Depending on the engine manufacturer, all of these arrangements can be designed to utilize spark or compression ignition and operate on either a two- or four-stroke cycle.

In a two-stroke engine, the conversion of chemical energy into mechanical energy occurs over a two-stroke operating cycle. The intake, compression, power, and exhaust processes occur in only two strokes of the piston rather than the more common four strokes. Because a two-stroke engine has a power stroke upon each revolution of the crankshaft, it typically has higher power-to-weight ratio than a comparable four-stroke engine. Due to the inherent inefficiency and disproportionate emissions of the earliest designs, use of the two-stroke engine has been limited in aviation.

Recent advances in material and engine design have reduced many of the negative characteristics associated with two-stroke engines. Modern two-stroke engines often use conventional oil sumps, oil pumps, and full pressure fed lubrication systems. The use of direct fuel injection and pressurized air, characteristic of advanced compression ignition engines, make two-stroke compression ignition engines a viable alternative to the more common four-stroke spark ignition designs. *[Figure 7-3]*

Spark ignition four-stroke engines remain the most common design used in GA today. *[Figure 7-4]* The main parts of a spark ignition reciprocating engine include the cylinders, crankcase, and accessory housing. The intake/exhaust valves, spark plugs, and pistons are located in the cylinders. The crankshaft and connecting rods are located in the crankcase. The magnetos are normally located on the engine accessory housing.

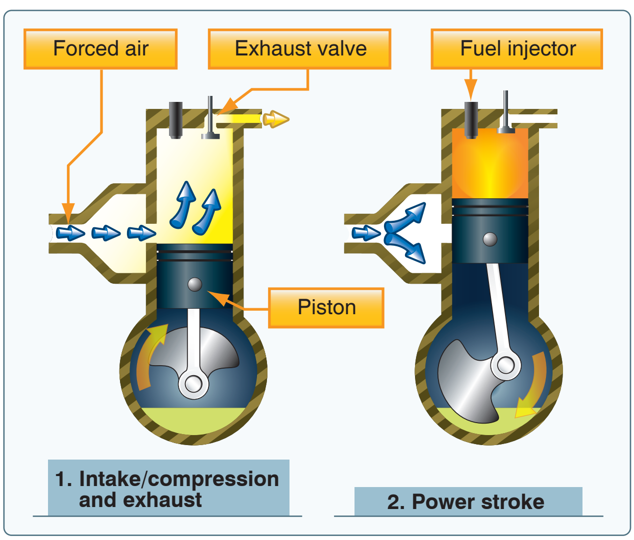


**Figure 7-3.** *Two-stroke compression ignition.*

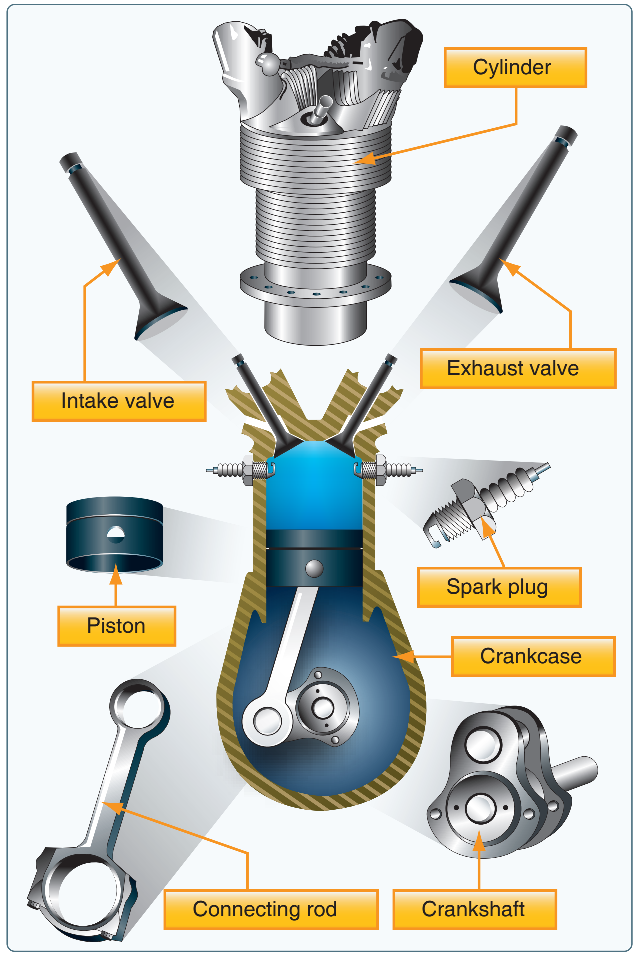


**Figure 7-4.** *Main components of a spark ignition reciprocating engine.*

In a four-stroke engine, the conversion of chemical energy into mechanical energy occurs over a four-stroke operating cycle. The intake, compression, power, and exhaust processes occur in four separate strokes of the piston in the following order.

1. The intake stroke begins as the piston starts its downward travel. When this happens, the intake valve opens and the fuel-air mixture is drawn into the cylinder.
2. The compression stroke begins when the intake valve closes, and the piston starts moving back to the top of the cylinder. This phase of the cycle is used to obtain a much greater power output from the fuel-air mixture once it is ignited.
3. The power stroke begins when the fuel-air mixture is ignited. This causes a tremendous pressure increase in the cylinder and forces the piston downward away from the cylinder head, creating the power that turns the crankshaft.