§ 23.1047 Cooling test procedures for reciprocating engine powered airplanes.

Compliance with §23.1041 must be shown for the climb (or, for multie- 
gine airplanes with negative one-en- 
gine-inoperative rates of climb, the de- 
scent) 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.

[Amdt. 23–51, 61 FR 5137, Feb. 9, 1996]

LIQUID COOLING

§ 23.1061 Installation.

(a) General. Each liquid-cooled engine 
must have an independent cooling sys- 
tem (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) There are pads or other isolation 
means between the tank and its sup- 
sports to prevent chafing.
(3) Pads or any other isolation means 
that is used must be nonabsorbent or 
must be treated to prevent absorption 
of flammable fluids; and
(4) No air or vapor can be trapped in 
any part of the system, except the 
coolant tank expansion space, during 
filling or during operation.
(b) Coolant tank. The tank capacity 
must be at least one gallon, plus 10 per- 
cent 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 sub- 
jected in operation;
(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.
(c) Filler connection. Each coolant 
tank filler connection must be marked 
as specified in §23.1557(c). In addition—
(1) Spilled coolant must be prevented 
from entering the coolant tank com- 
partment or any part of the airplane 
other than the tank itself; and
(2) Each recessed coolant filler con- 
nection must have a drain that dis- 
charges clear of the entire airplane.
(d) Lines and fittings. Each coolant 
system line and fitting must meet the 
requirements of §23.993, except that the 
inside diameter of the engine coolant 
inlet and outlet lines may not be less 
than the diameter of the corresponding 
engine inlet and outlet connections.
(e) Radiators. Each coolant radiator 
must be able to withstand any vibra- 
tion, inertia, and coolant pressure load 
to which it may normally be subjected. 
In addition—
(1) Each radiator must be supported 
to allow expansion due to operating 
temperatures and prevent the trans- 
mittal of harmful vibration to the radi- 
ator; and
(2) If flammable coolant is used, the 
air intake duct to the coolant radiator 
must be located so that (in case of fire) 
flames from the nacelle cannot strike 
the radiator.
(f) Drains. There must be an acces- 
sible drain that—
(1) Drains the entire cooling system 
(including the coolant tank, radiator, 
and the engine) when the airplane is in 
the normal ground altitude;
(2) Discharges clear of the entire air- 
plane; and
(3) Has means to positively lock it 
closed.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as 
amended by Amdt. 23–43, 58 FR 18973, Apr. 9, 
1993]

§ 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 devel- 
oped during the maximum ultimate ac- 
celeration with a full tank or a pres- 
sure of 3.5 pounds per square inch, 
whichever is greater, plus the max- 
imum 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 speci- 
men liner must be conducted with the 
coolant at operating temperature.

§ 23.1047

14 CFR Ch. 1 (1–1–14 Edition)
§ 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 of ingestion of foreign matter during takeoff, landing, and taxiing.

§ 23.1093 Induction system icing protection.

(a) Reciprocating engines. Each reciprocating engine air induction system must have means to prevent and eliminate icing. Unless this is done by other means, it must be shown that, in air free of visible moisture at a temperature of 30 °F—

1. Each airplane with sea level engines using conventional venturi carburetors has a preheater that can provide a heat rise of 90 °F with the engines at 75 percent of maximum continuous power;

2. Each airplane with altitude engines using conventional venturi carburetors has a preheater that can provide a heat rise of 120 °F with the engines at 75 percent of maximum continuous power;

3. Each airplane with altitude engines using fuel metering device tending to prevent icing has a preheater that, with the engines at 60 percent of maximum continuous power, can provide a heat rise of—

   (i) 100 °F; or

   (ii) 40 °F, if a fluid deicing system meeting the requirements of §§23.1095 through 23.1099 is installed;

4. Each airplane with sea level or altitude engine(s) using fuel metering device tending to prevent icing has a sheltered alternate source of air with a preheat of not less than 60 °F with the engines at 75 percent of maximum continuous power;

5. Each airplane with altitude engine(s) using fuel injection systems having metering components on which impact ice may accumulate has a preheater capable of providing a heat rise of 75 °F when the engine is operating at 75 percent of its maximum continuous power; and

6. Each airplane with sea level or altitude engine(s) using fuel injection systems not having fuel metering components projecting into the air induction system downstream of any components or other obstruction on which ice produced by fuel evaporation may form, has a sheltered alternate source of air with a preheat of not less than 60 °F with the engines at 75 percent of its maximum continuous power.