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GM Autonomy



Autonomy's "skateboard" chassis

The future of passenger vehicles

In 1905, when SAE was born, automobiles were known as horseless carriages. It was an apt description considering their appearance and level of sophistication. Most were powered by rudimentary internal combustion engines that were started by hand crank. It would be another six years before Charles Franklin Kettering's invention of the electric starter resulted in a new Cadillac motor car that cranked over at the touch of a button.

"Boss" Kettering went on to become one of the world's most prolific inventors, with more than 300 patent applications. His genius with electrical devices provided a competitive advantage that helped propel General Motors to global automotive leadership. I wonder if even he could have predicted remote-starting a car with the push of a button on a key fob from the comfort of a living room chair.

The further into the future we look, the more clouded our vision becomes. So I won't even begin to predict the passenger car of 2105. But we can look at today's trends and make some educated estimates of what to expect in the near future. For example, the electrical evolution that Kettering began nearly a century ago has become an electronic revolution in recent years. Electronic systems already represent the greatest development cost in new vehicles. Their use will continue to grow into new areas of the vehicle with increasing levels of sophistication and capabilities.

Several years ago, we challenged our engineers at GM to start with a clean slate and do nothing less than reinvent the automobile. They responded with a concept vehicle combining fuel-cell and by-wire technology on an innovative vehicle architecture consisting of a 6-in (150-mm) thick skateboard-like chassis with electric motors at all four wheels and the fuel-cell stack, hydrogen storage system, controls, and heat exchangers embedded within.

At the 2002 North American International Auto Show in Detroit, the advanced concept vehicle was introduced as the Autonomy, with the following description: There is no IC engine, no transmission, no drivetrain, no axles, no exhaust system, no radiator, and no mechanical steering, braking, and accelerating linkages. In fact, the only things moving other than electrons, protons, water, and air are the wheels and suspension!

In another 100 years, Autonomy will be a museum piece that future generations will view as rudimentary. But it has served its purpose well today, breaking with the past in many key areas and pointing us toward a future in which evolutionary automotive boundaries are no longer quite so limiting. Technologies such as throttle-by-wire, electric power steering, and integrated remote start already have moved into the automotive mainstream. Many more are in development.

What kind of education will it take to prepare future automotive engineers for this rapid advancement of technology? Speaking at the General Motors Institute (now Kettering University) 1932 commencement, Kettering said, "I think that the greatest education in the world is the education which helps one to be able to do the right things at the time it has to be done."

As we prepare to enter the second century of SAE and accelerate the second century of automotive development, there are many things left to be done in the evolution of passenger vehicles to meet the world's ever-changing needs. Some seem obvious today; others are less predictable. I have great confidence that, working together now and into the future, SAE, the automotive industry, and automotive engineers will do the right things at the time they have to be done. **aei**