between the maximum ambient atmospheric temperature for the relevant altitude for which approval has been requested and the temperature of the ambient air at the time of the first occurrence of the maximum fluid or component temperature recorded during the cooling test.

(d) Correction factor for cylinder barrel temperatures. Cylinder barrel temperatures must be corrected by adding to them 0.7 times the difference between the maximum ambient atmospheric temperature for the relevant altitude for which approval has been requested and the temperature of the ambient air at the time of the first occurrence of the maximum cylinder barrel temperature recorded during the cooling test.

§ 23.1045 Cooling test procedures for turbine engine powered airplanes.

(a) Compliance with §23.1041 must be shown for all phases of operation. The airplane must be flown in the configurations, at the speeds, and following the procedures recommended in the Airplane Flight Manual for the relevant stage of flight, that correspond to the applicable performance requirements that are critical to cooling.

(b) Temperatures must be stabilized under the conditions from which entry is made into each stage of flight being investigated, unless the entry condition normally is not one during which component and engine fluid temperatures would stabilize (in which case, operation through the full entry condition must be conducted before entry into the stage of flight being investigated in order to allow temperatures to reach their natural levels at the time of entry). The takeoff cooling test must be preceded by a period during which the powerplant component and engine fluid temperatures are stabilized with the engines at ground idle.

(c) Cooling tests for each stage of flight must be continued until—

1. The component and engine fluid temperatures stabilize;
2. The stage of flight is completed; or
3. An operating limitation is reached.

§ 23.1047 Cooling test procedures for reciprocating engine powered airplanes.

Compliance with §23.1041 must be shown for the climb (or, for multi-engine airplanes with negative one-engine-inoperative rates of climb, the descent) stage of flight. The airplane must be flown in the configurations, at the speeds and following the procedures recommended in the Airplane Flight Manual, that correspond to the applicable performance requirements that are critical to cooling.

§ 23.1061 Installation.

(a) General. Each liquid-cooled engine must have an independent cooling system (including coolant tank) installed so that—

1. Each coolant tank is supported so that tank loads are distributed over a large part of the tank surface;
2. Each coolant tank must have an expansion space of at least 10 percent of the total cooling system capacity; and
3. It must be impossible to fill the expansion space inadvertently with the airplane in the normal ground attitude.

(b) Coolant tank. The tank capacity must be at least one gallon, plus 10 percent of the cooling system capacity. In addition—

1. Each coolant tank must be able to withstand the vibration, inertia, and fluid loads to which it may be subjected in operation;
2. Each coolant tank must have an expansion space of at least 10 percent of the total cooling system capacity; and
3. No air or vapor can be trapped in any part of the system, except the coolant tank expansion space, during filling or during operation.

(c) Coolant tank. The tank capacity must be at least one gallon, plus 10 percent of the cooling system capacity. In addition—

1. Each coolant tank must be able to withstand the vibration, inertia, and fluid loads to which it may be subjected in operation;
§ 23.1063 Coolant tank tests.

Each coolant tank must be tested under § 23.965, except that—
(a) The test required by § 23.965(a)(1) must be replaced with a similar test using the sum of the pressure developed during the maximum ultimate acceleration with a full tank or a pressure of 3.5 pounds per square inch, whichever is greater, plus the maximum working pressure of the system; and

(b) For a tank with a nonmetallic liner the test fluid must be coolant rather than fuel as specified in § 23.965(d), and the slosh test on a specimen liner must be conducted with the coolant at operating temperature.

INDUCTION SYSTEM

§ 23.1091 Air induction system.

(a) The air induction system for each engine and auxiliary power unit and their accessories must supply the air required by that engine and auxiliary power unit and their accessories under the operating conditions for which certification is requested.

(b) Each reciprocating engine installation must have at least two separate air intake sources and must meet the following:

(1) Primary air intakes may open within the cowling if that part of the cowling is isolated from the engine accessory section by a fire-resistant diaphragm or if there are means to prevent the emergence of backfire flames.

(2) Each alternate air intake must be located in a sheltered position and may not open within the cowling if the emergence of backfire flames will result in a hazard.

(3) The supplying of air to the engine through the alternate air intake system may not result in a loss of excessive power in addition to the power loss due to the rise in air temperature.

(4) Each automatic alternate air door must have an override means accessible to the flight crew.

(5) Each automatic alternate air door must have a means to indicate to the flight crew when it is not closed.

(c) For turbine engine powered airplanes—

(1) There must be means to prevent hazardous quantities of fuel leakage or overflow from drains, vents, or other components of flammable fluid systems from entering the engine intake system; and

(2) The airplane must be designed to prevent water or slush on the runway, taxiway, or other airport operating surfaces from being directed into the engine or auxiliary power unit air intake ducts in hazardous quantities.

The air intake ducts must be located or protected so as to minimize the hazard.