Ignition System

The typical ignition system on WSC aircraft provides the spark that ignites the fuel/air mixture in the cylinders and is made up of magneto/generators, control boxes, spark plugs, high-voltage leads, and the ignition switch. For most LSA engines designed specifically for aircraft, a magneto/generator uses a permanent magnet to generate an electric current independent of the aircraft's electrical system, which might include a battery. The aircraft electrical system can fail—the battery can go dead. However, this has no effect on the ignition system.

The electricity from the ignition magneto/generator goes into the ignition control box where the correct voltage is produced and timed to fire the spark plugs at the proper time. Modern WSC aircraft use an electronic capacitance discharge system that operates without any moving parts to increase reliability and efficiency. Capacitance Digital Systems (CDI) operate similarly but they have the ability to change the timing of the spark for different rpm. Consult the POH for the particular system for each engine.

The system begins to fire when the starter is engaged and the crankshaft begins to turn. It continues to operate whenever the crankshaft is rotating. Most WSC aircraft incorporate a dual ignition system with two individual magneto/generators, separate sets of wires, separate sets of control boxes, and separate sets of spark plugs to increase reliability of the ignition system. Each magneto/generator operates independently to fire one of the two spark plugs in each cylinder. If one of the systems fails, the other is unaffected. The engine will continue to operate normally, although a slight decrease in engine power can be expected.

The operation of the magneto/generator output to the ignition system is controlled in the flight deck by the ignition switch. Since there are two individual ignition systems, there are normally two separate ignition toggle switches or separate positions on the ignition control, as shown in *Figure 4-16.*

Identification of a malfunctioning ignition system during the pretakeoff check is observed by the decrease in rpm that occurs when first turning off one ignition switch, turning it back on, and then turning off the other. A noticeable decrease in engine rpm is normal during this check. If the engine stops running when switching to one ignition system or if the rpm drop exceeds the allowable limit, do not fly until the problem is corrected. The cause could be fouled plugs, broken or shorted wires between the magneto/generator and spark plugs, or improperly timed firing of the plugs because of a defective control box. It should be noted that "no drop" in rpm is not normal, and in that instance, the aircraft should not be flown. Following engine shutdown, keep the ignition

Figure 4-16. *Keyed ignition system with integral starter.*

switches in the OFF position. Even with the battery and master switches OFF, the engine can fire and turn over if an ignition switch is left ON and the propeller is moved because the magneto/generator requires no outside source of electrical power. The potential for serious injury in this situation is obvious.

Standard category aircraft engine systems are described in the Pilots Handbook of Aeronautical Knowledge; however, these engines are not typically used on WSC. Automobile engines or other non aircraft engines may be used on WSC where the ignition system runs off the battery rather than a magneto/generator system. In this case if the battery system fails, the engine ignition system will fail and the engine will stop.

Combustion

During normal combustion, the fuel/air mixture burns in a very controlled and predictable manner. Although the process occurs in a fraction of a second, the mixture actually begins to burn at the point where it is ignited by the spark plugs, then burns away from the plugs until it is consumed completely. This type of combustion causes a smooth buildup of temperature and pressure and ensures that the expanding gases deliver the maximum force to the piston at exactly the right time in the power stroke.

Detonation is an uncontrolled, explosive ignition of the fuel/air mixture within the cylinder's combustion chamber. It causes excessive temperatures and pressures which, if not