The SOARce is an online, quarterly publication of the Society of Accident Reconstructionists, prepared exclusively for members of that society and distributed by email invitation. The Winter 2017 edition contained some articles which I found quite interesting.

The first article in that edition was titled "In the Dark," which summarized some recent testing and findings by the Insurance Institute for Highway Safety (IIHS) and the Highway Loss Data Institute (HLDI). IIHS has recently conducted some tests to evaluate the efficacy of headlights on new cars, both with respect to forward illumination and also considering the glare to oncoming motorists. For the forward illumination study, they used a minimum illuminance of five lux (0.5 foot-candle) as their baseline level. Previous studies have used a baseline of three lux, which is the lowest level at which most people can see in color. Below that level, human vision is in black and white, but black-and-white vision does not involve the visual receptors which have precision. I have always thought that three lux was too low a level, but that is the one I have used in the past, because that was the "industry standard." I believe the five-lux lower limit is more useful for evaluating the effectiveness of headlights in night driving. There were two useful results reported in this article. The headlight effectiveness of some cars was considered acceptable at best, with most being marginal or poor. Those who think they see well at night with their headlights have never been involved in night conspicuity testing. According to the article, the only vehicle with good headlights was the Toyota Prius V when equipped with LED lights and high-beam assist, but those are only available with the advanced technology package. The other finding, based on observations and telephone polls conducted in the region of Ann Arbor, Michigan, showed that most drivers do NOT use high-beam headlights in situations where they could and should, but that most drivers who were contacted by telephone said they did use high beams whenever they could.

The second article I found interesting was an excerpt from testing of Adaptive Driving Beam (ADB) headlights by the National Highway Traffic Safety Administration (NHTSA). In the United States, Federal Motor Vehicle Safety Standard (FMVSS) Number 108 governs details of headlights which may be used on vehicles sold in the United States. In Europe, and to a lesser extent Japan, vehicles with ADB headlights, which adjust their high beams in response to an oncoming vehicle to reduce glare, are commonly used to allow drivers to maintain good forward visibility without creating a great deal of glare for other drivers. Toyota recently submitted a petition to the NHTSA to begin rulemaking to amend FMVSS 108 to permit the use of an advanced ADB system called adaptive high-beam system (AHS). In response, the NHTSA conducted some closed-course tests to evaluate whether additional testing of this system is warranted. These preliminary tests resulted in the development of a test procedure to more fully evaluate the usefulness and overall safety of ADB and AHS systems. To date, the studies and tests have not resulted in changes to the Federal standard, although more extensive testing is planned, and that testing may result in revisions to FMVSS 108.

The third article I found interesting concerned motor vehicle crashes related to weather conditions in the United States over the period from 2010 to 2014. Weather conditions were broken into the major categories of clear (including cloudy but dry), rain, sleet, snow, and fog. Surface conditions were examined based on dry, wet, snow, ice, and other. There was a statistically irrelevant number of crashes on unknown surfaces; those were excluded from the study. The study was based on analysis of police reported crashes. Although there were regional variations in the percentages of crashes in different weather conditions, 86 percent overall occurred in clear weather, with 79 percent occurring on dry roads. I will admit that I was surprised at the low numbers of adverse-weather-affected crashes. When we watch the news or read a newspaper or magazine, we read about crashes related to heavy rain, fog, snow, ice, etc., but it turns out that those crashes, newsworthy as they may be, only comprise a small percentage of all crashes.

I am not a small-car person—I can't fit into most small cars, period. But I remember when most small cars were considered econo-boxes—inexpensive, and inexpensively made, with few amenities, small engines, 13-inch tires, and other shortcomings. Small cars are econo-boxes no more. As an example, The 2017 Ford Fiesta shown to the left has improved styling, quieter cabin, a stiffer body structure, increased cornering grip, and reduced skid-to-stop distances, according to an article in the January 2017 edition of Automotive Engineering.

The Mazda CX-5 was also among the vehicles featured in that magazine issue. In the second half of 2017, it will be available with a diesel engine. The new engine is claimed to have the torque of an engine twice its size but with the fuel efficiency of a hybrid while using an all-aluminum, low-compression (for a diesel) engine to reduce diesel clatter, meet emissions standards, and willingly rev to high rpm (for a diesel).

Speaking of compression ratios: Those of you who are old enough to remember the late 50s, 60s, and even a few of the early 70s cars will remember that, all other factors being equal, the engine with the highest compression ratio had the most power. But higher-compression engines need higher-octane (research octane number—RON) gasoline to perform properly. A lead compound was found to cheaply increase the RON of gasoline and was used for decades until it was realized that the lead in the exhaust was creating a biohazard. No lead in gasoline, big drop in compression. (Remember the huge V8 engines of the early to mid 70s which had no power because their compression ratios had been dropped to 9 to 1, or possibly less, so they could burn the low-octane unleaded fuel that was the only fuel allowed?) Other additives to increase RON were used but also found to be biohazards or harmful to the environment. Alcohol was found to increase octane, but it also reduced the fuel economy of a gallon of gasoline/alcohol mix because the chemical composition of alcohol included carbon, hydrogen, and oxygen; i.e., it carried its own oxygen, helping the fuel to burn cleaner, but there was less energy per gallon, because the oxygen content did not provide any energy boost, just clean burning. One method of increasing

the efficacy of gasoline engines is to increase the compression ratio. But there are no gasolines currently widely available which will support a fleet of high-performance, high-compression, naturally aspirated engines. If gasoline producers and engine designers could work together to develop high-compression, high-specific-output engines and the high RON fuels which would effectively run those engines, we could all see more power and better fuel mileage with smaller engines. And no gasahol. Wouldn't that be nice? As I wrote previously, I have found a reliable source of 90-octance, alcohol-free, unleaded gasoline for my Oldsmobile, and its engine loves that fuel. The increase in power is almost frightening. But the EPA wants to keep pouring alcohol down our throttle throats. The engines in my other vehicles were designed to run on gasoline fit for burning trash piles and don't run any better on the alcohol-free gasoline, but they don't get anywhere near the fuel mileage my Oldsmobile gets when I burn the alcohol-free gasoline. The Oldsmobile didn't get anywhere the mileage it gets now when all I could get was gasahol, even when I used the "93 octane" gasahol. When burning the alcohol-free gasoline, the Oldsmobile always gets at least ten percent better fuel mileage than it did when it was fed gasahol. And the Oldsmobile still passes the strict emission tests administered to cars and light trucks licensed in the greater Atlanta area. Do you think maybe the EPA has not told us the truth, the whole truth, and nothing but the truth? I have my opinion—perhaps yours is different. God bless America.

A specific example comes to mind: I bought a 1971 Buick Riviera with a 455-cubic-inch engine. The GM 455 engine had been a torque monster and powerhouse, but, for the 1971 model year, the compression ratio had been severely reduced to burn the unleaded fuel that had been recently mandated. I did not realize the problems until I started driving the car—it had all the acceleration of a Mack truck but better fuel mileage--12 mpg on the highway. Duh! Other than that, it was a wonderful car to drive, so I started making modifications to the engine, with subsequent modifications to the factory TH400 transmission, the brakes, and the suspension to enable the car to deal with the greatly increased torque and horsepower of the engine. Not only did I now have a car with exemplary performance, but I consistently got 16 mpg on the highway (18 mpg if I could resist the temptation to stay out of the back two barrels of the Holley double-pumper carburetor) running on the highest-octane unleaded (alcohol-free, back then) gasoline I could buy. Do you think I had less emissions at 12 mpg than I did at 16 mpg? One of the many good things about the car is that it came from the factory with fully independent dual exhausts. In retrospect, I wish I had kept that car, but I bought a 1978 Alfa Romeo Spider Veloce and wasn't reasonably able to keep both because I was living in an apartment, so I sold the Buick.

I had very little work last year, so I decided to share some facts and opinions in this newsletter. I hope you enjoyed reading it. I still provide the same services I have provided for over 45 years cumulatively. To see special 2017 prices on some charges, please visit www.ralphcunningham.net and click on the time and expense link on the home page.

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1804 Thornhill Pass, SE
Conyers, GA 30013
770.918.0973
Fax: 770.918.8076

Ralph Cunningham, Inc.
1804 Thornhill Pass, SE
Conyers, GA 30013