certain problems with carrying the high-voltage from the magneto internally and externally to the spark plugs. In early years, it was difficult to provide insulators that could contain the high-voltage, especially at high altitudes when the air pressures were reduced. Another requirement of high-tension systems was that all weather and radio-equipped aircraft have ignition wires enclosed in shielding to prevent radio noise due to high-voltages. Many aircraft were turbosupercharged and operated at increased high altitudes. The low pressure at these altitudes would allow the high-voltage to leak out even more. To meet these problems, low-tension ignition systems were developed.

Electronically, the low-tension system is different from the high-tension system. In the low-tension system, low-voltage is generated in the magneto and flows to the primary winding of a transformer coil located near the spark plug. There, the voltage is increased to high by transformer action and conducted to the spark plug by very short high-tension leads. *[Figure 4-20]*

The low-tension system virtually eliminates flashover in both the distributor and the harness because the air gaps within the distributor have been eliminated by the use of a brush-type distributor, and high-voltage is present only in short leads between the transformer and spark plug.

Although a certain amount of electrical leakage is characteristic of all ignition systems, it is more pronounced on radio-shielded installations because the metal conduit is at ground potential and close to the ignition wires throughout their entire length. In low-tension systems, however, this leakage is reduced considerably because the current throughout most of the system is transmitted at a low-voltage potential. Although the leads between the transformer coils and the spark plugs of a low-tension ignition system are short, they are high-tension high-voltage conductor, and are subject to the same failures that occur in high-tension systems. Low-tension ignition systems have limited use in modern aircraft because of the excellent materials and shielding available to construct high-tension ignition leads and the added cost of a coil for each spark plug with the low-tension system.

FADEC System Description

A FADEC is a solid-state digital electronic ignition and electronic sequential port fuel injection system with only one moving part that consists of the opening and closing of the fuel injector. FADEC continuously monitors and controls ignition, timing, and fuel mixture/delivery/injection, and spark ignition as an integrated control system. FADEC monitors engine operating conditions (crankshaft speed, top dead center position, the induction manifold pressure, and the induction air temperature) and then automatically adjusts the fuel-to-air ratio mixture and ignition timing accordingly for any given power setting to attain optimum engine performance. As a result, engines equipped with FADEC require neither magnetos nor manual mixture control.

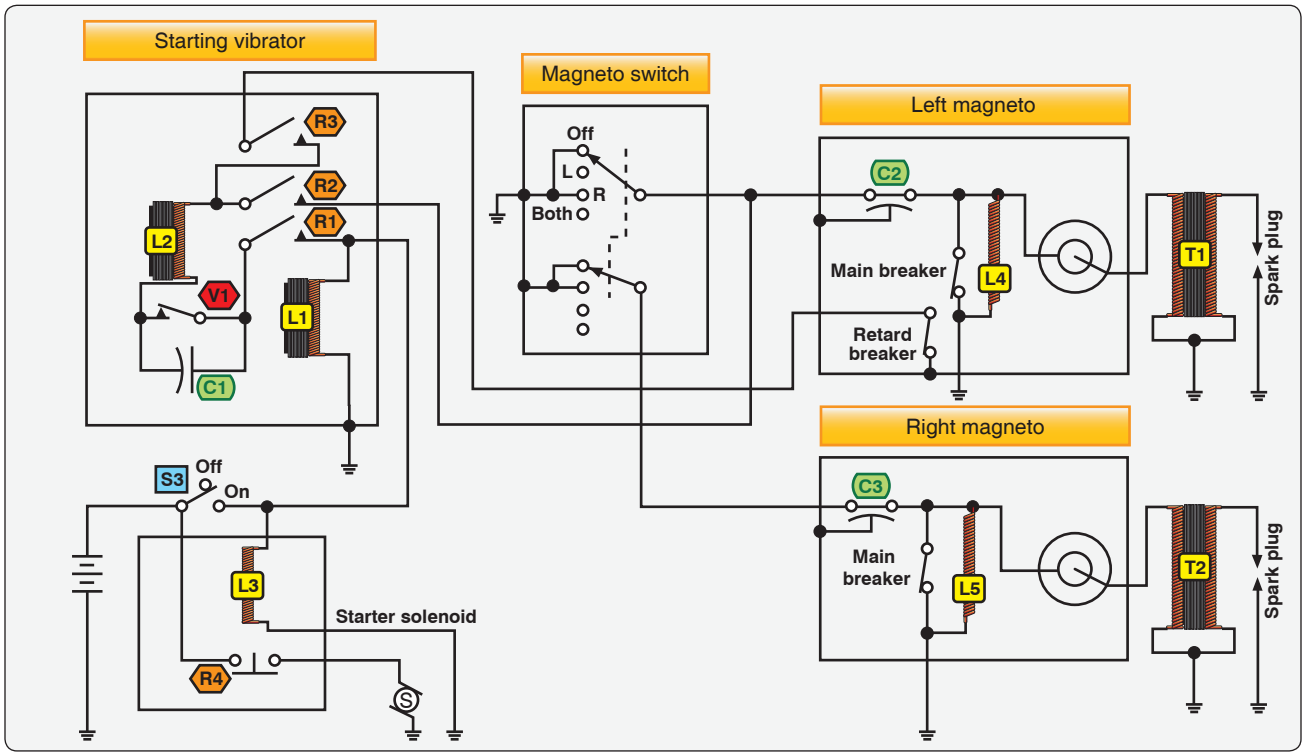

Figure 4-20. *Simplified low-tension ignition system schematic.*