FUEL QUANTITY INDICATOR

One of the most important instruments is the fuel quantity indicator, which displays fuel remaining for use in computing flying time remaining. For the light aircraft, it is very similar to its automotive counterpart—a float-type system. During preflight, it is important to compare the instrument reading visually with the actual tank level. Again, just prior to takeoff, double-check fuel quantity and selector position.

The float-type system consists of two devices: a tank (transmitter) unit and an indicator. The tank unit measures volume of fuel with a float riding on the fuel surface. An arm connects the float to a potentiometer, and as the tank empties, the arm moves across the potentiometer, which, in turn, varies the amount of voltage sent to a remote indicator. The indicator is calibrated to translate different voltages into the appropriate number of gallons remaining.

Pilots have learned to be distrustful of the fuel quantity indicator. For instance, it is sensitive to electrical system voltage fluctuations, which can cause erroneous fuel quantity readings. An even bigger problem is due to the many variations in tank design. Fuel tanks—which are integral to the wing—twist, turn, rise, and fall in an effort to take advantage of any free space where fuel might be stored. Finally, there is the problem that airplanes just don't sit still; they pitch up, down, yaw, bounce, and roll. The fuel float indicator is not unlike trying to determine sea level with a cork bobbing on the North Atlantic in winter. There are methods of reducing the problem, such as fuel tank baffles, but fluid level is not the best way to determine fuel quantity. Unfortunately, more accurate methods are very expensive and are left to larger aircraft.

FUEL FLOWMETER

As recently as 15 years ago, the fuel flowmeter was restricted primarily to the realm of large aircraft and jets. Now, many general-aviation pilots are able to glance at flowmeters, such as the one illustrated in Figure 4-16, to ascertain the rate of fuel moving from tank to engine. Flowmeters in aircraft with fuel injection actually measure the pressure across a fuel injection nozzle. From one point of view, this approach makes sense because the pressure drop across an orifice is proportional to the fuel flowing through it, and the gauge can be calibrated conveniently in gallons per hour. This method has one significant drawback: a plugged nozzle means a fuel flow decrease and a nozzle pressure increase. The gauge interprets this situation as an increase in flow, giving the pilot erroneous information that is opposite to the actual condition!

Aircraft with pressure carburetors use a hinged, spring-loaded plate called a dynamic hinged transmitter. The plate partially obstructs the fuel line, causing the flow to push against the plate as it passes; the greater the flow, the more the plate is displaced.

The plate pivots on a rotating shaft connected to the transmitter, which in turn electrically drives the cockpit indicator. The indicator usually is calibrated to show percent of horsepower and fuel flow in gallons per hour. Because there is some variability in the method employed to lean an engine using a fuel flowmeter it is important to read the aircraft POH, and follow the procedure outlined there.