

fuel at a point of low pressure, the discharge nozzle must be located at the venturi throat, and the throttle valve must be on the engine side of the discharge nozzle. This means that the drop in temperature due to fuel vaporization takes place within the venturi. As a result, ice readily forms in the venturi and on the throttle valve.

A pressure-type carburetor discharges fuel into the airstream at a pressure well above atmospheric pressure. This results in better vaporization and permits the discharge of fuel into the airstream on the engine side of the throttle valve. With the discharge nozzle in this position fuel vaporization takes place after the air has passed through the throttle valve and at a point where the drop in temperature is offset by heat from the engine. Thus, the danger of fuel vaporization icing is practically eliminated. The effects of rapid maneuvers and rough air on the pressure-type carburetors are negligible, since their fuel chambers remain filled under all operating conditions.

Mixture Control

Carburetors are normally calibrated at sea-level air pressure where the correct fuel-air mixture ratio is established with the mixture control set in the FULL RICH position. However, as altitude increases, the density of air entering the carburetor decreases, while the density of the fuel remains the same. This creates a progressively richer mixture that can result in engine roughness and an appreciable loss of power. The roughness normally is due to spark plug fouling from excessive carbon buildup on the plugs. Carbon buildup occurs because the rich mixture lowers the temperature inside the cylinder, inhibiting complete combustion of the fuel. This condition may occur during the runup prior to takeoff at high-elevation airports and during climbs or cruise flight at high altitudes. To maintain the correct fuel-air mixture, the mixture must be leaned using the mixture control. Leaning the mixture decreases fuel flow, which compensates for the decreased air density at high altitude.

During a descent from high altitude, the fuel-air mixture must be enriched, or it may become too lean. An overly lean mixture causes detonation, which may result in rough engine operation, overheating, and/or a loss of power. The best way to maintain the proper fuel-air mixture is to monitor the engine temperature and enrich the mixture as needed. Proper mixture control and better fuel economy for fuel-injected engines can be achieved by using an exhaust gas temperature (EGT) gauge. Since the process of adjusting the mixture can vary from one aircraft to another, it is important to refer to the airplane flight manual (AFM) or the POH to determine the specific procedures for a given aircraft.

Carburetor Icing

As mentioned earlier, one disadvantage of the float-type carburetor is its icing tendency. Carburetor ice occurs due to the effect of fuel vaporization and the decrease in air pressure in the venturi, which causes a sharp temperature drop in the carburetor. If water vapor in the air condenses when the carburetor temperature is at or below freezing, ice may form on internal surfaces of the carburetor, including the throttle valve. [Figure 7-11]

The reduced air pressure, as well as the vaporization of fuel, contributes to the temperature decrease in the carburetor. Ice generally forms in the vicinity of the throttle valve and in the venturi throat. This restricts the flow of the fuel-air mixture and reduces power. If enough ice builds up, the engine may cease to operate. Carburetor ice is most likely to occur when temperatures are below 70 degrees Fahrenheit (°F) or 21 degrees Celsius (°C) and the relative humidity is above 80 percent. Due to the sudden cooling that takes place in the carburetor, icing can occur even in outside air temperatures as high as 100 °F (38 °C) and humidity as low as 50 percent. This temperature drop can be as much as 60 to 70 absolute (versus relative) Fahrenheit degrees ($70 \times 100/180 = 38.89$

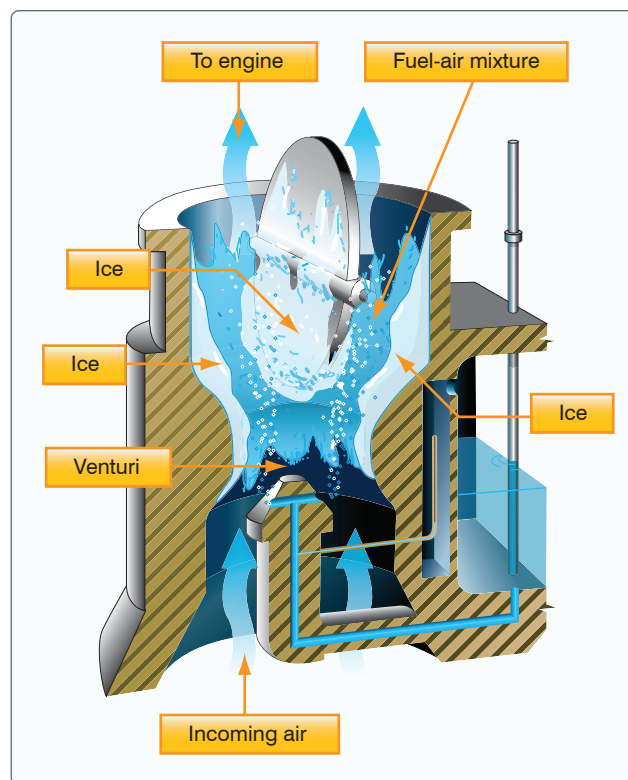


Figure 7-11. The formation of carburetor ice may reduce or block fuel-air flow to the engine.