in the filter should be sent along with the oil sample for determination of origin. To prevent inadvertent contamination of spin-on filters, which are sealed in a can, there is a special cutter that will remove the top without allowing any particles to fall into the filter itself. More than one pilot has been aghast to discover small chunks of metal in the filter, only to find out they were the result of cutting open the filter for inspection.

OIL ANALYSIS

One of the most effective preventive maintenance procedures you can do for the long-term health of your engine is to have your used oil sent away for spectrometric laboratory analysis. And while there are certainly those who feel it is a waste of time and money, many more swear by it. There are countless claims that the early detection of problems by oil analysis prevented what could have been catastrophic in-flight failures.

Labs that perform aviation oil analysis generally agree that about 75% of the samples they analyze indicate normal engine wear. Approximately 20% indicate some sort of abnormal wear, with 5% showing a critical engine defect that requires immediate attention. Considering that a critical engine defect could result in a catastrophic in-flight engine failure, it just makes sense to have your oil analyzed on a regular basis.

The reason for establishing a regular engine oil analysis program is because reciprocating engines are by design high-friction-causing machines with a lot of relative motion between moving parts like the crankshaft and crankcase or the connecting rod bearings. When two metals rub together, such as the piston rings against the cylinder walls, the resulting friction at the points of contact slowly wear away the metal, eventually leading to failure of the part. The metals used at the various contact points within an engine and oil system are known as "wear metal." Oil analysis labs know what wear metals are used in specific areas, and traces of a given metal will indicate what area or areas are experiencing wear. But there are more reasons than just wear to worry about.

Reciprocating engines attract a wide variety of nasty contaminants such as dirt, fuel, water, oxidation, nitration, and for those few liquid-cooled engines—glycol. Add these to particles of metal floating in the oil, and the oil's effectiveness is dramatically eroded. The problem is these contaminants are usually microscopic and can't be seen by the human eye, so just looking at oil when you change it, or feeling it with your fingers, is of little value.

Oil analysis is a trend-indicating program requiring a minimum of three sample periods to establish a meaningful trend. It is not a one-time or occasional thing to do. Therefore, it is suggested that oil samples be taken every 50 operating hours or 3 months, whichever comes first. At the very minimum, for the program to be effective, samples should be taken with every oil change.

It is important to note that there is variation among labs in their methods of recording data, so you should pick one lab and stick with it over time. This assures the structure of using the same system and builds up historical data for long-term comparison. Another important aspect of the analysis is to completely and accurately fill out the questionnaire. Being completely candid when answering questions about operating conditions and procedures helps the analyst to make recommendations based on what