Chapter Ten

It wasn't long before flying became popular and pilots started thinking of practical uses for the airplane. First, they thought of carrying one passenger, then two, then a package or two, mail, and as a result airplanes got bigger and heavier. Approach speeds increased, landing distances grew longer, ground maneuvering became more difficult, and hard surface runways began to appear. The need for pilot-controlled brakes became obvious. It was a logical step to borrow the idea from the automobile brake and adapt it to the airplane. And that's just what was done; the standard drum-and-shoe type brake began to appear on airplanes.

Aircraft ground handling and control improved, but airplanes continued to get heavier and faster. Brake fade, the drawback of the automotive brake, began to rear its ugly head in aviation. The friction to stop the airplane was caused by an asbestos-lined metal shoe that wedged against a rotating cast iron drum attached to the inside of the wheel. In principle, it worked well; in practice, it was another thing completely.

As engine power, gross weights, and speeds increased, the demand on the brake increased. In fact, the modern brake has several jobs. It provides sufficient friction to stop the airplane on landing, holds the airplane during engine runup, absorbs the kinetic energy of the wheel and converts it into heat, and sheds the resultant heat as efficiently and quickly as possible. The old shoe and drum just couldn't handle that much work. The heat became high enough to cause the rotating cast-iron drum to expand away from the shoe, which resulted in a dramatic reduction of brake effectiveness. A better method had to be devised, and after some serious effort the disc brake was designed.

Probably one of the simplest systems in most light aircraft, the brakes are usually activated by a dedicated hydraulic system. The major components, shown in Figure 10-6, are rudder pedal/toe brakes; master cylinder; the hydraulic tubing brake line; disc; and brake housing, which includes the piston and linings, also known as pads. The toe brakes are integral to the rudder pedals, though a few aircraft use either a hand brake or independent heel brakes. When using toe brakes, it is important not to confuse rudder pedal deflection with pushing on the top half of the pedal for brake application. The two functions are independent of each other, as Figure 10-7 illustrates. The left toe brake operates the left main gear brake while the right toe brake operates the right main gear brake, making differential braking possible. There is one master cylinder for each toe brake, and its purpose is to translate foot pressure into hydraulic fluid pressure through the brake line to operate the wheel brake.

Single Disc Systems

Virtually all modern, light aircraft use a single disc brake system. The system is composed of two large friction-producing calipers, one on each wheel, which are controlled by the brake pedals. A caliper works by clamping down on a disc attached to the rotating wheel.

One reason for the popularity of the single-disc brake system in light aircraft is its simplicity, as seen in Figure 10-8. It consists of a brake unit housing, typically made of aluminum or magnesium alloy, attached to the landing-gear strut. Within that housing is a steel disc that is rigidly fixed to, and rotates with, the aircraft wheel. The purpose of the