

Vertical Velocity Indicator

The purpose of the vertical-velocity indicator (VVI) is to indicate rate of change in altitude by measuring ambient static pressure. The VVI, as shown in Figure 2-7, is calibrated in positive and negative feet per minute and also serves as a reference for level flight.

The VVI is a differential pressure instrument similar to the airspeed indicator. Inside the instrument case there is an aneroid vented to the outside ambient pressure, which operates a needle through a series of gears and levers shown in Figure 2-8. Instead of using ram-air pressure, the case is vented to static air that passes through a calibrated restrictor. As the altitude changes, the diaphragm responds immediately to the free-flowing static pressure. The case pressure, through the restrictor, has an inherent airflow lag, which artificially creates a pressure differential. Manufacturers have developed mechanical compensations for the retarding effect of cold temperatures on the airflow through the restrictor, and to the inherent lag while differential pressure builds. Otherwise the VVI has changed little over the years. Used as a supporting trend instrument, the VVI will help the pilot establish constant rates of climb and descent.

Pitot Tube

Named for Henri Pitot (sounds like pea-toe), the French engineer who invented it, the pitot tube measures the flow of fluid. Adapted for use in airplanes, the pitot tube measures dynamic (ram) air pressure. Pitot tube placement is carefully considered by the manufacturer and becomes more critical as the normal operating speed of the aircraft increases. At subsonic speed the total pressure error as a result of a less-than-optimum position usually will be negligible if the pitot tube is not located in a wake, boundary layer, or region of supersonic flow. An extended boom in front of the fuselage probably is the most effective area, but is difficult for normal ground operations.

Typically, the pitot tube on larger aircraft is located on or near the nose, but light, general-aviation aircraft will generally have it mounted under the wing. Often a small drain hole is added to permit rain to pass through, as illustrated in Figure 2-9. Sometimes

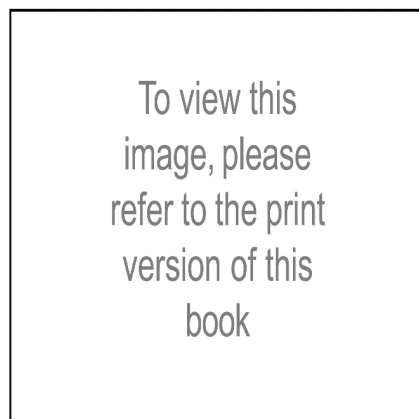


Fig. 2-7. Vertical speed indicator.