AD oil may not be as effective as with a lower-time engine. If you are planning to switch to a synthetic from either AD or straight mineral oil, then you should drain and flush the system as per manufacturer's recommendation. If you are using synthetic oil in your engine and need to add a quart or two of oil but don't have synthetic available, it is safe to use mineral oil. Bear in mind, as you dilute the synthetic with the mineral oil, you're defeating the purpose of using synthetic oil in the first place.

AIRCRAFT OIL SYSTEMS

Modern, light aircraft use a wet sump system similar to that shown in Figure 5-1. Oil is stored in the sump of the engine and is drawn out through a suction tube by the oil pump. The positive displacement, gear-type pump diagrammed in Figure 5-2 is the most common in light aircraft. Each time the engine-driven pump rotates, a fixed amount of oil is moved. A pressure relief valve maintains a constant system pressure as the pump speed varies. The pump has two spur gears meshed together. One is driven by the engine; the other follows. At the inlet side of the pump the teeth unmesh, causing the cavity volume to increase. This draws oil into the pump, where it fills the spaces between the teeth and is carried around. At the outlet side, the gears mesh, causing cavity volume to decrease, forcing the oil out of the pump. Here, in the close quarters of the meshing teeth, is one area where metal chips and other oil contamination can lead to trouble. The source for the oil pressure gauge is tapped off the pump outlet. To prevent gauge fluctuation and minimize oil loss if the line is broken, the hole is very small (approximately 3/16ths of an inch). The potential to clog such a small hole, or most oil passages, with sludge and other particulate matter is high, so a filtration system is employed.

In addition to clogging oil passages, solid contaminants and sludge can cause significant wear and damage to bearings, rings, cylinder walls, and pump vanes. Typically, a full flow filter is used, forcing all oil to pass through the filter each time it circulates. If only we had something like that filtering our arteries; think of the chocolate sundaes and cheeseburgers you could consume! The most common filter used in general aviation is the semidepth, which is a long, pleated sheet of resin-impregnated fibers, as shown in Figure 5-3. This sheet is rolled up around a steel core and is either put inside a metal spin on container or into a housing integral to the engine. To prevent oil system failure should the filter become clogged and prevent the normal flow of oil, a pressure-sensitive bypass valve is installed that will reroute oil around the filter. It is worth noting that the pilot will have no indication that the filter is being bypassed; contaminated oil will continue to flow through the engine until the next oil change or until sufficient damage is done to draw attention to itself. This is one of the major reasons why it is critical to change the oil and filter routinely.

A spring-loaded relief valve, downstream from the pump, is used to maintain constant system pressure as the pump speed varies with the engine. If the pump outlet pressure is less than spring pressure, oil continues through the system; if it is greater, the spring is displaced and oil is rerouted back to the inlet side of the pump, causing system pressure to reduce. This process happens so rapidly that fluctuations are not noticeable on the pressure gauge. An adjustable screw varies relief valve spring tension to permit system pressure calibration.