EGT Myths Debunked

Understanding exhaust gas temperatures

BY MIKE BUSCH

PILOTS STILL SEEM TO have a lot of misconceptions about exhaust gas temperature (EGT). Let's see if we can clear some of them up.

These days, pilots of piston-powered aircraft seem to be fixated upon EGT. Scarcely a day goes by that I don't receive a phone call, e-mail, or support ticket asking some EGT-related question.

Pilots will send me a list of EGT readings for each of their cylinders and ask me if I think they look okay, whether I think their EGTs are too high, what maximum EGT limit I recommend, why their EGTs seem to be higher in the winter than in the summer, or why the EGTs on their 1972 Cessna 182 are so much higher than the ones on their friend's 1977 model. They'll voice concern that the individual cylinders on their engine have such diverse EGT readings, worry that the spread between the highest and lowest EGT is excessive, and ask for advice on how to bring them closer together. They'll complain that they are unable to transition from rich-of-peak (ROP) to lean-of-peak (LOP) operation without producing EGTs that are unacceptably high.

Each of these questions reveals a fundamental misunderstanding of what EGT measures, what it means, and how it is interpreted. Let me attempt to clear up some of this confusion by asking you to forget everything you thought you knew about EGT and start at the beginning.

A LITTLE HISTORY

When petroleum engineer Al Hundere introduced the first EGT instrumentation for piston-aircraft engines in the 1960s, he did something quite clever. The analog EGT gauges manufactured by his company Alcor (and widely installed by Beech, Cessna, Mooney, Piper, and other aircraft manufacturers) had no absolute temperature markings, only a series of unlabeled tick marks spaced 25 degrees Fahrenheit apart, with an asterisk at 80 percent of full-scale (See Figure 1). As the pilot leaned the engine, the EGT needle rose to a peak value on the meter, then started to fall off. The pilot would note where the needle peaked, then would richen until the needle dropped by the desired number of tick marks (e.g., three for 75 degrees Fahrenheit). The gauge provided the pilot no way to determine the *absolute* value of EGT (e.g., 1,475 degrees), but only its relative value (e.g., 75 degrees rich of peak).

Hundere understood that the absolute value of EGT is not particularly meaningful (we'll see why shortly), and that presenting this information to the pilot would simply be a distraction. Since the Alcor EGT gauges provided no absolute temperature information, pilots never worried about whether their EGTs were too high or what the maximum EGT limits should be—and that was a good thing.

The first probe-per-cylinder engine analyzers introduced by Alcor and Bill Simkinson's KS Avionics were arrays of vertical analog meter movements, and they also provided only relative EGT information to the pilot. When John Youngquist introduced the original Insight graphic engine monitor (GEM), its novel LED bar-graph display also provided only relative EGT.

FIGURE 1

The original Alcor EGT gauge provided no absolute temperature information; the same was true of early engine analyzers and even the original Insight GEM 640/660.