Moving upward, the piston compresses Fred and friends into a smaller and smaller space, possible because the valves are now closed, until the piston arrives at its highest point in the cylinder called top dead center (TDC). At that point, Fred and friends are now compressed into a comparatively small space with the piston at TDC; talk about losing inches around the middle. Having survived two strokes, intake and compression, the bad news is about to arrive. A spark plug delivers a spark and ignites the fuel/air mixture, an event that is simply called "ignition."

The spark plug is powered by a magneto, also "timed" in a manner similar to the valves, to provide a spark at just the right moment. Early on I said the reason an aircraft engine works is based on the simple chemical fact that if you compress the correct fuel/air mixture and ignite it, the result will be a rapid, even burning, which results in substantial expansion of the gasses. This is where that chemical reaction occurs.

As the burning gasses expand, the pressure dramatically increases, causing the piston to be pushed downward on what is known as the power stroke. This is how the engine accomplishes work. The piston itself is connected to a crankshaft by a connecting rod. As the piston is forced downward during the power stroke, its connecting rod causes the crankshaft to rotate. It is the crankshaft that is connected, often through various gears, to the propeller and a host of accessories such as the alternator and various pumps.

When the piston has reached BDC once more, the exhaust valve, again one per cylinder, is timed to open. As the piston begins its upward journey for an exhaust stroke, it forces the burned gas out the exhaust valve, down an exhaust manifold that runs along the engine in a manner very similar to the intake manifold, and finally out of the exhaust stack into the atmosphere.

So, if we look at the term four-stroke cycle, it should now make sense. A cycle is one complete series of events that occur during engine operation. During one cycle of an aircraft reciprocating engine, there are four strokes incorporating five key events. The first stroke/event is intake. The second stroke is compression with two events occurring, both compression and ignition. The third stroke (fourth event) is power, and the fourth stroke (fifth event) is exhaust.

There are one or two minor details to clarify before moving on. It is obvious where the piston gets the power for the power stroke; it is the expansion of the burning gases. What may not be so obvious is what provides power to move the piston for the intake, compression, and exhaust strokes. The answer is quite simple. There are multiple cylinders, so the power strokes of each cylinder are timed so as to occur in a sequence. For instance, as cylinder #1 is experiencing a power stroke, which turns the crankshaft, the piston of cylinder #2, which is connected to the crankshaft, may be upward on the compression stroke, while #3 may be downward on intake and #4 upward on exhaust. At all times there is one cylinder delivering power sufficient to turn the propeller and accessories and move the remaining pistons through their nonpower-producing strokes.

Another detail deals with momentum. While the above description is accurate in simple concept, the timing is not quite so straightforward. Gas flow doesn't happen instantly. Therefore, both the intake and exhaust valves actually open slightly in advance of TDC and BDC to accommodate the reality of physics.