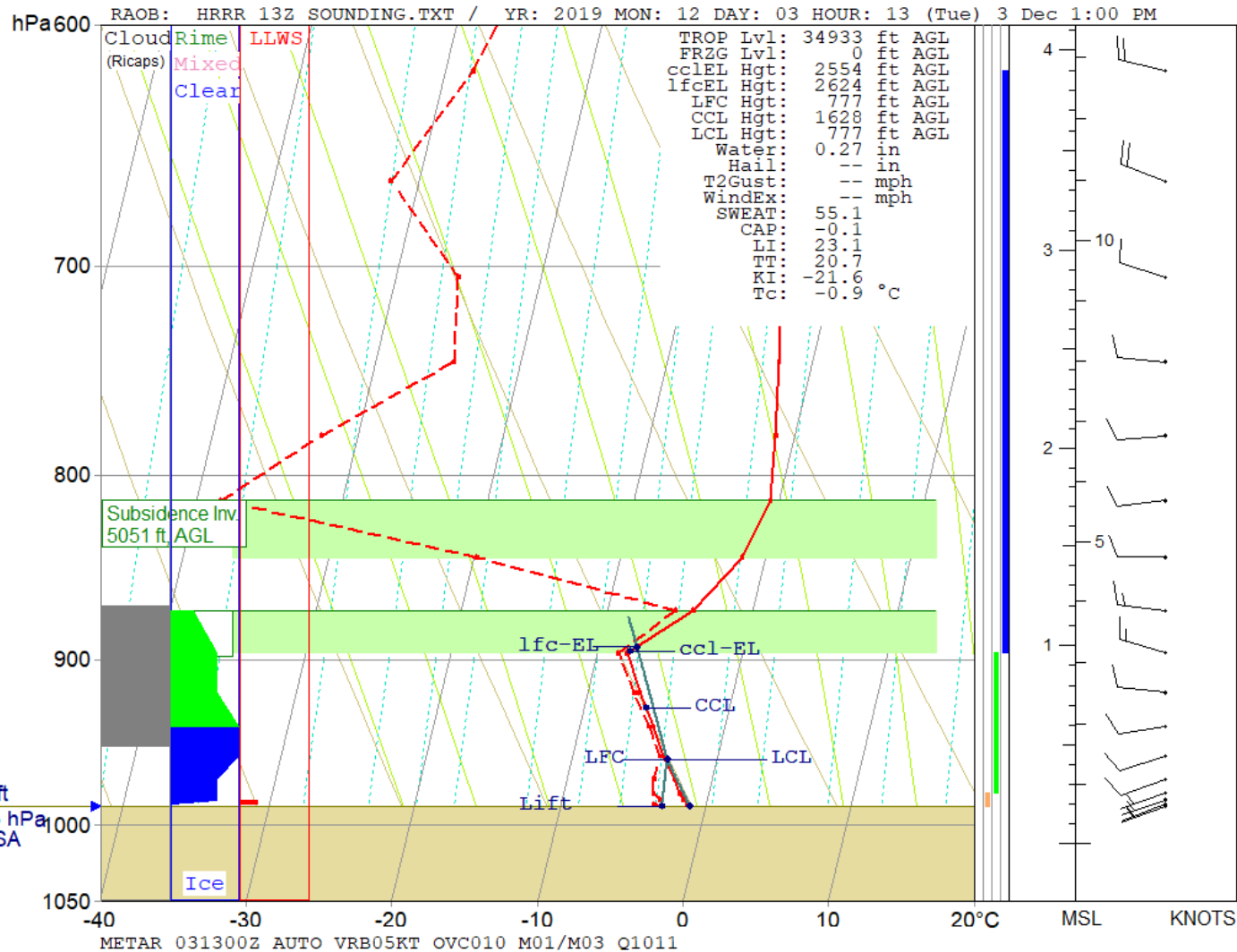


2019-Dec-03 08:34:02



Pilot of Hawker, N122LJ, which landed at 0810 EDT, indicated that they also encountered light icing on approach between 3,000 ft to 1,000 ft. Prior to entering the clouds, they had turned on their TKS, engine heat, and engine ignition. Upon exiting the aircraft, they observed visual signs of ice buildup on the leading edges of the wing, tail surfaces, and the temperature probe which had an umbrella shape ice formation. While both outer ends of the horizontal stabilizer had a “T” shape 9” ice formation on both surfaces.

CEN20LA028 – Detroit, MI



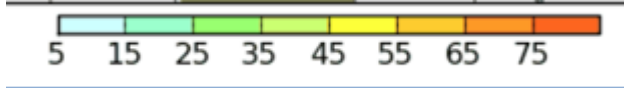
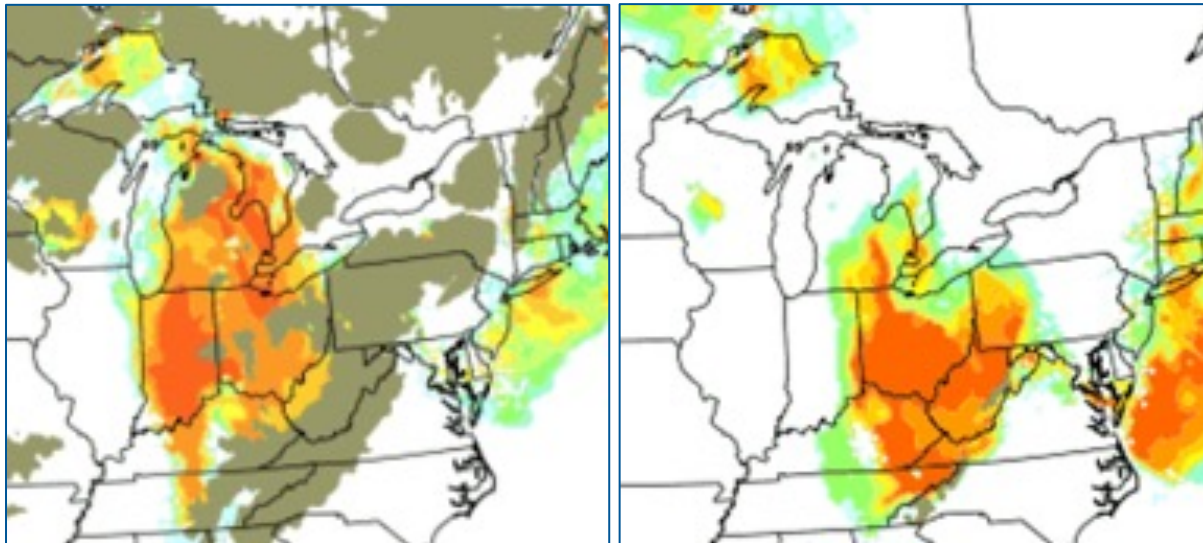
HRRR sounding for 1300Z

- Freezing level at surface
- LCL/LFC at 1,000 ft agl saturated thru 4,000 ft.
- Inversion from 3,000 ft thru 6,000 ft remaining below freezing.
- LGT-MOD mixed icing expected in clouds

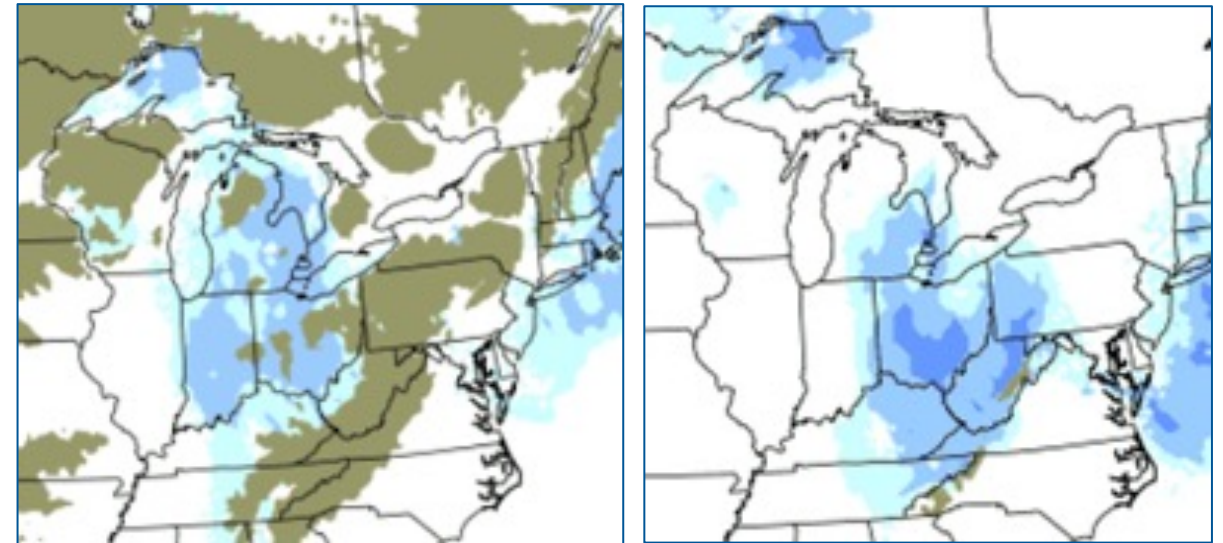
AIRMET ZULU for OCNL
MOD icing BLW 7,000 ft

CEN20LA028 – Detroit, MI

CIP probability for 1,000 ft CIP for 3,000 ft



CIP Severity for 1,000 ft CIP for 3,000 ft



NCAR Current Icing Product (CIP) icing probability and severity products indicated a high probability of moderate icing conditions over the area between 1,000 and 3,000 ft.





Aircraft Operating Manual (AOM) – Icing Conditions
Fly $V_{ref} + 10$ kts (V_{ref} 138kt + 10kt = 148 kts)

CEN20LA028 – Detroit, MI

NTSB Probable Cause:

The pilots' failure to increase approach speed as recommended for flight in icing conditions, which resulted in an aerodynamic stall and subsequent impact with terrain. Contributing to the accident was the failure of the stall warning system to advise the crew of the approaching stall.

What about contaminated runways?

CEN21LA071 – Lufkin, TX

Cessna C551, N48DK

December 2, 2020 @ 0842 CST

- Part 91 IFR business flight
- Pilot >17,700 hr, 2,000 hr in type
- Austin (AUS) to Lufkin (LFK), TX
- RNAV approach RWY 16 (4,311 ft)
- Calculated stopping distance 4,127 ft
- Touched down 1,000 ft, on the wet runway and overran into grass.
- Anti-skid system stopped working on landing



METAR KLFK 021453Z AUTO 10006KT 6SM -RA BR BKN065 OVC080 09/07 A3015 RMK AO2 SLP208 P0009



Questions?



[ntsb.gov](https://www.ntsb.gov)