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may/june 2013

AUTOMATING YOUR RIDE

The self-driving car is closer than you think

by Steve Marshall • Illustrations by Howard McWilliam

My dad likes to tell a story about Grandpa Charlie, who grew up in Pullman in the early 1900s, just as cars were beginning to replace horses. Harvesttime meant getting up before dawn to work, but it also meant Grange dances and parties far into the night. He figured out how to do both. When it came time to leave, he got on his horse and tied his hands to the saddle, and the horse took him home while he slept on the way.

Horses were smarter and safer than cars. They knew the way home, avoided crashing into each other, didn't run off the road, and when you called them, they would come.

But they were slow. Cars filled a need for speed. They allowed people to do a lot more each day, and they physically connected people to each other faster and more often than any other invention in history. When Henry Ford's Model T made cars affordable, horses disappeared from the roads within a generation.

Unfortunately, cars and their drivers created a new set of problems. More than 30,000 people die on U.S. roads each year; vehicle collisions are the leading cause of death for those between ages 5 and 34. Even minor crashes take a toll in lost time as well as repairs. Drivers are responsible for 93 percent of U.S. vehicle collisions, at a cost of \$299.5 billion a year.

Fortunately, the desire to reduce the potential for human error in driving and rapid advances in technology are fueling a movement

to restore horse sense to personal mobility—and make cars safer and more efficient.

Imagine being able to tell your car where you want to go and letting it drive you there without needing to touch the steering wheel, accelerator or brakes. Imagine a car smart enough to never rear-end another car or hit a pedestrian or bicyclist—just as a horse wouldn't. Now imagine this same car getting you from Seattle to Portland or San Francisco—in a convoy of other self-driving cars all traveling at 90 mph—while you finish that office memo or connect to a videoconference.

These notions are not as far-fetched as you might think.

A YouTube video with nearly 4 million visits shows Steve Mahan getting into one of Google's self-driving cars—a Toyota Prius with a spinning sensor assembly mounted to the roof—at his home. Although he is in the driver's seat, he doesn't touch the steering wheel as he visits a drive-through restaurant and the dry cleaners. As he gets out of the car to pick up his clothes, he retrieves his white cane from the backseat, revealing that he is blind. With a smile, he says, "This is some of the best driving I've done in years."

When will cars such as this begin hitting dealer showrooms? Google co-founder Sergey Brin predicts they will be available within five years. Google's self-driving cars (the fleet includes multiple Priuses, an Audi TT and multiple Lexus RX450h crossover SUVs) have already traveled more than half-a-million collision-free miles on roads in



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California and Nevada. Steve Underwood, director of the Connected Vehicle Proving Center at the University of Michigan, thinks we may need 10 or more years to resolve policy issues and sort out the best combination of technologies.

Some of the technologies that will be in self-driving cars are here already. Cars that can park themselves are available now. Rear-end collisions and inadvertent lane changes are being reduced or prevented in a growing number of vehicles equipped with Advanced Driver Assist Systems (ADAS).

Several additional technologies are converging to make reliable self-driving cars possible. Advances in telecommunications, ever more powerful and affordable integrated circuits, advanced sensors, low-cost cameras, motion detectors and other devices are being combined in different ways to enable cars to drive themselves more safely than could be imagined just 10 years ago. Advanced Vehicle-to-Vehicle (V2V) and Vehicle to Infrastructure (V2I) communication technologies are adding to the mix. Microsoft, Airbiquity and VoiceBox Technologies are among the Washington-based companies at the forefront of these technologies, joining other companies with a strong presence in the state, most notably Google and Verizon Communications, in helping lead the way.

For its part, the U.S. Department of Defense wants fast deployment of self-driving vehicles in tactical settings, as it did for drones, and will soon test how to shuttle troops and contractors around on bases and, eventually, to and from their homes to their bases. (Congress jump started domestic research and development of autonomous-vehicle technology in 2001 when it set a goal for the armed forces to have one-third of its ground combat vehicles be unmanned by 2015.)

The prospect of autonomous vehicles will arouse skepticism and even some fear. Anyone who's had their computer freeze up midway into a task will be wary about letting computers drive cars anywhere at any speed. A host of public policy issues will need to be addressed. And most importantly, these vehicles will need to undergo exhaustive testing and complete rigorous demonstration projects to win the public's trust.

But consider this: advanced, automated systems that cross-check each other and enable planes to take off, fly and land without a pilot's input have made commercial airline travel much safer today than it was just a few decades ago. These systems were also met by initial resistance and doubt. While it will be much more difficult to safely navigate surface roads in cars, the combination of technologies being tested now is fast becoming powerful and affordable enough to meet the challenge. As a result, a future with smart, self-driving, personal mobility is now within the realm of the probable, not just the possible.



Steve Marshall is the executive director of the Center for Advanced Transportation and Energy Solutions (aboutcates.org), which is currently working on a grant from the Graham Sustainability Institute with Steve Underwood, director of the Connected Vehicle Proving Center, on a policy road map for the emerging and disruptive personal-mobility technologies that will be smart, connected, increasingly autonomous and electric-powered.

