Issues and Opportunities with Driver-Facing Cameras

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Prepared by the American Transportation Research Institute

ATRI American Transportation Research Institute

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LIST OF ACRONYMS

ACTA – American College of Transportation Attorneys

ADAS – Advanced Driver Assistance Systems

ADS – Automated Driving Systems

ATRI – American Transportation Research Institute

BLS – Bureau of Labor Statistics

CEAs – Critical Event Alerts

CMV – Commercial Motor Vehicle

DFC – Driver-Facing Camera

FMCSA – Federal Motor Carrier Safety Administration

FMCSRs – Federal Motor Carrier Safety Regulations

GES – U.S. DOT General Estimates System

GPS – Global Positioning System

LTL – Less-than-truckload

MCIEF – Motor Carrier Insurance Education Foundation

OOIDA – Owner-Operator Independent Drivers Association

RAC – Research Advisory Committee

RFC – Road-Facing Camera

SAE – Society of Automotive Engineers

SD – Secure Digital

TIDA – Trucking Industry Defense Association

USB – Universal Serial Bus

VBOSMS – Video-Based Onboard Safety Monitoring Systems

VTTI – Virginia Tech Transportation Institute

INTRODUCTION

In-cab technologies are becoming increasingly commonplace, with an emphasis on promoting safety. One in-cab technology grouping, which is closely related to safety, is in-cab cameras. While they possess many descriptions, ranging from the pithy (e.g. "dash cams," "video telematics," "digital video recorders") to the complex (e.g. "video-based onboard safety monitoring systems"), they all rely on various configurations of cameras, sensors and occasionally audio receivers to capture video footage during truck operations. The scale of worldwide in-vehicle camera revenue was estimated to exceed $3.6 billion in 2021.[1] The North American marketplace is considered the largest in the world with 2.9 million camera units in 2021 and an annual growth rate of 16.5 percent.[2]

The use of in-cab camera technologies in the trucking industry is dramatically increasing, but primarily within the road-facing camera (RFC) group. RFC systems are growing in popularity with both truck drivers and motor carriers primarily because of their ability to accurately capture safety event data, which often exonerates truck drivers and motor carriers from claims of negligence. Of equal importance is their ability to identify truck driver and/or fleet negligence – allowing the parties to settle cases more quickly and at a lower cost.

In fact, recent Federal Motor Carrier Safety Administration (FMCSA)-sponsored research, led by the American Transportation Research Institute (ATRI), found that RFCs were a truck driver's second most preferred in-cab technology.[3] Decades ago, truck drivers abhorred all in-cab camera systems – providing a hint that education, clear policies, device costs and litigation precedents can influence truck driver attitudes over time.

That said, driver-facing cameras (DFCs) are not well utilized across the trucking industry, often for the following reasons:

- Driver privacy issues / concerns;
- Confusion over video use, personnel access and recording models;
- Concern that truck driver negligence, however subtle, will be highlighted.

Within the larger commercial vehicle market, these concerns are generally unique to trucking since most school, transit and charter bus fleets readily install and use driver- or passenger-facing cameras.

Based on the growing popularity of RFCs and interest in potential DFC benefits, in 2022 ATRI's Research Advisory Committee (RAC) reviewed two separate RAC proposals relating to DFCs.[4]

The first DFC research suggestion focused on DFCs' existing and potential role in litigation. The second research suggestion proposed a deeper assessment of truck driver issues and

[1] Straits Research, "Dashboard Camera Market growth is projected to reach USD 10.86 Billion by 2030, growing at a CAGR of 13%: Straits Research," *Globe Newswire* (June 28, 2022), https://www.globenewswire.com/en/news-release/2022/06/28/2470507/0/en/Dashboard-Camera-Market-growth-is-projected-to-reach-USD-10-86-Billion-by-2030-growing-at-a-CAGR-of-13-Straits-Research.html.
[2] Rickard Andersson, *The Video Telematics Market: 3rd Edition*, Berg Insight (2022), https://media.berginsight.com/2022/04/21155248/bi-videotelematics3-ps.pdf.
[3] Federal Motor Carrier Administration, "Tech-Celerate Now" (accessed on March 2023), https://www.fmcsa.dot.gov/Tech-CelerateNow.
[4] ATRI's Research Advisory Committee RAC is comprised of industry stakeholders representing motor carriers, trucking industry suppliers, federal government agencies, labor and driver groups, law enforcement, and academia. The RAC is charged with annually recommending a research agenda for the Institute.

concerns toward DFCs. After a short discussion, the RAC proposed synthesizing the two issues together and later prioritized a single DFC white paper.

Accordingly, this research has two objectives: to understand truck driver issues and perceptions associated with the use of DFCs; and to understand DFCs' role in claims and litigation processes. Drivers, legal experts, and insurers all have important roles to play if a carrier wishes to use DFCs to fully leverage the benefits of the technology. By investigating these two objectives, this research will identify existing points of agreement as well as paths for compromise among these key stakeholder groups on the optimal use of DFCs.

BACKGROUND

In-Cab Cameras: A Primer on Applications and Attributes

Road-Facing Only Cameras

Road-facing (only) cameras are becoming extremely common in both trucks and cars, particularly because they can be easily purchased online or at local truck stops and retail centers, with low-end systems often costing less than $100. These stand-alone systems, as opposed to subscription systems, store video feeds locally on a storage system such as a Universal Serial Bus (USB), Secure Digital (SD) or Micro SD card. The stand-alone systems do not utilize wireless connectivity to external locations, but they can still provide useful monitoring and documentation of outside (of the truck) activities and/or safety-related events.

When wireless connectivity is included, typically through a terrestrial linkage, the RFC camera system often includes some type of subscription service (e.g. monthly service fees). The RFC systems that utilize wireless connectivity usually offer expanded services and capabilities including Global Positioning System (GPS) vehicle positions, posted vs vehicle speed data, and other add-on information.

RFCs (with or without DFCs) typically include other sensors that capture kinetic events, such as contact with another vehicle, sudden changes in speed, or sudden changes in direction. Because most camera sensors are located in the truck cab, they do not always register kinetic events specific to trailers.

Driver-Facing Cameras

Driver-facing cameras generally use the same video and storage components as RFCs but are turned inward to view the interior of the cab, with an emphasis on capturing truck driver activities and behaviors. The primary objective of DFCs is to capture behaviors that might create safety risks, as well as to corroborate that risky behaviors are not occurring – thus exonerating the driver when safety critical events or crashes occur. DFCs are almost always integrated with RFCs; only in limited instances such as driver fatigue research have DFC-only cameras been installed and used.

Multi-Camera Systems

Because DFC-only systems are essentially non-existent, the next most common system is an integrated road-facing plus driver-facing camera system. Again, these can easily be purchased as a stand-alone, plug-and-play device, or as a fully integrated subscription-based video camera system. Within an integrated system, footage from multiple cameras can be synchronized to provide multiple perspectives on the same event. Some multi-camera systems even include – and integrate with – externally mounted sideview and back-up cameras.

It should also be pointed out that some RFC and integrated systems include audio recordings. In an article published in January 2023, attorney John Stacy points out that most states have differing, often conflicting laws on audio recording, with many states requiring that any and all recorded parties are given advance permission to be recorded.[5]

[5] John Stacy, "See what we can see; A very brief glimpse into the benefits and pitfalls of dashboard cameras," Setliff Law (January 26, 2023), https://www.setlifflaw.com/news/2023/01/see-what-we-can-see-a-very-brief-glimpse-into-the-benefits-and-pitfalls-of-dashboard-cameras/.

Since these integrated systems are often built on a subscription service business model, it is more difficult to identify true system "costs."

While RFCs with and without DFCs are the most commonly used systems, there are other types of in-cab cameras. While the following systems are not incorporated into this research, they do play unique safety roles in industry and hence are defined here.

Sideview and Back-Up Cameras

In the trucking industry, back-up cameras are most commonly used on straight trucks, although multiple sideview and back-up camera systems are available for tractor-trailer combinations. Many of these systems use a wireless feed from trailer-mounted cameras to a monitoring screen in the tractor. The wireless connectivity allows a driver to switch tractors and trailers with relative ease.

Back-up cameras in particular provide multiple benefits and functionality, with the three most common being elimination of blind zones, assistance in backing up to locations, and cargo theft monitoring. Sideview and back-up camera prices, depending on sophistication, typically range from $150 to $800 per system, with some packages costing over $1,000.[6]

Active Safety Systems

While it is tangential to this specific research, it should also be noted that video cameras are a foundational component of many active (and passive) safety systems. As a group, these active safety systems are often termed automated driving systems (ADS) or advanced driver assistance systems (ADAS). In both cars and trucks, camera-based safety systems, which include lane management systems and parking systems among others, continuously monitor the roadways and vehicle operations to make operational changes as needed.

Closely related to ADS, most Society of Automotive Engineers (SAE) Level 3/4/5 autonomous car and truck systems utilize automated video camera systems in parallel with sophisticated algorithms and neural networks.

Some DFCs exclusively are used to monitor for driver distraction or driver fatigue algorithmically and automatically, though these are much less common than DFCs in general.

Recording Formats

There are two primary DFC recording formats:

- Event-based DFCs are designed to capture a specific time period of video based on sensor triggers and/or safety critical events. These event-based DFC video feeds capture and store video from a discrete period of time immediately before, during and after a safety event; storage occurs either on the local DFC hardware or is wirelessly uploaded to external storage.
- Continuously recording DFCs are always on, and they allow either real-time monitoring of the truck driver or continuous uploading and storing of in-cab video for future reviews.

[6] Rickard Andersson, *The Video Telematics Market: 3rd Edition*, Berg Insight (2022), https://media.berginsight.com/2022/04/21155248/bi-videotelematics3-ps.pdf.

It is important to note that several DFC systems continuously monitor the driver and cab but only capture and distribute to carriers video events that are noteworthy from a safety standpoint. Based on this policy, these systems can be considered event-based from a carrier perspective.

A small percentage of DFCs provide a live-streaming functionality, whereby a person outside of the truck can log in to a computer and see the truck driver in real-time. Based on truck driver survey comments, truck drivers appear to believe that live-streaming capabilities are more common than they are, based on anecdotal DFC vendor information.

In almost all instances, truck drivers are notified visually or audibly when either active camera format is in recording mode. At least two DFC systems also notify truck drivers when the camera is no longer recording.

Several leading DFC systems include a "privacy mode" that turns the camera off automatically when the truck has been idle for a set amount of time, when the transmission is in park, or when the truck is turned off.

Camera Placement

While in-cab cameras are legal in all 50 states, there are conflicting requirements as to how and where the camera systems can be mounted in a vehicle, and many state laws even differentiate placement locations between cars and large trucks.[7] For example, in some states the cameras cannot be mounted on the windshield, and in other states they must be mounted on the windshield.

Given that a large segment of the trucking industry is engaged in interstate commerce, variations in state law placement requirements create considerable confusion among fleets and drivers. On March 7, 2022, FMCSA published changes to its windshield obstruction rule, allowing more safety technologies to be mounted to the windshield (49 CFR §393.5) and increasing the mounting space (§393.60l(1)), providing some clarity on how and where safety technologies can be mounted in large trucks.[8] The revised rule permits dash cameras, GPS devices, and other safety technologies to be mounted up to 8.5 inches below the upper edge of the area swept by the windshield wipers, or up to 7 inches above the lower edge. The device cannot obstruct the driver's view of the road or highway signs or signals. However, there is no certainty that local law enforcement will be aware of the Federal Motor Carrier Safety Regulations (FMCSRs) nor whether the FMCSRs supersede state laws.

In-Cab Cameras: Scale of Industry Usage

Based on a review of published market research, there are more than three dozen providers of in-cab camera systems in North America. As such, there are a wide variety of subscription models, recording formats and camera policies currently in use. The Berg Insight market research report estimated that 2.9 million active video telematics systems were in use in North America in 2021, with numbers projected to exceed 3,960,000 by 2023.[9]

[7] Sarah Harris, "Dashcam Laws by State," *FreightWaves Ratings* (October 27, 2022), https://ratings.freightwaves.com/dash-cam-laws-by-state/.
[8] Parts and Accessories Necessary for Safe Operation, 49 CFR 393.5 (2023), https://www.ecfr.gov/current/title-49/subtitle-B/chapter-III/subchapter-B/part-393.
[9] Rickard Andersson, *The Video Telematics Market: 3rd Edition*, Berg Insight (2022), https://media.berginsight.com/2022/04/21155248/bi-videotelematics3-ps.pdf.

The number of less-costly stand-alone RFCs in the trucking industry is substantially higher and will likely grow much faster than the active video systems market.[10]

In-Cab Cameras and Safety Benefits

While RFCs and DFCs were formally included in the FMCSA Tech-Celerate Now program, most industry experts would describe the RFC/DFC role in safety as indirect, whereby video feeds are used for driver training or post-event safety management to document safety-related outcomes.[11] That said, there is limited safety research associated with in-cab camera usage.

One of the earliest in-cab camera safety studies using "onboard safety monitoring devices" was conducted by Virginia Tech Transportation Institute (VTTI) in 2009.[12] The methodology generally tracked truck drivers from two motor carriers over a 17-week period. During a 4-week baseline phase, the cameras were not accessible to the motor carrier, but VTTI still documented safety critical events. In the 13-week intervention phase, safety directors could monitor safety critical events and related driving behavior to provide remedial or corrective training.

The research found that safety critical events dropped from the baseline phase to intervention phase by 37.0 percent for Carrier A and by 52.2 percent for Carrier B.[13] The research suggests that the primary safety benefit of in-cab cameras is the driver intervention and corrective training based on video footage.

More recent research conducted by the AAA Foundation estimated that video-based onboard safety monitoring systems (VBOSMS) could, on an annual basis, potentially prevent:[14]

- 63,243 truck-involved crashes;
- 2,753 injuries; and
- 293 deaths.

The AAA Foundation methodology was also based on the VBOSMS being used to proactively and reactively train truck drivers to mitigate dangerous driving situations and behaviors, and it assumes the VBOSMS systems were installed on all large trucks in the U.S.

Finally, a vendor-sponsored study conducted by VTTI compared the vendor's crash reduction data from carrier customers and extrapolated benefits to the larger truck and bus industries, based injury and fatality data within the U.S. DOT General Estimates System (GES) database.[15]

[10] Future Market Insights, *Dashboard Camera Market Outlook 2022-2023* (October 2022), https://www.futuremarketinsights.com/reports/dashboard-camera-market.
[11] Tech-Celerate Now is a Federal Motor Carrier Safety Administration program with funding and technical support from the U.S. Department of Transportation's Intelligent Transportation Systems Joint Program Office, for accelerating the adoption of ADAS in the commercial motor vehicle (CMV) industry.
[12] Jeffery S. Hickman, George J. Hanowski, and Olu Ajayi, "Evaluation of an Onboard Safety Monitoring Device in Commercial Vehicle Operations," Driving Assessment Conference (June 2009), https://doi.org/10.17077/drivingassessment.1300.
[13] Ibid.
[14] Matthew C. Camden et al., *Leveraging Large-Truck Technology and Engineering to Realize Safety Gains: Video-Based Onboard Safety Monitoring Systems*, AAA Foundation for Traffic Safety (September 2017), https://aaafoundation.org/wp-content/uploads/2017/11/Truck-Safety_-Braking-Report.pdf.
[15] Susan Soccolich and Jeffery S. Hickman, *Potential Reduction in Large Truck and Bus Traffic Fatalities And Injuries Using Lytx's Drivecam® Program*, Virginia Tech Transportation Institute (May 2014), https://vtechworks.lib.vt.edu/handle/10919/64308.

The study found that in-cab cameras, when combined with corrective truck driver training, could:

- reduce truck- and bus-involved fatalities by 801 annually; and
- prevent 25,007 truck and bus injury crashes annually.

While additional research on the safety impacts of different in-cab camera systems and policies is still needed, these findings indicate that in-cab cameras have a strong potential to reduce roadway incidents when deployed effectively.

METHODOLOGY

In order to assess the myriad complexities of DFCs in trucking, this research utilized multiple qualitative and quantitative data collected from truck drivers, attorneys and legal experts, and insurance staff.

In addition, the research team maintained continuous communications with four leading in-cab camera vendors, who provided technical support and insight into camera functionalities and market research. These vendors were also consulted during the development of the report's driver and litigation survey questions.

The research team first completed a literature review on in-cab cameras in general to understand the marketplace of in-cab camera functionality, utilization and user perspectives. The literature on in-cab cameras is somewhat limited from a research perspective. Vendor marketing materials were reviewed as well, as they provide interesting anecdotal information on in-cab camera usage, but these resources must obviously be tempered for potential bias. The Berg Insight report, a comprehensive market research document, was used as an important input to various components of ATRI's primary research.

Truck Driver Survey

To address the RAC topic relating to truck driver perspectives on in-cab cameras, the research team developed and pre-tested a truck driver survey (Appendix B) that solicited information on in-cab camera usage, with a focus on DFC. The survey asked in-depth questions on driver concerns, opportunities and perceived safety impacts of DFCs.

Approximately 2,100 drivers responded to the survey, which was publicized through ATRI's contact database, the Owner-Operator Independent Drivers Association (OOIDA), and numerous industry news outlets. It is important to note that this survey distribution approach is considered a "convenience sample," as it does not attempt to control for truck driver population representativeness, so respondent data may not reflect the total U.S. truck driver population.

The survey's demographic data indicates that truck driver respondents work in all sectors and business models within the trucking industry. For-hire fleets employ 73 percent of respondents while private fleets employ the remainder. For-hire truck drivers are slightly over-represented in the survey data, as for-hire carriers currently hold a 52.6 percent share of the trucking market.[16]

Across industry sectors, the survey data more closely resembles industry-wide employment:

- Truckload drivers represented 42.3 percent of respondents, compared to 56.5 percent of truckload drivers as identified by the Bureau of Labor Statistics (BLS).
- Less-than-truckload (LTL) drivers represented 14.5 percent of respondents, compared to 29.3 percent of LTL drivers as identified by BLS.
- Specialized drivers represented 28.5 percent of respondents compared to 14.2 of drivers of specialized drivers as identified by BLS.[17]

Table 1 shows other key driver demographics in the survey.

[16] American Trucking Associations, *American Trucking Trends 2021* (2021).
[17] Bureau of Labor Statistics, "Quarterly Census of Employment and Wages, 2021 Third Quarter," (accessed on May 10, 2023), https://www.bls.gov/cew/. SOC codes used were 484121 for truckload carriers, 484122 for less-than-truckload carriers, and 484230 for specialized/other carriers.

Table 1: Driver Survey Demographics Breakdown

Gender	
Male	90%
Female	10%
Trip Length	
Local (less than 100 miles)	13%
Regional (100 – 500 miles)	40%
Interregional (500 – 1,000 miles)	24%
National (1,000+ miles)	22%
Experience	
Less than 1 year	3%
1–5 years	10%
6–10 years	11%
11–20 years	20%
21+ years	55%
Age	
21–24	1%
25–34	8%
35–44	13%
45–54	25%
55–64	39%
65+	14%
DFC Usage	
Current use	32%
Past use	8%
Equipped but unused	9%
Never used	51%
RFC Usage	
Current use	72%
Past use	5%
Equipped but unused	4%
Never used	18%

Litigation Survey

To address the RAC priority on litigation opportunities for DFCs, a second survey assessed the role of in-cab cameras on litigation and legal issues associated with in-cab cameras (Appendix C). This litigation survey was distributed primarily to transportation defense attorneys, both corporate and outside law firm attorneys, through the Trucking Industry Defense Association (TIDA), and the American College of Transportation Attorneys (ACTA).

Approximately 60 percent of litigation survey respondents were defense attorneys at outside firms, 10 percent were in-house corporate attorneys, and the remaining 30 percent were subject matter experts in litigation, incident claims, or risk management. The litigation survey respondents represent significant legal experience:

- 78 percent of defense attorney respondents and 68 percent of all respondents have more than 20 years of legal experience.

Insurance Survey

To complement the driver and legal expert analyses, a third survey assessed the role of in-cab cameras on insurance policies and claims management (Appendix D). This insurance survey was circulated through the Motor Carrier Insurance Education Foundation (MCIEF), among other channels. Respondents represented over 33,000 carrier insurance policies.

FINDINGS

Truck Driver DFC Perspectives

After a series of demographic questions, the driver survey asked truck drivers to rate DFCs in four key "issue bins" on a scale of 0 to 10, with 0 representing no benefit and 10 representing great benefit. These key issue bins were selected, after consultation with technology vendors, as the most important functions of DFCs:

- DFCs' ability to improve safety ("Safety");
- DFCs' ability to positively impact litigation ("Litigation");
- DFCs' ability to protect driver privacy ("Privacy"); and
- overall approval rating of DFCs ("Approval").

Ratings were binned and averaged according to driver demographics, carrier operations, and DFC functionalities, among other categories. Many of these categories have a substantive impact on driver opinions and attitudes regarding DFCs.

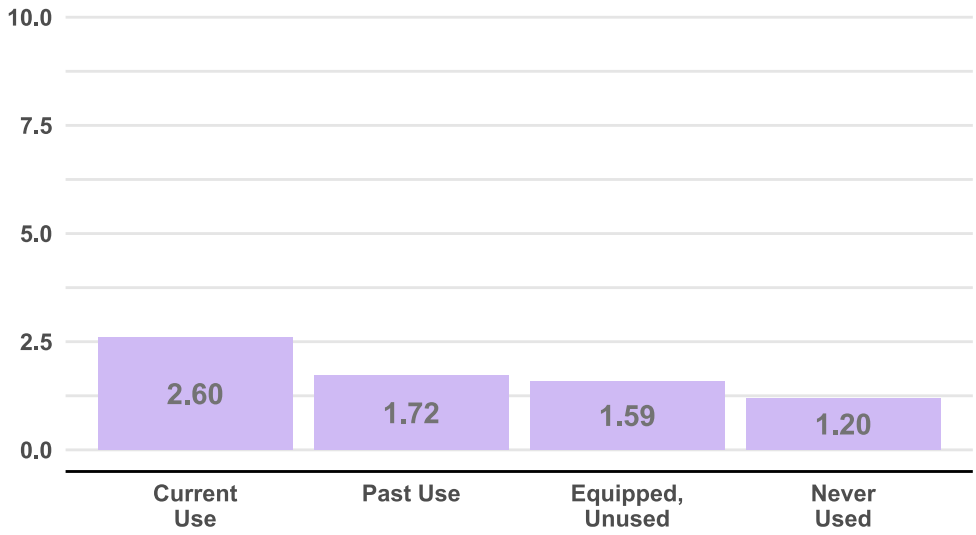
The Impact of DFC Experience on Driver Perceptions

DFC Usage and Safety Perceptions

Current experience with DFCs is one of the biggest factors leading to higher driver approval.

Truck drivers who currently use DFCs rated the technology's ability to improve safety at 2.6 out of 10, more than two times higher than drivers who have never used DFCs (Figure 1). Drivers with past experience rated DFC safety higher than those with no experience but lower than current users, which may be the result of improvements in DFC technology.

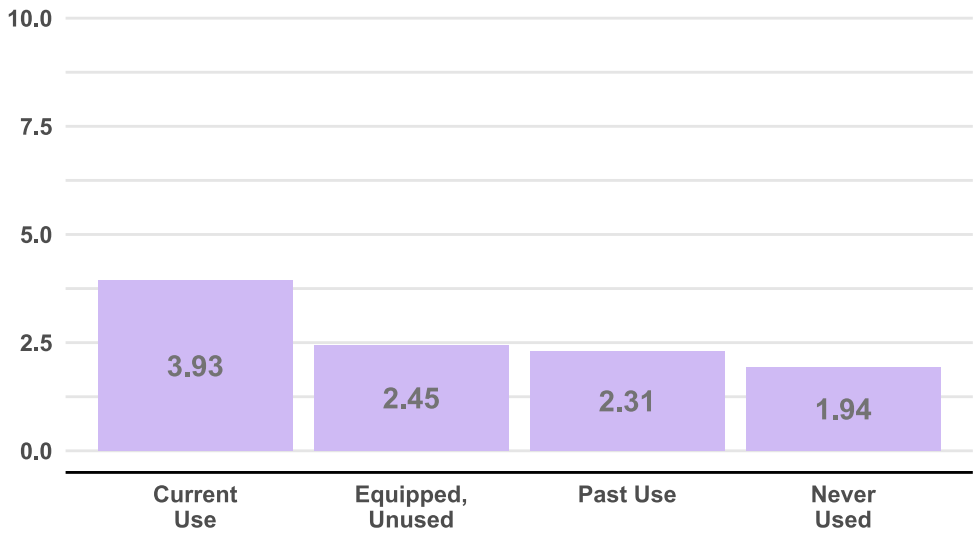
Figure 1: Average Driver DFC Safety Ratings by Use



DFC Usage and Litigation Perceptions

Current users rated DFCs' ability to positively impact litigation at nearly 4 out of 10 on average. In general, drivers in all DFC use categories rated litigation effectiveness higher than the other three issue bins tracked in this survey.

Figure 2: Average Driver DFC Litigation Effectiveness Ratings by Use



Several truck drivers stipulated that, with enough footage, a plaintiff attorney will always find some minor driver issue or behavior to fault; they fear that DFCs provide plaintiffs with more material that can be presented negatively to a jury even if there is no substantial evidence of driver negligence or error. On this point, there is consensus between truck driver and defense attorney concerns, as discussed in the DFC Issues and Implications in Litigation section. Truck drivers gave higher ratings to DFCs' effectiveness in litigation than in safety, privacy, and overall approval, but the average rating was still just under 4 compared to 8.5 for RFCs (Figures 2 and 6). Motor carriers can reassure truck drivers on this concern by limiting the recording or retention of footage that is not related to a safety-critical event.

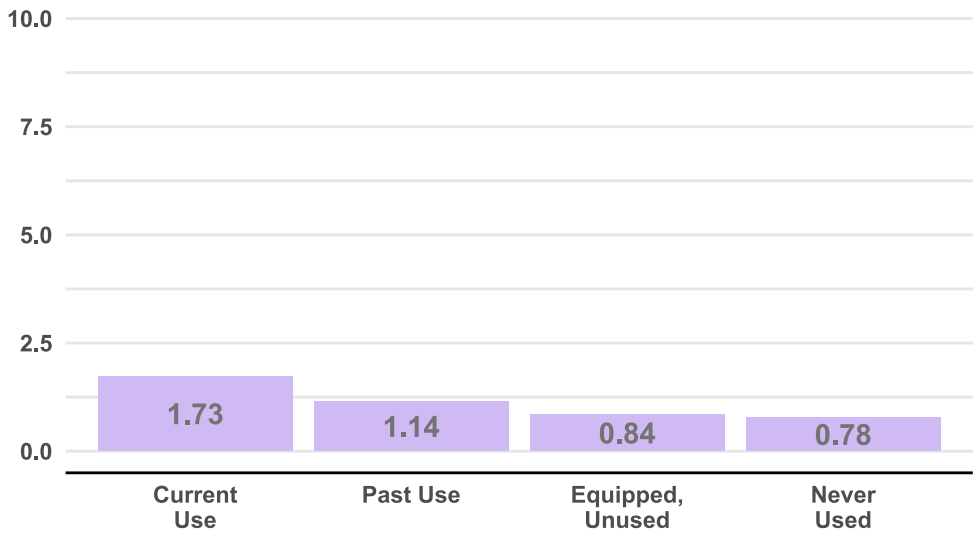
> "The driver-facing camera can only add [additional footage] that will hurt the driver's case, regardless of fault or no-fault incidents. Example, someone runs a red light and hits your truck, the road-facing camera proves you had a green light, but driver-facing camera shows you were taking a drink at the moment of the crash. All the driver-facing camera does is provide ammo to lawyers or your own company to find you at fault." – Truckload Driver

Truck drivers in the survey who were previously involved in litigation where DFC footage was used tend to have a more positive opinion of the technology than drivers who have never needed to rely on DFC footage in litigation. Experiencing positive outcomes from DFC footage, either directly or through a coworker, is one of the most reliable causes of improved driver perceptions of DFCs.

DFC Usage and Privacy Perceptions

Of the four key areas tracked in this survey – safety, litigation, privacy, and overall approval – truck drivers rated DFCs' ability to protect privacy the lowest. Drivers who have never used DFCs had the most negative opinion of the technology. Drivers who currently use DFCs were more than twice as likely as non-users to positively rate DFC privacy benefits (Figure 3).

Figure 3: Average Driver DFC Privacy Ratings by Use



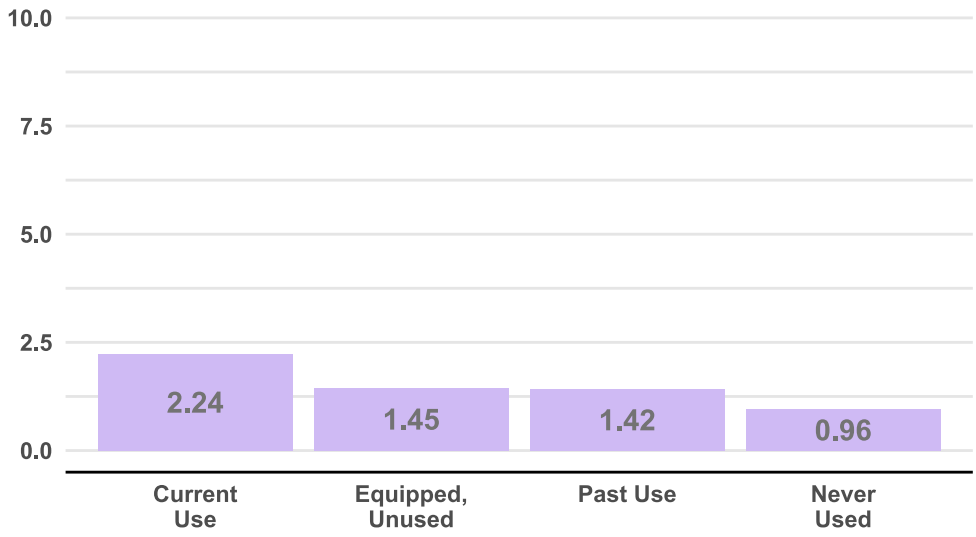
Follow-up questions confirm that drivers' primary concern with DFCs is the potential for invasion of privacy, especially but not exclusively pertaining to off-duty time in sleeper cabs. Numerous drivers shared instances in which DFCs activated randomly while they were off-duty or when safety managers discussed video footage that was recorded while the drivers were off-duty. While these instances appear to be rare, they do contribute to the strong privacy concerns raised by truck drivers.

> "It's hard to accept a camera pointed at you in your work/living space. This isn't like an office job where cameras may be all over a building. The truck is our workspace but also our personal space just like a home. A company may own the truck, but it doesn't give them the right to have a camera looking at me. Landlords can't install cameras in their homes to make sure tenants are following rules." – Intermodal Driver

DFC Usage and Overall Approval

Overall approval ratings followed the same tendencies. Current users gave DFCs the highest average overall approval rating at 2.24, more than twice as high as drivers who have never used them (Figure 4).

Figure 4: Average Driver DFC Approval Ratings by Use



Though drivers gave DFCs comparatively higher ratings on litigation effectiveness and safety improvement, overall approval ratings track more closely to the comparatively lower privacy ratings.

Road-Facing Cameras: How Do They Compare to DFCs?

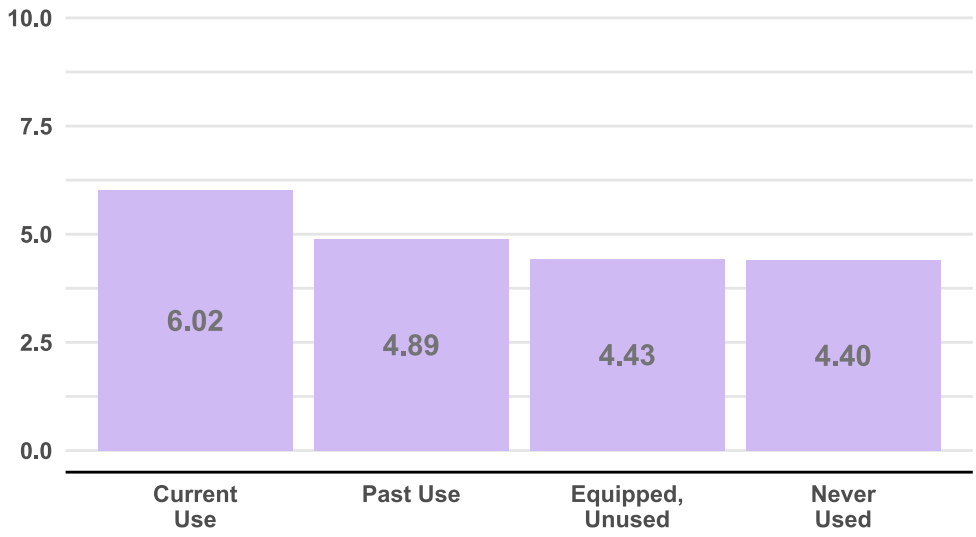
Recognizing that road-facing cameras are now widely used and valued by truck drivers, a series of RFC-related questions were included – thus allowing the research to make relative comparisons.

Driver opinions on RFCs are considerably higher than DFCs in every category, although there is still some limited skepticism for RFCs.

RFCs and Safety Perceptions

While current users gave RFCs' safety benefits an average rating of 6.02, drivers who have never used RFCs rated them 27 percent lower (Figure 5). Truck drivers currently using RFCs rated them 132 percent higher in safety than current users rated DFCs in the same category.

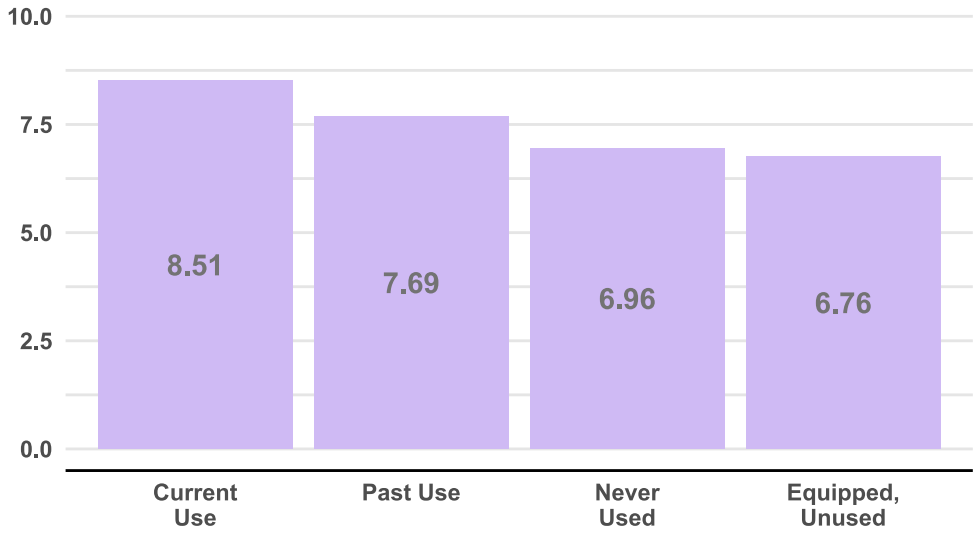
Figure 5: Average Driver RFC Safety Ratings by Use



RFCs and Litigation Perceptions

Drivers rated RFCs' litigation benefits higher than the other three issue bins tracked in this research, much as they rated DFCs' potential usefulness for litigation higher than the other issue bins for that technology (Figure 6). By comparison, current users rated RFCs 117 percent higher than DFCs for litigation benefits.

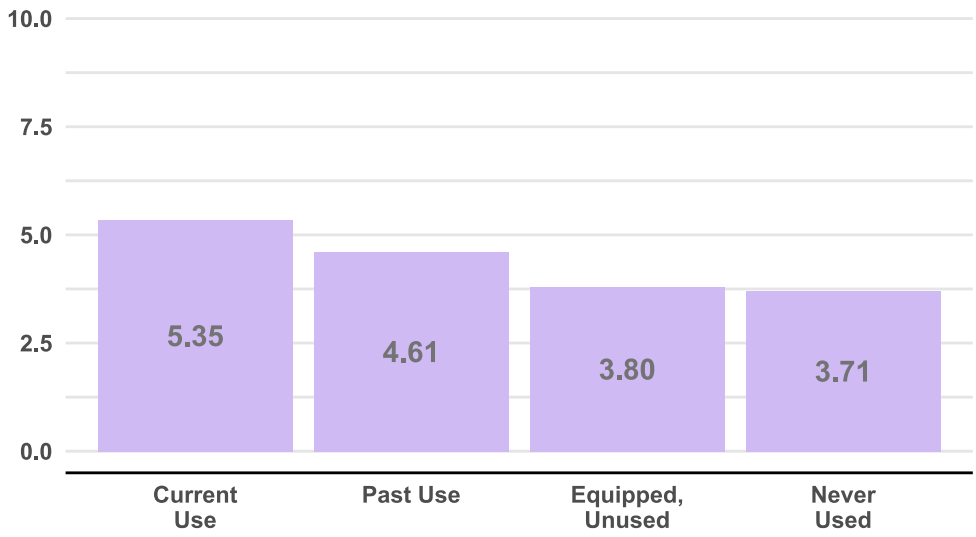
Figure 6: Average Driver RFC Litigation Effectiveness Ratings by Use



RFCs and Privacy Perceptions

RFCs' perceived ability to protect privacy received the lowest average driver rating of the four key issue bins, with an average of 5.35 from current users and an average of 3.71 from drivers who have never used RFCs (Figure 7). Nevertheless, current users rated RFCs 209 percent higher than DFCs for protecting privacy.

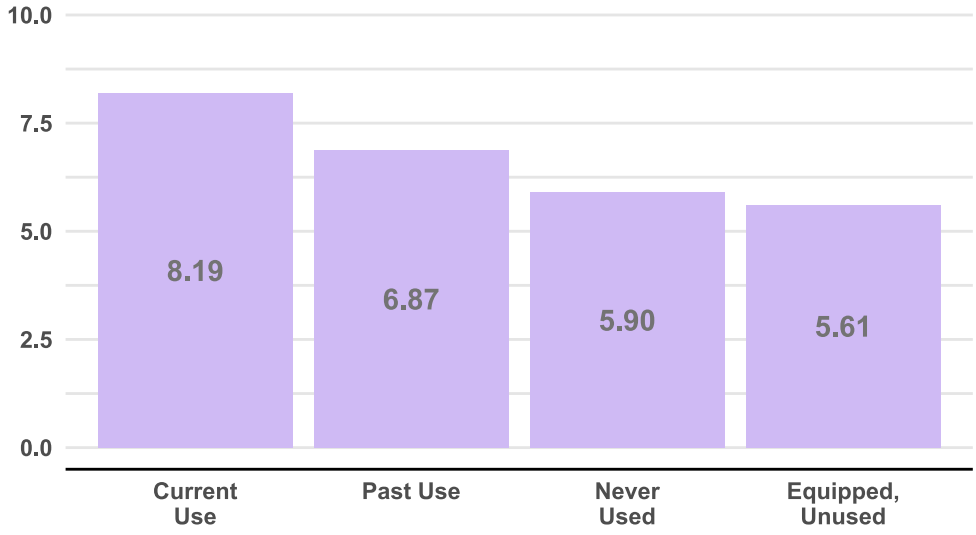
Figure 7: Average Driver RFC Privacy Ratings by Use



RFCs and Overall Approval

Even with lingering concerns about privacy protection and safety benefits, drivers currently using RFCs gave them a high overall approval rating of 8.19 (Figure 8). Drivers who have never used RFCs rated them 28 percent lower. In comparison, RFCs had an overall approval rating among current users that was 266 percent higher than DFCs.

Figure 8: Average Driver RFC Approval Ratings by Use



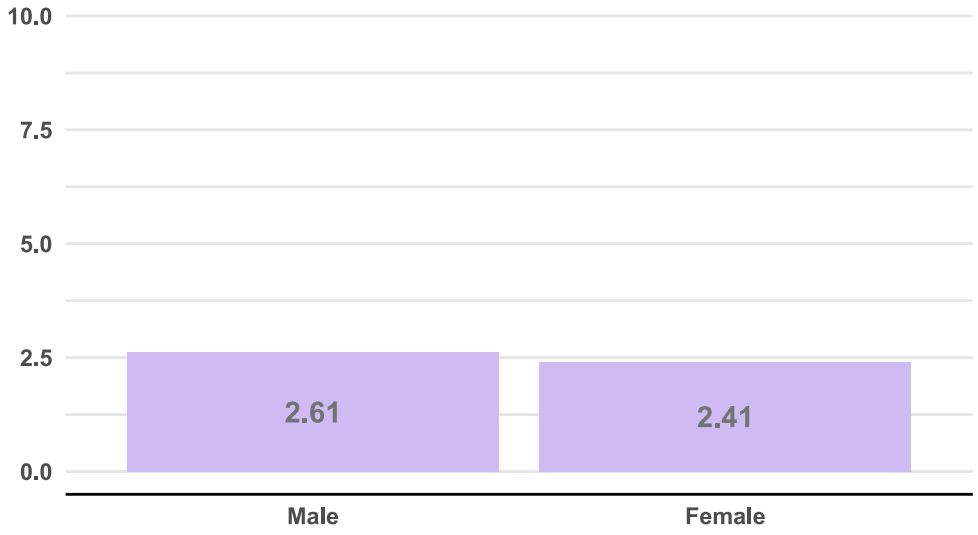
Driver RFC ratings can shed light on other driver issues with DFCs. First, they corroborate that acceptance and approval increases with camera experience and interaction. Additionally, they suggest that overall approval – ostensibly the most important perspective – is not directly dependent on safety or privacy. Overall RFC approval was high even though average scores in these other categories were each more than 25 percent lower.

Impact of Gender on Driver DFC Perspectives

Gender and Safety Perceptions

Male and female drivers had similar assessments of DFCs' contributions to safety, with female drivers giving a slightly lower rating (Figure 9).

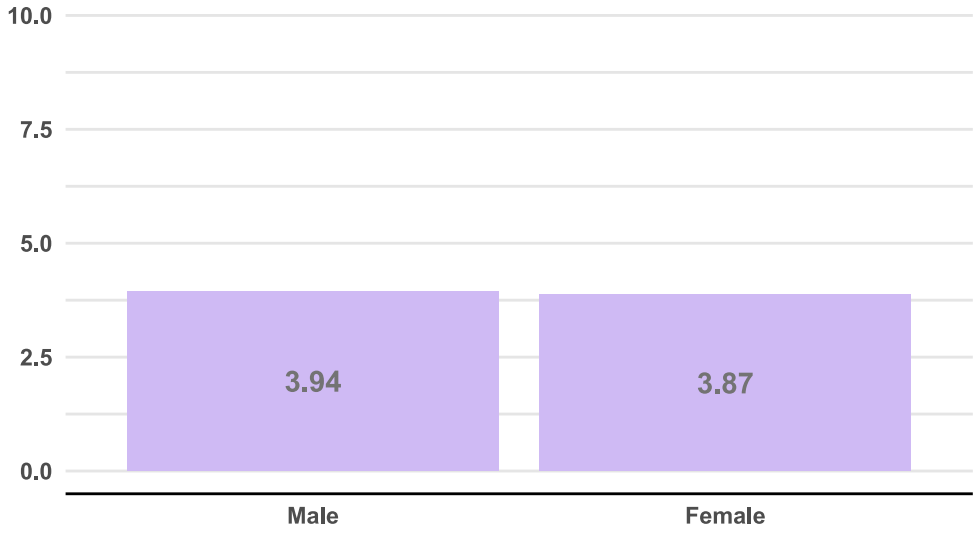
Figure 9: Average Driver Safety Ratings among Current Users by Gender



Gender and Litigation Perceptions

Male and female drivers also rated DFCs' positive impact on litigation similarly (Figure 10).

Figure 10: Average Driver Litigation Effectiveness Ratings among Current Users by Gender



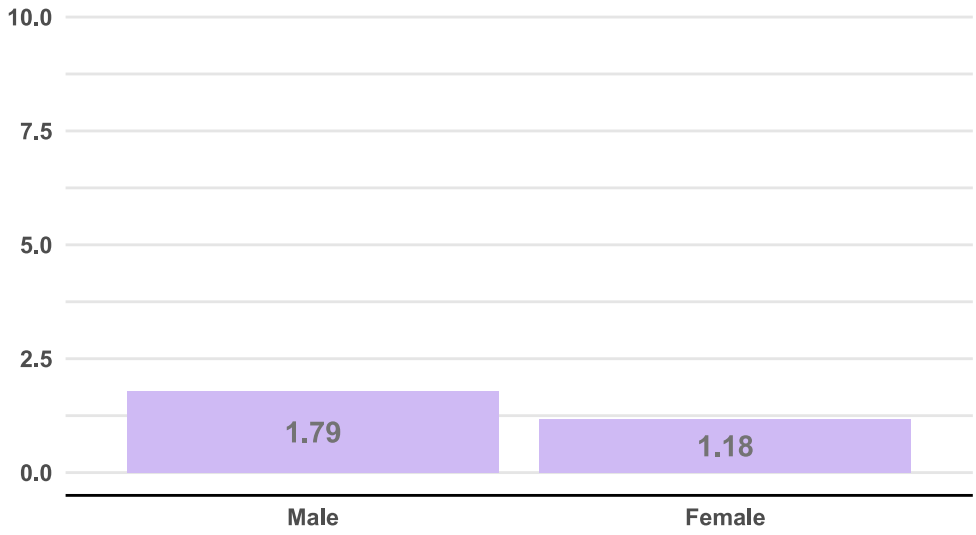
Gender and Privacy Perceptions

Gender had the greatest impact on the DFC privacy issue bin. Female drivers rated the technology's ability to protect their privacy 34 percent lower than male drivers (Figure 11). Several female drivers in the survey complained that they have experienced voyeurism, unwanted comments about their appearance, or even sexual harassment from employees tasked with reviewing DFC footage.

> "Female drivers were sexually harassed by staff members with access to the driver-facing cameras. For an OTR driver, it's no different than if your employer had a camera facing you in your personal car, your working space, in your living room, your bedroom, your kitchen, and even your bathroom on occasion." – Truckload Driver

Based on these comments and ratings, female drivers may be at greater risk for impermissible misuses of DFCs.

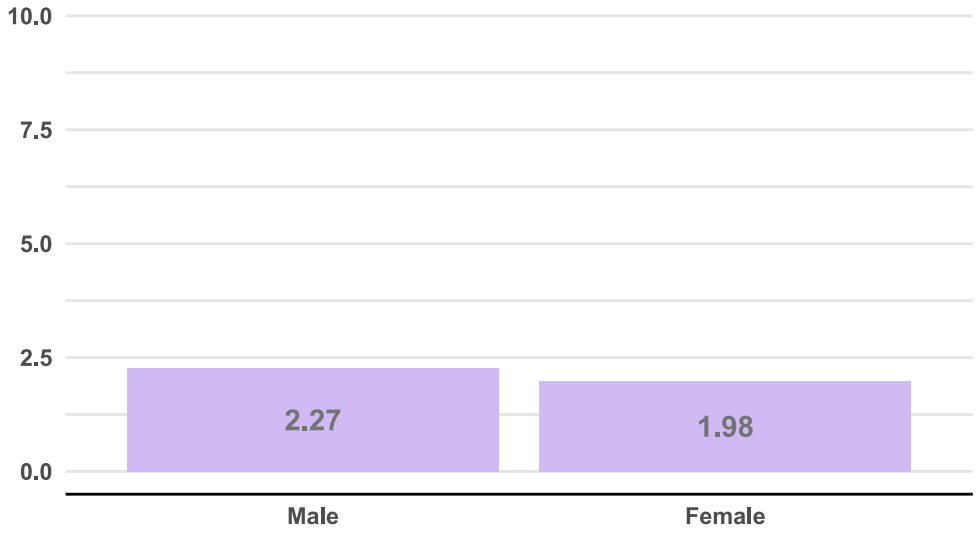
Figure 11: Average Driver Privacy Ratings among Current Users by Gender



Gender and Overall Approval

Female drivers gave DFCs slightly lower overall approval ratings on average (Figure 12). Given that their opinions on safety and litigation did not differ substantially from their male peers, this is most likely a result of female drivers' greater concerns about DFC privacy. With an increased industry focus on recruiting female truck drivers, these concerns should be given special attention.

Figure 12: Average Driver Approval Ratings among Current Users by Gender



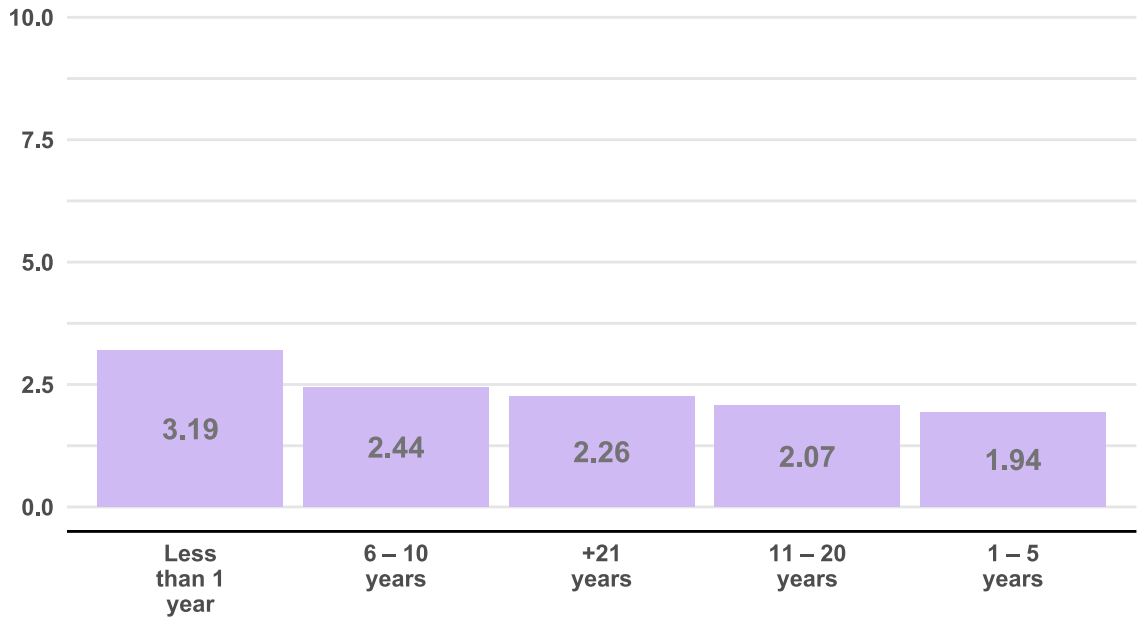
Though female drivers made up 10 percent of respondents, only 6 percent of respondents that gave DFCs a top overall approval rating of 10 were women.

> "To be candid, I think female truck drivers are more concerned than male truck drivers about being watched on cameras because we care more about how we present ourselves in public than do our male counterparts." – Women in Trucking Annual Conference attendee

Industry Experience and DFC Perceptions

Truck drivers' opinions of DFCs are influenced by the number of years they have spent in the industry. New truck drivers with less than one year of experience gave 31 percent higher overall approval ratings than any other experience group (Figure 13). Ratings of DFC safety improvement, litigation effectiveness, and privacy protection followed the same general pattern, with new truck drivers giving the highest average ratings and decreasing ratings as driver experience increased.

Figure 13: Average Driver Approval Ratings among Current Users by Years of Experience



New drivers are more likely to have experience with the beneficial aspects of DFCs in driver training – where footage has been used increasingly in recent years – which may give new drivers a more positive outlook on the technology and its applications. New drivers coming from other commercial vehicle driving jobs also may have experience with similar camera systems in other industries and thus be more inclined to accept DFCs. For example, continuous recording DFCs are now commonly used in transit and charter bus operations.

Table 2: Overall Approval for RFCs and DFCs by Experience

	Drivers with 21+ Years of Experience	Drivers with < 1 Year of Experience	Percent Difference
RFC Overall Approval Average Rating	7.96	8.82	11%
DFC Overall Approval Average Rating	2.26	3.19	41%

New truck drivers also had higher RFC overall approval ratings than their peers with 21 or more years of experience, as shown in Table 2.

Entry-level drivers' higher DFC ratings represent an opportunity for increased DFC adoption. If this acceptance does not wane as drivers gain experience, DFC acceptance could improve over time as entry-level drivers progress in tenure within the industry. The biggest challenge to increasing DFC approval may rest with the truck driver shortage in general; new entrants are in short supply.

That said, technology vendors and motor carriers should leverage new drivers' greater receptivity to DFCs by first utilizing DFCs among this driver population. Carriers can showcase the transparency and productivity of DFCs in training by showing drivers video footage to pinpoint strategies for improvement. While it may generate a slower adoption rate, the long-term benefit will likely be more positive attitudes by all truck driver experience groups.

DFC Factors with No Observed Impact: Age, Sector, Segment, and Fleet Size

- Age. Though years of driving experience did impact truck driver opinions on DFCs, drivers' age surprisingly did not have a substantial impact on their DFC opinions in this research.
- Sector. Drivers at for-hire fleets rated DFCs slightly higher than drivers in private fleets in all four categories; tank truck drivers gave slightly higher ratings than truck drivers in other sectors, while intermodal drivers gave the lowest ratings across all sectors.
- Fleet size. Fleet size and trip length did not have an impact on driver opinions of DFCs. Owner-operators rated DFCs' usefulness in litigation higher than drivers in all other fleet sizes, but they rated DFCs' usefulness for improving safety lower than drivers in all other fleet size.

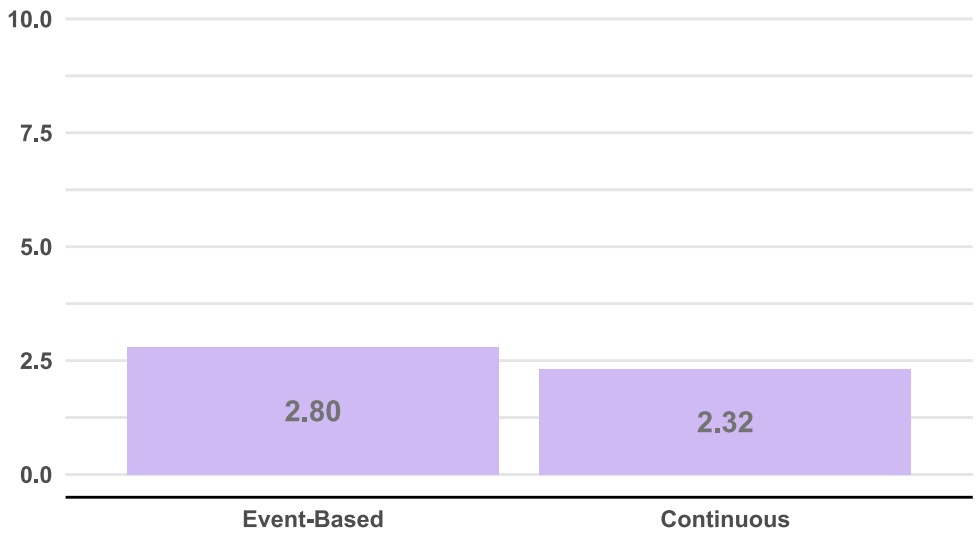
DFC Functionality and Driver Perceptions

The different formats, functionalities and attributes of DFCs have an important influence on driver perceptions. As previously noted, there are two primary DFC formats used in trucking. Event-based DFCs capture video of a specific time period based on sensor triggers, while continuously recording DFCs are always active.

DFC Video Formats and Safety Perceptions

On average, truck drivers considered event-based DFCs 21 percent better for improving safety than continuously recording DFCs (Figure 14).

Figure 14: Average Driver DFC Safety Ratings by Video Formats



One possible reason for this difference is that truck drivers reported that continuously recording DFCs make drivers more stressed or anxious in challenging situations because they know everything is being monitored and can be used against them.

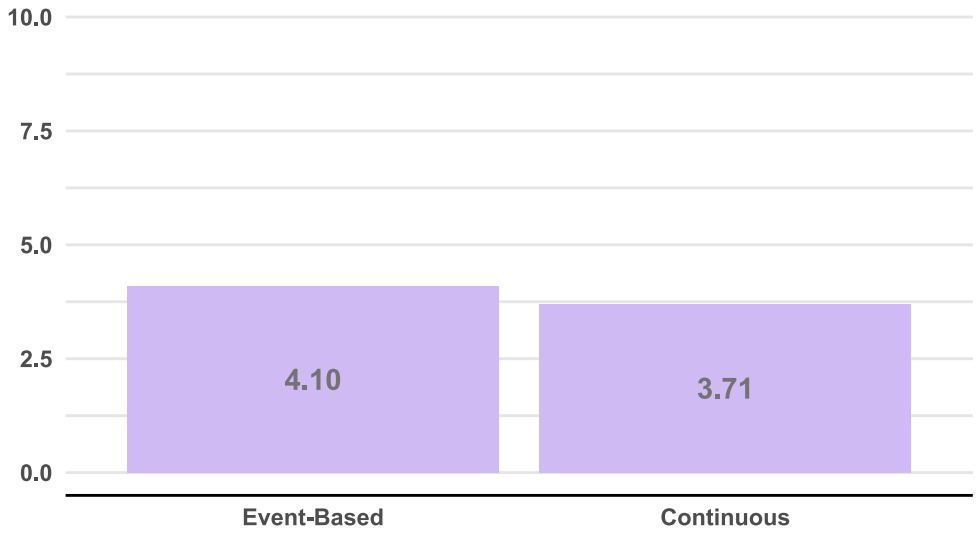
> "[DFCs] actually endanger my safety and those around me, because I feel stressed and nervous about being watched, even though I'm doing nothing wrong." – LTL Driver

> "When I was a company driver my company installed driver-facing cameras. That put my stress level through the roof and made me the least safe driver I have ever been. It is also what drove me to purchase my own truck." – Specialized Driver

DFC Video Formats and Litigation Perceptions

Truck drivers with event-based DFCs also rated their effectiveness in litigation higher on average than drivers with continuous DFCs (Figure 15). This opinion was shared by legal experts, as discussed in the DFC Issues and Implications in Litigation section, because it reduces the amount of irrelevant footage and may reduce disclosure of video that indicts the truck driver.

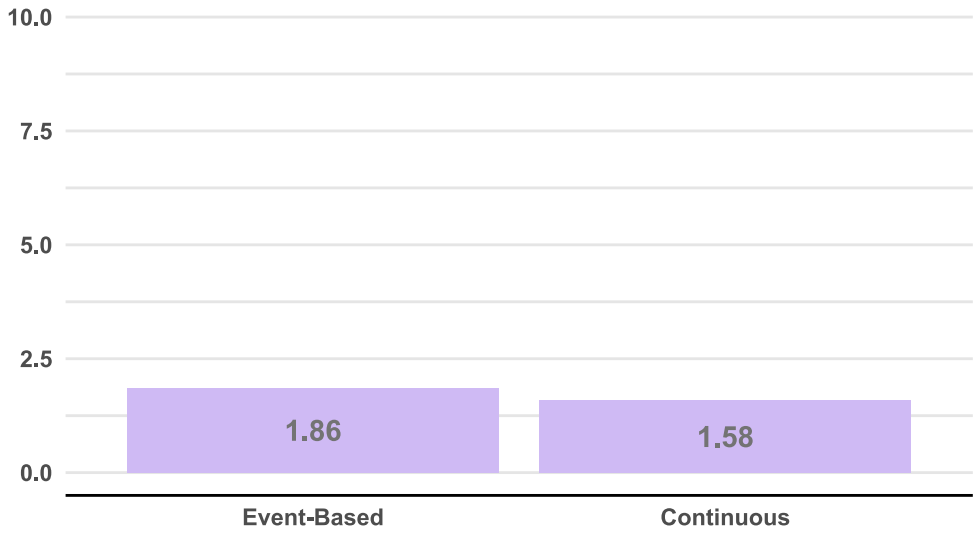
Figure 15: Average Driver DFC Litigation Effectiveness Ratings by Video Formats



DFC Video Formats and Privacy Perceptions

Counterintuitively, truck drivers felt that event-based DFCs protected their privacy only slightly better, on average, than did continuous recording DFCs (Figure 16). This suggests that truck drivers in general have privacy issues with DFCs, regardless of camera format.

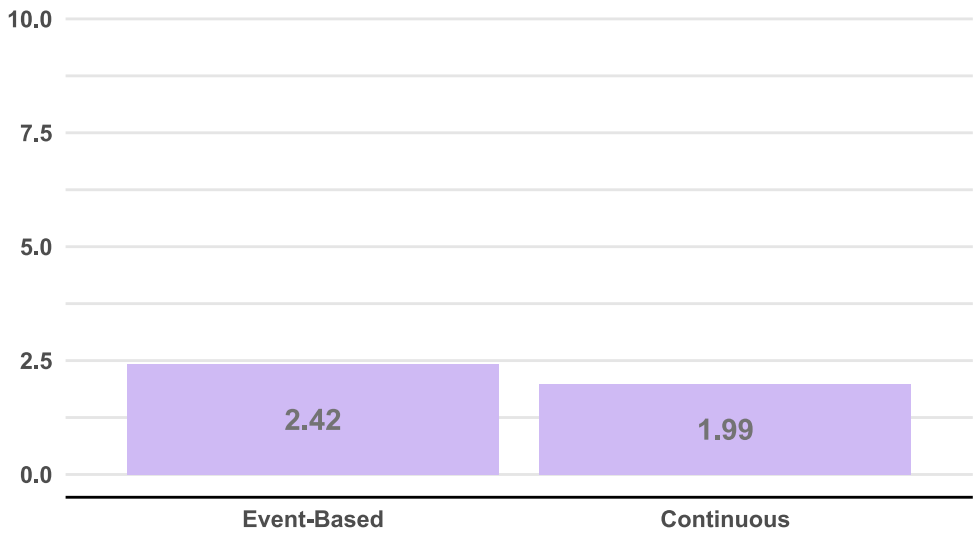
Figure 16: Average Driver DFC Privacy Ratings by Video Formats



DFC Video Formats and Overall Approval

On average, truck drivers with event-based DFCs gave the technology an overall approval rating 22 percent higher than truck drivers with continuously recording DFCs (Figure 17).

Figure 17: Average Driver DFC Approval Ratings by Video Formats



In light of truck driver preferences for event-based cameras over continuously recording cameras, it is likely that improvements to event trigger sensitivity could lead to improved acceptance. It is also apparent that truck driver perceptions of DFC improve when they can see, and trust, the recording status of DFCs.

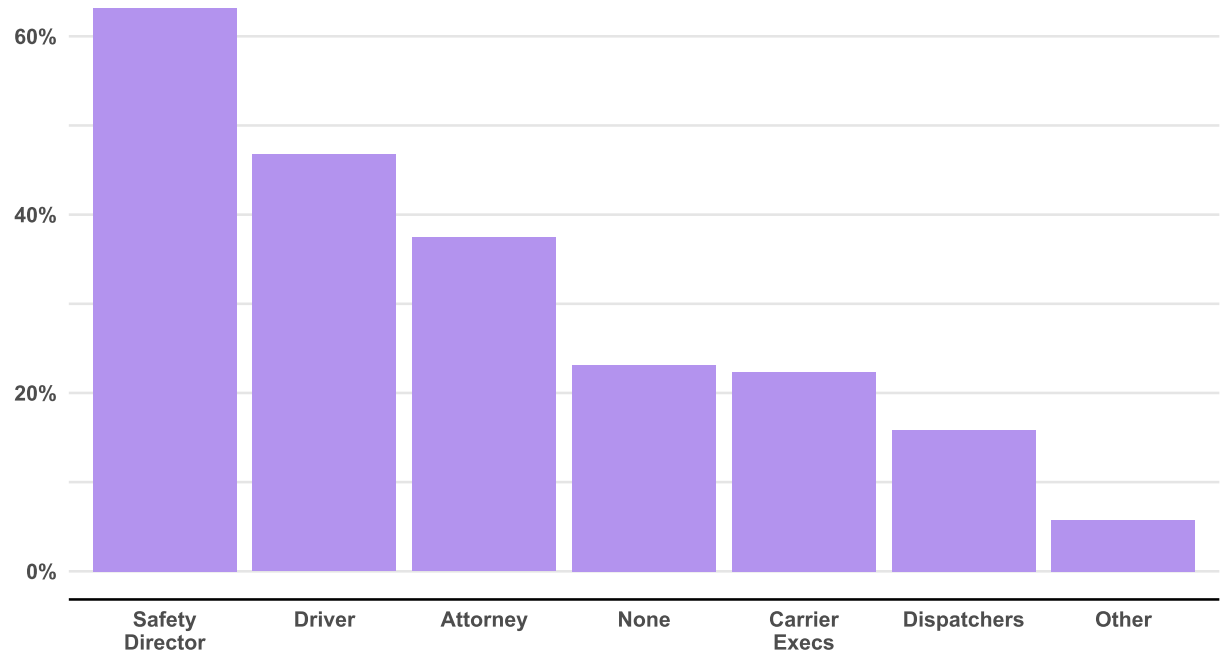
> "With a driver-facing camera you get the feeling that you are being watched 100 percent of the time. I know that is not the case, but it's the perception. The company has to find a way to assure the driver that they are not looking to punish the driver for every little thing that they may do wrong." – LTL Driver

Multiple truck driver responses confirm that while audio notifications of camera status are fine, audio recording is strongly disliked in all forms and across all experience levels because drivers do not believe that there is a relationship between what they say or listen to in the cab and their safety. Among these drivers, audio recording heightens the impression that DFCs can be used for prying into their personal lives.

DFC Video Access and Driver Perceptions

Truck drivers are strongly concerned over who has access to DFC footage. A majority of drivers, 63 percent, believe that safety directors should be able to review footage (Figure 18). Answers were not exclusive, so drivers could choose as many positions as they wished. After safety directors, 47 percent of truck drivers believe that the truck drivers themselves should be given full access to footage in order to ensure transparency. Truck drivers were more hesitant about attorneys having access to DFC footage, and they least favor carrier executives and dispatchers having access.

Figure 18: Positions that Drivers Believe Should Have Footage Access



Truck drivers' preference for their own access to DFC footage reflects their concern with transparency and accountability. When asked how to improve acceptance of DFCs, drivers expressed a desire for strict and clear agreements on what footage is viewed by whom and under what circumstances – so that they are not faced with improper use of footage or sudden policy changes in which they have no say.

> "[I'd be more accepting of DFCs] if the footage was captured by and sent to a secure third-party storage company and was only accessed in the event of litigation." – Truckload Driver

Several drivers proposed the use of legally binding contracts or third-party auditors to ensure that carriers abide by policies and privacy rules. As previously noted, truck driver opinions of DFCs are currently low; as such, any carriers considering DFCs should consider implementing formal policies and procedures that ensure DFC privacy and accountability.

During the course of the research, two motor carriers that use DFCs noted that they have DFCs installed in all company vehicles including sales cars and maintenance vehicles. This both standardizes the use of DFC from a policy standpoint and sends the message to truck drivers that they are not being uniquely targeted.

Impacts of Preventative Safety Measures

The factor with the greatest impact on driver opinions is a carrier's use of DFC footage as a part of their safety program. Within a safety program, preventative safety measures are generally understood as any carrier initiative designed to improve safety and prevent crashes. ATRI's survey asked drivers whether their motor carrier used DFC footage in any of three types of preventative safety measures:

- Ongoing driver coaching;

- Creating and/or improving general driver safety programs; and
- Training new drivers.

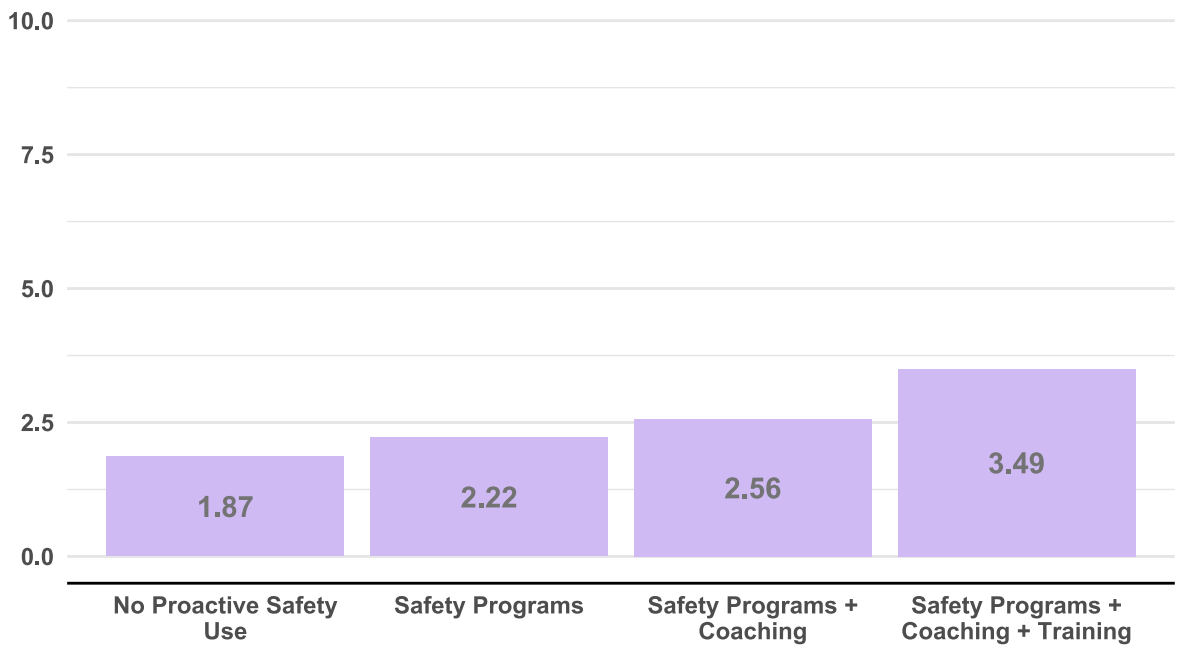
Drivers' DFC ratings were then binned and averaged based on which and how many preventative safety measures their carrier used, and the analysis focused on current users with event-based cameras. These bins are summarized in Table 3.

Table 3: Preventative Safety Measure Bins

	Safety Program Development	Ongoing Driver Training	Training New Drivers
No Preventative Safety Measures			
One Preventative Safety Measure	✓		
Two Preventative Safety Measures	✓	✓	
All Three Preventative Safety Measures	✓	✓	✓

As Figure 19 shows, truck drivers' overall DFC approval ratings increase when carriers use footage for more preventative safety measures.

Figure 19: Average Driver DFC Approval Ratings among Current Users by Preventative Safety Measures



Drivers with carriers that use DFCs but do not use DFC footage for preventative safety gave the lowest overall approval rating of just 1.87.

When carriers use DFC footage for one preventative safety measure – creating and/or improving general driver safety programs – drivers' overall DFC approval ratings were 19 percent higher than when carriers did not use DFC footage for preventative safety.

When carriers use DFC footage for a second preventative safety measure – ongoing driver coaching as well as safety programs – drivers' overall DFC approval ratings increased by an additional 18 percent.

When carriers used DFC footage for all three preventative safety measures, drivers' overall DFC approval ratings increased by an additional 49 percent to 3.49 – or 87 percent higher than carriers that use DFCs but do not use footage for preventative safety.

Similar effects were observed in other key issue bins. For example, drivers with carriers that use DFC footage for all three preventative safety measures rated DFCs' ability to improve safety 96 percent higher than drivers with carriers that use DFCs but do not use footage for preventative safety.

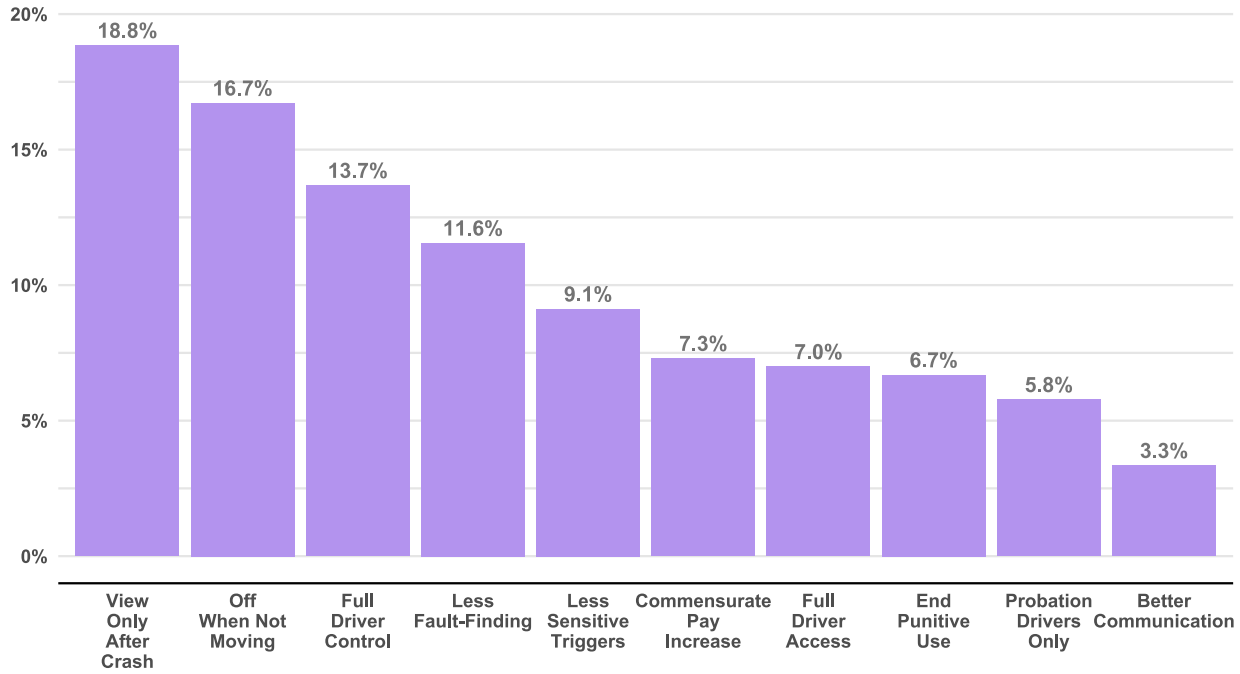
By using all three preventative safety measures together, carriers can significantly improve driver buy-in with DFCs. One explanation for why truck driver ratings increase with preventative safety measures is that coaching, training, and enhanced safety programs all give drivers direct, beneficial feedback based on the DFC footage. Several skeptical truck driver respondents shared that they often believe that DFCs are a means for carriers or insurers to protect themselves by pushing more risk and liability onto drivers. Many asked, "what is the benefit for the driver?" Preventative safety measures can answer this question when DFCs are used to improve drivers' skills. More specific coaching recommendations based on driver feedback are discussed in the next section of this report.

> "Make the camera a useful tool that's simply too convenient to the driver to not use. Whether it's integrating an internal camera into a satellite radio unit, ELD, or bypass device, etc. The driver-facing camera must be made separate from the road-facing camera and then integrated with a piece of equipment too useful to ignore its practicality and convenience." – LTL Driver

Driver Suggestions for Improving DFC Acceptance

The final question on ATRI's driver survey asked respondents to share suggestions for how to improve driver acceptance of DFCs. While the majority (77.5%) of drivers responded that they did not have any suggestions, the remainder shared a series of constructive criticisms and opportunities for improving acceptance. Their responses were binned into ten categories. Figure 20 shows the percentage of drivers' suggestions in each category bin.

Figure 20: Driver Suggestions for Improving DFC Acceptance



What follows is an explanation of each truck driver suggestion category and recommendations for carrier actions to address them. Each of these recommendations can improve driver acceptance of DFCs, even when partially implemented. The more of these steps a carrier can undertake, the greater the driver acceptance will likely be for DFCs.

When implementing driver recommendations, success depends on clearly communicating implementation strategies and consistent policies. The effectiveness of any communication about DFCs must be predicated on an existing foundation of trust within the driver-carrier relationship. Without driver trust, communication activities will likely be ineffective.

1. View Footage Only After Crash (18.8%)

   The most common truck driver suggestion, with 18.8 percent of responses, is that DFC footage should only be used as evidence in legal contexts and not for any coaching purposes or internal evaluation. Though many drivers value DFCs more as a result of proactive coaching as discussed earlier, this group of drivers differs in opinion. Carriers can act on this recommendation by establishing a set policy that footage is only viewable after a crash or significant safety event has occurred. This approach would treat DFCs like the black box in an airplane. Numerous drivers recommending this approach and the next, "Full Driver Control," also added that cameras should be offline, with local storage only and no streaming capacity.

2. Off When Not Moving (16.7%)

   A common truck driver complaint – raised in 16.7 percent of driver suggestions – relates to DFC activity while off-duty. Drivers believe that DFCs should never be on when a driver is off-duty, on break, or parked at a shipper facility or gas station – essentially, any time a truck is in park. Numerous drivers described experiences in which carriers questioned them about events recorded by DFCs while off-duty. As previously noted, some DFC systems

turn off when the ignition is off, but trucks often idle with the ignition on in order to maintain climate control in the tractor and/or trailer. Several historical studies confirm that truck driver tolerance for negative issues and outcomes is low; it only takes one bad experience with DFCs to make a driver indefinitely skeptical, and these feelings will be quickly shared with other truck drivers.[18] Due to trust issues, many drivers in this category requested a mechanical shutter that they can manually close, to know for certain that DFCs are not recording while off-duty.

3. Full Driver Control (13.7%)

Other truck drivers prefer the even more restrictive approach of giving drivers full authority over DFC use. Opinions in this category take two approaches: drivers would either get to decide when the camera is on or have full discretion over whether to grant carriers access to view footage. The second option would give drivers strong incentive to grant access after an incident only when it shows that the truck driver was not negligent, but it is unlikely that a carrier would implement this suggestion due to liability concerns, or accusations of spoliation of evidence.

4. Less Fault-Seeking (11.6%)

Fault-seeking by managers, safety directors, or other carrier employees – what drivers often called "nitpicking" and "micromanaging" – was the top concern of 11.6 percent of truck drivers. There are several impactful ways that carriers can respond to this complaint. Carriers should act on camera footage more selectively by focusing coaching programs on significant or recurring behaviors and pass over minor or isolated behaviors in order to avoid the impression of redundancy and fault-seeking. Emphasis should be placed on outcomes rather than behaviors alone, as well as issues that offer the opportunity for genuine skill growth.

Based on comments, this counterproductive coaching can be worse than no coaching at all if it leads drivers to disregard safety policies and good driving behavior. To make coaching as effective as possible, carriers should ensure that the employees discussing footage with drivers have some background driving commercial vehicles, because these individuals will be able to offer the most relevant advice, understand the unique demands of driving, and inspire greater trust from drivers. For example, some driving behaviors that look like "distraction" in DFC footage may be instances of appropriate visual scanning.

Another way carriers can act on this concern is by implementing "driver-led coaching," a coaching program in which drivers are presented with footage from safety-critical events and prompted to develop a response. Driver-led coaching can give drivers a greater feeling of control over the use of video footage and confidence in self-improved driving skills.

5. Less Sensitive Triggers (9.1%)

Over 9 percent of truck drivers reported that event-based DFCs are too sensitive, and that cameras should only be activated by significant safety events. For example, sudden swerves and sudden braking are clearly appropriate triggers, but drivers grow impatient with cameras that are activated by bumps in the road or taking a hand off the wheel to turn a

[18] Dan Murray and Alexandra Shirk, *Truck Parking Information Systems: Truck Driver Use and Perceptions*, American Transportation Research Institute (June 2021), https://truckingresearch.org/2021/06/14/truck-driver-perspectives-on-truck-parking-information-systems-june-2021/.

radio dial. Though the accuracy of event-activated triggers will always involve some variability, vendors and/or carriers could improve driver relations by taking steps to adjust sensitivity.

> "The technology is often faulty causing triggers for mundane tasks such as [putting on] sunglasses. The psychological effects of this are incredibly harmful and I have experienced them." – Truckload Driver

Truck drivers also emphasized that DFCs shouldn't make distracting sounds or lights aside from a simple recording light, which should be small and/or dim. These light/sound notifications can add to driver stress.

6. Commensurate Pay Increase (7.3%)

According to 7.3 percent of truck drivers, a pay increase provided to truck drivers who use DFCs would make them more amenable to DFCs even without any change in a carrier's camera policy. Many drivers shared that DFCs create additional stress from a sense of continuous monitoring. Furthermore, if DFCs make both drivers and carriers safer, drivers argue that a commensurate pay increase for DFC driver users is reasonable. Carriers could view DFC usage as an expanded work responsibility and offer additional compensation in exchange.

Carriers can also respond to DFC-based safety improvements through graduated pay or bonuses based on camera activity (or lack thereof), as several drivers mentioned. Greater usage of DFCs and accompanying improvements in safety and/or litigation could be financially incentivized. This strategy could be used with either continuously recording or event-based cameras.

7. Full Driver Access (7.0%)

Seven percent of truck drivers said that they distrust carrier information on when cameras are recording and who can access footage. To address these concerns, they suggested providing drivers with full access to all DFC footage and formal assurances that no additional inaccessible footage is collected. Ideally, a light is activated whenever DFCs are recording to reduce driver anxiety and frustration as to whether they are being watched. As previously noted, the best way to mitigate these concerns is for carriers to develop formal policies and agreements as to what footage is viewed by whom and under what circumstances to ensure data transparency.

8. End Punitive Use (6.7%)

The next category of truck driver concerns related to punitive use of camera footage by carriers. Truck driver respondents are concerned that DFCs will be used for punishment, or loss of bonuses that are considered a standard component of their pay. These drivers appear to be open to DFC-based coaching and feedback – as long as there is no penalty associated with DFC-captured behaviors that did not lead to an incident.

> "It is my opinion that the driver-facing camera is overly abused to harass and punish drivers and limits a driver's ability to defend themselves from incidents." – Tank Truck Driver

> "If this data is used to create a safety atmosphere it's ok but when it starts to create a stressful atmosphere then it's not good." – Car Transport Driver

Carriers should prioritize positive DFC feedback over negative feedback by using footage to highlight drivers handling incidents successfully. One way a carrier can prioritize positive feedback is by emphasizing driver improvement after improper driving behavior. Another way is to provide positive feedback outright when a driver has not had any safety-critical events, such as sudden braking, during a pre-determined period of time. This can be deduced by driver scoring systems generated by DFCs. Positive feedback can be the basis for a more direct form of safety bonus or reward, or it can be treated as a badge of honor. Like the number of accident-free miles, the number of safety-critical events successfully avoided is a measure of driver excellence.

9. Probation Drivers Only (5.8%)

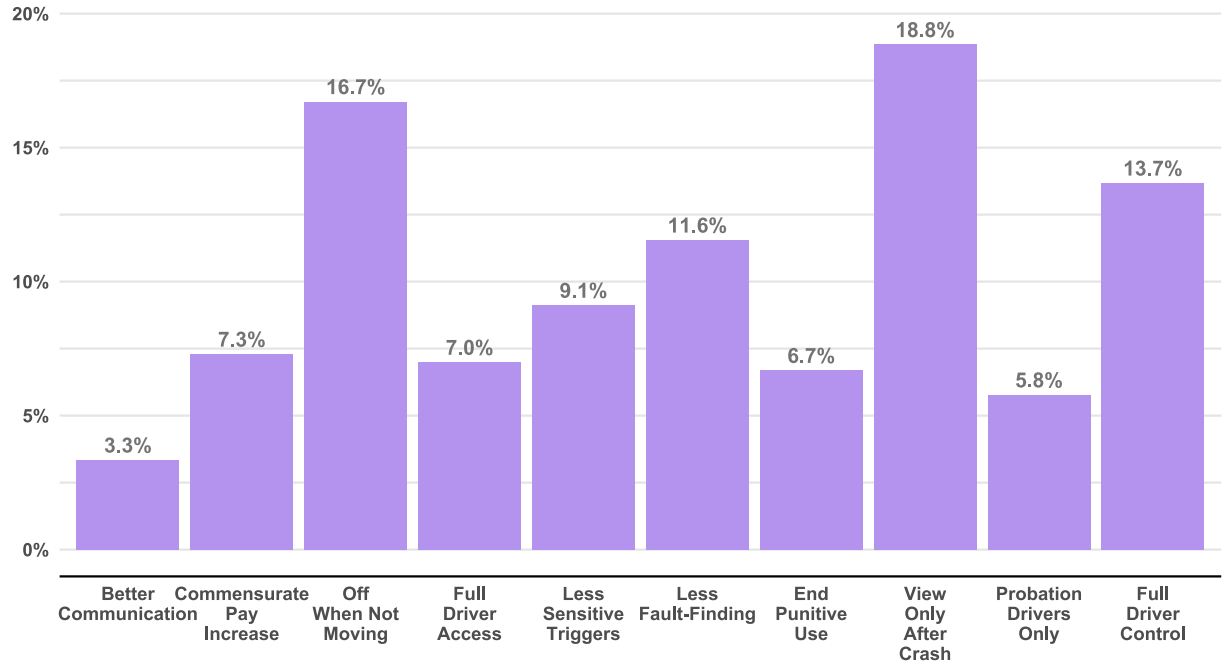
Nearly 6 percent of truck drivers consider it appropriate for carriers to use DFCs with drivers who are new to the industry or drivers with safety infractions – even though they are against DFCs for drivers with proven safety records. Carriers could activate a driver's DFC or assign a driver to a DFC-equipped truck-tractor after a safety incident for a predetermined number of accident-free miles or months, for drivers to prove themselves. This policy would allow carriers to use DFCs to better train and better ensure the risk associated with their most incident-vulnerable drivers without making any changes for drivers who have proven themselves to be safe. However, legal experts were clear that using DFCs that are turned off creates litigation exposure.

10. Better Communication (3.3%)

Based on binned truck driver responses, the most easily implemented driver suggestion for improving driver acceptance of DFCs was to communicate DFC use, policies and procedures in a clear and transparent manner; 3.3 percent said that addressing this issue alone would improve acceptance. Drivers wanted a better explanation of the DFC systems and accessible, formal documentation of carrier use and access policies for video footage.

Figure 20 presented driver recommendations in order of response frequency. Another way to analyze this data is the difficulty of implementation for carriers. Some recommendations can be implemented more easily than others, without major changes to existing DFC policies or major limitations on when and how DFCs are active. Figure 21 presents driver recommendations in order of increasing difficulty for carrier implementation based on likely resources required, with "Better Communication" being the easiest recommendation to act upon and "Full Driver Control" posing the greatest difficulties.

Figure 21: Driver Suggestions Ordered by Increasing Difficulty of Implementation



DFC Issues and Implications in Litigation

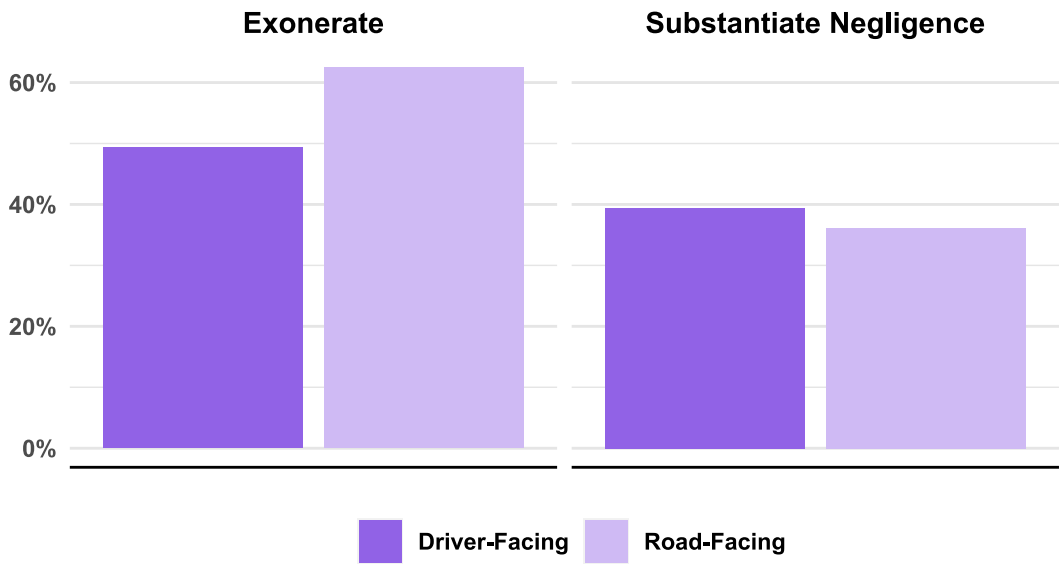
ATRI's survey of legal experts focused on the use of DFC footage in litigation, approaches for managing DFC video footage, and best practices to improve litigation outcomes when using DFC footage. To facilitate comparison, several questions also addressed the use of RFC footage in litigation.

DFC Impacts on Litigation Outcomes

Based on legal expert input, the benefit of DFC footage in litigation is that, in many cases, it can provide clear evidence of whether or not the driver was negligent – failing to behave with the level of care of a reasonable person under the circumstances.

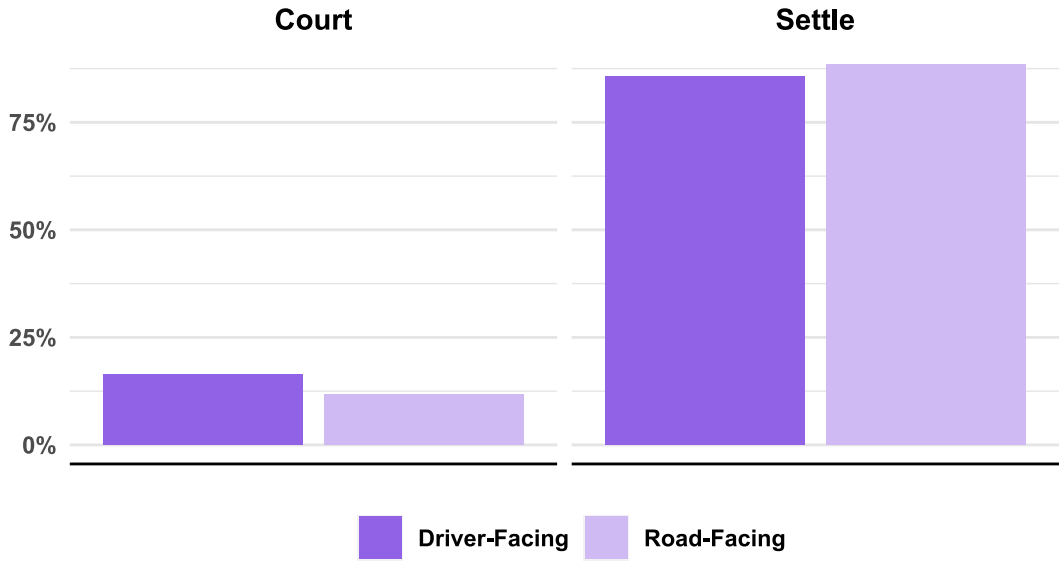
Legal expert respondents estimated that DFC footage helps exonerate commercial truck drivers in 49 percent of cases and substantiates truck driver negligence in 39 percent of cases (Figure 22). The same experts estimated that RFC footage is more consistently beneficial to the defense than DFC footage; it helps exonerate the driver (and carrier) approximately 63 percent of the time. RFC footage substantiates truck driver negligence approximately 36 percent of the time. In 12 percent of cases, DFC footage neither disproves nor substantiates negligence.

Figure 22: In-Cab Camera Footage Impacts on Litigation Outcomes



Since DFC footage often provides clear evidence of whether or not the driver was negligent, litigation that includes DFC footage often results in settlements. Legal experts estimated that 86 percent of DFC cases settle on average, as compared to RFC footage, which led to settlements 89 percent of the time (Figure 23).

Figure 23: In-Cab Camera Footage Impacts on Court Trials versus Settlements



Since DFC footage can be obtained by plaintiffs during discovery, DFCs are viewed by defense attorneys as a double-edged sword. While DFCs can and do vindicate truck drivers, plaintiffs can use the footage to demonstrate a longer history of driver actions or inactions that might be presented as driver negligence. Addressing this concern over plaintiff use of DFC footage – a concern shared equally by drivers – was the primary subject of defense experts' opinions and recommendations.

DFC Video Formats

Legal expert respondents clearly prefer event-based DFCs (88%) over continuously recording DFCs (12%). In this respect, legal experts concur with truck drivers. Drivers with event-based cameras rated overall DFC approval 22 percent higher than drivers with continuously recording cameras (Figure 17).

That said, 77 percent of legal experts reported at least one experience where an event-based camera failed to capture a critical driver behavior. While event-based DFC cameras may not capture as much information as continuous DFCs, the legal expert respondents are concerned that continuously recording cameras may capture too much information. Forty-two percent of legal experts reported at least one experience where a continuously recording camera captured damaging information that an event-based camera would not have – most often, according to anecdotal responses, that the truck driver was on their phone or distracted prior to the incident. Overall, legal expert opinion is clear: 88 percent prefer event-based cameras.

The most commonly mentioned cause of cameras failing to record an event is a camera malfunction. Another cause of recording failure is when the cab (and camera) are destroyed in a crash. Event-based cameras reportedly can also fail to activate during a relatively low-impact incident such as a sideswipe, when contact is predominantly with the trailer.

Both recording formats, continuous and event-based, can be leveraged in different ways by plaintiff attorneys during litigation. A continuously recording camera creates more discoverable, potentially damaging DFC footage that plaintiffs can mine for granular examples of suboptimal driver behavior. An event-based camera, however, may allow plaintiffs to use footage of an event outside of its larger context or to create suspicion among the jury by asking why a camera that could be used continuously was not. Legal expert respondents posited that these plaintiff strategies can be mitigated by ensuring that a carrier maintains a clear and standardized policy on recording and by emphasizing the prohibitively expensive storage requirements for continuous footage over time.

DFC Video Storage: How Much and How Long?

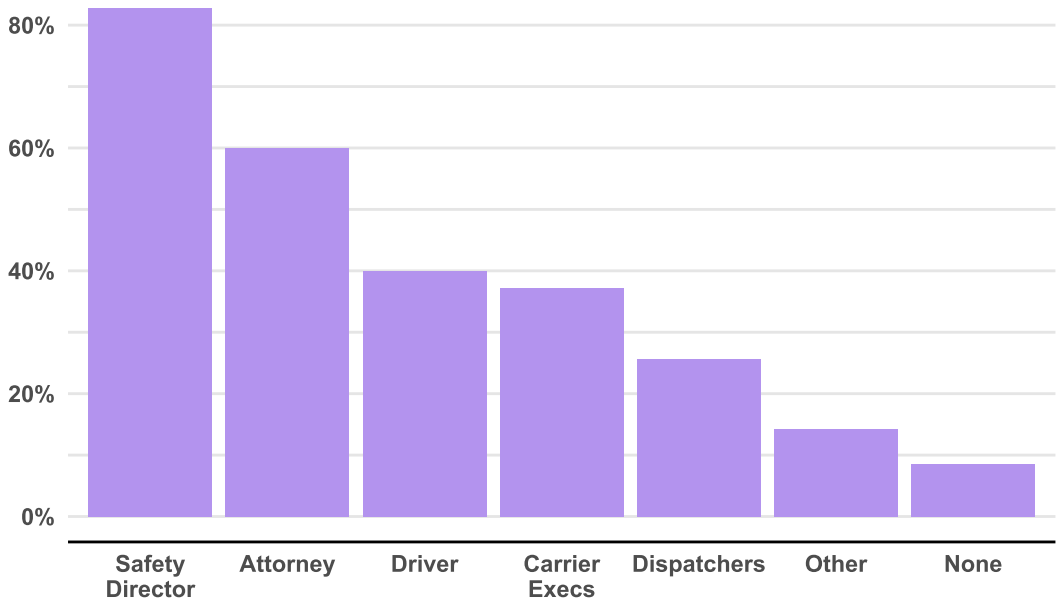
When legal expert respondents were queried as to how long DFC video files should be retained, the consensus was that incident video files should be kept for the duration of the statute of limitations in the state in which the incident occurred. This time window varies by state and by type of incident. While the appropriate statute of limitations is two years in many cases, each incident should be evaluated individually when determining how long to retain relevant footage.[19] Legal expert respondents recommended that incident-free video used for coaching or other purposes should be deleted regularly in order to prevent it from being inappropriately used against carriers in litigation.

[19] For an overview with citations to state statutes, see Matthiesen, Wickert & Lehrer, S.C. Attorneys at Law, "Statutes of Limitations for All 50 States" (upon March 7, 2023), https://www.mwl-law.com/wp-content/uploads/2018/02/SOL-CHART-00219774x9EBBF.pdf.

Footage Access and Coaching

Legal experts were also asked who should have access to DFC footage (Figure 24). Nearly 83 percent of legal experts believe that access was most important for safety directors, in agreement with truck drivers' preference. Answers were not exclusive, so legal experts could choose as many positions as they wished. Sixty percent of legal experts emphasized that attorneys should receive rapid access to DFC footage in the event of an incident – in order to advise carriers before other actions are taken. Large percentages of respondents believe that truck drivers (40%) and carrier executives (37%) should also have access to footage.

Figure 24: Positions that Legal Experts Believe Should Have Footage Access



When executed successfully, driver coaching based on DFC footage can play two beneficial roles: it improves driver safety and demonstrates carrier commitment to safety during litigation; or disproves the claim that carriers were negligent in their duty to adequately supervise drivers).

Legal expert respondents pointed out that, in both of these roles, poor coaching can be worse than no coaching at all because coaching creates an additional form of evidence. Carriers that repeatedly coach drivers on bad behaviors which still manifest and later contribute to, or exacerbate, an incident may find that juries view this as an indication of a negligent or ineffective safety program.

> "Repeated coaching to eliminate a bad behavior that ultimately still occurs and leads to an accident can be used against the carrier. On the flip side, a record of … coaching with improvement by drivers demonstrates safety culture." – Defense attorney, in-house counsel

Some legal experts warned against capturing too much data and over-coaching based on video footage – a complaint that truck drivers frequently made as well – for a similar reason. Recording excessively or recording minor behaviors as "incidents" for coaching creates artificial or unwarranted evidence of "negligence" that plaintiffs can leverage in litigation.

Legal experts share similar views on real-time DFC Critical Event Alerts (CEAs). If carriers elect to receive real-time alerts, it is imperative that they provide and document responsive coaching in a timely, consistent and effective manner – otherwise their lack of response will be used against them. Legal experts also emphasized that carrier responses to real-time alerts should take place within days of an offense, and if significant a driver should be taken off the road until coaching, or other actions, are conducted. Specific actions should be consistent and documented across similar events. CEAs should not be documented as requiring coaching if, on review, the driver made no mistake. One legal expert recommended calling drivers, rather than emailing or messaging, only when the truck is not operating and ideally on the driver's next break. Only one legal expert reported that a decline in CEAs resulting from targeted driver coaching was used as favorable evidence for the carrier in litigation.

> "Let [DFC footage] fall off the record after a specific period of time. Also, not every alert should result in a written coaching record. If the alert goes off because of a follow-too-closely signal, but the video shows someone cutting the driver off … it shouldn't be recorded as a coaching event." – Defense attorney, outside firm

Legal experts also indicated that progressive discipline should be part of a carrier's response toolbox, and carriers with such policies must be prepared to terminate the employment of drivers who commit significant mistakes or fail to respond to coaching. As with all other aspects of DFC policy, coaching policy should be documented and followed with the utmost consistency.

Improving Acceptance

To improve acceptance by truck drivers, legal experts recommend bonus systems based on good driving behaviors recorded by DFCs. Carriers should also reiterate to drivers that only clips generated from specific incidents are captured. Legal experts agreed with drivers on both of these points, as discussed earlier. Several legal experts recommended that carriers emphasize DFCs' ability to help protect drivers' livelihood and get them back on the road sooner if there is an incident in which the truck driver was not at fault. Legal experts agree that dialogue with drivers on DFCs should be honest and empathetic – carriers need to communicate that they understand and sympathize with drivers' concerns, that they take these concerns into account when developing policies, and that the resulting policies are designed to protect drivers as much as the carrier.

Legal experts also agreed with drivers on steps that could improve driver acceptance without negatively impacting litigation. These suggestions included the removal of audio recording and offering guarantees that video is only captured during active operation. In general, legal experts preferred policies that take a strategic but minimalistic approach, rather than a comprehensive approach to data collection.

Legal Expert Overall Assessment

When asked how helpful DFC footage is for refuting claims of driver negligence, legal experts responded with a median rating of 7.5 out of 10. This median reflects experts' generally positive attitudes toward DFCs, but individual assessments varied. Legal experts had mixed reviews for DFCs' effectiveness in litigation. More than a third (34%) of respondents gave the DFC footage a 10 out of 10 in disproving negligence, but 25 percent of respondents rated it at 2 or lower.

There are several possible reasons for this lack of consensus among legal experts on the question of DFCs' helpfulness for refuting claims of negligence. First, DFC adoption is still new

for many carriers, with only 24 percent of legal experts' clients currently using DFCs. As such, many in the industry are still developing experience, opinions and strategies for working with DFC evidence in claims and litigation. Second and more importantly, DFC effectiveness in litigation is highly dependent on the quality of carrier policies, driver coaching, and driver buy-in. Inconsistent or perfunctory DFC programs can be unreliable, generate expanded liability, or increase litigation work and expenses. While the survey question asked specifically about using DFC footage to refute claims of driver negligence, legal experts pointed out that this is not the only legal benefit of DFCs; even when DFCs show driver negligence, they can save time and money through quick settlements.

> "The oldest (and best) joke in the dash cam business is: '*the greatest thing about dash cams is that they show you exactly what happened in the accident. The worst thing about dash cams is that they show you exactly what happened in the accident.*' Although funny, it's not accurate. In reality, the greatest thing about dash cams is that they show you exactly what happened in the accident, period." – Defense attorney, outside firm

Fifteen percent of surveyed legal experts stated that they prefer not to work with DFCs because the systems can be used against the carrier in multiple ways. For example, all DFC footage is discoverable, which means the plaintiff will review it and use potentially insignificant driver behaviors as an argument in court. DFCs also create the opportunity for plaintiffs to exploit gaps and/or inconsistencies in carrier policies regarding video collection, storage, coaching, and discipline.

For these reasons, carriers that choose to implement DFCs should take the necessary steps to make DFC systems beneficial by:

- establishing thorough DFC policies in accord with expert recommendations;
- documenting and applying policies consistently;
- developing standardized coaching programs that prioritize positive reinforcement; and
- cultivating truck driver trust through clear communication and understanding.

Legal experts cautioned that, as DFC systems become more common, carriers involved in litigation that do not use DFCs will need to have strong rationalization for why they chose not to use DFCs. These carriers' explanations should document clear alternative safety strategies, beyond difficulties like retaining drivers, paying for data storage, etc., that offset the DFC benefits that the plaintiffs may raise.

> "If you are not going to utilize the DFC, then do not install a camera system with a DFC. The plaintiff attorney will argue that the motor carrier took active steps to prevent the DFC from collecting evidence." – Defense attorney, outside firm

DFC Uses and Implications in Insurance

ATRI's survey of insurers focused on DFC adoption rates among motor carriers, insurer policies regarding in-cab camera technology, and DFCs' impact on safety and related claims processes.

DFC Use among Insureds

Only 1.1 percent of policyholders insured by respondents have DFCs, whereas RFCs were used by 62.1 percent of insurers' policyholders on average.

Table 4 shows the percentage of policyholders that use DFCs in each fleet sector and size category.

Table 4: Policyholders with DFCs by Fleet Sector and Size

Fleet Size	
1–5 power units	13.4%
6–25 power units	25.9%
26–100 power units	20.6%
101–500 power units	18.2%
500+ power units	12.6%
Sector	
Truckload	51.3%
Less-than-Truckload	11.0%
Tanker	6.4%
Specialized	9.4%
Intermodal	5.3%
Owner-Operator	4.5%
Private Fleets	11.0%

Insurance respondents indicated that the majority of their policyholders that use DFCs were truckload carriers, representing 51.3 percent of the insured carriers using DFCs, followed by LTL and private fleets with 11 percent each. In terms of fleet size, a plurality of policyholders that use DFCs had 6 to 25 power units (25.9%), followed by fleets with 26 to 100 power units (20.6%) and fleets with 101 to 500 power units (18.2%).

DFCs and Insurance Policies

No surveyed insurers currently require DFCs, though 35 percent of respondents did require RFCs.

Insurers generally prefer event-based DFCs, with 79 percent recommending that video format as ideal. In this respect, they agree with legal experts and drivers.

Some form of DFC hardware price or installation discount was offered by 25 percent of insurers. These discounts ranged from 5 to 15 percent of the equipment cost. Based on the very small use of DFCs by policyholders, this incentive does not appear to be a strong motivator.

The same 25 percent of insurers offered some form of RFC hardware price or installation discount, ranging from 3 to 15 percent of the cost.

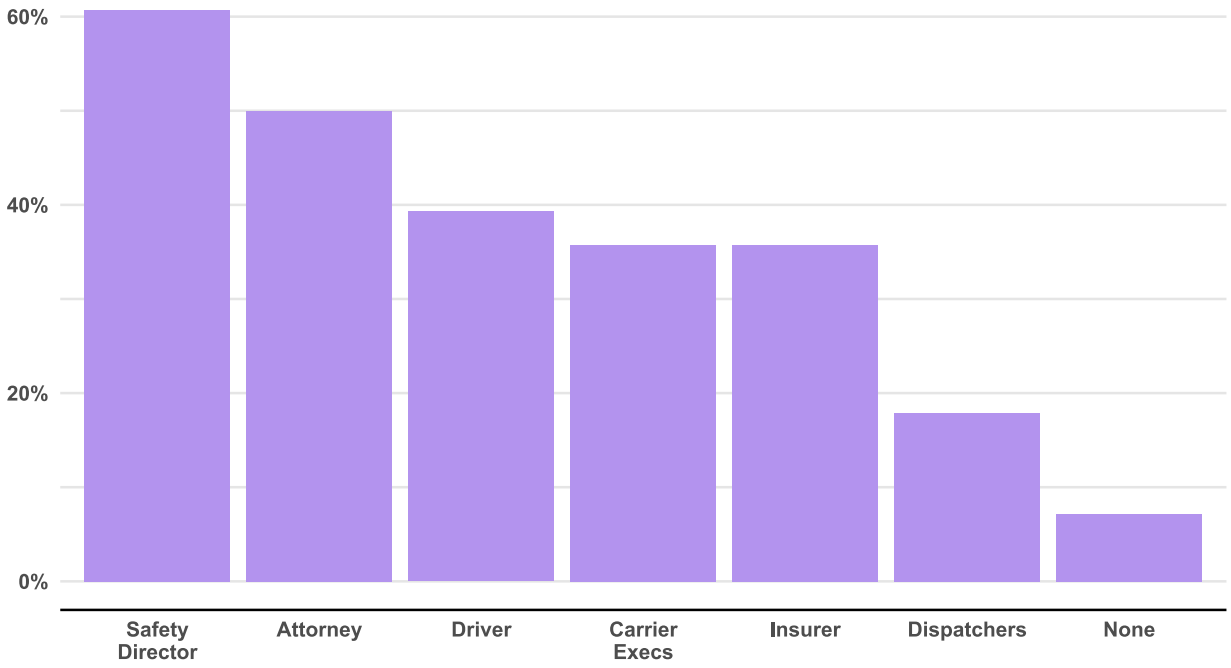
A smaller share of insurers – 21 percent – offered premium discounts to carriers that use DFCs – independent of the carriers' safety performance. These discounts vary from 1 to 10 percent based on a variety of factors including a motor carrier's DFC policies and procedures.

Twenty-nine percent of insurers offered premium discounts for using RFCs – independent of the carriers' safety performance. These discounts vary from 1 to 15 percent.

Insurer Preferences on Access to DFC Footage

As Figure 25 shows, 61 percent of insurers believe that safety directors should have access to DFC footage, in agreement with legal experts and drivers that access is most important for safety directors. Answers were not exclusive, so insurers could choose as many positions as they wished. Fifty percent of insurers believe that attorneys should have access, compared with 60 percent of legal experts who believe the same (see Figure 24); 39 percent of insurers believe that drivers should have access, compared with 47 percent of drivers who believe the same (see Figure 18).

Figure 25: Positions that Insurers Believe Should Have Footage Access

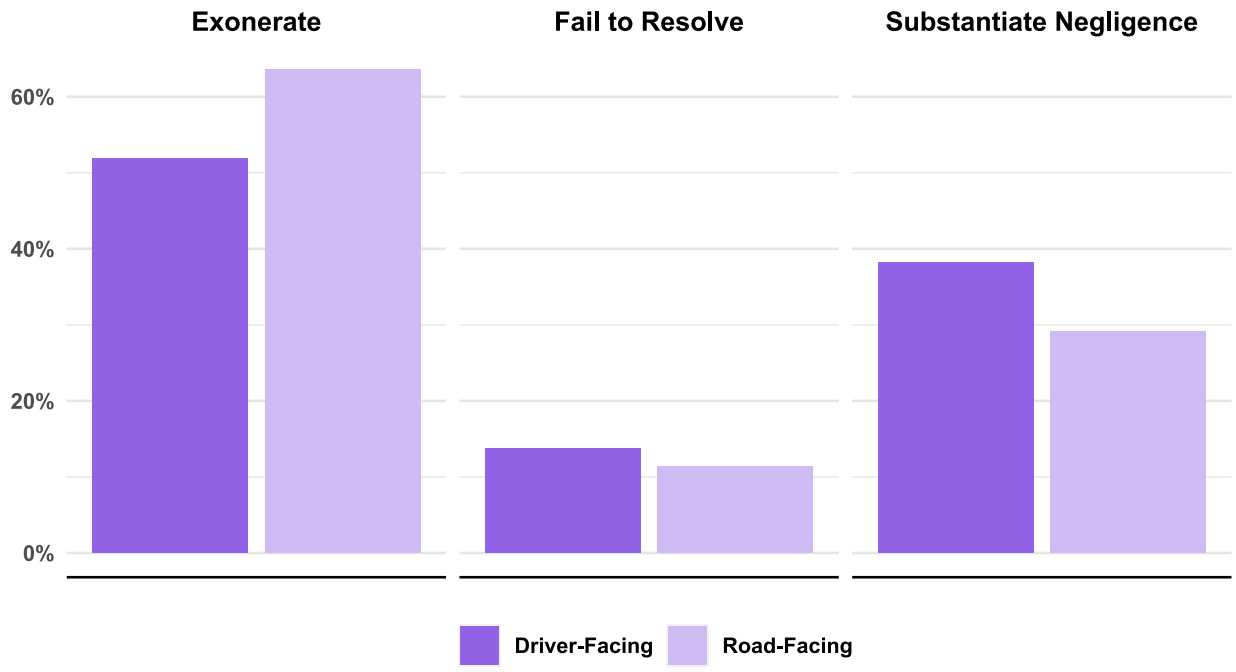


Just 36 percent of insurers believe that they should have access to DFC footage. This is consistent with the finding that there is not an established standard as to whether policyholders should share footage with their insurers. On average, 52.5 percent of respondents' policyholders share footage, but responses ranged from 1 percent to 100 percent.

DFCs and Claims Outcomes

Insurers reported that DFC footage exonerates commercial truck drivers in 52 percent of claims and negligent in 38 percent of claims. Figure 26 shows the frequency of each possible outcome in claims for which DFC footage is available.

Figure 26: In-Cab Camera Footage Impacts on Claims Outcomes



Insurers estimate that RFC footage, when available, indicates commercial truck drivers are not at fault in 64 percent of claims, and truck drivers were found to be negligent in 29 percent of claims involving RFC footage.

In-cab camera evidence thus has a similar impact on the claims process as it does on the litigation process (see Figure 22). Both RFC and DFC camera systems more often exonerate commercial truck drivers than prove negligence.

Insurers rated the overall effectiveness of DFC footage for resolving claims at 7.1 out of 10. The most common ratings were 5 and 10, suggesting that while many insurers are enthusiastic about DFCs, others remain unconvinced by their capacity to resolve claims.

DFCs and Safety

DFC-based driver coaching is the primary method for using DFCs to improve driver safety and skills.

Insurers rated the overall effectiveness of DFC-based coaching for improving safety at 7.9 out of 10. In this respect they broadly agree with drivers, who rate DFCs' ability to improve safety more highly when their carrier uses DFC footage for more preventative safety measures (Figure 19). Insurers rated DFC-based coaching higher than DFCs' effectiveness in resolving claims, with 80 percent of respondents rating coaching effectiveness between 7 and 10.

As with legal experts and drivers, insurers cautioned that coaching must be conducted strategically. When asked about best practices from a claims prevention perspective for responding to driver behavior alerts or driver issues recorded by DFCs, insurers emphasized consistent coaching policy, transparency with drivers, and progressive discipline for unheeded feedback.

> "Have a consistent platform across the entire fleet. One of our accounts had a split where video upload was only accessible to fleet management for a portion of their drivers, causing significant inconsistency in event-management from case to case." – Insurer

Insurers observed several beneficial DFC outcomes in safety. A majority reported a decrease in claims among their policyholders that had installed DFCs, ranging from 10 to 45 percent.

> "Driver coaching creates a reduced frequency of [critical event] video footage. This in turn leads to a reduced number of claims, as there is no trigger activity to create video. … Proactive coaching leads to reduced premiums via the reduced frequency by ingraining behavioral trends into the driver pool." – Insurer

For the majority of insurers (79%) that did not offer DFC-related premium discounts, the only way for DFCs to lower premiums is by reducing the number of incidents. A carrier's ability to reduce their insurance premiums by using DFCs depends on the coaching policies and procedures they develop.

CONCLUSIONS

The first objective of this research was to understand truck driver issues and perceptions associated with the use of DFCs.

With an overall approval score among current users of 2.24 on a 0-to-10 scale, truck drivers do not hold DFCs in high regard. Many of these concerns are based on privacy and administrative issues. Given the relatively recent emergence of DFCs, the resulting low adoption rates, and the wide variety of camera technologies and policies in use, truck drivers' limited experience with DFCs certainly plays a role in this low approval rating. Within the ATRI data set, only 32 percent of survey respondents utilized DFCs as compared to 72 percent who use RFCs. But direct DFC experience does have a positive impact on approval; current users rate DFCs more than twice as high as drivers who have never used DFCs.

The second objective of this research was to understand DFCs' existing and potential role in claims and litigation processes. According to surveys of legal and insurance experts, DFC footage, when available, exonerates drivers in 52 percent of insurance claims and 49 percent of litigation cases as well as leading to settlements in 86 percent of cases versus proceeding to trial.

Recommendations for Carriers that Use or Plan to Use DFCs

This research identified numerous issues relating to both DFCs and RFCs, as well as points of consensus and potential compromise among drivers, legal experts, and insurers. Table A1 in Appendix A summarizes and compares issue positions among these three groups on key DFC issues, indicating where they converge and where they align. Based on these areas of consensus and concern, the research identifies key strategies for improving driver approval and highlights recommendations for better leveraging DFCs to improve safety, privacy, litigation, and the insurance claims process. These recommendations are organized in three tables based on the primary source of the concern they address: truck driver concerns (Table 5); legal expert concerns (Table 6); and insurance concerns (Table 7).

Table 5: Addressing Truck Driver Concerns

Finding	Recommendation
Truck drivers with event-based cameras gave DFCs an overall approval rating 22 percent higher than did drivers with continuously recording cameras – primarily due to privacy concerns.	Carriers should use event-based DFCs unless they have strong specific reasons to prefer continuously recording DFCs.
Most *legal experts* also preferred event-based DFCs (88%) based on concerns that plaintiffs will use expanded footage from continuously recording cameras to find historical negligence, however insignificant it may be.	Carriers should consider using DFCs in all fleet vehicles to reduce the sense that truck drivers are being exclusively targeted.
Current *truck driver* users rate DFC privacy protections at only 1.73 out of 10, and 16.7 percent of drivers suggested that driver acceptance would improve if DFCs were always off when their truck is not moving.	Carriers should leverage Privacy Modes that ensure DFCs are inactive whenever a truck is parked, and they should only use cameras that have camera on / off notifications.
Female drivers are even more concerned about DFCs than the overall driver population, rating DFC privacy protections 34 percent lower than male drivers.	Carriers should develop standardized DFC policies and procedures and promulgate them to drivers in a clear, accessible and transparent manner.
Truck drivers, legal experts, and insurers all agree that safety directors should have access to footage; the majorities of these groups believe that dispatchers and carrier executives should not have access.	Carrier policies should limit employee access to video footage on a need-to-know basis.
	Carriers can improve truck driver acceptance and trust by providing drivers with access to footage, as 47 percent of drivers believe they should.
New *truck drivers* with less than one year of experience have higher overall approval ratings for DFCs and RFCs than any other experience bin.	Carriers should make DFC use in training as productive and transparent as possible to build approval with new drivers and sustain it over their careers.
When asked to provide unprompted suggestions for improving driver acceptance, 9.1 percent of *truck drivers* wanted less sensitive event-based triggers and 6.7 percent wanted to end punitive use of DFC footage.	Carriers should prioritize positive feedback and use DFCs to incentivize good performance or improvement.
	Carriers should work with in-cab camera system vendors as well as truck drivers to identify the appropriate trigger sensitivity for their company, operations, and culture.
Overall *truck driver* approval of DFCs increased by 87 percent when carriers used footage for developing preventative safety programs, new driver training, and ongoing driver coaching.	Carriers should use DFC footage for all three of these preventative safety measures.

Truck drivers want DFC-related coaching to be improved; 11.6 percent suggested that less fault-seeking or "nitpicking" would improve driver acceptance of DFCs.	Coaching policies should focus on responding to recurring or significant behaviors, with an emphasis on outcomes and skill growth, and avoid classifying minor or isolated behaviors as coachable incidents.
	Coaches should have experience driving commercial vehicles.
	Both event-based and continuous recording video feeds should also be used for positive feedback and incentives.

Table 6: Addressing Legal Expert Concerns

Finding	Recommendation
Legal experts shared that gaps in carrier DFC policies or carrier actions that conflict with DFC policies will create increased liability.	Carriers should document when DFCs will be active (continuously recording), what will trigger DFCs (event-based), who can access footage, and all other DFC policies (including coaching if relevant) and ensure that policies are formalized and applied consistently.
Legal experts expressed concerns that plaintiffs can use extra footage or policies that result in excessively frequent coaching against drivers even when not directly related to a case; these concerns were also shared by truck drivers.	Carriers should delete DFC footage that does not depict an incident as soon as internal review or coaching is completed, in accordance with formal carrier policies.
	To protect against unnecessary disclosure of video, incidents should not be documented by the carrier as requiring coaching if, on review, the driver made no mistake.
Legal experts recommend retaining DFC footage depicting an incident only as long as required by the statute of limitations.	Carriers should classify DFC footage depicting an incident based on the incident type and the state in which it occurred, as these factors determine statute of limitations.

Table 7: Addressing Insurance Concerns

Finding	Recommendation
Insurers rated DFC-based safety coaching effectiveness at 7.9 out of 10.	Carriers should ensure coaching takes place as soon as possible after the behavior/event in order to maximize driver improvement.
A majority of *insurers* did not offer DFC-related premium discounts (79%) or hardware installation discounts (75%).	Carriers that hope to realize savings by using DFCs should be prepared to wait for several years of improved loss history and/or litigation outcomes.

Recommendations for Carriers that Do Not Want to Use DFCs

As DFCs become more common, it will become increasingly important for motor carriers that do not use DFCs to develop a thorough justification for why they do not – in order to protect themselves in litigation. Based on legal expert and insurer feedback in this report, these carriers should ideally be prepared to:

- Institute and document safety practices and procedures that make DFCs redundant and/or unnecessary, which can include active safety systems that reduce crashes;[20]
- Document the extraordinary storage and/or cost requirements of maintaining DFC footage;
- Link the challenge of recruiting and retaining safe drivers with truck driver disdain for DFCs;
- Avoid other in-cab systems (such as RFCs) that include inactive DFCs.

[20] Federal Motor Carrier Administration, "Tech-Celerate Now" (accessed on March 2023), https://www.fmcsa.dot.gov/Tech-CelerateNow.

APPENDIX A: Concurrence Summary Matrix

Table A1: Agreement and Disagreement between Drivers, Legal Experts, and Insurers

Issue	Drivers	Legal Experts	Insurers	Alignment
Carrier Communication Approaches	Transparent, consistent	Transparent, consistent	Transparent, consistent	Agree
Preferred Recording Type	Event-Based, less sensitive triggers	Event-Based	Event-Based	Agree
Who Warrants Primacy Access to Footage	Safety Directors	Safety Directors	Safety Directors	Agree
DFC Uses that Increase Approval	Training, coaching, and designing safety programs	Training, coaching, and designing safety programs	Training, coaching, and designing safety programs	Agree
Preferred Coaching Style	Selective, based on outcomes more than behaviors; fault-seeking annoys and decreases usefulness	Selective; fault-seeking or excessive response gives plaintiffs ammunition	Selective; based on recurring issues	Agree
Financial Incentives	Improves safety and acceptance	Improves safety and acceptance	Improves safety and acceptance	Agree
Footage Retention	Minimal	One year or longer (to statute of limitations) for incidents, otherwise minimal	Minimal unless depicting an incident	Partial Agree
Who Warrants Secondary Access to Footage	Drivers should have access; lawyers should have access only as necessary; otherwise, access should be strictly limited	Lawyers should see incident footage immediately; carrier executives and drivers have equal reason to access footage	Lawyers should have access to footage	Disagree
Punitive Use	Should be limited or stopped; negatively influences driver attitude and takes focus away from improving safety	Necessary part of response toolkit	Necessary part of response toolkit	Disagree
Usefulness of DFC Footage in Claims / Litigation	Somewhat low, but risks plaintiff manipulation	Generally high, but risks plaintiff manipulation	Somewhat high	Disagree
DFCs' Main Use	Oversee drivers	Justify drivers	Improve safety	Disagree

APPENDIX B: Driver Survey

Truck Driver Perspectives on Driver-Facing Cameras

The American Transportation Research Institute (ATRI), the trucking industry's not-for-profit research organization, is working with industry partners, including the OOIDA Foundation, to better understand truck driver issues and perceptions relating to in-cab driver-facing cameras.

All responses to this survey will be kept **strictly confidential** and will only be reported as general statistics. Due to the sensitivity of this research, under NO circumstances will we release any of your personal or organizational information.

Demographics

1. **How many years of professional driving experience do you have?**
   a. Less than 1 year
   b. 1 – 5 years
   c. 6 – 10 years
   d. 11 – 20 years
   e. 21+ years

2. **How many power units are operated by your fleet, or the primary fleet you contract with?**
   a. 1 truck
   b. 2 – 5
   c. 6 – 20
   d. 21 – 100
   e. 100 – 1,000
   f. 1,000 +
   g. Don't Know

3. **In which sector of the trucking industry do you operate?**
   a. For-hire fleet (i.e. may haul goods for multiple customers)
   b. Private fleet (haul goods for own non-motor carrier company)
   c. Don't Know

4. **If you operate in the for-hire sector, what is your primary type of business?**
   a. Truckload
   b. Less-than-truckload
   c. Tank Truck
   d. Specialized (Flat bed, Oversized, etc.)
   e. Intermodal/Drayage
   f. Other _____

5. **What is the primary vehicle configuration that you typically drive?**
   a. 5-axle Dry Van
   b. 5-axle Refrigerated Trailer
   c. 5-axle Flatbed
   d. 5-axle Tanker
   e. Straight Truck
   f. Longer-Combination Vehicles (Doubles, triples, etc…)
   g. Other _____
   h. Don't know

6. **What is your average length of haul?**
   a. Local (Less than 100 miles per trip)
   b. Regional (100 – 499 miles per trip)
   c. Inter-regional (500 – 999 miles per trip)
   d. Long-haul (1,000+ Miles per trip)

7. **What is your gender?**
   a. Male
   b. Female
   c. Prefer not to answer

8. **What is your age?**
   a. 18 - 20
   b. 21 - 24
   c. 25 - 34
   d. 35 - 44
   e. 45 - 54
   f. 55 - 64
   g. 65+
   h. Prefer not to answer

9. **Please describe your use of a road-facing camera:**
   a. My truck is not equipped with a road-facing camera
   b. My truck is equipped with a road-facing camera, but I've never used it
   c. I've used a road-facing camera previously, but not now
   d. I'm presently using a road-facing camera

10. **If you have used or are using a road-facing camera, was it turned on:**
    a. Less than 25% of the time
    b. Between 25% to 50% of the time
    c. Between 50% to 75% of the time
    d. Between 75% to 99% of the time
    e. 100% of the time
    f. Do not know

11. **Please describe your use of a driver-facing camera:**
    a. My truck is not equipped with a driver-facing camera
    b. My truck is equipped with a driver-facing camera, but I've never used it
    c. I've used a driver-facing camera previously, but not now
    d. I'm presently using a driver-facing camera

12. **If you have used or are using a driver-facing camera, was it turned on:**
    a. Less than 25% of the time
    b. Between 25% to 50% of the time
    c. Between 50% to 75% of the time
    d. Between 75% to 99% of the time
    e. 100% of the time
    f. Do not know

13. **Does your driver-facing camera:**
    a. Continuously capture and store all video data recorded by the camera
    b. Only capture and store a short segment of video data when a crash or safety event occurs

14. **Is your camera video data used for: (Check all that apply)**
    a. Creating and/or improving general driver safety programs
    b. Training for new drivers
    c. Ongoing driver coaching
    d. Submission to insurance carriers
    e. Protection from legal action
    f. Other (please describe): _____
    g. I don't know

15. **Is your camera activated by in-cab events (e.g. smart phone usage, eyes off road)?**
    a. Yes
    b. No
    c. I don't know

16. **Who should have access to driver-facing camera video feeds, when the video feed is accessed / reviewed? (Check all that apply)**
    a. Carrier senior executives
    b. Safety director
    c. Dispatchers
    d. Carrier / truck driver defense attorneys
    e. Truck Driver
    f. Other: _____
    g. No one

17. **In terms of cost, how was/is your camera paid for:**
    a. Purchased out-right with a one-time cost/payment
    b. Paid for with a monthly subscription service

18. **Who paid for your camera?**
    a. I paid for it myself
    b. My employer paid for it
    c. OTHER:

19. **How does your camera store data?**
    a. Internal memory storage
    b. Uploaded wirelessly to cloud storage
    c. I don't know

20. **Whether you use an in-cab camera or not, please indicate on a scale of 1-10 the degree to which you LIKE or DON'T LIKE road-facing cameras:**
    LIKERT SCALE: DON'T LIKE / LIKE

21. **Whether you use an in-cab camera or not, please indicate on a scale of 1-10 the degree to which you LIKE or DON'T LIKE driver-facing cameras:**
    LIKERT SCALE: DON'T LIKE / LIKE

22. **Whether you use an in-cab camera or not, please indicate on a scale of 1-10 the degree to which you feel that road-facing cameras improve your road safety:**
    LIKERT SCALE: HAS NO IMPACT ON SAFETY/GREATLY IMPROVES SAFETY

23. **Whether you use an in-cab camera or not, please indicate on a scale of 1-10 the degree to which you feel that driver-facing cameras improve your road safety**
    LIKERT SCALE: HAS NO IMPACT ON SAFETY/GREATLY IMPROVES SAFETY

24. **Whether you use an in-cab camera or not, please indicate on a scale of 1-10 the degree to which you think that road-facing cameras protect privacy:**
    LIKERT SCALE: NOT PROTECTED AT ALL/ EXTREMELY PROTECTED

25. **Whether you use an in-cab camera or not, please indicate on a scale of 1-10 the degree to which you think that driver-facing cameras protect privacy:**
    LIKERT SCALE: NOT PROTECTED AT ALL/ EXTREMELY PROTECTED

26. **Whether you use an in-cab camera or not, please indicate on a scale of 1-10 the degree to which road-facing cameras prevent false crash claims or trial lawyer litigation:**
    LIKERT SCALE: DOESN'T PROTECT ME AT ALL / PROTECTS ME A LOT

27. **Whether you use an in-cab camera or not, please indicate on a scale of 1-10 the degree to which driver-facing cameras prevent false crash claims or trial lawyer litigation:**
    LIKERT SCALE: DOESN'T PROTECT ME AT ALL / PROTECTS ME A LOT

EVERYONE should be presented with the remaining questions

28. **What driver-facing camera functions or employer policies regarding driver-facing cameras might increase truck driver acceptance or interest in driver-facing camera?**

Thank you! We greatly appreciate your participation. If you would like to receive a copy of the survey analysis, please provide your name and email below.

Name	Email Address

APPENDIX C: Legal Expert Survey

Litigation Perspectives on Driver-Facing Cameras

The American Transportation Research Institute (ATRI), the trucking industry's not-for-profit research organization, is working with industry partners, including ACTA and TIDA, to better understand how driver-facing cameras (DFCs) and DFC video can / is being used to address defense litigation in the trucking industry.

All responses to this survey will be kept **strictly confidential** and will only be reported as general statistics. Due to the sensitivity of this research, under NO circumstances will we release any of your personal or organizational information.

Demographics

1. **I would describe myself as:**
   a. Motor carrier – inside legal counsel
   b. Defense attorney – outside firm
   c. Non-attorney / legal subject-matter expert
   d. Other: _____
2. **What is your gender?**
   a. Male
   b. Female
   c. Prefer not to answer
3. **How many years of professional legal experience in trucking or transportation do you have?**
   a. Less than 1 year
   b. 1 – 5 years
   c. 6 – 10 years
   d. 11 – 20 years
   e. 21+ years
4. **How many motor carriers have you formally worked with in the last 5 years?**
   a. 1
   b. 2 – 5
   c. 6 – 20
   d. 21+
   e. Don't Know
5. **Please describe the percentage of your clients by sector:** ***(Total should equal 100%)***
   a. Truckload: _____%
   b. Less-than-truckload: _____%
   c. Tank Truck: _____%
   d. Specialized (Flat bed, Oversized, Overweight, etc.): _____%
   e. Intermodal/Drayage: _____%
   f. Other: _____%

6. **If you have other client sectors not listed Q5 above, please specify type and percentage here.**
   a. Other client sector type: _____
   b. % of other client sector: _____

7. **What percentage of your clients use ROAD-facing cameras?**
   _____%

8. **What percentage of your clients use DRIVER-facing cameras (DFC)?**
   _____%

9. **If you have used in-cab camera video footage in litigation:**

   a. When Driver-facing camera footage is available, how often do you use it?
      _____%
   b. When Road-facing camera footage is available, how often do you use it?
      _____%

10. **When Road-facing video footage is used in litigation, what percentage results in: (***Total should equal 100%)*
    a. Courtroom/trial litigation: _____%
    b. Out-of-court settlements: _____%

11. **How often does ROAD-facing camera video footage (Total should equal 100%):**
    a. Exonerate the defendant: _____%
    b. Incriminate the defendant: _____%

12. **Have you ever used DRIVER-facing camera video footage in connection with ongoing litigation?**
    a. Yes
    b. No
       If yes, please describe how: _____

13. **When DRIVER-facing video footage is used in litigation, what percentage results in: (***Total should equal 100%)*
    a. Courtroom/trial litigation: _____%
    b. Out-of-court settlements: _____%

14. **How often does DRIVER-facing camera video footage:**
    a. Exonerate the defendant: _____%
    b. Incriminate the defendant: _____%

15. **From a litigation stand-point, what is the ideal video footage retention period for**: (in months)
    a. Video from Road-facing cameras: _____ Months
    b. Video from Driver-facing cameras: _____ Months

16. **From a litigation standpoint, should DRIVER-facing cameras:**
    a. Continuously capture and store all video data recorded by the DFC camera
    b. Only capture and store a short segment of video data when a crash or safety event occurs

17. **Have you had an experience where an event-triggered camera failed to capture the event?**
    a. Yes
    b. No
    If yes, please describe how: _____

18. **Have you had an occasion where a continuously recording DRIVER-facing camera captured damaging information that an event-triggered camera would not have?**
    a. Yes
    b. No
    If yes, please describe how: _____

19. **Have you ever tried to recover footage, and could not get it, that was more than:**

    30 days old: YES NO

    60 days old: YES NO

20. **What role does driver coaching documentation based on DRIVER-facing camera video footage play in litigation?**

    _____

21. **From a litigation standpoint, how should carriers best respond to real-time driver behavior alerts generated from DRIVER-facing camera driver monitoring**?

    _____

22. **Have in-cab alerts, based on DFCs, been used as evidence in litigation to show a decline in risky driving?**
    a. Yes
    b. No
    If yes, please describe how: _____

23. **On a scale of 1 – 10 (10 being Extremely Helpful), how helpful is/would DRIVER-facing camera video footage be in refuting claims of driver negligence / distraction?**

    1 ---------- 10

24. Who should have access to DRIVER-facing camera video footage, when the video feed is accessed / reviewed? (Check all that apply)

a. Carrier senior executives
b. Safety director
c. Dispatchers
d. Carrier / truck driver defense attorneys
e. Truck Driver
f. DFCs should not be used
g. Other (please specify): _____

25. What DRIVER-facing camera functions or employer policies regarding DRIVER-facing cameras might increase truck driver acceptance or interest in these camera?

_____

Thank you! We greatly appreciate your participation. If you would like to receive an advance copy of the ATRI driver-facing camera analysis, please provide your name and email below.

Name	**Email Address**

APPENDIX D: Insurance Survey

Insurance Perspectives on Driver-Facing Cameras

The American Transportation Research Institute (ATRI), the trucking industry's not-for-profit research organization, is working with a variety of industry stakeholders to better understand how driver-facing cameras (DFCs) are perceived and used by truck drivers, motor carriers and defense attorneys.

ATRI is now working with the Motor Carrier Insurance Education Foundation (MCIEF) to determine how the commercial insurance industry views DFCs among their insured carriers, including the impacts on commercial auto liability premiums and claims management in the trucking industry.

All responses to this survey will be kept **strictly confidential** and will only be reported as summary statistics. Due to the sensitivity of this research, under NO circumstances will we release any of your personal or organizational information.

Demographics

1. **How many motor carrier policies did you issue in 2022?**

   _____

2. **How many of your clients use DRIVER-facing cameras?**

   _____

3. **How many of your clients use DRIVER-facing cameras in each fleet size category:**
   - **a.** 1-5 power units _____
   - **b.** 6-25 power units _____
   - **c.** 26-100 power units _____
   - **d.** 101-500 power units _____
   - **e.** 500+ power units _____

4. **How many of your clients use DRIVER-facing cameras in each sector:**
   - a. Truckload: _____
   - b. Less-than-truckload: _____
   - c. Tank Truck: _____
   - d. Specialized (Flat bed, Oversized, Overweight, etc.): _____
   - e. Intermodal/Drayage: _____
   - f. Private Fleet _____
   - g. Owner-Operator/ICs _____
   - h. Other: _____
   - i. Other: _____

5. **What was your total direct premiums written in 2022?**

   $ _____

Usage / Policy

6. **Do you require your policyholders to use ROAD-facing cameras?**

    a. Yes
    b. No
    If no, what percentage of your clients use ROAD-facing cameras? ___ %

7. **Do you require your policyholders to use DRIVER-facing cameras?**

    a. Yes
    b. No

8. **If you require policyholders to use DRIVER-facing cameras, have you lost clients over this requirement?**
    a. Yes
    b. No

9. **What percent of your clients that use DRIVER-facing cameras *do not* share this data with you?**
    ___%

10. **Do you offer hardware price / installation discounts for:**
    a. ROAD-facing cameras: enter dollar amount or percent of cost: ____
    b. DRIVER-facing cameras: enter dollar amount or percent of cost: ____

11. **Do you offer premium discounts for using (independent of safety performance):**
    a. ROAD-facing cameras: if yes, enter dollar amount or value of discount: ____
    b. DRIVER-facing cameras: if yes, enter dollar amount or value of discount: ____

12. **From an insurance / claims management standpoint, should DRIVER-facing cameras:**
    a. Continuously capture and store all video data recorded by the DFC camera
    b. Only capture and store a short segment of video data before/after a crash or safety event occurs

13. **Who should have access to DRIVER-facing camera video footage, when the video feed is accessed / reviewed? (Check all that apply)**
    a. Carrier senior executives
    b. Safety director
    c. Dispatchers
    d. Carrier / truck driver defense attorneys
    e. Truck Driver
    f. Insurers
    g. DFCs should not be used
    h. Other (please specify): _____

Outcomes

14. **How often does ROAD-facing camera video footage:** (*Total should equal 100%*)
    Resolve the claim by absolving the truck driver: ___ %
    Resolve the claim by identifying truck driver negligence: ___ %
    Fail to resolve the claim: ___ %

15. **How often does DRIVER-facing camera video footage:** (*Total should equal 100%*)
    Resolve the claim by absolving the truck driver: ___ %
    Resolve the claim by identifying truck driver negligence: ___ %
    Fail to resolve the claim: ___ %

16. **Of your clients that use DRIVER-facing cameras, what was the average percent decrease in claims?**
    ___ %

17. **What percentage of your clients that use DRIVER-facing cameras have seen a reduction in premiums resulting, at least in part, from improved safety performance related to DRIVER-facing cameras?**
    ___ %

18. **From a claims prevention standpoint, how should carriers best respond to driver behavior issues or alerts captured from DRIVER-facing cameras? What coaching policies are considered best practices?**

    _____

19. **What role does driver coaching based on DRIVER-facing camera video footage play in determining premiums?**

    _____

20. **On a scale of 1 – 10 (10 being Extremely Helpful), how helpful is DRIVER-facing camera video footage in resolving claims?**
    1 ---------- 10

21. **On a scale of 1 – 10 (10 being Extremely Helpful), how helpful are coaching or other policy reactions to DRIVER-facing camera video footage in improving safety?**
    1 ---------- 10

22. **What DRIVER-facing camera functions or employer policies regarding DRIVER-facing cameras might increase truck driver acceptance or interest?**

    _____

Help! ATRI has separate research underway on the "Impacts of Predatory Towing on the Trucking Industry." If you would like to participate in a brief telephone interview, please contact Alex Leslie at: Aleslie@trucking.org.

Thank you! We greatly appreciate your participation. If you would like to receive an advance copy of the ATRI driver-facing camera analysis, please provide your name and email below.

Name	Email Address

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