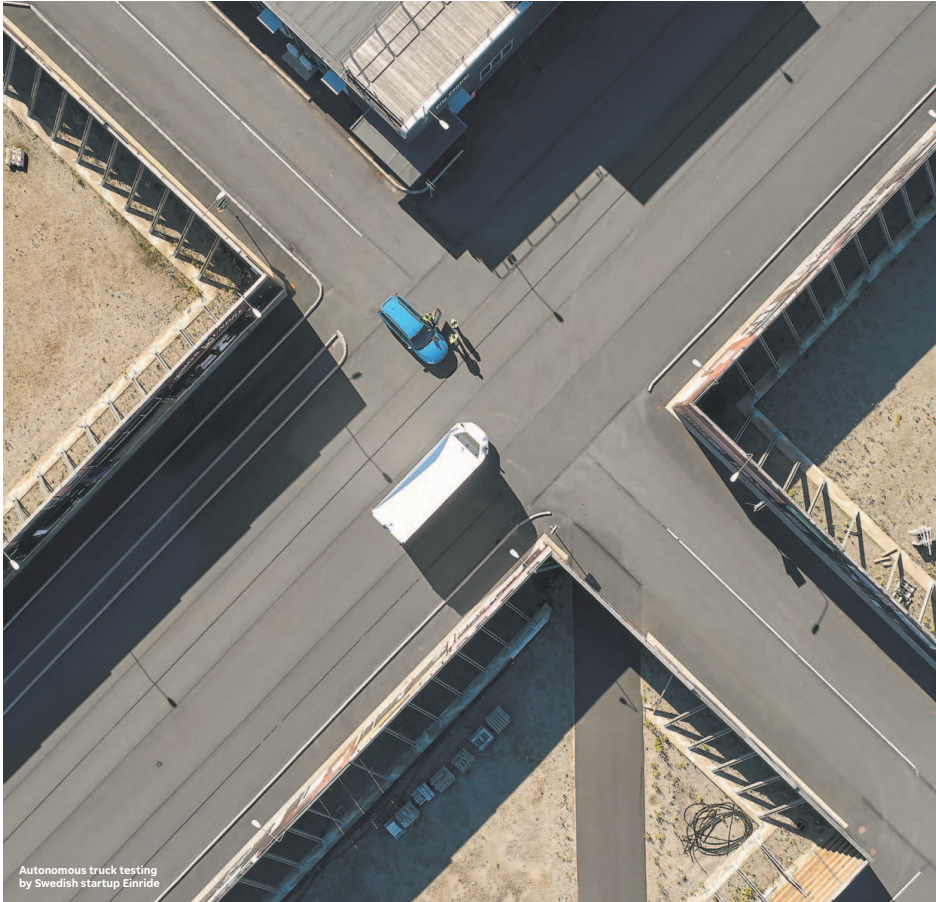


OVER THE ROAD



Autonomous truck testing by Swedish startup Einride

ENRIDE

OVER THE ROAD

Shifting Gears

On the road to autonomous driving, driverless trucks are low-hanging fruit

By Matt Alderton

DRIVERLESS CARS ARE COMING. Tesla and General Motors say they will have fully autonomous vehicles ready this year. Ford and BMW, meanwhile, have promised them by 2021. Even if automakers meet their established timeframes, however, there are cultural and regulatory concerns that could delay the autonomous-driving tipping point by years or even decades.

"It's a wonderful, wonderful goal," Gill Pratt, CEO of Toyota's research arm, the Toyota Research Institute, said in 2017 at CES, the world's largest consumer electronics show. "But none of us in the automobile or IT industries are close to achieving true ... autonomy. We are not even close."

The path to autonomous driving is a marathon, not a sprint. And yet, there's one runner in the race that seems to be moving faster than others: the trucking industry. "We could see the first true driverless truck operations as soon as this year," said Baltimore-based automated vehicles analyst Richard Bishop, principal of Bishop Consulting, which monitors intelligent vehicle applications and industry trends.

When experts like Bishop look at the trucking industry, they see a sector bucking under the weight of serious challenges, many of which could be solved by driverless technology. While autonomy in passenger vehicles still feels like a novelty, in trucking it feels to some like a necessity. Motor carriers' appetite

for innovation could be the linchpin that makes trucks, not cars, the proving ground for autonomous driving.

DRIVING PROFITS

"Trucking is a difficult business. It's super competitive," said Steve Viscelli, a sociologist at the University of Pennsylvania and author of *The Big Rig: Trucking and the Decline of the American Dream*. "Margins are small — fractions of pennies per mile — and companies have to figure out how to sustain or grow them while maintaining a consistent level of reliable, there-on-time service."

Companies' biggest expense is labor, the cost of which is further inflated by a driver shortage that has left the industry with at least 50,000 vacancies, according to the American Trucking Associations (ATA). "Because there's a severe driver shortage, shippers and fleets can't meet all the shipping needs that are required, which drives prices up," said Chuck Price, chief product officer at TuSimple, a San Diego-based self-driving truck startup.

Because they're such hot commodities, employers compete fiercely for drivers, who switch jobs frequently in pursuit of incremental pay increases. The resulting turnover requires trucking companies to invest as heavily in recruiting and

training as they do in wages.

For labor-starved employers, automation might be a lifeline. "By taking the truck driver out of the picture, self-driving trucks are going to solve tons of organizational problems that consume a huge amount of resources," Viscelli said.

Another bottom-line issue that stands to benefit from automation is fuel consumption, which is typically motor carriers' second-highest expense and can account for as much as 20 percent of total operating costs, according to ATA.

TUSIMPLE AUTONOMOUS TRUCKS MADE

5

TEST RUNS DELIVERING MAIL BETWEEN PHOENIX AND DALLAS



Swedish commercial transportation startup

Einride has further pushed the fuel-saving envelope by eliminating not just drivers, but also the cabs in which they sit. Because its self-driving trucks — the 23-foot-long T-pod, which can carry 15 standard pallets, and the T-log, a version made for logging — are cabless, they cost less to manufacture

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Einride's T-pod is a cabless truck.

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and are light enough to run on electric engines.

Those types of bottom-line benefits are why trucking companies will likely embrace autonomy. "Individual consumers are just fine without autonomy, but for trucking there's a cost benefit that's immediately recognized," Price said.

ROAD TO AUTOMATION

Economics is not the only reason trucking is primed for autonomy. There are other practical considerations as well.

For one, personal vehicles must be able to travel virtually anywhere. Trucks, however, generally travel fixed routes, which would allow autonomous trucks to be deployed where and when conditions are optimal. "There's a lot of freight that runs in the middle of the night and out in the western United States, where there's hardly any traffic and the weather is consistently good. We're going to see

driverless operations in those benign environments first, and it will spread from there," Bishop said.

For San Francisco-based autonomous truck startup Ike, the most benign environment for a truck is an interstate. Its autonomous driving system will therefore power driverless trucks that travel only on highways, where there are no pedestrians, intersections or right turns.

"We think driving on the highway is a much more structured and simplified domain," said Ike co-founder and CEO Alden Woodrow, adding that Ike-powered trucks will take a "hub and spoke" approach that incorporates last-mile human drivers who can perform tasks that are more difficult to automate, like driving on surface roads and backing up to loading docks. In such a scenario, "The automated truck drives just on the highway, then hands off the



Ike's hub-and-spoke approach will be driverless on highways and use last-mile human drivers.

IKE

OVER THE ROAD

trailer at a transfer hub near the highway to a human driver who takes it to its final destination," he said.

Because humans would drive local, rather than long-haul routes, truck driving jobs will be safer and more attractive. "We're really excited about this approach because it preserves a role for truck drivers and has the potential to make their lives and livelihoods better," Woodrow said.

Einride, which is in the middle of its first commercial rollouts with German logistics company DB Schenker and German grocery chain Lidl, also wants to keep people in the mix. Remote operators will supervise up to 10 vehicles at a time and take control of trucks if they end up in situations they can't handle.

"Having a human operator in the background ... allows us to put autonomous trucks into commercial operation sooner than would otherwise be possible," said Einride founder and CEO Robert Falck, who plans to expand into the United States next year. "Our reliance on human operators will decrease as self-driving technology matures."

In contrast to Ike and Einride, TuSimple plans a "depot to depot" solution wherein trucks navigate entirely free of humans — over highways, on ramps and surface streets and at loading docks. "We're continuing to develop all areas of our technology, but we're far enough along now that we can operate fully autonomously within our domain monitored by a safety driver and an engineer, and we're using that opportunity to start introducing the capability to shippers and fleets," said Price.

TuSimple reached a milestone this spring when it completed a two-week pilot program encompassing five round trips hauling mail more than 1,000 miles between U.S. Postal Service distribution centers in Phoenix and Dallas. "This is significant because it's our first opportunity to demonstrate the power of an autonomous system on a long route for a mission-critical service," Price said.

SAFETY FIRST

In almost every aspect of autonomous driving, progress is evident. Just because it's close, however, doesn't mean real-world autonomy in trucks is imminent.

"It's really easy to get excited about the technology, but there is still a tremendous amount of work to do," Woodrow said. Indeed, autonomy faces the same challenges in trucking that it faces in the broader consumer market — including



TuSimple's pilot with the U.S. Postal Service was monitored by a safety driver and engineer.

TUSIMPLE

those that are technological, regulatory and cultural in nature.

The regulatory bar, at least, was lowered last October, when the U.S. Department of Transportation published new federal guidance for automated vehicles stating that current administrative processes are sufficient to allow autonomous trucks, and that existing regulations should not assume that "drivers" are human.

"It very explicitly says that an automated truck does not have to comply with the human-oriented regulations that exist for truckers," Bishop said. "That's very significant because it indicates the market is fully open for driverless trucks at the federal level, although states still have some say, too."

Culturally, perception and acceptance are the major hurdles. "The real challenge is winning the public's trust," Falck said.

For that reason, safety is the bottom

“Human drivers are paid by the mile, so they drive as quickly and aggressively as possible to get to their destination. An autonomous vehicle doesn't have that motivation, so it operates more gently and efficiently, which saves fuel and reduces maintenance costs over the life of the vehicle.”

— CHUCK PRICE,
chief product officer, TuSimple

line, said Anthony Levandowski, co-founder and CEO of Pronto, a San Francisco-based startup whose autonomous driving system promotes an incremental approach to autonomy. Called Copilot by Pronto, it's focused on delivering the building blocks of driverless operations — safety features like power steering, adaptive cruise control and collision mitigation, which are common in passenger vehicles but rare in trucks — before pursuing full autonomy.

"As an industry, if we truly want to see mass adoption and acceptance of the tech we're building, we have to take safety more seriously," said Levandowski, adding that trucking and technology companies should be focused first on safe driving, rather than self-driving technology. "Safety is the only metric that should determine when autonomous vehicles are ready to be deployed."

OVER THE ROAD



Einride's vehicles are light enough to use electric engines.

EINRIDE

LONG HAUL

DOT studying workforce implications of autonomous vehicles

The Department of Transportation has teamed with the departments of Labor, Commerce, and Health and Human Services to study just how autonomous technology will affect the profession that employs millions. The first leg of that research, which focuses on truck and bus drivers, is scheduled for delivery to Congress this summer. A second phase will examine how package deliveries, taxis and ride-sharing services will be affected.

The DOT study is expected to conclude that, at least in the near term, "adoption of partial automation technologies will likely lead to improvements in safety and operations and is not expected to bring about driver job displacement," according to a DOT official familiar with the study but unable to comment on the record until the findings are released.

Peter Pantuso is president and CEO of the American Bus Association, which represents about 1,000 motorcoach and tour companies in the U.S. and Canada. Unlike passenger cars, buses typically stay on the road for about 20 years, he said, so "You're still going to have, at least in the motorcoach fleet, a significant portion of buses that ... are not going to necessarily have all the new bells and whistles."

To understand why he believes job displacement won't be immediate and widespread among his membership, Pantuso said it can be helpful to think of the driver as a bus' pilot. "You essentially have self-flying airplanes," he said. "They're almost completely computer driven, but you still have pilots on board. And I don't think that has changed the number of pilots in the workforce."

Stefan Seltz-Axmacher, whose company manufactures self-driving trucks and was the first to perform an unmanned commercial-truck driving test, makes it a point to hire skilled truckers. Starsky Robotics employs several longtime truckers who help create and operate technology that would allow drivers to deliver goods from a control center rather than a truck's cab.

"In time, as our system improves and it becomes more generally usable, our hope is that we can take any driver and train them into being a teleoperator," Seltz-Axmacher said, "and give them a higher quality of life while working as part of our team."

— Gina Harkins