THE GLOBE AND MAIL

Report on Business

Economy Lab | Delving into the forces that shape our living standards
Best Business Blog, EPPY awards, 2011 and 2012

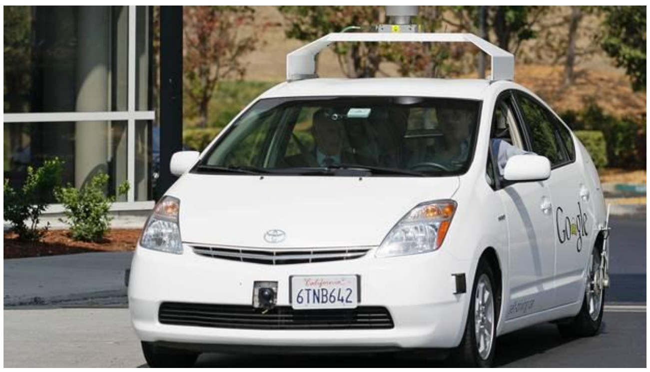
Published on Wednesday, December 26, 2012

http://www.theglobeandmail.com/report-on-business/economy/economy-lab/how-driverless-cars-will-navigate-into-the-mainstream/article6699818/

How driverless cars will navigate into the mainstream

RICHARD GILBERT

Globe and Mail



California Gov. Edmund G Brown Jr., front left, rides in a driverless car to a bill signing at Google headquarters in Mountain View, Calif., Sept. 25, 2012. The legislation will open the way for driverless cars in the state. (Eric Risberg /AP)

Driverless cars, discussed in a previous post, have been under development at least since the 1960s. Initially the focus was on external direction of the vehicle, for example, from a cable buried in the highway. With developments in sensors and computers, particularly during the last decade, “intelligence” and thus control has moved inside the vehicle, supported by wireless contact with other cars, transport infrastructure, and a central facility. A modern driverless car can do most things a human driver can do, usually better, and can interact with other vehicles and with infrastructure.

A major boost to the development of driverless cars came in 2001 when the US congress mandated that one third of military aircraft had to be unmanned by 2010 and one third of ground combat vehicles by 2015. Aviation regulators have now been asked by the US Congress to integrate unmanned aircraft into the air-traffic control system by 2015.

For ground vehicles, implementation of the 2001 mandate was spearheaded by the Defense Advanced Research Projects Agency. DARPA is the successor to ARPA (Advanced Research Projects Agency) whose Arpanet, which became operational in 1969, was the progenitor of the Internet. Arpanet was developed to provide a communications system that could survive a nuclear attack.

Today, road vehicle operations are being automated chiefly to provide safer driving. Injuries requiring hospitalization and deaths resulting from road traffic collisions have fallen steeply in Canada, per capita by much more than half between 1990 and 2009. Nevertheless, the total of both in 2009 was a not-inconsiderable 13,660, and road crashes remained the leading cause of death for persons aged 15-24.

The fall in serious injuries and deaths from crashes on Canadian roads is typical of richer countries. Poorer countries, which are rapidly motorizing and often with inferior vehicles and infrastructure, mostly show an increasing rate of road-traffic-related serious injuries and fatalities. On a per-capita basis their average rate passed that of richer countries around the year 2000 and is expected to be more than double that of richer countries by 2020.

Modern automobiles have some or all of these automated safety features: anti-lock brake system, emergency brake assist, forward-collision warning, traction-control system, blind-spot detector, lane-departure warning, lane-departure prevention, electronic stability control, adaptive cruise control, and drunk-driving prevention. Also available in high-cost vehicles are automatic braking, backover detection, traffic sign recognition, and automatic pedestrian recognition. Other automatic features are less related to safety, including self-parking systems. Most of these features are elements of control systems for driverless vehicles.

The crash rate for driverless cars is far below that for cars with drivers. However, driverless cars are not yet ready for widespread deployment. They need better sensors of hazards and more ability to act in face of uncertainty. The pace of technology is such that jurisdictions that now permit driverless cars on theirs road only if a driver is on board – even though on-board computers may be fully in control – could well permit them to be deployed without an on-board driver within a year or two.

Then the challenge will be to bring down the cost of driverless cars. At the moment, the hardware required for full automation costs several tens of thousands of dollars per vehicle. With refinement and mass production, the cost is expected to fall to about $3,000 per vehicle. This extra purchase cost could be more than offset by reduced insurance costs (because vehicles and roads will be safer), reduced operating costs (because autonomous vehicles will drive more uniformly, using less fuel and wearing out the vehicle less), and reduced vehicle manufacture costs (because autonomous vehicles will need fewer human-operated controls and fewer safety features).

A major issue, still to be worked out, is who will be responsible for crashes involving autonomous cars. These must be anticipated, even though their rate may be extremely low. Reason might demand that manufacturers will be solely to blame. Manufacturers are unlikely to want this and may seek to share the blame with purchasers or even users. Individual owners may balk at accepting liability, especially if they are not in the car. Fleet owners may be more likely to accept responsibility. Thus, the first adopters of driverless cars, when they are ready and legal, are likely to be companies providing what will be remarkably low-cost taxi services.

Operators of fleets of autonomous taxis (ATs) may turn out to be the only adopters of driverless cars. Early deployment by fleet operators will help iron out the legal and technical bugs, making driverless cars potentially more available to individual owners. However, fleet owners will meanwhile be establishing comprehensive AT services that could be convenient and inexpensive enough to reduce car purchase substantially.

Some people may think they will always want to be able to drive their own car, or that cars must always have operators. Many decades ago, elevators usually had operators and aircraft were never flown by autopilot. A few decades from now, only driverless cars may be allowed on most roads, for safety reasons. Human operators could be a hazard when most vehicles are under automatic control.

Moreover, why buy a driverless car when you can summon one on demand, as small or large as you need, at a lower cost than ownership, and more convenient because it will not have to be parked, refuelled, and cared for in other ways? The arrival of the driverless car could mean the beginning of the end of individual automobile ownership.

Individually owned cars are used on average for less than an hour a day in the United States. It's probably about the same in Canada. If ATs were to carry passengers for an average of eight hours a day, other things being equal, we would need only an eighth of the automobiles per person that we have now.

Other things would not be equal. Because ATs could substitute for some public transit services –to be discussed in a later post – we would need more than the number required to replace today's personal automobiles. Also, because ATs would be used more intensively they could have a shorter life. All being said, a reasonable guess is that the deployment of driverless cars will cause automobile production to shrink to half or less of its present level over the next few decades. This may be why Google has complained that some parts of the auto industry have impeded deployment of driverless cars.

Other parts of the auto industry are, for the moment, embracing driverless cars. Chinese-owned Volvo is said to be "staking its future on … [producing] an accident-free vehicle within seven years." This means, in effect, producing a marketable car that can be driverless, although Volvo – always cautious – has said it would like humans to remain in control most of the time. The German auto company BMW recognizes that car sales may fall, perhaps more because "young people have learned that life without a car is still a life." It sees automation as a way of making car ownership more attractive. "You may have the option to drive or not. Sit back, relax, do other things." In North America, General Motors has been reported as saying that "self-driving cars could be in showrooms by the end of the decade" and that vehicles that "partially drive themselves" may debut by the middle of the decade.

Paradoxically, although there will be many fewer cars, there could be more on the roads at any one time. This challenge will also be the subject of a later post.

Richard Gilbert is a Toronto-based consultant on energy and transportation. These five posts are adapted from his contribution to International Handbook on Megaprojects *to be published during 2013, a draft of which is available on request to mail@richardgilbert.ca.*