The third way for water to enter a fuel tank is for it to be pumped in with the fuel. FBO fuel trucks and storage tanks suffer from the same problems as airplane fuel tanks about collecting water, but they have filtering systems built in. Reputable FBOs properly maintain this equipment and train personnel to use it correctly.

A strainer is located between the fuel source and carburetor to trap impurities and water. Quick drains usually are located at the lowest point in each fuel tank—and for the entire fuel system—where water and sediment tend to collect. During preflight, the pilot should check a fuel sample for purity and correct color. Any mixing of fuels will cause the color to become clear. Water, heavier than avgas, will sink to the bottom of the cup and form a distinct "bubble," while sediment will appear as floating specks. Always use a clear container for collecting the fuel sample so it may be inspected carefully.

Fuel Pump and Delivery System

Pressure systems have two types of fuel pumps: engine-driven and auxiliary. The engine-driven pump runs off the accessory panel at the rear of the engine. Typically an eccentric sliding vane type, it provides a positive displacement with a large volume output of fuel to the carburetor. As with most fuel pumps, the rotor is lubricated by the fuel itself, virtually eliminating the need for any kind of preventive maintenance.

The auxiliary fuel pump is required as a backup for the engine-driven pump. Originally these pumps were hand operated and known as *wobble pumps*. Today, auxiliary fuel pumps are powered by electric motors. In addition to their role as backup pumps, they are commonly used during engine start to build up fuel pressure, during takeoff as a safety margin, at altitudes above 10,000 feet to reduce potential for vapor lock, and during emergency operations.

In most light aircraft, a single pump is sufficient for normal operations, but in larger aircraft, electric boost pumps are often required. The purpose of the boost pump is to supply fuel under pressure to the engine-driven pump, thus preventing vapor lock. Failure of a boost pump usually means operational limitations imposed on the aircraft, including altitude restrictions and even a drastically reduced useful life of the engine-driven pump.

The purpose of the fuel selector valve is fuel manipulation by the pilot, including tank to engine, tank to tank, and (in multiengine aircraft) cross-feeding one engine from the opposite fuel tank. In the event of engine fire, emergency procedures call for the fuel to the engine to be shut off, a procedure that alone may put out the fire. As the pilot's options increase, so do the hazards, therefore several safe operating practices should be adopted.

First, never change the fuel selector position just prior to takeoff. Why switch to the unknown?

Second, never operate by feel alone. Always check visually; some fuel selectors require you to go through the OFF position when switching from one tank to another.

Third, always test all tanks while you still have options. Don't deplete one tank without knowing for sure that the other tank will work properly.

Fourth, never run a tank empty. You are creating an emergency condition when you do. It may take longer than anticipated for the fresh tank to recharge the system and get