GOING FULL THROTTLE ON AUTONOMOUS TRUCKING

ARE TOLL LANES THE ANSWER?

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Prematurely accelerating the implementation of fully autonomous trucking (no driver in the cab) seems like an idea that could be fraught with risk. While driverless long-haul trucks have the potential to increase economic productivity by enabling more cost-effective transport of goods, the technology is not yet ready for prime time. There is growing pressure, however, to make it a reality sooner rather than later – particularly as long-distance trucking faces a worsening driver shortage.

At the same time, highway infrastructure in many parts of the country is clearly inadequate even for today’s traffic, let alone a mixed bag of driven and driverless cars and trucks. The safety of autonomous vehicle technology – particularly when it comes to 18-wheelers – will be a question mark for some time to come.

What autonomous trucking needs now is a carefully crafted path to implementation. We believe that separated highway toll lanes could not only mitigate perceived risks, but provide a solution to a convergence of public and private needs. (See Exhibit 1.)

WHERE THE RUBBER MEETS THE ROAD

Although partially autonomous trucks (with a driver still behind the wheel) could be rolling quite soon, these won’t solve the core dilemma for the trucking industry – a shortage of long-haul truck drivers in developed markets that is projected to steadily worsen. Fully autonomous trucks could quite soon be able to take over the highway portion of movements, while drivers on either end handle local, last-mile responsibilities, such as getting trucks to and from distribution centers and warehouses, navigating suburban and city streets brimming with hazards, and participating in loading/unloading operations. Such a system would end the quality-of-life issues that cause so many to avoid long-haul trucking as a career choice: long stretches of time away from home and on the road.

At the same time, many developed markets are facing a crisis of capacity when it comes to highway infrastructure. Public funding (and political appetite) for expensive road projects is at a standstill in many regions. One idea that governments have used to solve highway funding crises is to turn over management and operation of toll roads to private parties. But these deals can be risky: The privatized Indiana Toll Road, for example, filed for bankruptcy in 2014, after the recession drove down truck volumes.

Autonomous trucking might help solve the twin problem of insufficient highway capacity and funding as well – providing benefits that further incentivize its development. Governments could tender construction of a single, separated autonomous trucking lane on major highways to private investors. This new toll lane would serve only autonomous trucks – moving from an on-ramp to an off-ramp in a single lane, at a uniform speed – essentially a conveyor belt on wheels, with built-in telemetry and monitoring of vital safety and mechanical systems.
Safety risks would be addressed by keeping these trucks segregated from the driving public, while congestion on the drivers’ portion of the highway would be vastly reduced simply by moving most trucks to their own lane. And the greater density of this “AT lane” would result in higher revenues for investors.

The conveyor-belt approach also would provide for the easiest implementation of autonomous driving; that is, lane adherence, vehicle following, and simple merging at ramps. Technologically more difficult behaviors, such as overtaking, lane changes, and complex hazard evaluation would be avoided, meaning that such trucks could get on the road sooner and need not wait on the development of artificial intelligence capable of handling every conceivable situation.
With no drivers (and no hazardous materials) in the AT lane, any potential accident would be a matter of property casualty only. And on the other side of the barrier, the lanes for vehicles with drivers would not only experience less gridlock but become safer as well, thanks to fewer trucks interspersed with cars.

What about disruptions for maintenance and equipment breakdowns? Long-haul trucks today lose 10 to 12 hours every day for driver rest. So roadway maintenance windows and occasional delays should not make a single, dedicated AT lane less operationally feasible – and the offset is that driverless trucks can run 24/7, every day of the year. (Simple solutions such as regularly spaced sidings or hook-and-haul tow vehicle depots would likely further minimize delays.)

HEADING DOWN THE (DRIVERLESS) HIGHWAY

The economics to support private toll AT lanes are sound. We estimate that 40,000 trucks per day could use an AT lane (assuming 80-foot vehicles, 30-foot spacing, 60 miles per hour, and a conservative 75 percent utilization to account for maintenance and disruptions). This would be triple the capacity of a typical interstate highway lane in use today. A toll of just $0.10 per truck-mile would be sufficient to cover the construction costs of a dedicated AV lane at a volume of 10,000 trucks per day or more.

Historically, it has been difficult for toll roads to attract truck traffic, since there may be few or no benefits to the trucker to offset the cost of the toll. The substantial benefits of autonomous trucking and a dedicated high-capacity lane could be persuasive, however: Driverless linehaul trucking could save $0.40 per truck-mile from fuel, driver, and risk costs – even after truck conversion costs and a $0.10 per truck-mile toll is deducted.

Two issues would need to be resolved to bring this implementation path to fruition. One is that to get private funds such as pension plans to invest in dedicated lanes, these lanes must remain the only on-highway option for driverless trucks for about 15 years. Such a time frame would match the length of a typical infrastructure fund (and bond payback period). If there is a risk that AT lanes would be quickly superseded by autonomous trucks gaining open highway access (an unlikely case given public safety concerns and technology challenges), the up-front investment would not be worthwhile.

The other issue is that governments would need to be willing to develop AT lane projects that cross state/regional lines. A “driver day” in the United States, for example, is about 500 to 600 miles, and it would take autonomous trucking runs of that length to fully realize the benefits of the technology.

In sum, the conversation around how autonomous trucking gets implemented should start happening now – it doesn’t need to wait until the trucks are ready. Highway infrastructure projects often require five to ten years (or more) for completion – similar to the projected feasibility time frame for fully autonomous trucks. Segregated AT lanes could provide an important solution to funding highway transportation deficits by adding capacity through private investment, while simplifying driverless technology requirements and minimizing public safety risks.