VIDEO-BASED VEHICLE SAFETY SYSTEMS: Lessons Learned from Commercial Fleets







ACKNOWLEDGEMENTS

Stacey Gray Senior Director for U.S. Policy, Future of Privacy Forum

Adonne Washington Policy Counsel for Data, Mobility, Location, Future of Privacy Forum

> Madison Fleischaker US Policy Intern, Future of Privacy Forum

Amie Stepanovich Vice President for U.S. Policy, Future of Privacy Forum

> Shailey Jain Product Legal, Samsara

> Meera Bhaskar Product Legal, Samsara

> **Jovanna Bubar** Product Legal, Samsara



The Future of Privacy Forum (FPF) is a non-profit organization that serves as a catalyst for privacy leadership and scholarship, advancing principled data practices in support of emerging technologies. Learn more about FPF by visiting fpf.org.



Samsara is the pioneer of the Connected Operations Cloud, which allows businesses that depend on physical operations to harness IoT (Internet of Things) data to develop actionable business insights and improve their operations. The company's mission is to increase the safety, efficiency, and sustainability of the operations that power the global economy. Learn more about Samsara at www.samsara.com. Samsara is a registered trademark of Samsara Inc.



All FPF materials that are released publicly are free to share and adapt with appropriate attribution. Learn more at creativecommons.org.

Recent years have seen an increasing deployment of onboard video-based safety systems in vehicles. While video technologies have been seen already in passenger vehicles, these systems have been even more prominent in the commercial fleet industry (e.g., trucking, delivery, and rental vehicles). Fleet operators have substantial regulatory, financial, and other incentives to implement safety programs, including to improve driver safety and reduce costs of litigation and insurance.¹ Commercial fleets also have the benefit of being able to test the value of different safety systems at scale. As a result, the widespread deployment of video-based safety systems in commercial fleets can provide lessons for manufacturers of passenger vehicles equipped with similar technologies.

Overview of Video-Based Safety Systems

From delivery vehicles for transporting goods to vehicles used to transport equipment or employees in commercial settings, many commercial fleets use video-based driver monitoring systems. These driver monitoring systems (DMS), among other advanced driver assistance systems (ADAS), can reduce driver distraction, provide real-time feedback and data, improve training, and assist in post-collision investigations — all of which may enhance safety, increase operational efficiencies, and lower costs.² Systems can range from basic dashcams to sophisticated AI-powered video telematics.³ As described in a 2022 report:

"Video and sensor-based systems . . . use cameras and sensors to give drivers and administrators more awareness of safetycritical events, like harsh braking, rolling through stops, and collisions. Road-facing and dual-facing cameras (recording the road ahead and the driver in-cab) can help drivers actively avoid collisions by enhancing the field of view and signaling alerts to drivers in real-time when the systems detect external safety issues or distracted driving behaviors in the cab." ⁴

In recent years, even basic vehicle dash cam technology has evolved from simple camera systems that record footage to including more advanced video analytics. Modern video-based systems may capture data such as location, driving performance, and diagnostics drawn directly from a vehicle ("telematics data") and transmit this data to a cloud server where it can be accessed by authorized end-users in different locations, including drivers and fleet managers, to provide insight into driver and vehicle performance. The most sophisticated dashcams may be powered by artificial intelligence (AI) and use predictive and prescriptive capabilities to improve driving behavior.⁵

Impacts of Video-Based Safety Systems

Dash cams have become invaluable tools in commercial motor vehicle fleets for their ability to exonerate drivers, improve safety, and reduce insurance costs in the event of a traffic dispute or accident. When an incident occurs. front-facing and rear-facing video footage from the exterior of the cabin can provide a record of events, providing evidence that can potentially save drivers who are not at fault from legal consequences, insurance premium hikes, or criminal charges. For example, one implementer, a distributor of building materials, reported seeing over \$100,000 USD in estimated savings from driver exonerations after implementing dash cams.⁶ Another implementer reported reducing insurance claims costs by 75% in a year following the installation of dash cams in truck fleets.⁷

In addition to the externally facing cameras, driver safety systems are increasingly using driver-facing video, including video analytics, to record and detect signals of unsafe driving, such as a driver who may be sleepy, distracted, or otherwise impaired.⁸ Distracted or impaired driving are among the leading causes of roadway crashes and driver fatalities.⁹ In commercial fleets, implementers of driver-facing video analytics-based safety features have reported significant improvements, with one implementer observing a 73% reduction of on-theroad incidents after implementing dash cams with driver-facing safety alerts.¹⁰

Notably, both internal and external video systems in vehicles bring significant risks to the privacy of drivers, passengers, and passersby (e.g., pedestrians, other drivers, homeowners, or building owners).¹¹ As discussed in recent publications, these risks must be mitigated in order to protect individual privacy and realize the full benefits of safety systems.

Differences between Consumer Passenger Vehicles and Commercial Fleets

There are several important differences between the implementation of driver monitoring systems in **commercial fleets** and their use in **passenger vehicles** (i.e., privately owned vehicles primarily used for transporting individuals and their families).

> Privacy Regulations, Norms, and Expectations -Generally, any organization deploying vehicle safety technologies will be subject to privacy and data protection laws of the relevant jurisdiction, particularly if the systems involve video cameras or microphones, or otherwise process personal information of drivers, passengers, or other individuals. Relevant laws will depend on the type of data, where the technology is used, what other types of data are processed, and the presence and nature of an employment relationship. In an individual and consumer-facing context, state and federal regulators are increasingly focusing on vehicle privacy, including with respect to rental vehicles.¹² In contrast, data collected in an employment context is often exempted from relevant comprehensive privacy regulations, instead implicating workplace safety regulations and other laws.¹³ In addition to relevant legal

frameworks, individuals typically have a heightened expectation of privacy with respect to their own (i.e., passenger) vehicles, while at least in the United States, expectations of privacy in employment settings are often diminished.¹⁴

- > **Negotiating Power** In the consumer context, individual vehicle buyers may have a broad range of choices, including whether to install or use a dash cam or other add-on features. In some cases, they may also have choices with respect to safety features that come preinstalled, integrated, or otherwise included in the vehicle at purchase. However, advanced driver safety systems are increasingly becoming a default inclusion in new vehicles, including those prescribed by federal mandates.¹⁵ As a result, vehicle buyers may have fewer choices concerning those features over time. Where market choices do exist, buyers face well-known challenges with respect to understanding complex privacy policies in order to make informed decisions.¹⁶ In contrast, drivers in commercial fleets often have to rely on unions for negotiating power, as they typically do not have a choice as to what vehicle they drive or what safety features their employer chooses to require as part of an employment agreement.
- Business Incentives In the consumer context, safety features can be driven first by regulatory requirements and to a lesser extent by the opportunity to offer buyers desirable safety benefits within reasonable ranges of affordability. To the extent that safety features decrease accidents or reduce litigation costs, usually, the benefits primarily accrue to the vehicle owners and other road users rather than directly to the manufacturer. Meanwhile, commercial fleet operators are responsive to a broader range of business incentives, including the desire to reduce costs across the fleet, increase efficiency, and mitigate environmental impact.

Lessons from Implementation in Commercial Fleets

Commercial fleets have been earlier and more intentional adopters of video-based vehicle safety systems at a large scale, in part driven by some of the key differences between commercial fleets and passenger vehicles (described above). As a result, there are a number of lessons that passenger vehicle manufacturers can learn from these implementations, both in their successes and their challenges. Lessons can be learned regarding how to implement effective notices, the prioritization of quality and long-lasting hardware, restrictions on access to data, and building positive consumer sentiment through clear benefits and mitigation of privacy risks.

- > Effective Notices Notices about data collection should be transparent, easy to understand, and include sufficient information for individuals to have a greater understanding and make informed decisions about what data is collected, how the data is being used, and whether the data is shared with third parties. In the commercial context, notice typically occurs in an employment agreement and related policies that employees are expected to receive and acknowledge, which can be negotiated by labor unions. As a result, commercial implementation has benefited from "early and frequent communication [with] labor associations ... [including] clearly communicating what data [would be gathered and used]."¹⁷ In a similar way, passenger vehicle purchase agreements may include click-through terms and notices, which may be complex, difficult to read, or overwhelming for most average individuals.¹⁸ As a result, manufacturers and sellers of passenger vehicles can be more effective by finding ways to provide notices that go above and beyond legal requirements, for example by in-vehicle "just in time" notices, providing additional easy-to-understand information in the form of pamphlets or educational videos, or training employees to be able to answer questions at the point of sale.
- Hardware While there is an associated cost, commercial fleets have the ability to switch out hardware if needed to fix known problems and make improvements. This can include enabling additional privacy functionality over time through upgraded or additional third party hardware, including in response to advances in technology, changes in law or regulation, or evolving driver and fleet needs.¹⁹ In contrast, individual vehicle buyers are less likely to take the steps needed to update and replace hardware. NHTSA reports that even in the context of safety-related recalls for vehicles and

in-vehicle technology, "millions of vehicle recalls go unrepaired or unaddressed every year."20 Although over-the-air software updates can sometimes provide solutions, hardware plays a key role in the ability to provide cost-effective privacy features. For example, hardware affects the amount of video that is able to be stored on a device without being pushed to the cloud. Ondevice storage can help enable exoneration and insurance uses (similar to cloud storage), while at the same time providing a strong safeguard against many forms of breaches and improper use. In addition, AI models that run entirely on a consumer-facing device such as a vehicle ("on the edge") traditionally require more device processing power than those that leverage backend cloud-based algorithms.²¹ As a result, manufacturers of passenger vehicles should plan and make investments in hardware early for privacy-enhancing features to be sustainable and improved over time.

- > Data Access and Administrative Controls In general, people other than the primary driver of a vehicle should have limited access to data and only on a need-to-know basis. Implementing role-based access controls can help safeguard driver footage, ensuring it is used only for approved purposes as communicated to the drivers.²² This also helps protect such data from being accessed by non-authorized individuals.²³ Conversely, it is crucial that drivers have easy access to video recordings related to their driving in order to take advantage of the benefits of exoneration. Prioritizing ease of access can sometimes be in tension with other privacy measures - for example, on-device storage. In the consumer context, manufacturers of passenger vehicles will encounter similar design choices and may have a greater ability to prioritize individual privacy and control.
- Driver Sentiment In general, commercial implementers of safety features have learned that drivers in commercial fleets care deeply about privacy, and seek to avoid being unnecessarily watched in their workplace, including through technology that can be used to discipline them.²⁴ In commercial fleets, implementing technology transparently, and educating drivers about contemplated use cases and associated benefits can lead to higher and smoother adoption.²⁵ For example,

demonstrating the safety and exoneration benefits of Al-powered driver-facing cameras to drivers is one way to increase driver buyin.²⁶ Indeed, "76% of physical operations leaders [now] report their drivers are mostly or completely accepting of dash cams."²⁷ Transparent and accountable notices about data use, role-based access controls, customizable settings, and retention and storage options are some techniques that helped gain driver acceptance and would likely prove similarly effective in the consumer setting.

Consumers should be able to pick and choose which features are used in their vehicle. Commercial drivers have been able to work with fleet operators, especially through unions where they exist,²⁸ to implement driver safety solutions that only utilize features necessary to achieve the organization's specific goals.

What to Expect in the Coming Years

Driven by efforts to improve roadway safety amid rising levels of distracted driving and other dangerous driving behaviors, driver monitoring systems are becoming more commonplace. In the United States, a 2021 Infrastructure law has led to new requirements in passenger vehicles for driver safety monitoring systems.²⁹ Similarly, the EU requires certain driver safety systems to be built into new vehicles manufactured after 2024.³⁰ Vehicle manufacturers and technology providers should carefully consider the lessons learned from the deployment of safety systems in commercial fleets, as well as lessons from experts in consumer advocacy, user design, traffic safety, domestic and child abuse, and surveillance, among others. By doing so, they can more effectively tailor these technologies for passenger vehicles, ensuring they meet the unique needs and expectations of individual drivers. Drivers, in turn, should also stay informed about these advancements and actively engage with how they are implemented, in order to maximize their benefits and enhance personal safety on the road.

Endnotes

- 1 Future of Privacy Forum & Samsara, A Practical Guide To Video-Based Safety Technologies In Commercial Vehicle Fleets: Understanding Safety Programs, Data Use, and Privacy Best Practices, 1 (June 2022), https://fpf.org/wp-content/uploads/2022/05/FPF-Samsara-White-Paper.pdf. See also Samsara, How Dash Cams Can Help Lower Your Insurance Costs (Aug. 15, 2023), https://www.samsara.com/guides/dash-camera-for-insurance/.
- 2 Future of Privacy Forum & Samsara, A Practical Guide To Video-Based Safety Technologies In Commercial Vehicle Fleets: Understanding Safety Programs, Data Use, and Privacy Best Practices, Future of Privacy Forum (June 2022), https://fpf.org/wp-content/uploads/2022/05/FPF-Samsara-White-Paper.pdf.
- 3 See id.
- 4 See id at 4.
- 5 See id.
- 6 How Foundation Building Materials Improved Driver Safety, Samsara, https://www.samsara.com/customers/foundation-building-materials (last visited June 4, 2024).
- 7 Antalis reduces insurance claims costs by 75% and slashes incident response time from hours to minutes with Samsara dash cams, Samsara, https://www.samsara.com/customers/antalis (last visited June 4, 2024).
- 8 Adonne Washington, Future of Privacy Forum, *Vehicle Safety Systems* (Amie Stepanovich & John Verdi eds., 2024). https://fpf.org/wp-content/ uploads/2024/03/FPF-Vehicle-Safety-Systems_March2024-FINAL.pdf.
- 9 8% of fatal crashes in 2020 involved at least one distracted driver. 30% involved at least one alcohol-impaired driver. Overview of Motor Vehicle Crashes in 2020, Nat'l Highway Traffic Safety Admin., 12-18 (2022) https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813266
- 10 How Eurovia USA empowered their drivers to reduce unsafe mobile usage and increase seatbelt usage, Samsara, https://www.samsara.com/ customers/eurovia-usa (last visited June 4, 2024).
- 11 Adonne Washington, Future of Privacy Forum, Vehicle Safety Systems (Amie Stepanovich & John Verdi eds., 2024). https://fpf.org/wp-content/ uploads/2024/03/FPF-Vehicle-Safety-Systems_March2024-FINAL.pdf; Future of Privacy Forum & Samsara, A Practical Guide To Video-Based Safety Technologies In Commercial Vehicle Fleets: Understanding Safety Programs, Data Use, and Privacy Best Practices, 1 (June 2022) https://fpf.org/wp-content/uploads/2022/05/FPF-Samsara-White-Paper.pdf.
- 12 CPPA to Review Privacy Practices of Connected Vehicles and Related Technologies, California Privacy Protection Agency (July 31, 2023), https://cppa.ca.gov/announcements/2023/20230731.html.
- 13 See James Dempsey, *Exceptions in new US state privacy laws leave data without security coverage*, IAPP, May 17, 2022. https://iapp.org/ news/a/exceptions-in-new-state-privacy-laws-leave-data-without-security-coverage
- 14 See Joshua H. Lerner et al., *New Rules and Risks in Employee Monitoring*, WilmerHale (June 2022), https://www.wilmerhale.com/insights/ client-alerts/20220628-new-rules-and-risks-in-employee-monitorin.
- 15 Advanced Impaired Driving Prevention Technology, 89 Fed. Reg. 830 (proposed Jan. 5, 2024) (to be codified at 49 C.F.R. § 571) https://www. federalregister.gov/documents/2024/01/05/2023-27665/advanced-impaired-driving-prevention-technology.
- 16 Jen Caltrider et al., *What Data Does My Car Collect About Me and Where Does It Go*?, *Privacy Not Included, Mozilla Foundation (Sept. 6, 2024), https://foundation.mozilla.org/en/privacynotincluded/articles/what-data-does-my-car-collect-about-me-and-where-does-it-go/.
- 17 The City of Memphis takes citizen services to the next level with Samsara, Samsara, https://www.samsara.com/customers/city-of-memphis/ ("Learn More": Increased visibility improves employee safety and protects the City from false claims) (last visited June 6, 2024); See also Olivia Marcus, Creating a Dash Cam Program with Union Drivers: Tips from a Teamsters Expert, Samsara (April 7, 2021), https://www.samsara. com/blog/dash-cam-program-union-tips-teamsters-expert/ (observing that employee engagement across many sectors benefits from clear communication from senior leadership).
- 18 See, e.g., Thorin Klosowksi, *Here's what you're actually agreeing to when you accept a privacy policy*, The New York Times, Apr. 14, 2023. https://www.nytimes.com/wirecutter/blog/what-are-privacy-policies/
- 19 See Privacy Button, Samsara, https://www.samsara.com/products/models/privacy-button/ (last visited June 5, 2024) (additional hardware to disable GPS tracking).
- 20 Vehicle Safety Recalls Week, Nat'l Highway Traffic Safety Admin., https://www.nhtsa.gov/recalls/vehicle-safety-recalls-week (Mar. 2024).
- 21 What is Edge AI?, IBM, https://www.ibm.com/topics/edge-ai (last visited June 7, 2024).
- 22 In some jurisdictions, these norms have been codified in law. See, e.g., Cal. Bus. & Prof. Code §§ 22948.50-.59.
- 23 See Elizabeth Napolitano, *Tesla driver sues company for allegedly accessing customer videos*, CBS (Apr. 10, 2023 11:09 AM), https://www. cbsnews.com/news/tesla-lawsuit-privacy-concerns-autopilot-reuters/.
- 24 Samsara, *The State of Privacy in Physical Operations* 11 (2023) https://www.samsara.com/pdf/the-2023-state-of-privacy-in-physical-operations-report.pdf. ("54% [of physical operations leaders] said that privacy concerns can slow AI implementation or stop it altogether.")
- 25 See generally, Driver Assistance Technologies: NHTSA Should Take Action to Enhance Consumer Understanding of Capabilities and Limitations, United States Gov't Accountability Office, (2024) https://www.gao.gov/assets/d24106255.pdf ("when drivers have a realistic understanding of their vehicles' driver assistance technologies, they are more likely to use them as intended."). See also Samsara, *The State of Privacy in Physical Operations* 3-4 (2023) https://www.samsara.com/pdf/the-2023-state-of-privacy-in-physical-operations-report.pdf.
- 26 Samsara, Best Practices for Building a Video-Based Safety Program (2023) https://www.samsara.com/pdf/the-2023-state-of-privacy-inphysical-operations-report.pdf. (last visited June 4, 2024).
- 27 Samsara, *The State of Privacy in Physical Operations* 5 (2023) https://www.samsara.com/pdf/the-2023-state-of-privacy-in-physical-operations-report.pdf.
- 28 Id. at 18 ("86% of leaders report they agree that unions are active in helping drivers be more informed about privacy.")
- 29 Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429. (2021).
- 30 Council Regulation 2019/2144, New Vehicle General Safety Regulation, 2019 OJ (L 325) https://eur-lex.europa.eu/legal-content/EN/ ALL/?uri=CELEX%3A32019R2144.





1350 EYE STREET NW, SUITE 350 | WASHINGTON, DC 20005 FPF.ORG | info@fpf.org