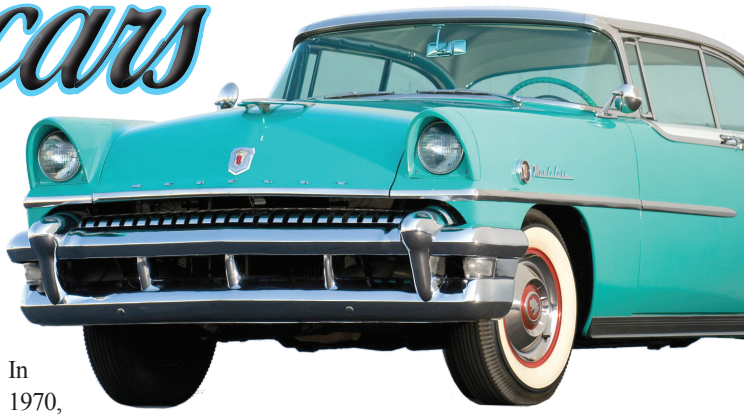
My life in cars



I've been fascinated by cars my whole life. Even when I was way too young to drive, I read every car magazine that I could get my hands on. Fortunately, one of my cousins kept a large collection of such magazines. A fascination for cars was part of the culture that I grew up in. Every discussion with my compatriots sooner or later turned to cars. In addition to the technical aspects of cars, the discussions included more practical aspects, such as which car was fastest and which cars would help attract girls. In the 1950s, one of my cousins bought a Plymouth Fury convertible, the one with the large fins. For a while, I wanted that car. However, in the mid-1960s my attention was drawn to the Chevy Corvette Stingray. And my automobile fantasies have remained there ever since.

In terms of full disclosure, I should note that several family members of mine have worked for General Motors (GM) or Ford, developing new technologies, making cars, or in management. A few years ago, I mentioned my dream of owning a Corvette Stingray to the cousin who had owned the Plymouth Fury. For many years, he worked in management at GM and had considerable experience with their complete line of cars. At one point, he even owned a Corvette. To my considerable surprise, he was very negative about my dream of owning one of the classic Stingrays. His main point in opposition was that the classic versions do not contain the technologies that make modern cars much safer. Another car had hit his Corvette, and the rear half of the fiberglass body was ripped off. He recommended that instead I buy a modern Corvette. Alas, the modern Corvettes have an extremely low profile. At this stage of my life, I might be able to get into and drive a modern Corvette, but it would take a heavy-duty crane to get me out. So my lust for the Stingray remains, although I doubt that I will ever own one.

My father was an imminently practical man, as befitted an accountant/teacher/farmer with a wife and four kids. Our cars were mostly sedans from Ford, GM, or Mercury. We owned a Studebaker in the 1950s and a Volkswagen Beetle in the late 1960s, but nothing really exotic. My hints that the family should own a Stingray, or better yet, that he should simply buy me one, went unremarked and unconsidered.

When I became old enough to drive, my father allowed me to purchase one of the older family cars from him for the princely sum of $200. My first car was a 1955 Mercury. One of its advantages was that the driver and passengers were surrounded by a large hunk of metal. Of course, at that time, most cars were large hunks of metal–mostly steel. One of the endearing features of the car was for the accelerator pedal to stick when pressed down. At which point, I would sometimes have to throw the car in neutral and stab at the brake pedal, just to avoid colliding with whatever was in front of me. Another of its endearing features was that it would occasionally refuse to start, even though nothing was proven wrong. I remember getting fed up with it and was going to sell it, so my father bought it back for $200 and traded it in for the VW Beetle.

In 1970, I bought a 1968 Ford Galaxy XL. It was a huge, two-door sedan. Its two seats could comfortably hold six people, seven to eight people in a pinch. The first two years that I owned it, I used it to travel back and forth between home and graduate school at Purdue. Like the Mercury, it was a true gas-guzzler. It had a 25-gallon tank, and I would have to fill it several times on the trips to and from the university. At that time, however, gasoline cost approximately 25–30 cents/gallon. In terms of safety features, it had seat belts, but no shoulder harness.

The Galaxy was a good car, but in 1974 when gas prices started to rise, I traded it in for a 1974 Chevy Vega. The Vega was a two-door hatchback with a manual transmission. At the beginning, it was fairly economical to operate. The body and frame were lightweight. The engine contained one of the first aluminum blocks. This was a reasonable idea to lighten the car and make it economical. However, the engine began to burn engine oil. The oil was mixing with the gas line, and the fuel filter usually would become fouled with oil. I have been told that these problems originated with the aluminum block. The pistons and rings were made of steel, and their operation deeply abraded the aluminum cylinder walls. I didn't know this at first. I only knew that the car was using oil, and it would occasionally sputter and struggle to maintain speed.

In early 1981, I moved from graduate school in Texas to a postdoctoral position at the US Naval Research Laboratory in Washington, DC. I remember a harrowing, foggy night driving along Interstate 40 through Tennessee climbing up the eastern continental divide, when my car slowed suddenly due to the oil problem. I was as far to the right on the road as I could get, but I was still being passed by big tractor-trailer rigs traveling 30–40 miles per hour faster than me, horns blaring as they warned me of their sudden approach through the fog. In my opinion, the materials issues associated with the design and operation of that engine were a mortal peril for all owners.

There was one other endearing safety feature of the Vega that I discovered the hard way. At one point, the only way that I could get the car to start was to touch a screwdriver across the solenoid contacts. The ignition switch would not work. I took it to several mechanics, who could not figure out the problem. Some of the mechanics just sent me on my way without considering the problem, telling me that they no longer worked on Vegas. One of my colleagues and I traced our way through the entire electrical

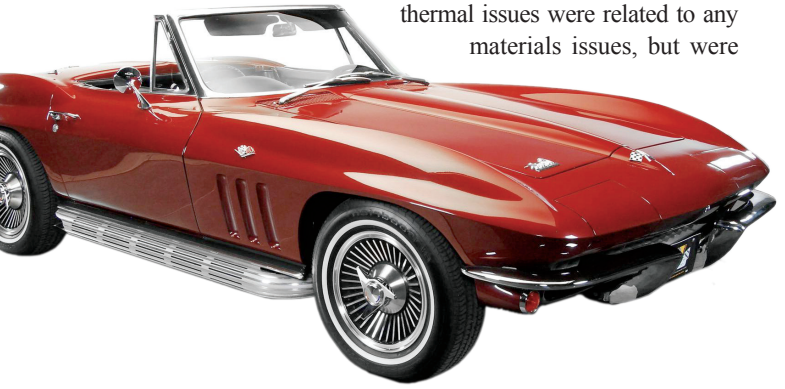
https://doi.org/10.1557/mrs.2017.314 Published online by Cambridge University Press

system to no avail. The problem was with an interlock to prevent the car from rolling under power during ignition. The interlock was a simple, inexpensive switch in line with the clutch so that the ignition would not engage unless the clutch was depressed. The switch was defective and failed after a few years of ownership. It failed in a manner such that the ignition could not engage the starter.

For a few weeks, my starting procedure included the following: (1) open the hood; (2) open the driver's side door; (3) engage the emergency brake; (4) place the transmission in neutral; (5) enable the ignition switch; (6) exit the vehicle; (7) engage the starter by applying the aforementioned screwdriver to the contacts of the solenoid; (8) rush to the driver's seat to depress the accelerator pedal to give the motor enough gas to keep it operating; (9) exit the car and quickly close the hood; (10) return to the driver's seat (hopefully before the motor died) in order to depress the accelerator again, and (11) if successful, close the car door, release the emergency brake, engage the transmission, and depart. If not successful, iterate. I'm convinced that if videos of my attempts to start the car were available, they would go wildly viral on YouTube. Henceforth, I would be widely derided as an imbecile or hailed as a comic genius. I can't believe that I'm the only Vega owner that encountered this problem. All because of a defective switch that likely cost significantly less than $1. To end this segment on a positive note, I believe the Vega was the first car that I owned in which the seat belt system had an integrated shoulder harness.

In 1981, I traded the Vega in for a Dodge Challenger that was really manufactured by Mitsubishi. It was a sporty little two-door sedan with a five-speed manual transmission. I know that it was a sports car, because an insurance agent told me that any car with a five-speed transmission was a sports car, and that he did not insure those. I received $100 as the trade-in value for the Vega. Boy, did I get a deal from those Dodge guys! The Challenger was lightweight and had good fuel economy. It had none of the other problems that I've discussed—just the usual wear and tear.

In 1996, I traded the Challenger in for a Jeep Cherokee Sport. I really enjoyed owning the Jeep. It had plenty of room for passengers and allowed me to sit higher relative to sedans, although not as high as some other sport utility vehicles. I had some electrical problems that were mostly due to allowing the dealership to talk me into installing an after market security system. As the vehicle aged, it also began to have some problems, including the engine cooling system that had trouble maintaining the engine temperature. I don't believe that the thermal issues were related to any materials issues, but were likely just a problem with the measurement and control systems. These finally convinced me to trade in the Jeep.



In 2007, I traded the Jeep in for a 2008 Ford Escape XLT, which I currently own. It's smaller than the Jeep, but still a pleasure to drive. Although I've owned it for 10 years, I have not experienced any problems that I can attribute to materials issues.

Over the more than 50 years that I've been driving, cars have significantly improved, are safer to operate, are more fuel efficient, and contain many more features than earlier automobiles. Much of that is due to advances in materials science and engineering.

- Automobile tires are much safer.[1] Tires formerly required an inner tube. Radial tires have replaced bias ply tires. Some tires can operate safely for many miles, even with a complete loss of pressure.[2]
- Battery technology for cars has evolved significantly, with longer lasting and higher performance batteries.[3]
- Automobile windshields and windows are now made with shatterproof glass.[4]
- Automobile bodies have gone from steel to aluminum, fiberglass, and other composites, including carbon fiber.[5]
- Cars initially had no seat belts, then had seat belts only, and now have seat belts with integrated shoulder harnesses.[6]
- Air pollution has been reduced by the development of catalytic converters,[7] hybrid engine technology,[8] and fully electric vehicles.[9]
- Most cars have dozens of microcontrollers that monitor and control almost every aspect of the automobile.[10] This requires tens of millions of lines of code. High-end luxury automobiles may have more than 100 microcontrollers that require more than 100 million lines of code.
- Smart cars[11] have sensors in the front and back for automatic braking, side sensors for blind spot awareness, and cameras to aid in operating the car in reverse. Some cars have smart systems for automated parallel parking.
- The newest development is driverless operation and autonomous cars,[12] although much work remains.

Wouldn't it be ironic if I finally bought my dream car, my Corvette Stingray, only to have the laws changed such that it had to be retrofitted with modern safety and antipollution technologies, and most driving zones were enabled for driverless operation only?

Steve Moss

References

1. https://en.wikipedia.org/wiki/Tire.
2. https://en.wikipedia.org/wiki/Run-flat_tire.
3. https://en.wikipedia.org/wiki/Automotive_battery.
4. https://en.wikipedia.org/wiki/Windshield.
5. G. Wand, Autoblog (2017), www.autoblog.com/2017/03/09/evolution-auto-bodies-wood-carbonfiber.
6. https://bestattorney.com/auto-defects/defective-seatbelts/history-of-seat-belts.html.
7. https://en.wikipedia.org/wiki/Catalytic_converter.
8. https://en.wikipedia.org/wiki/Hybrid_vehicle.
9. https://en.wikipedia.org/wiki/Electric_vehicle.
10. B. O'Donnell, *USA Today* (2016), www.usatoday.com/story/tech/columnist/2016/06/28your-average-car-lot-more-code-driven-than-you-think/86437052.
11. https://en.wikipedia.org/wiki/Vehicular_automation.
12. https://en.wikipedia.org/wiki/Autonomous_car.

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