*T*erminal *A*rea *I*cing *W*eather *I*nformation for *N*extGen (TAIWIN)

By: Ms. Stephanie DiVito, Dr. James T Riley

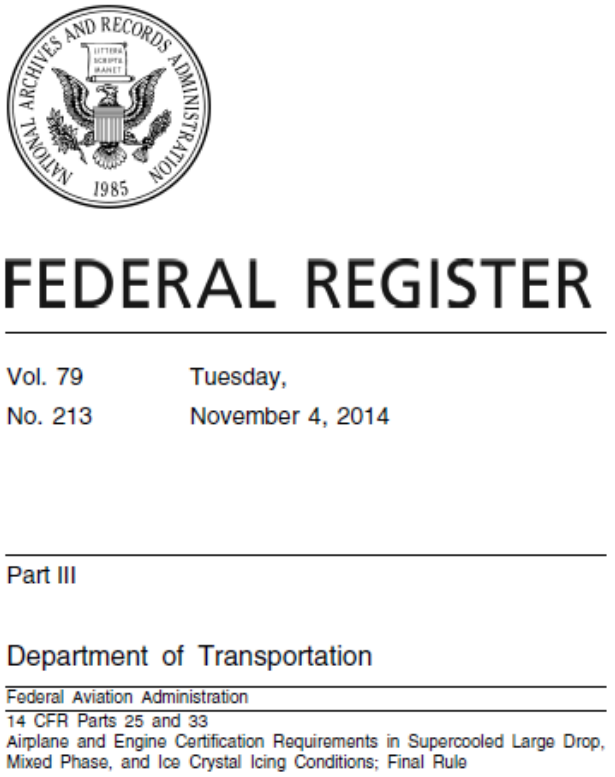
FAA Aircraft Icing Research, ANG-E282

To: Technical Interchange Meeting

Date: February 26, 2015

Introduction

- **FAA released new aircraft icing regulations on November 4, 2014.**
- **Portion of Part 25 aircraft, addressing supercooled large drop (SLD), mixed phase, and ice crystal icing conditions.**
- **TAIWIN addresses only SLD**



FEDERAL REGISTER

Vol. 79 Tuesday,
No. 213 November 4, 2014

Part III

Department of Transportation

Federal Aviation Administration

14 CFR Parts 25 and 33
Airplane and Engine Certification Requirements in Supercooled Large Drop, Mixed Phase, and Ice Crystal Icing Conditions; Final Rule

Appendix O (1/3)

- **SLD environments are freezing drizzle (FZDZ) or freezing rain (FZRA) environments**
  - **FZDZ Environments - Conditions with spectra maximum drop diameters from 100 μm to 500 μm**
  - **FZRA Environments - Conditions with spectra maximum drop diameters greater than 500 μm**

Appendix O (2/3)

- **Refer to DOT/FAA/AR-09/10, "Data and Analysis for the Development of an Engineering Standard for Supercooled Large Drop Conditions," March 2009.**
  - **Note. Appendix O was known as Appendix X when report was published.**
  - **Provides explanation of data and analysis used in the development of Appendix O.**

Appendix O (3/3)

- **Appendix O or DOT/FAA/AR-09/10**
  - **“freezing drizzle and freezing rain environments”**
  - **FZDZ, FZRA, and smaller drops aloft**
- **Proposed Aircraft Flight Manual (AFM) limitations on operations in SLD**
  - **Ground is included**
- **TAIWIN focuses on ground conditions and conditions aloft in the terminal area.**

§ 25.1420 Aircraft Affected

- **No aircraft have applied for certification under rule as yet**
- **<u>Subject</u> to new rule: New type design airplanes with a maximum takeoff weight less than 60,000 pounds or with reversible flight controls**
  - Includes some new design regional jets and smaller turboprops
- **<u>Not subject</u> to new rule:**
  - *"Grandfathered" aircraft* - Aircraft designs which are currently certified or have begun the icing certification process for Appendix C will not be subject to the new rule.

Part 23 Aircraft and SLD

- General Aviation (GA) aircraft mainly fall under Part 23
- Part 23 airplanes are under 12,500 pounds
- No proposed rule 23.1420 Supercooled Large Drop Conditions has been published in the Federal Register
- Part 23 SLD rule is under review in the Small Airplane Directorate

Review: §25.1420 and Appendix O

- **(a) (1): Certified to Appendix C but must detect and exit Appendix O, or**
- **(a) (2): Certified to operate in a selected portion of Appendix O, or**
- **(a) (3): Certified to operate in all Appendix O.**

Appendix O	Operate in FZDZ	Operate in FZRA
a(1)		
a(2)	X	
a(3)	X	X

Takeoff and Landing Limitations

- **Based on the certification, a statement will be placed in the Limitations Section of the Airplane Flight Manual.**
- **Proposed statements in accompanying advisory circular**
- ***(a)(1) "Intentional flight, including takeoff and landing, into freezing drizzle or freezing rain conditions is prohibited.***
- ***(a)(2) "Intentional flight, including takeoff and landing, into freezing rain conditions is prohibited.***

Information Available to Pilots

- **How do pilots decide?**

- **The information currently available to pilots is currently not deemed robust enough to make sound decisions such as diverting to an alternate airport.**

- **Central purpose of TAIWIN: Improve the information on icing, particularly SLD icing, available in terminal area.**

TAIWIN Goals

- **To provide:**
  - Real-time representative rate measurement of all ground-level precipitation types and accurate identification of precipitation type
  - Highly resolved, timely diagnoses and forecasts for terminal area freezing precipitation that provide local-area information
  - Highly resolved, timely icing conditions aloft in the terminal area that quantify cloud properties in four-dimensions (4-D) to support aircraft trajectories

TAIWIN Approach

- **Near-term requirements to implement terminal area icing information with current capabilities**
- **Follow-on plan for more mature TAIWIN capability needs with the improvement and/or development of technologies and icing weather information**
  - Current improvements and enhancements
  - New methods
  - Delivery

TAIWIN Stages

- **Stage I:** current state of observational weather information for icing conditions, both at the ground and aloft.
- **Stage II:** capable of identifying and distinguishing between Appendix C and Appendix O icing conditions.
- **Stage III:** capable of distinguishing between the icing conditions defined in Appendix C and the subsets of Appendix O (FZDZ versus FZRA aloft).
- **Stage IV:** provide a capability at a spatial and temporal resolution that allows arrival and departure routings within the terminal area to be tailored with respect to the icing conditions.

TAIWIN Stages

	In-Flight		
STAGES	App C & App O	FZDZ & FZRA	High Res
I			
II	X		
III	X	X	
IV	X	X	X

Conclusion

- **TAIWIN ConOps**
- **NCAR and other organizations**
- **Optimistic!**

Thank You!

Questions?