firing. This is one of the principle reasons why we shut down aircraft engines by starving them of fuel as we pull the mixture control into the full lean position.

If you decided to shut down the engine by turning off the mag switch, fuel would continue to be pumped into the cylinders as the engine wound down, but it would not be burned. The result would be raw fuel in the cylinders when the engine was shut down. It is true that magnetos have what is known as a "P-lead" that grounds the magneto when you turn off the mag switch, but you only need to see that frail wire one time to realize the potential for it to break.

So, thus far we have two things happening to shut down the engine. We starve it of fuel then ground the magneto to prevent ignition. Sound safe? Typically it is, but fuel systems are known to leak, especially primers, and the result could be fuel in the cylinders, even though the mixture is in the idle cutoff position. If a magneto P-lead should break, it is possible that even turning the prop a few inches could result in the engine roaring to life! As unlikely a sequence of events as that may seem, there have been quite a few cases where exactly that has happened, resulting in loss of life, limbs, and in a few cases, an aircraft taxiing out of control around a ramp with no pilot inside.

Types of Magneto Systems

There are two types of magneto ignition systems: high tension and low tension. The high-tension system, which is most common, actually generates within the magneto the high voltage necessary to fire the spark plugs. This voltage, which is transmitted through a distributor and wiring harness to the appropriate spark plug, has a tendency to jump from the harness and/or distributor and follow the path of least resistance. Known as "flashover," this is especially a problem in the low pressure and cold atmosphere of high altitudes.

Another problem with the high-tension system results from some leads being longer than others because the plugs are farther away from the magneto. These long leads tend to store energy, releasing it after the normal timed ignition. This second spark is called "capacitance after-firing." High in heat energy, it attacks spark plug electrode materials and causes approximately double the electrode erosion rate. A high-tension system is relatively lower in cost, less complicated to install than its low-tension counterpart, and lighter in weight, making it ideal for most general-aviation light aircraft.

The low-tension system overcomes flashover by transmitting low voltage from the magneto through the harness, which then is stepped up through a transformer near the spark plug. In addition to performing better at high altitudes, the magneto also has greater resistance to in-flight moisture problems, operates more efficiently, and the shorter high-tension leads reduce potential voltage loss as a result of the lead's low capacitance.

Magneto timing is critical to engine health and performance. An improperly timed spark can cause significant, even catastrophic, problems. Timing that is too advanced can lead to power loss, overheating, detonation, and preignition. If timing is too retarded, a significant power loss and increased fuel consumption would be expected. Any inspection should include checking the magneto hold-down nuts, which should be tight and safetied. If they are loose, there is a good possibility that the magneto timing will be off.