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Transformative Technologies: Regulating Autonomous Vehicles

Rory Barnable, Barnable Law P.C.
with commentary on aviation and drones by Marcus Dickinson, X4Drones.

This article addresses the potential changes that autonomous vehicles ("AVs") will necessitate for current transportation regulatory and liability regimes. The future introduction of AVs requires adaptations for legislative and insurance regimes on a massive scale and has the potential to rewrite present methods of risk allocation in the affected industries. This article will appeal to those with interests in infrastructure and transportation; as the AV - and as an expansion of the "internet of things" - presents a convergence of these fields.

Disruptive Technology

Our first encounters with AV operation were probably through self-driving cars depicted in pop culture – and we reveled in the novelty. But since those early blushes, individuals have increasingly appreciated the importance of AV implementation. While auto advertisers often suggest lone vehicles on picturesque mountain roads, or racing across empty deserts, the undeniable fact is that, for most individuals, driving occurs surrounded by other vehicles, and represents a time consuming chore. It is also one of the most dangerous chores we can do. Self-driving cars, with vehicle to vehicle connectivity, for example, hold the potential for incredible safety improvements.

AVs also present a disruptive technology. For individuals, driverless cars represent perhaps the most intimate of several new forms of individual mobility, which also includes the increasing prevalence of ride sharing programs, or car sharing services. Combining AV technology with these services could potentially drastically alter transportation options, maintenance and operational costs altering individual vehicle ownership rates and utilization. For the public at large, potential impacts range from alterations to public transport consumption, curbing travel delays as well as the frequency and severity of traffic accidents - thereby reducing injuries and fatalities while diminishing the related "accident economies" - and even changing land use planning requirements, as a road usage and even parking needs diminish.

Much of the present literature surrounding autonomous vehicles concerns regulatory programs pointed at testing of vehicles. In addition, much insurance industry commentary addresses the possible claims adjustment or new programs that are forthcoming. For example, some predict AVs pose a severe disruption to auto insurance regimes as accident frequency and severity could fall sharply. Eventually, such a change ought to translate to lower claims costs for insurers, and lower premiums for customers. AVs therefore have the potential to transform the insurance industry, particularly given that individual and commercial auto

represents the largest property and casualty insurance lines for many insurers, often constituting upwards of 40% of premiums.

Given the potential AVs represent, many insurers are following developments within the sector and participating in strategy to develop and implement suitable programs. However, the insurance industry's reaction is somewhat restrained largely due to the technological uncertainty and unknown consumer uptake. Insurance product delivery can only adapt and respond as the technological issues become better delineated.

Present hurdles include appreciating and planning for the distinctions between vehicles with varying levels of semi-autonomous driver aids - through the phases of autonomous operation up to fully autonomous operation, and obtaining a better understanding of future utilization rates for private automobiles in the face of changing demographics and as less consumers own vehicles; as well as factoring in individuals now able to offer up their own vehicles for limited commercial or shared ownership options. There exists no real track record or accident statistics for AVs and so there is little to provide guidance on how to insure against associated risks.

One expectation is that the sophistication of commercial insurance offerings will increase, including the introduction of hybrid type policies with personal and commercial coverages operating when the vehicle is in use for commercial purposes. As well, insurance regimes will need to adapt from programs focused on personal liability, to programs focused on product liability, as ever more of vehicle operation is assumed by software and related componentry, leading to a shared liability with equipment suppliers. New modes of failure will be attributed to the vehicle, as the responsibility for avoiding accidents shifts from driver to vehicle manufacturer. A non-exhaustive list of potentially responsible parties could include vehicle or component manufacturers, software developers, or perhaps road designers and builders in the case of intelligent road systems.

Commercial vehicles too will be impacted. The introduction of increased automation and, perhaps sooner, vehicle to vehicle connectivity, leads to improved efficiencies in operations and supply chain management. Such improvements, in turn, can affect the applicable insurance programs available to the commercial sphere.

With AVs, and increased connectivity, the importance of high levels of data collection and analysis is evident. This data will be necessary to decipher what causes future accidents. The required analysis also has the potential to alter the current approach to forensic accident investigations. Big data collection and analysis will be equally important to appreciate operational risks and thus to underwrite it.

The auto insurance industry is, or very soon will be, in flux. The looming introduction of AVs presents a high degree of uncertainty and the rate of change will depend upon the introduction of the technology, which in part is governed by available regulatory frameworks.

Regulatory Framework

Presently, in North America, federal governments are responding to potential changes created by AVs and are introducing additional research efforts and funds to help prepare. In the United States, the National Highway Traffic Safety Administration has issued policy statements and provided interpretation to industry, while the Obama administration had proposed to spend $4 billion over the next decade to accelerate the acceptance of AVs on U.S. roads. Closer to home Transport Canada has had access to testing vehicles, and Canada's Transport Minister has called for a Senate committee to study connected and automated vehicles. Ontario's government has stated that AVs are a priority of Ontario's Transport Minister. There have also been calls for national self-driving regulations.

Meanwhile, individual provinces and states are introducing pilot programs and developing regulations to accommodate the testing and eventual introduction of autonomous vehicles. Almost every jurisdiction which has approached the issue has done so slightly differently, as each attempt to make their respective regions more attractive to testing and development, while at the same time balancing the concerns and needs of their constituents.

A common question that arises is the degree to which existing regulation actually prohibit AV operation. Industry actors seek clarity and regulatory certainty and tend to gravitate to those areas that most provide it. Various jurisdictions, including Michigan, California, Florida, Nevada and the District of Columbia, allow the testing of autonomous vehicles on public roads. Georgia, Hawaii, New Jersey, North Carolina, New York, Maryland, Rhode Island, Oklahoma, Virginia, and Arizona are currently addressing the issue either through pending bills, or executive orders, or with designated plans to study the introduction of autonomous vehicles. Along with a theme of engaging in future study, the present regulatory programs have common elements that focus on permissible testing conditions and the continuing role of human operators.

AV regulations are also directed to maintain distinct lines of liability. Some exempt original vehicle manufacturers from liability arising from AV conversions (as noted in regulations in D.C., Florida, Michigan, or Nevada). Others expressly impose liability upon subcomponent system producers, or expressly state that a licensed driver must remain in the driver's seat at all times and able to take control, or at the very least, remains legally responsible for the AV for traffic infractions and criminal offenses in the same manner as a driver of a non-autonomous vehicle.

Regulations adapted for AVs also must consider exceptions to present rules concerning driving requirements, which were drafted against the premise of a human operator. For example, a Florida regulation bans the usage of handheld devices while driving, but exempts operators of autonomous vehicles operating in autonomous mode. A similar exemption is necessary to circumvent a present New York requirement that a vehicle's operator have one hand on the steering wheel at all times, as such a requirement runs counter to autonomous operation. The potential interconnectivity of vehicles also requires reconsideration of regulations

concerning road usage, for instance, safe driving distances and "tail gating". California is finalizing regulations for the post testing deployment requiring manufacturers to confirm vehicles were successfully tested, meet certain safety requirements, and are ready for the general public to operate on public roads.

Given the amount of data that may be collected by AVs, regulations have also been developed concerning the handling of that data. California (with other states) requires manufacturers of autonomous technology installed on vehicles to provide a written disclosure to purchasers describing the data collection by said technology.

It is evident that the regulatory structure must accompany the advance of AV technology, as uncertainty benefits few. Already, some auto manufacturers have opted to scale back the operation of autopilot systems as users seemed increasingly disinterested in actually driving. For example, due partly to a risk of driver disengagement, Tesla implemented changes its autopilot system to limit the autopilot operation to roads with dividers and medians.

Interestingly, of six identified roadblocks to the mass adoption of driverless, legal liability, policymakers and consumer acceptance were ranked as the biggest obstacles. Cost, infrastructure and technology were considered less of a hindrance. Regardless of the roadblocks to instruction, one continuing certainty is that with an accident somebody will be accountable – be it human driver in a negligence scenario, or manufacturer in a product liability context. An ongoing doctrine of victim protection requires a comprehensible liability regime and an efficient mechanism of compensation.

AVs Beyond Land

While much discussion focuses on the implementation of AV on roadways, technology extends the potential of AVs to sea and air transportation as well. Such operations, in turn, requires further reassessment of present law, convention and regulation.

Automation is already prevalent throughout these forms of transport. For instance, in air transport, the term autopilot is new to no one. In the marine context, AVs are already used in submarine applications, in the defence industry for mine clearance and targeting, in the oil and gas for subsea positioning, in environmental and surveying and in data collection.

Similar to land transport industries, further automation in marine shipping could translate to improved efficiencies and safer operations. Marine shipping is an industry spanning 90% of world trade and approaching $400 billion, so improving efficiencies at this scale presents an opportunity for considerable results.

Manufacturers, operators and working groups see potential in decreasing crew living quarters and support systems. Doing so would raise vessel carrying capacity while reducing vessel mass and operating costs. However, opponents suggest that the technological investment required to implement unmanned vessels for the carriage of goods or passenger is not

justified against potential savings. Critics suggest that few international shipping bodies are seriously considering unmanned ships while labour unions are particularly opposed given the impact upon seafarers.

Additionally, while the technology could be developed or may already exist, the regulatory hurdles necessary to harmonize international conventions and national state laws are significant. Marine law, and accompanying international conventions and regulations, are steeped in a long history largely developed quite independent from present technological factors.

Much law and international harmonization was developed during, or derived from, an age of sail and are frequently based upon the involvement of master and crew. Conventions derived from the roles of master and crew starts to fall away with the introduction of autonomous vessels. Affected conventions would include the Law of the Sea Convention, International Convention for the Safety of Life at Sea (SOLAS), International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW), Port State Control programs, and the list goes on. Indeed, one author has suggested that the potential impact of autonomous vessels on international convention would leave only the stowaway and the pirate as retaining their original legal character.

Nevertheless, consider that we have already seen, and will continue to see an extensive use of automation of vessels. While human error and fatigue still does cause most maritime accidents, accidents have declined significantly. That very reduction in accidents may prove to be the prevailing reason why the widespread introduction of AVs at sea is less likely than on land. Improved automation and declining accident rates may simply not justify the massive investment required to develop marine AVs or retrofit existing vessels.

Marine transport engages legal international harmonization to address common concerns raised by expensive methods of transport carrying much valuable cargo, and which - if an incident arose - could cause considerable harm to the environment and to third parties. Accordingly, the persistence of human oversight, however flawed that is, will likely continue.

AV operation in the aviation field are similarly significant and well underway. Perhaps the most technologically accessible is that of the drone. Until recently, the word ‘drone’ was perhaps most associated with news highlights of unmanned aerial vehicle strikes in foreign countries. But the more common and increasing usage is much closer to home. The 2015 holiday season saw over 1 million drones sold, while Boxing Day 2015 saw over 400,000 drone related hospital visits. With the consumer drone industry set to be in excess of $17 million in Canada over the next ten years, the increasing prevalence of consumer, and commercial, drones represent another area for significant regulatory advancement.

Transport Canada presently has regulations in place for safety, with restrictions on recreational users largely designed around principles of individual security and privacy. These regulations include minimum insurance liability requirements and restrictions on flight at

night, over crowds, and within the vicinity of other buildings or aircraft. Commercial operators are mandated to carry operator certificates, and have higher levels of liability insurance. Local municipalities are also enacting bylaws concerning drone usage.

The expectation is that by 2017, Transport Canada will introduce three tiers of UAV operation: recreational use, with a required registered product with serial number, simple professional operations, largely similar to existing commercial operators, and a third tier for complex professional operations including consistent and stringent licensing for those with demonstrated competency.

In Conclusion

The development of appropriate regulation is crucial to the introduction of emerging technologies. As the technology develops, and like any of these industries when in their infancy, the present regulatory uncertainties will eventually coalesce into a more uniform code for operations and liability apportionment. The scope of data collection and connectivity that allows AVs to operate will generate incredible amounts of specific data about individual actors. Such data will ultimately improve our calculation of risks, our assessments of events, and our imposition of liability. But managing and containing that data itself presents significant risks. The capture and management of that large data underscores the issues of software reliability and cyber-security, which may eventually become as central to liability in transportation industries as human error is currently.