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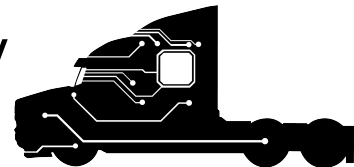


GOVERNMENT/ INDUSTRY MEETING

January 22-24, 2020 | Washington, DC
sae.org/gim

Capturing the Real Safety Potential of Automation

The business and moral imperative for
commercial vehicle developers to shift away
from Safety Theater and toward real safety



Pronto is the leader in autonomous trucking

Team comprised of the most experienced autonomous technology veterans (including the key members of the Otto team) working together with the industry's brightest young talent.

2018: First coast-to-coast trip with zero disengagements

- Validates Pronto's new approach to autonomous tech
- Marks transition from R&D and demos to a safe, commercially viable product
- Developed prototype in just 6 months and continued to make rapid progress since



Copilot is our breakthrough product: automation in safest, fastest way!

Powered by breakthrough technology

Pronto's tech is > 10,000x as powerful as the first autonomous systems thanks to massive improvements in AI hardware and vision algorithms

Runs on automotive-grade equipment

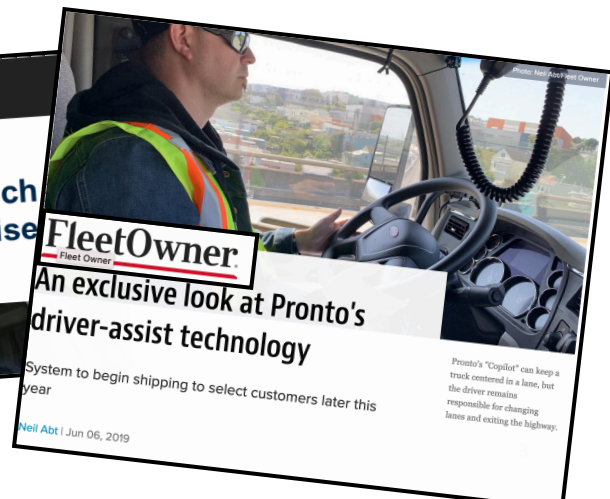
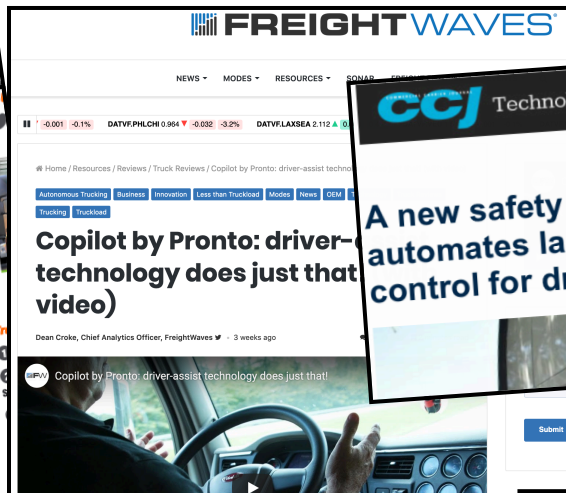
High-quality, low-cost cameras and hardware from commercial Tier 1 suppliers. Others rely on brittle prototype equipment and cost > \$150k

Blows beyond old limits

Core tech works in all weather & road conditions and not just on idealized pre-mapped routes. We tackle real world driving.

Integrates easily

An evolutionary upgrade to the trucks on the road today, so no need to reinvent the entire freight ecosystem to integrate best tech



But it's not “Level 4”

Common joke in Silicon Valley:

Q: How can you tell if a vehicle is autonomous?

A: If it has at least two drivers

Persistent confusion about what is and isn't “autonomous”

Sample article: _____ has started testing trucks with Level 4 autonomy (that is, fully self-driving in specific situations) on public roads in _____... They won't be strictly driverless -- a specially trained safety driver will be ready to take over in a pinch, and an engineer will watch over the system.

Must do better as an industry at communicating the state of technology and our safety!

Safety Theater

A Serious Threat to Realizing the Promise of AVs

There are no autonomous vehicles

There are some amazing demos

- Many can be done safely and can provide invaluable learning
- Still a long way from repeatable, reliable, and commercially viable operations

Awaiting a scientific breakthrough for driverless

- It's not an investment, engineering, or applied science problem
- Taking longer than many of us anticipated... but that's perfectly ok



We've been gauging progress (dangerously) poorly

Miles per disengage

- Not all miles are created equal
- No agreed-upon definition of disengage
- When would we want this number to go up?

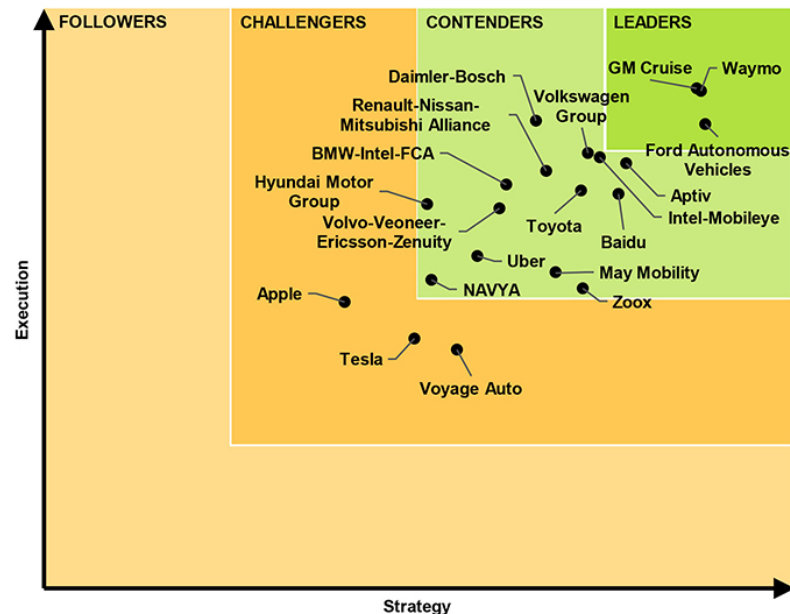
Total miles driven (and simulated)

- At best partially useful... some day in the future
- For now, just an indicator for likelihood of crash

Misaligned incentives for safety

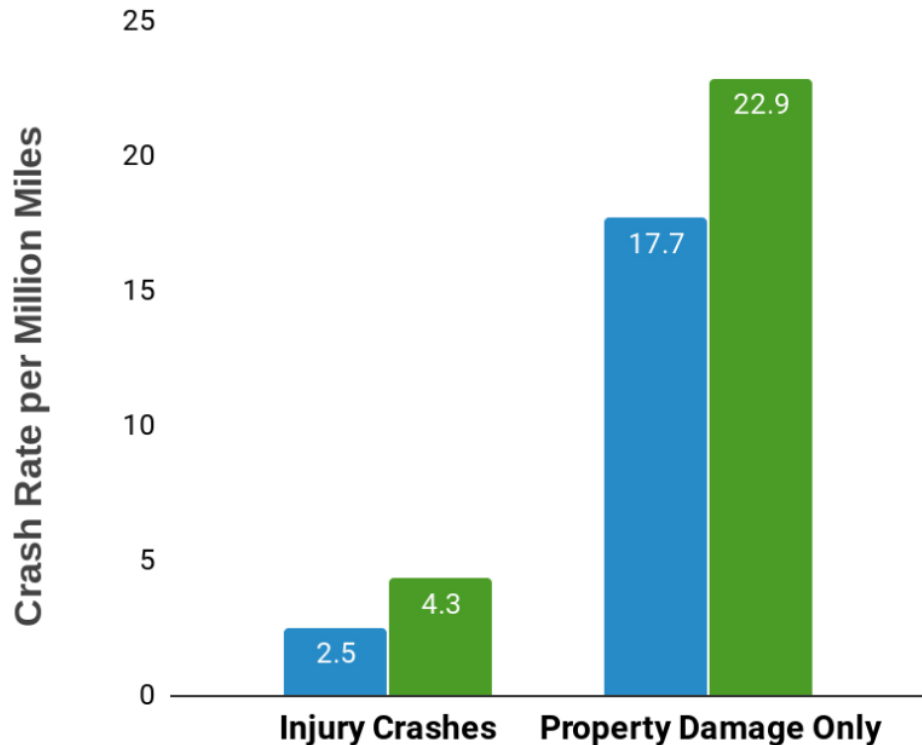
- **Metrics that are attractive to media, marketing, investors, and employee recruitment may threaten public safety**

The Navigant Research Leaderboard Grid



We crash unacceptably often

■ SHRP 2 Age-Adjusted ■ Self-Driving Car in Autonomous Mode



Crash rates are a lagging indicator, but they're the best metric we have

It's actually much worse than this chart suggests

And we've gotten worse over time

We don't even know what's happening outside CA

- 70 autonomy crashes in 2019
- resulting in at least 26 injuries
- 66 of them caused by two companies

And we distract by talking only of legal fault

There have been almost no “at fault” crashes with self-driving cars

- But what would we make of a human driver who crashes all the time but is never legally at fault?
- Should we worry more about the “two guys in a garage” or the established AV industry?

How can insurance interface with law enforcement to help correct this problem?



Beyond Theater

Steps we can take together to get things back on track

Demand Transparency + Accountability

Ask tough questions and demand data-driven answers

- Bottom line must be crash rates

Justify the public roads miles driven (over a certain threshold)

- 3rd party audits
- Crash preventability instead of legal fault

Set clear expectations and goals

- The public didn't sign up for vague "moonshot" experiments

Demos can be invaluable learning opportunities

- But they must be clearly defined and limited
- Leading vs. trailing announcements/marketing



Better Aligning Safety Incentives

What is the role of the safety drivers?

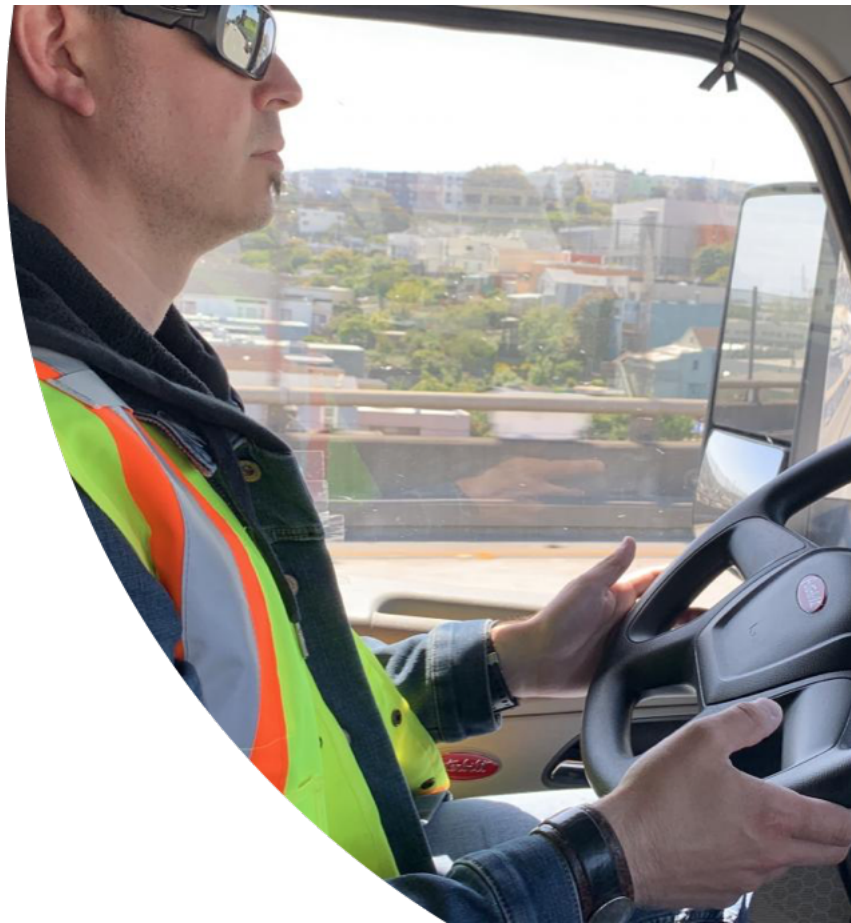
- Recruit vs. replace today's drivers

Minimize excess miles

- Would the test miles be driven anyway?

If aiming for “Level 4,” treat it as a moving target

- Better ADAS raises the bar for “driverless”
- That's a good thing



Trucking is a great space for government and industry to cooperate

Much lower safety tech baseline than cars

- Don't even have DBW in trucks
- Why has the best tech been reserved for luxury cars?

Business-to-business proposition

- Integrate into existing model and ecosystem
- Reduced risks of “gadget enthusiast” consumers

Unique regulatory ecosystem

- No FMCSA equivalent for passenger vehicles
- State vs. federal responsibility better defined
- Existing toolbox better suited for AVs
- CVSA and other forums for intellectually honest debate

Let's do better together



Thank you
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