

TABLE 1—CONDITIONS THAT MUST BE DEMONSTRATED BY AN ENGINE TEST—Continued

Condition	Total air temperature	Supercooled water concentrations (minimum)	Median volume drop diameter	Duration
3. Glaze ice holding conditions. (Turbojet, turbofan, and turboprop only).	Turbojet and Turbofan, only: 10 to 18 °F (–12 to –8 °C). Turboprop, only: 2 to 10 °F (–17 to –12 °C).	Alternating cycle: First 1.7 g/m ³ (1 minute), Then 0.3 g/m ³ (6 minute).	20 to 30 microns	Must show repetitive, stabilized operation (or 45 minutes max).
4. Rime ice holding conditions. (Turbojet, turbofan, and turboprop only).	Turbojet and Turbofan, only: –10 to 0 °F (–23 to –18 °C). Turboprop, only: 2 to 10 °F (–17 to –12 °C).	0.25 g/m ³	20 to 30 microns	Must show repetitive, stabilized operation (or 45 minutes max).

(d) Operate at ground idle speed for a minimum of 30 minutes at each of the following icing conditions shown in Table 2 of this section with the available air bleed for icing protection at its critical condition, without adverse effect, followed by acceleration to take-off power or thrust. During the idle operation, the engine may be run up periodically to a moderate power or thrust setting in a manner acceptable to the

Administrator. Analysis may be used to show ambient temperatures below the tested temperature are less critical. The applicant must document any demonstrated run ups and minimum ambient temperature capability in the engine operating manual as mandatory in icing conditions. The applicant must demonstrate, with consideration of expected airport elevations, the following:

TABLE 2—DEMONSTRATION METHODS FOR SPECIFIC ICING CONDITIONS

Condition	Total air temperature	Supercooled water concentrations (minimum)	Mean effective particle diameter	Demonstration
1. Rime ice condition	0 to 15 °F (–18 to –9 °C).	Liquid—0.3 g/m ³	15–25 microns	By engine test.
2. Glaze ice condition	20 to 30 °F (–7 to –1 °C).	Liquid—0.3 g/m ³	15–25 microns	By engine test.
3. Snow ice condition	26 to 32 °F (–3 to 0 °C).	Ice—0.9 g/m ³	100 microns (minimum)	By test, analysis or combination of the two.
4. Large drop glaze ice condition (Turbojet, turbofan, and turboprop only).	15 to 30 °F (–9 to –1 °C).	Liquid—0.3 g/m ³	100 microns (minimum)	By test, analysis or combination of the two.

(e) Demonstrate by test, analysis, or combination of the two, acceptable operation for turbojet, turbofan, and turboprop engines in mixed phase and ice crystal icing conditions throughout Appendix D of this part, icing envelope throughout its flight power range, including minimum descent idling speeds.

[Amdt. 33–34, 79 FR 66536, Nov. 4, 2014]

§ 33.69 Ignitions system.

Each engine must be equipped with an ignition system for starting the engine on the ground and in flight. An electric ignition system must have at least two igniters and two separate secondary electric circuits, except that only one igniter is required for fuel burning augmentation systems.

[Amdt. 33–6, 39 FR 35466, Oct. 1, 1974]