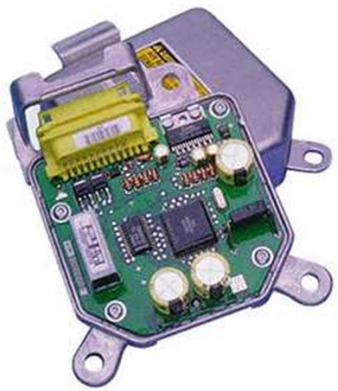

There are images of four different airbag control modules on this sheet. The first one on the left shows what the inside of an airbag control module from a Saturn looks like. The image below it shows an airbag control module from a 4500-8500 series Kodiak truck. The top image at the right is an airbag control module from an Alfa Romeo 156. The image below it is a module from a Ford Expedition/Lincoln Navigator. These are but a few of the many different sizes, types, and configurations of ACMs. Subsequent years of vehicle production will only increase the number of sizes and types of ACMs in use in automobiles.

I have shown these photographs as an introduction to a new system supposedly in development in Columbia. According to an article I recently read, traffic situations there are radically different from what is familiar to us in the United States. There are about 250,000 traffic crashes involving vehicle damage each year; the injury rate from those crashes is approximately 50,000, and documented deaths number approximately 5,000 annually, but that does not include those persons who were recorded at the scene as injured but later died from their injuries. Traffic law enforcement is also apparently a very low priority in Columbia.

Researchers at Universidad Nacional de Columbia (the National University of Columbia) are reportedly developing an advanced component to monitor and record dynamic details of motor-vehicle operation with a depth and breadth of the data which will allow a direct, immediate download of an animated illustration of the vehicle's movements before, during, and after a crash, in addition to retaining the more typical details of three-dimensional motion. Their inspiration comes from the "black boxes" contained in aircraft. Although the unit they are developing is not designed to record conversations, it is intended to be capable of recording up to 10,000 data elements per second and storing the data in non-volatile memory. It is approximately the size of a cellular telephone. It is intended to be installed in the dashboard, inside a steel box. The researchers currently estimate that these monitoring units could be commercially produced for approximately one hundred U.S. dollars; it could conceivably retail for US$250 or less. As with many other ideas and inventions, it remains to be seen whether or not such devices will ever be produced in sufficient quantity and at a low enough cost to be accepted by the motoring public. Would you be willing to pay for one for your vehicle?

In other news about new developments, the Hyundai HCD-14 Genesis concept, first revealed in January of this year at the North American International Auto Show in Detroit, features eye-tracking, gesture-recognition technology, both allegedly fully functional in the concept car. Once a specific feature is selected by eye tracking, thumb controls or gesture recognition can be used to actuate the selected function, such as navigation, entertainment, HVAC, and cellular telephone

connectivity. A head-up display in the windshield allows the driver to keep his eyes straight ahead.

But wait! There's more! The European NCAP (similar to our NHTSA) is pushing for widespread adoption of autonomous emergency braking (AEB). In simple terms, that refers to the technology which applies a vehicle's brakes independent of driver input when onboard sensors detect a likelihood of a collision with some object ahead. Remember when anti-lock brakes were a new thing, available only on certain vehicles? Then four-wheel-disc ABS with traction control? Remember when Electronic Stability Control (ESC) was a new thing, available only on certain cars? Remember when tire pressure monitoring systems (TPMSs) were first presented? The early ones used the wheel speed sensors, part of the four-wheel-disc ABS, to compare wheel speeds; a significant difference in wheel speeds over a time span of vehicle operation indicated that (at least) one tire was underinflated. Now, the TPMSs report tire pressure at each wheel position, which the driver can check by pushing the appropriate button(s). And carbon fiber is gaining more widespread use in over-the-road vehicles, saving weight while providing the necessary strength.

There are several new or improved enhancements to electric and hybrid vehicle technology. Lithium battery technology studies are ongoing, with the goal of producing a battery which will store much more energy per pound of weight than is currently available. Several German companies are jointly developing a V-twin gasoline engine with a vertically positioned crankshaft and two 15-kilowatt permanent magnet synchronous motor-generators. The two motor-generators act as balancers for the V-twin engine, reducing the noise and vibration transmitted to occupants of the vehicle. This enhancement is intended to extend the driving range of a vehicle which is primarily driven by batteries and electric motors. And a company called Protean Electric has partnered with SKF (perhaps best known for their bearings) to develop an in-wheel electric motor with a mass of 31 kilograms (weighing 68 pounds) which will generate 109 horsepower and an astounding 590 foot-pounds of torque. (Those of you who have been reading my previous newsletters may recall that electric motors provide rated torque at zero rpm.)

On the fuel-economy front, Ford unveiled a concept pickup truck at January's North American International Auto Show which featured high aluminum content in the cab structure to save weight and active components to reduce speed-related wind losses. One such feature is active wheel shutters which close the openings between the spokes of the alloy wheels above a set road speed. Also, there are active grille shutters, an automatically deploying front air dam, and power running boards which are pulled in at speed, all to reduce wind drag. Completing the list of projected advances is a ten-speed, planetary-gear automatic transmission.

Some aspects of the current automotive market and the related competition are simply strange. In recent testing of the latest iterations of the Chevrolet Corvette and the Chrysler Viper by an enthusiast magazine, the Corvette was the undisputed winner, primarily because of its road-holding capabilities. But the Corvette was equipped with the latest Michelin Pilot Sport Cup tires, and the Viper was not. The current rumor is that Michelin will not sell the Sport Cup tires to Chrysler (perhaps because Chevrolet established some contractual exclusivity for those tires with Michelin); Chrysler is apparently working with Pirelli to have a tire with similar performance characteristics developed for the Viper. And, can the V-10 engine in the Viper produce substantially more power than it currently does? Yes, indeed, but Fiat owns Chrysler, and Fiat owns Ferrari, and Fiat is not currently willing to let the Viper's engine produce more power than the Ferrari's flagship F12 (731 horsepower).

The good old days. There are some characteristics of modern vehicles which make the older vehicles seem more desirable. For motorheads, many cars of the latter half of the last century were easy to work on—raise the hood, fix whatever was wrong, close the hood, and drive away. Back then, most engines needed a tune-up every 24,000 or 36,000 miles. That tune-up involved spark plugs, points, and a condenser; sometimes, a distributor cap, rotor, coil, or ignition wires had to be replaced. One could improve the performance of most engines with a simple timing light; substantial improvements could be gained by replacing the camshaft, intake manifold, carburetor, exhaust system, and ignition system. Now, most engine and exhaust modifications to late-model vehicles would create violations of emissions laws and regulations. Now, raise the hood of most cars and light trucks and you may not even been able to see ignition wires or distributors. With a very few possible exceptions, all new cars have some type of fuel injection; some are now featuring direct injection, where the gasoline is injected into the cylinder rather than into the airstream in the intake manifold. But, cars now go 100,000 miles between tune-ups, which usually only involve replacing the spark plugs (and possibly the ignition wires). Modern vehicles are much less prone to breakdowns than their predecessors, despite their apparent complexity. For the most part, modern cars perform better than their predecessors, with smaller engines which deliver more power while consuming less fuel. Without a doubt, they handle better and they stop shorter, most with little or no brake fade. And the many safety features greatly increase survivability in most crashes. Also consider the many comfort features in new cars. As an example, the 2014 Nissan Infiniti Q50 smart i-keys allow up to four different drivers to adjust and program up to 96 settings individually for each driver. When I was young, the cars my father owned didn't have air conditioning or power accessories; I remember one car whose windshield wipers were operated by intake-manifold vacuum—climb a hill in the rain and the wipers would stop moving, wherever they were, and not resume until the throttle pedal was released. Who would tolerate that in today's motor vehicles?

Please contact me any time you have need of consulting services pertaining to motor-vehicle related incidents or allegations of component or system failure.

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