P&E

>> The Cadillac Automobile Company's first year of production was 1903; the four-seat Model A had a one-cylinder engine and originally sold for $850.

OPINION

Car talk

What makes automobiles and airplanes so different?

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Savvy Maintenance coverage sponsored by **AIRCRAFT SPRUCE**

I RECEIVED A THOUGHT-PROVOKING email from *AOPA Pilot* reader Nate Bissonette of St. Paul, Minnesota, that started me thinking about the differences between automobiles and general aviation airplanes.

According to data from the U.S. Department of Transportation, the average U.S. driver puts in 13,474 miles behind the wheel each year. Males drive more than females: 16,550 miles versus 10,142 miles per year (I'm not sure why). The same study indicates that the average vehicle speed is a maddeningly slow 32 miles per hour, which probably says something about how much time we spend in traffic, and waiting at stop signs and red lights.

Bissonette suggested a thought experiment in which our cars were equipped with Hobbs meters. Divide 32 mph into 13,474 miles to calculate that the average automobile would put roughly 421 hours on its imaginary Hobbs every year.

These days, most piston aircraft engines have 2,000-hour times between overhauls. What if cars did, too? At 421 hours per year, your car engine would reach TBO in about 4.75 years and the odometer would read about 64,000 miles. "When's the last time you heard of somebody driving a Toyota Corolla that needed major engine work at 64,000 miles?" Bissonette asked me, rhetorically. "At that mileage, the Corolla engine would just barely be broken in. Heck, a Hyundai Sonata engine would still be under warranty."

Indeed, the current standard automotive powertrain warranty is 60,000 miles or six years; Hyundai, Kia, and Mitsubishi offer a 100,000-mile, 10-year powertrain warranty. Compare that to the warranty on a new Continental or Lycoming engine: 24 months. For the typical aircraft owner who flies 100 hours a year, that means the engine warranty runs out at about 200 hours on the Hobbs. For an airplane that cruises at 150 knots, that's about 30,000 miles.

APPLES AND ORANGES?

Is it fair to compare aircraft engines with car engines in this way? After all, aircraft engines operate continuously at 65 to 75 percent of maximum rated power in cruise, while car engines loaf along most of the time. Aircraft engines are air-cooled, so they have very poor temperature control compared with liquid-cooled automotive engines. Aircraft engines turn at ridiculously low rpm, so they require huge displacements and massive reciprocating components compared to high-revving car engines with their relatively tiny pistons and cylinders. Finally, aircraft engines operate on high-octane gasoline that is doped with tetraethyl lead, a chemical that causes severe internal contamination problems and (among other things) makes it impossible for the engines to use modern, full-synthetic lubricants.

While all this is true of the Continentals and Lycomings behind which most of us fly—engines based on the finest technology available in the 1950s—does it really need to be that way? Look at the Rotax 912 series designed in the 1980s (see "Savvy Maintenance: Outside the Box," June 2017 *AOPA Pilot*). These high-revving, small-displacement, liquid-cooled aircraft engines are designed to run on unleaded mogas and to use modern full-synthetic oils. They're lighter and more powerful than comparable engines from Continental and Lycoming. Although they currently have a manufacturer-recommended TBO of 2,000 hours, the folks who overhaul them tell me that they're still in pristine condition at TBO and almost certainly could be safely operated much, much longer.

If things progressed that far from the 1950s to the 1980s, just imagine the benefits of a certificated piston aircraft engine designed in, say, 2010. There are a few, but to the best of my knowledge they're all diesels, and they're trickling into the fleet at such a glacial pace that few of us will ever have the chance to fly behind one.

NOT JUST TECHNOLOGY

There are other reasons for the difference in longevity between aircraft and automotive engines. Probably the biggest difference is disuse. Most people drive their car every day, or at least several times a week; it seldom sits unused for very long. In contrast, GA airplanes often sit for weeks or months without being flown. While I put more than 120 hours on my Cessna 310 in 2017 (more than average), all that flying time was during only six months, and the aircraft sat hangared for the other six months. This sort of irregular use is extremely hard on the equipment, and is the number one reason that piston aircraft engines fail to make TBO. It's not that we need to fly more, but that we need to fly more often and more regularly.

Another non-technological factor is government regulation. Both the auto and aircraft industries are highly regulated, but historically the philosophies of their regulatory agencies have been dramatically different. In the automotive industry, regulations have compelled auto manufacturers to create innovative new engine designs to meet ever-tightening federal fuel economy standards. In the aircraft industry, the draconian requirements and punitive costs of certifying an innovative engine design have acted to stifle innovation and keep us flying behind 1950s technology.

Finally, there's the issue of TBO. Aircraft engines have them; car engines don't. Although the FAA doesn't require it, all aircraft engine manufacturers encourage us to tear down our powerplants at an arbitrary number of engine hours, even if they're running fine and giving all indications of being healthy. Doing the same thing to an automobile engine would be considered insane; we run them as long as they continue to perform properly. Most of us will never need to have an automobile engine overhauled. Auto engines don't need TBOs, and in my opinion aircraft engines don't, either. I'd like to see the whole concept of TBOs abolished from our vocabularies, and all aircraft engines maintained strictly on condition, the same as we've always done with our cars.

AFFORDABILITY

While ruminating about comparisons between airplanes and cars, I recalled an interesting one that I first heard many years ago from John Frank, the late founder of the Cessna Pilots Association. Frank suggested that a useful GA affordability metric was the ratio between the price of a new airplane and the price of a new Cadillac. It's a calculation that says a lot about the economic trajectory of GA.

I purchased my first airplane in 1968. It was a brand-new 1968 Cessna 182L Skylane that I picked up from the Cessna factory in Wichita and flew home to California; heady stuff for a 25-year-old kid. I paid $25,000 for the Skylane in 1968. At the time, a 1968 Cadillac DeVille sedan had an MSRP of $5,785, so the Skylane-to-Cadillac price ratio was roughly 4.3 to 1.

Fast forward to 2017, when the typical price of a new 2017 Cessna 182 NXi was $505,000 and a new 2017 Cadillac CTS sedan had an MSRP of $54,280. That's a Skylane-to-Cadillac price ratio of 9.3 to 1. Going further upscale, we might compare a new 2017 Cirrus SR22T NXi ($862,900) to a new top-of-the-line 2017 Cadillac CT6 3.0 Turbo AWD sedan (MSRP $72,959), for a Cirrus-to-Cadillac price ratio of 11.8 to 1.

My own choice for ground transportation these days is my 2018 Genesis G80, which I purchased new for about $38,000. I only required one of these incredibly luxurious and well-mannered vehicles (with its 100,000-mile, 10-year powertrain warranty), but I could have bought 14 of them for the price of one 2017 Cessna Skylane, and nearly 23 of them for the price of one 2017 Cirrus SR22T.

In real inflation-adjusted terms, the cost of new GA airplanes has gone up two-, three-, or even five-fold since 1968 compared to the cost of luxury cars, depending on what airplane and luxury car you choose for the comparison. I find that depressing. Is it any wonder that I could afford a new Skylane when I was a 25-year-old kid just out of college, but today it's far above my pay grade? Has the common belief that only rich folks fly private airplanes become a self-fulfilling prophecy? Is it any wonder that Experimental amateur-built airplanes are the fastest-growing segment of general aviation? **AOPA**

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