

Docket No. SA-533

Exhibit No. 13-I

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C.

FAA Presentation – Proposed Expanded Icing Envelope

(11 Pages)

Witness Panel #4 – FAA Icing Operational Guidance

Proposed Expanded Icing Envelope

Presented to: NTSB Public Hearing,
Empire Airlines Flight 8284

By: Tom Bond

Date: September 23, 2009



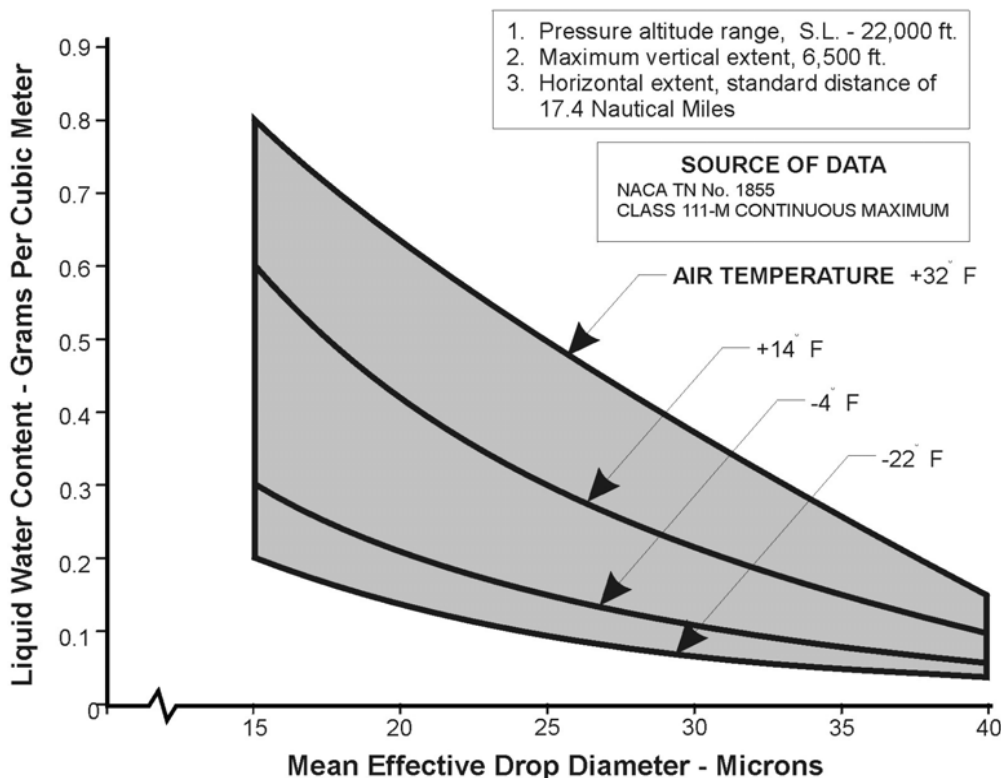
Federal Aviation
Administration



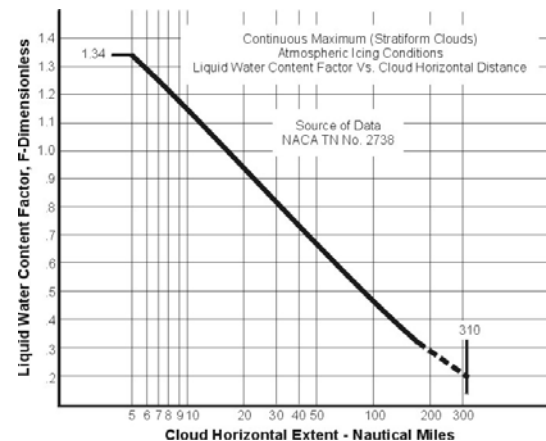
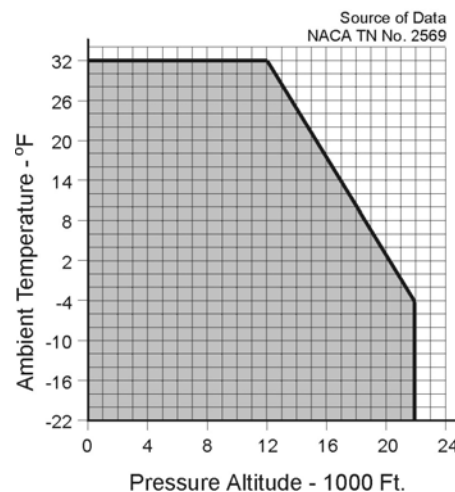
14 CFR part 25, Appendix C – Continuous Maximum (Stratiform Clouds) Atmospheric Icing Conditions

Continuous Maximum (stratiform Clouds)
Atmospheric Icing Conditions

Liquid Water Content Vs. Mean Effective Drop Diameter



Continuous Maximum (Stratiform Clouds)
Atmospheric Icing conditions
Ambient Temperature Vs. Pressure Altitude

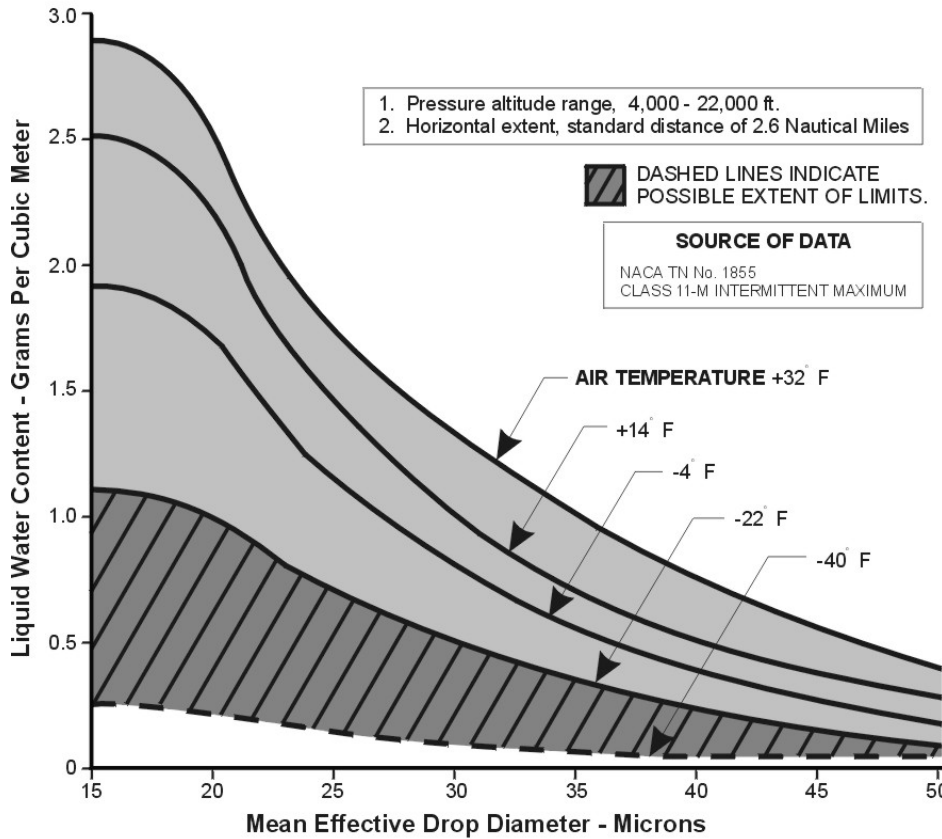


Federal Aviation Administration, DOT

Pt. 25, App. C

14 CFR part 25, Appendix C –Intermittent Maximum (Cumuliform Clouds) Atmospheric Icing Conditions

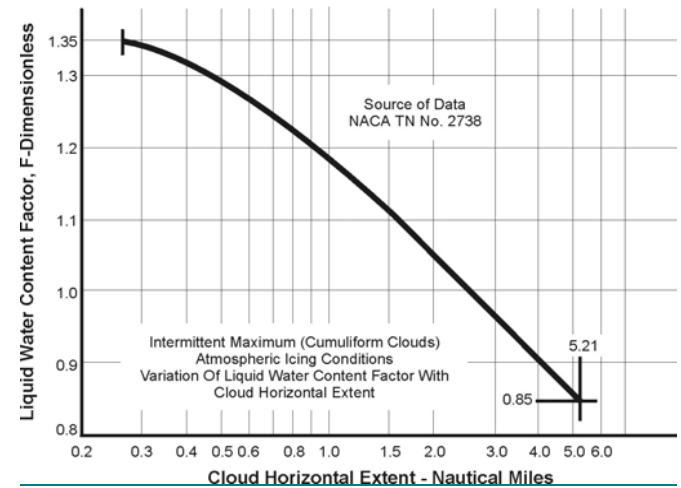
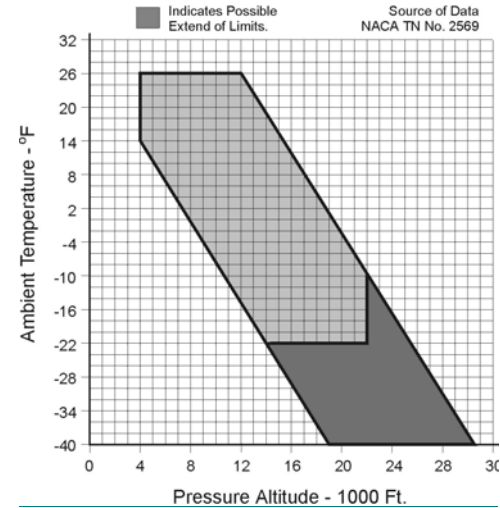
Intermittent Maximum (cumuliform Clouds)
 Atmospheric Icing Conditions
 Liquid Water Content Vs. Mean Effective Drop Diameter



Federal Aviation Administration, DOT

Pt. 25, App. C

Intermittent Maximum (Cumuliform Clouds)
 Atmospheric Icing conditions
 Ambient Temperature Vs. Pressure Altitude



Background For ARAC Working Group to Examine SLD Icing Conditions

- **14 CFR parts 25 and 23 require an airplane to operate safely in icing conditions defined in Appendix C of part 25.**
 - Appendix C includes 99% of icing conditions
- **After the 1994 ATR-72 accident in Roselawn, IN, the ARAC Ice Protection Harmonization Working Group (IPHWG) received tasking to review the Roselawn accident NTSB recommendations. Part of Task 2 was to define an icing environment that includes supercooled large droplets (SLD).**
- **The ARAC IPHWG reviewed the available data for SLD conditions:**
 - It was determined that further atmospheric characterization and analysis for large droplet icing conditions was needed. Research was initiated to collect and analyze data.
 - An IPHWG meteorology sub-group was formed to evaluate the results and develop draft icing envelopes that could be used to represent SLD icing conditions.
 - The IPHWG reviewed and developed a consensus set of SLD envelopes



Delivery of IPHWG Task 2 Recommendations for SLD Icing Conditions & Other FAA Actions

- **1998 – Start of IPHWG**
- **2005 – Task 2 initial recommendations for part 25 and 33 SLD, Mixed Phase, and Ice Crystal, including SLD icing conditions (Appendix X) submitted to ARAC**
 - 2007: Requested review of SLD icing conditions from Appendix X to assess whether acceptable MOC exist (completed 2009). Target for SLD NPRM release is 1st Qtr CY 2010
- **Activities for safety improvements in Appendix C and SLD icing conditions: the FAA embarked on a set of key actions to amend regulations to address new designs (ARAC process), address safety of current fleet by AD, conduct research for future enhancements, and continue to monitor operational safety. Below are some of those outcomes:**
 - 1999-2000: Over 25 ADs for part 23 and 25 airplanes requiring boot activation at the first sign of ice accretion, and cycling boots in auto-mode or manual operation to minimize ice accretions
 - 1998-2003: Icing training materials for pilots developed with NASA and Transport Canada
 - SAFOs, 2006-2009: ex. - ground deicing practices (06002), polished frost hazards (06014), turbo-prop in-flight icing dangers (06016), taxi ops during snow & ice (0812), pre-flight and in-flight planning for winter ops (09004)
 - Released (2002) and updated (2007) AC 91-74A (*Pilot Guide to Flight In Icing Conditions*) to educate pilots on icing certification, limitations on their airplane in icing conditions, potential hazards in SLD icing conditions, and to incorporate ice crystals
 - 2007: Revised part 23 AC materials (23.1419-2) to include results of recent icing research and lessons learned from icing accident investigations
 - 8/2009: Rule published – 2003 ARAC recommendation for part 25 Activation of Ice Protection,
 - Target release for rule end of CY 2009 – 2003 ARAC recommendation for part 121 Activation of Ice Protection



ARAC IPHWG Recommendation

The following five slides are the ARAC IPHWG recommendations to the FAA for consideration for a new set of envelopes for SLD icing conditions.

The Task 2 Working Group Report where this information can be found is located at:

- ARAC site
[<http://www.faa.gov/regulations_policies/rulemaking/committees/arac/>](http://www.faa.gov/regulations_policies/rulemaking/committees/arac/)
- Then choose “Transport Airplane and Engine”
[<http://www.faa.gov/regulations_policies/rulemaking/committees/arac/issue_areas/tae/>](http://www.faa.gov/regulations_policies/rulemaking/committees/arac/issue_areas/tae/)
- Then choose “Ice Protection Harmonization”.
- Select:
[<http://www.faa.gov/regulations_policies/rulemaking/committees/arac/media/tae/TAE_IP_T2.pdf>](http://www.faa.gov/regulations_policies/rulemaking/committees/arac/media/tae/TAE_IP_T2.pdf)

SLD Appendix X: Freezing Drizzle

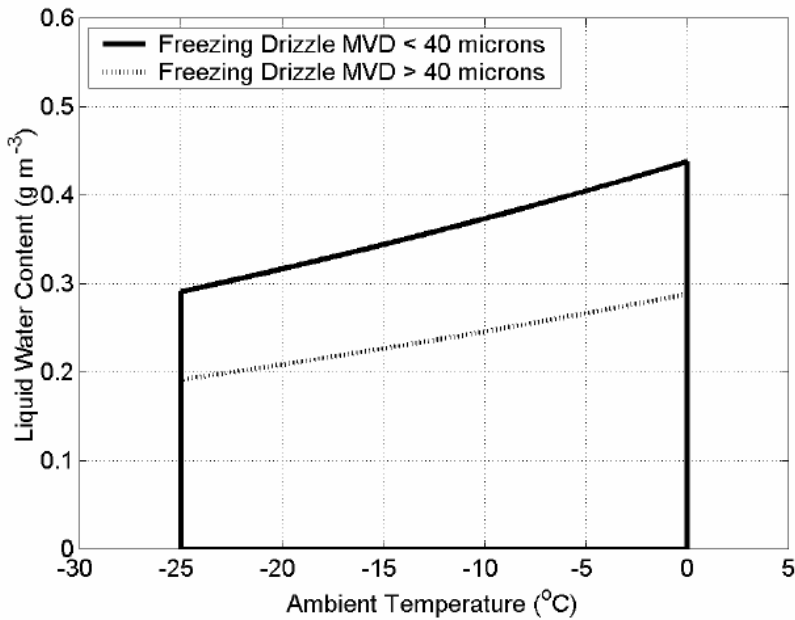


Figure 1 - 14 CFR 25, Appendix X, Freezing Drizzle, Liquid Water Content

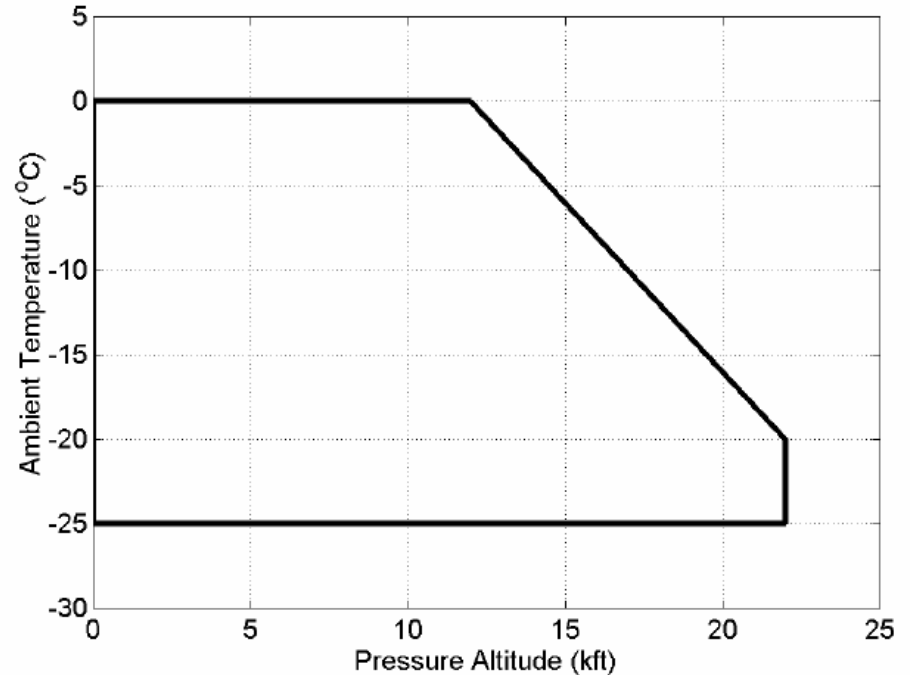


Figure 3 - 14 CFR 25, Appendix X, Freezing Drizzle, Temperature and Altitude

SLD Appendix X: Freezing Drizzle

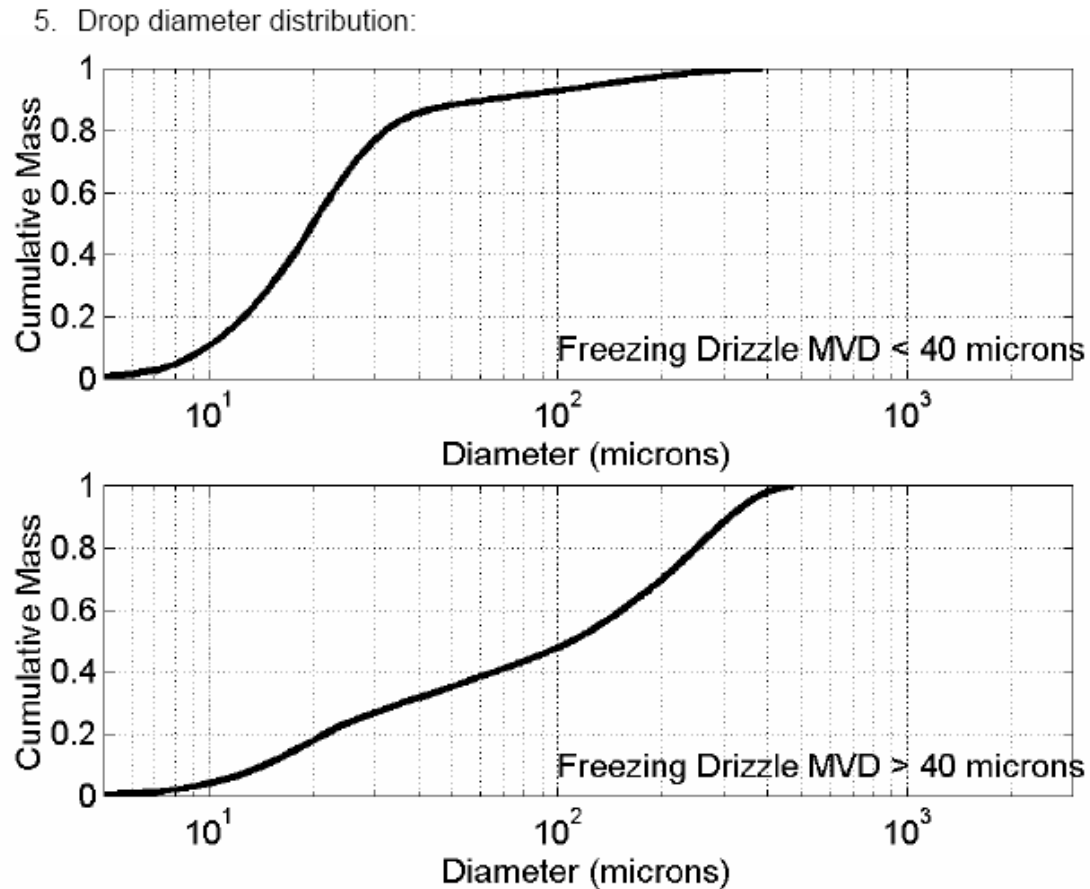


Figure 2 - 14 CFR 25, Appendix X, Freezing Drizzle, Drop Diameter Distribution

SLD Appendix X: Freezing Rain

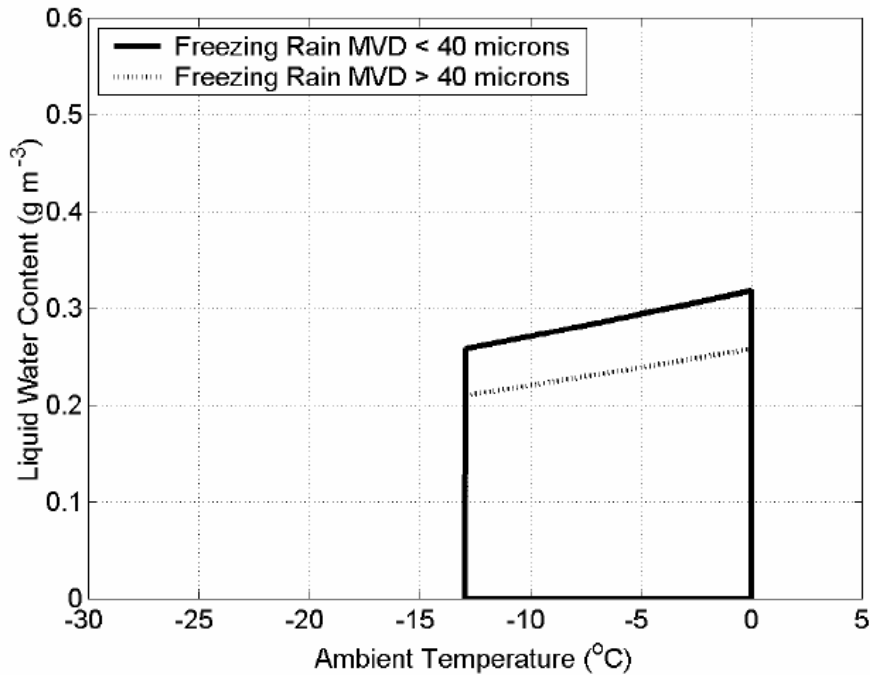


Figure 4 - 14 CFR 25, Appendix X, Freezing Rain, Liquid Water Content

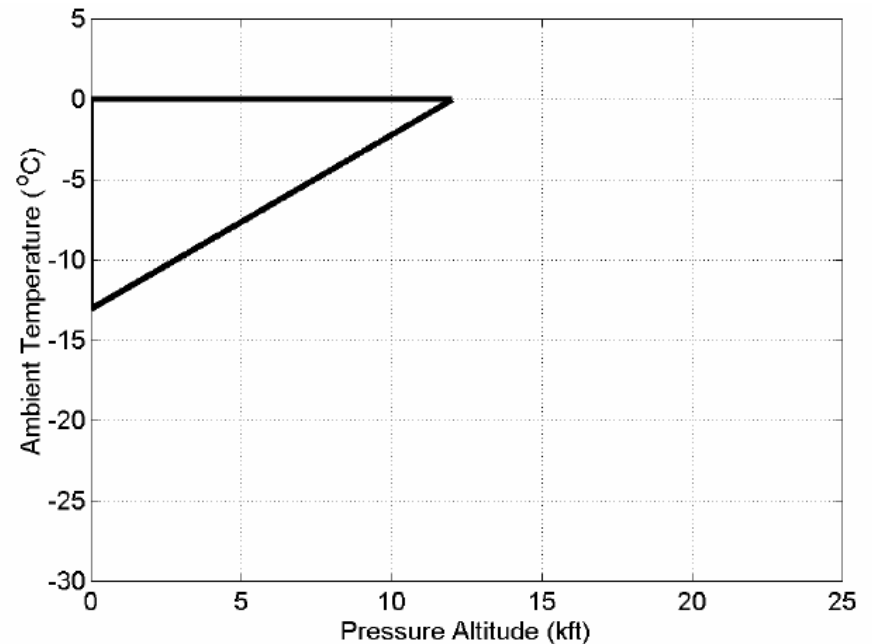


Figure 6 - 14 CFR 25, Appendix X, Freezing Rain, Temperature and Altitude

SLD Appendix X: Freezing Rain

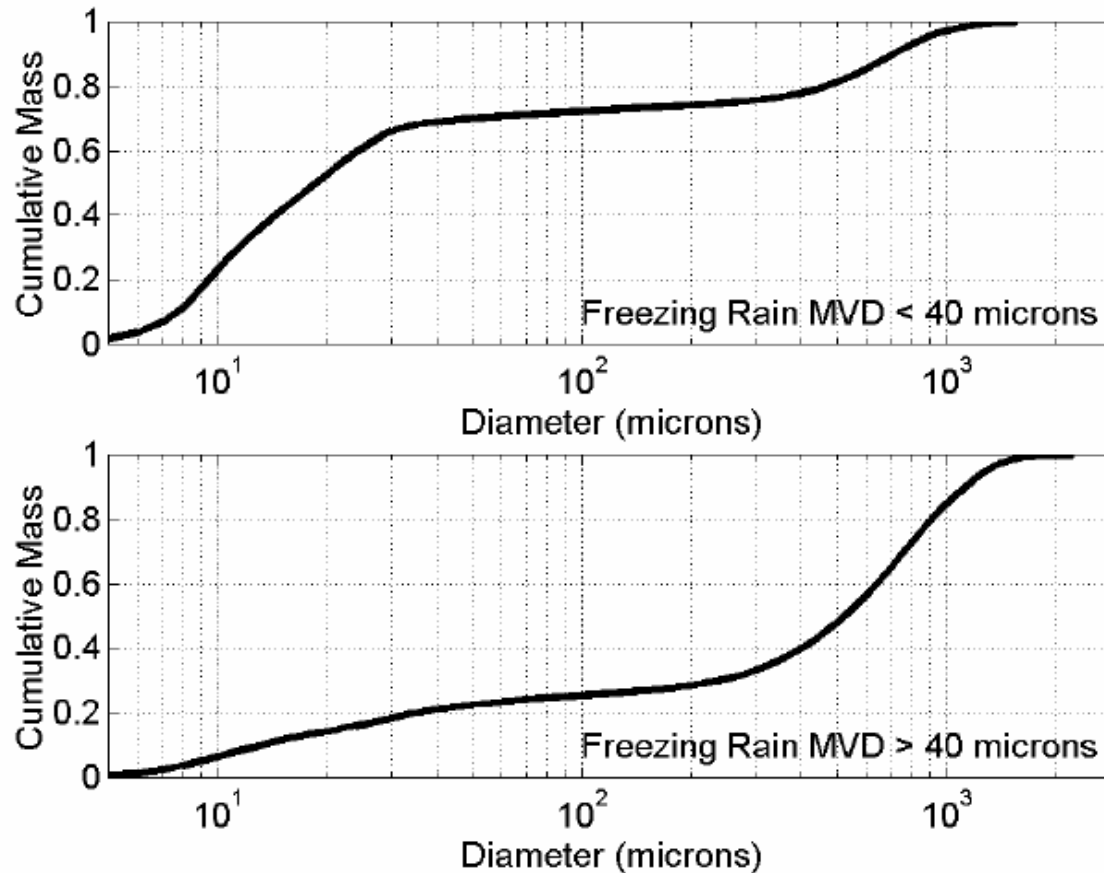


Figure 5 - 14 CFR 25, Appendix X, Freezing Rain, Drop Diameter Distribution

SLD Appendix X: Horizontal Extent

- The liquid water content for freezing drizzle and freezing rain conditions for horizontal extents other than the standard 17.4 nautical miles can be determined by the value of the liquid water content determined from Figure 1 or Figure 4, multiplied by the factor provided in Figure 7.

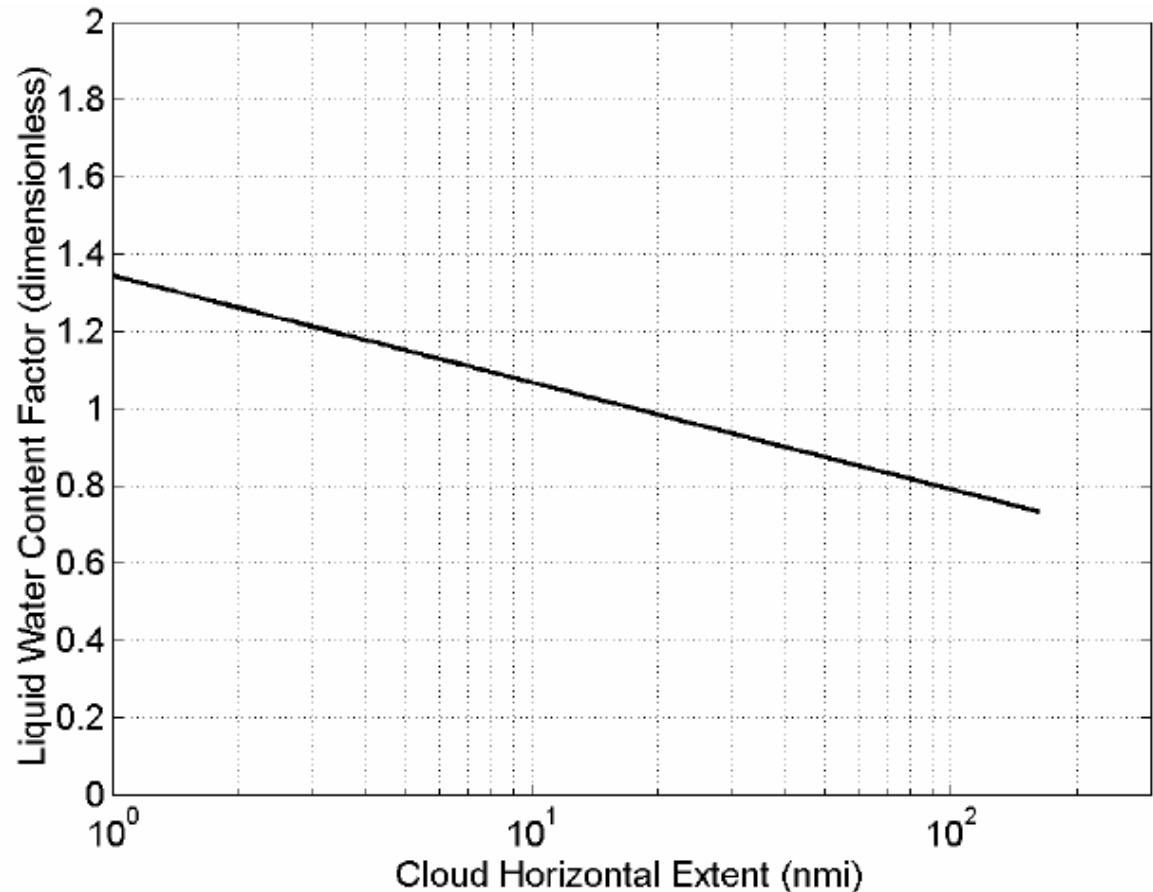


Figure 7 - 14 CFR 25, Appendix X, Horizontal Extent, Freezing Drizzle and Freezing Rain