

**Video-Based Driver Risk Management Systems:
Evaluating Effectiveness at Improving Transit Safety**

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ABBREVIATIONS AND ACRONYMS

ATU	Amalgamated Transit Union
BLET	Brotherhood of Locomotive Engineers and Trainmen
FMCSA	Federal Motor Carrier Safety Administration
Metro	Los Angeles County Metropolitan Transportation Authority
MTI	Mineta Transportation Institute
Muni	San Francisco Municipal Railway
MV	MV Transportation
NJ Transit	New Jersey Transit
NTD	National Transit Database
NTSB	National Transportation Safety Board
OCTA	Orange County Transportation Authority
Pace	Pace Suburban Bus Service
SFMTA	San Francisco Municipal Transportation Authority
TRB	Transportation Research Board
Veolia	Veolia Transportation
WMATA	Washington Metropolitan Area Transit Authority

EXECUTIVE SUMMARY

Starting in the mid-2000s, a number of public transit agencies in the United States began experimenting with a new form of video event recorder technology. These new video-based driver risk management systems were designed to improve safety by monitoring transit operator driving habits to identify risky behaviors and train operators to avoid them before they led to a collision. Rather than simply saving a continuous loop of video feed, the systems capture a short 12- to 30-second video clip only when triggered by an unusual driving event, such as hard braking, a sharp turn or impact with an object. Though cameras are becoming more widely accepted for security and accident investigation purposes on public buses and trains, these systems represent the first time cameras have been focused on the transit operators themselves.

This has led to complaints by some transit operators, and unions representing them, that the cameras violate a transit employee's right to privacy and will lead to increasingly strict discipline policies. The objective of this project was to (1) determine if video-based driver risk management systems have proven an effective tool to enhance transit safety and (2) identify best practices and lessons learned that could contribute to the success of the systems if implemented at other transit agencies in the future.

This project focused on understanding how video-based driver risk management systems have performed in the United States at the six public transit agencies and three private contractors that have installed the technology on their buses. Specifically, have video-based driver risk management systems helped prevent dangerous driving, and/or reduced the frequency and severity of collisions and injuries that can result from those behaviors? How can a transit agency that has chosen to install the video equipment increase the probability of success while still addressing employee and union concerns?

Interviews were conducted with representatives from each of the six transit agencies and three contract operators to determine how long cameras have been in place, what results have been seen in terms of changes to collision and injury rates, and how each agency has navigated the internal politics related to introducing a new technology that some employees find intrusive. Quantitative data was collected from National Transit Database collision and injury reports, as well as from DriveCam, Inc., one of the video system manufacturers, to determine if the technology has helped to improve safety through a reduction in collisions and injuries.

The primary finding of this research is that video-based driver risk management systems *do* appear to have a measurable, positive impact on safety at agencies where they have been implemented. The systems have proven a valuable training tool, both on an individual and group basis, and provide transit managers with a wealth of information about their employees' driving habits that was not previously available. They are an effective means of identifying risky drivers so that managers can coach and, when necessary, discipline operators engaging in risky behaviors, while rewarding those who demonstrate defensive driving. Additional research should be conducted to better quantify the cost and safety benefits of the program over time. However, based on these results, transit agencies should strongly consider investing in a video-based driver risk management system as one component of an overall safety and training program.

INTRODUCTION

During the past decade, transit agencies throughout the United States have installed cameras inside buses and trains in an effort to enhance security, deter criminal activity and discourage graffiti and vandalism. A number of transit agencies also have installed cameras pointed out the front windshield or entry doors of transit vehicles to aid in accident investigation and resolution of passenger injury claims. However, neither camera system generally includes a view of the transit operator while he or she is driving the vehicle.

Starting in the mid-2000s, a handful of public transit agencies in the United States began installing video recording devices in buses specifically intended to monitor transit operator performance and adherence to safety regulations. Though this technology has been used on commercial fleet vehicles for a number of years, its application in the public transit industry is still relatively recent and comparatively much less pervasive.

Proponents of video-based driver risk management systems argue that focusing cameras on transit operators helps to identify and correct potentially dangerous driving behaviors before they lead to a collision or injury. In addition, the cameras serve to deter operators from violating transit-specific safety regulations such as bans on use of personal electronic devices. Manufacturers of the camera systems claim they can lead to significant reductions in the frequency and severity of accidents, as well as the number of workers' compensation and personal injury claims.¹

However, the video systems also have prompted objections from union officials and transit operators themselves, who maintain the cameras are an invasion of privacy and are not a cost-effective solution to improve transit safety. Though anecdotal evidence provided by the manufacturers of the camera systems shows that video-based driver risk management systems reduce accidents and cut costs, there have been no formal studies to date examining the effectiveness of these types of systems on improving safety in the transit industry through a reduction in the frequency and severity of accidents and injuries.

There are currently two primary companies that manufacture video-based driver risk management systems used by transit operators: DriveCam, Inc., and SmartDrive Systems, Inc., both based in San Diego, California. DriveCam currently has a much larger share of the transit market, with DriveCam systems in use by Capital Metro (Austin, Texas), New Jersey Transit, Pace Suburban Bus (Chicago area), San Francisco Municipal Railway, and the Washington Metropolitan Area Transit Authority. DriveCam is also used by dozens of other public transit agencies contracted with First Transit, MV Transportation and Veolia Transportation. SmartDrive is used by the Los Angeles County Metropolitan Transportation Authority, and was recently selected to replace DriveCam systems in transit vehicles operated by Veolia Transportation.

This research project focuses on evaluating the effectiveness of the DriveCam system currently being used by the five public transit operators and three private contractors referenced above, as well as lessons learned by each agency in implementing the system. Though the report briefly discusses Metro's experience with the SmartDrive system in Los Angeles, it focuses primarily on use of the DriveCam system in the transit industry in order to maintain data consistency. It is worth noting that DriveCam and SmartDrive are both used by trucking firms, private motorcoaches, taxi cabs and a wide variety of other fleet vehicles; however, this report focuses specifically on their use in transit buses.

In October 2009, the Southern California Regional Rail Authority, which operates the Metrolink commuter-rail system, began installing "inward-facing camera" systems in the cab of each of its 52 locomotives to monitor the behavior of engineers. Because the Metrolink camera systems are continuously recording, not triggered by specific operator behaviors, and are not used for the same purposes as the video-based driver risk management systems installed in buses, they will not be discussed in detail in this report. However, an examination of the public debate that surrounded the implementation of the cameras by Metrolink is useful as it relates to the issue balancing a transit operator's right to privacy with the safety benefits cameras could potentially provide.

RESEARCH METHODOLOGY

This project attempts to determine to what extent video-based driver risk management systems have been successful in enhancing safety in the transit industry by reducing the frequency and severity of collisions and injuries. Data for this project was gathered from a variety of sources, including publicly available documents and reports from each of the transit agencies studied, information provided by the manufacturers of the camera systems, and a variety of academic and government reports.

Specific case study information was gathered through individual phone interviews with the safety or bus operations managers at each transit agency using video-based driver risk management systems. Some agencies provided specific metrics on results seen after implementation of the camera systems, while others provided more anecdotal information. The interviews also explored what policies and procedures each transit agency put in place when implementing the new video systems in order to identify a set of best practices and lessons learned.

National Transit Database (NTD) accident and injury statistics were examined for each of the five public transit operators using the DriveCam system to look for any trends in safety performance that could be correlated with adoption of video-based driver risk management systems.² However, NTD data was not analyzed for the three contracted operators using DriveCam – First Transit, MV Transportation and Veolia Transportation – due to the complexity of tracking which of the firms' transit clients were using DriveCam and on what percentage of each fleet.

The project also considers academic and government research conducted on video-based driver risk management systems in the trucking and private motorcoach industry. Though the trucking and private motorcoach industries differ from the public transit industry in terms of types of vehicles used and typical operating conditions, the research was relevant in that it considered the impacts of the same types of video systems currently being used in the transit industry.

Finally, detailed data, including trends on the number of captured events, was obtained from DriveCam for each of its transit-industry clients. To protect client confidentiality, the data does not include the names of the transit agencies; however, it is still relevant in order to see detailed records of performance of the DriveCam system at each transit agency from implementation to the present.

LITERATURE REVIEW AND BACKGROUND

Overview of Video-Based Driver Risk Management Technology³

The video-based driver risk management systems currently used by transit industry clients consist of a small, palm-sized dual-lens video camera that is mounted on the vehicle windshield, usually behind the interior review mirror of the bus. A wide-angle camera captures both the view out the front windshield of the bus, as well as an interior view, including a clear view of the operator, and typically the farebox and at least a portion of the passenger seating area. The cameras also include a microphone to capture audio inside and outside the vehicle.



Figure 1: DriveCam recording unit (left) and DriveCam camera being installed on WMATA bus. Sources: DriveCam, Inc., and WMATA

Though the cameras are continuously recording, the system is set to save video clips only when triggered by gravitational forces (g-forces) on the vehicle that exceed a predetermined level. These movements are measured by an accelerometer that triggers the camera system when atypical vehicle movements occur, such as sudden braking or acceleration, swerving, sharp turns, or the impact of a collision. The camera system automatically saves video footage from before and after the incident. Transit clients using the DriveCam system receive video clips of 8 seconds before and 4 seconds after each triggered event. In addition, the transit operator can press a button to manually trigger a clip to be saved if there is a particular event he or she wants recorded.

When the DriveCam video driver risk management system is triggered, a solid green light on the camera equipment that indicates the equipment is functioning properly begins to flash between green and red, indicating that a g-force has triggered a clip to be sent for review. This provides the driver with immediate feedback and awareness that an action he or she took activated the recorder. This is intended to encourage self-evaluation and can signal behaviors that the driver should work to avoid, even before formal review and coaching takes place.



Figure 2: Graphic depiction of DriveCam event scoring and coaching process.

Source: www.drivecam.com

If the DriveCam software determines the triggered event should be sent back to review, the light then turns red. Under DriveCam’s “managed services” program, all triggered events are downloaded via cellular network, analyzed by DriveCam personnel at a call center, and assigned a “risk score” on a scale of 0-20. This event is then labeled a “scored event.” Transit industry clients can review the scored events, including video clips, via an Internet-based “dashboard,” which also allows transit agency managers to run reports to view a list of riskiest drivers or driving behaviors, and includes mechanisms to track coaching and disciplinary actions related to each event. Transit managers are encouraged to follow up with individual bus operators on scored events by providing coaching within four days.

Each scored event includes an explanation of what triggered the event to be captured (braking, impact with object, etc.), as well as an analysis by DriveCam staff of what specific driver behaviors contributed to the event. The initial DriveCam system operated under a “self-review” model in which clips were not analyzed in detail by DriveCam staff before being sent to transit agencies. Though most transit agencies are now transitioning to the managed services program, many still use the self-review model.

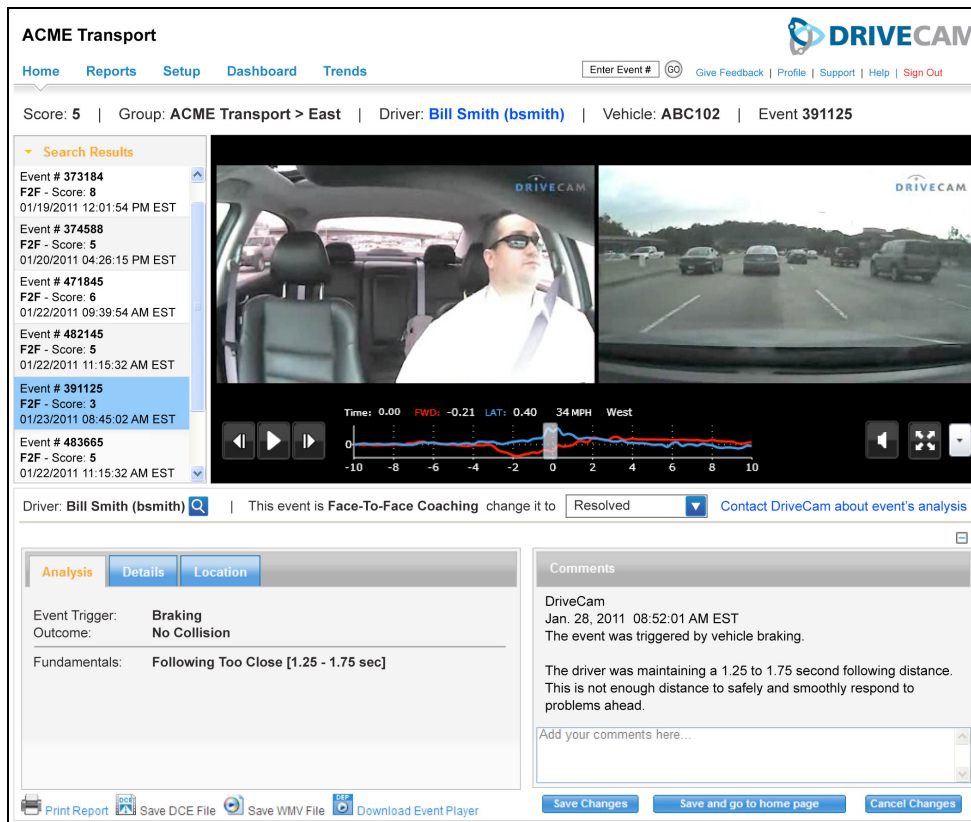


Figure 3: Example of DriveCam internet-based dashboard display used to review, track and resolve scored events captured by DriveCam. Source: DriveCam, Inc.

DriveCam reports that its transit-industry clients have seen a dramatic decreases in the frequency and severity of collisions year-over-year, resulting in an overall claims cost reduction of 30 percent to 80 percent, and a 40 percent to 80 percent reduction in accident frequency. Across all industries, DriveCam says it has reduced vehicle damages, and workers' compensation and personal injury costs by more than 50 percent in more than 110,000 commercial and government vehicles.⁴



Figure 4: Example of DriveCam forward and interior camera view. Note bus operator using cell phone. Source: www.drivecam.com

Role of Video Surveillance in Behavior-Based Safety

A 2003 report published by the Transportation Research Board (TRB) and sponsored by the Federal Motor Carrier Safety Administration discusses the recommended use of behavior-based safety techniques to improve safety in the trucking and private motorcoach industry, including on-board video systems.⁵

The TRB report defines behavior-based safety as, “a set of methods to improve safety performance by teaching workers to identify critical safety behaviors, perform observations to gather data, provide feedback to each other to encourage improvement, and use gathered data to target system factors for positive change.”⁶ The report states that behavior-based safety has been used successfully for decades in industrial settings to reduce risky behaviors, encourage safe behaviors, and prevent occupational injuries and compensation claims.⁷ However, there have not been many studies of use of the same techniques in the trucking and motorcoach industries, where it is much more difficult to conduct direct behavioral observation and feedback.⁸

Truck drivers, motorcoach drivers and transit operators all generally operate their vehicles independently, without direct supervision. So, it is nearly impossible to have a manager or supervisor monitoring each driver’s actions in person to provide real-time feedback, as would be possible in the manufacturing industry, where many workers are based in the same location and can be overseen directly by managers.

An alternative method of monitoring driver behavior when direct supervision is impractical is asking other drivers to report risky behavior through the use “How’s my driving” safety placards. The TRB reports that these placards are designed to “(a) hold drivers accountable for their driving behavior, (b) reduce crash rates and costs, and (c) provide good public relations by showing other motorists that transport companies care about safety.” These placards allow other drivers to report risky driving behavior, potentially allowing managers to coach drivers proactively before an accident occurs. “Commercial motor vehicle drivers who have ‘How’s My Driving’ safety placards affixed to their vehicles are aware their driving performance is being monitored by other motorists, and thus may feel more accountable.”⁹

The TRB study also discusses the use of “on-board monitoring and recording” devices as a safety tool in the trucking and motorcoach industry, stating, “Given the distributed operations of commercial driving and the difficulties of obtaining reliable, naturalistic observations of driver behavior, one concept is to employ onboard monitoring and recording devices to obtain behavioral and performance observations.”¹⁰

On-board monitoring takes the idea of the “How’s my driving” placard to the next level, and is not reliant on the potentially biased testimony of other drivers. Because drivers know their behavior is constantly being monitored, on-board monitoring systems have the potential to reduce risky driving behaviors that the driver may have

engaged in if there was a perception that no one was watching, in much the same way that many drivers check their speedometer and tap the brakes when they see a police car.

On-board video systems also eliminate the subjectivity of relying on other drivers, or in the case of the transit industry, passengers, to report unsafe driving behavior. One passenger may claim a bus driver took a turn too sharply or stopped too quickly, while the passenger sitting in the next seat may think the driving behavior was perfectly acceptable. With on-board video, “Many behavioral correlates of safe or unsafe driving can be directly measured and recorded, including driving speed, acceleration (longitudinal and lateral), brake use, and driving times.”¹¹

However, the TRB study notes that the most important challenge in applying on-board safety monitoring systems is achieving driver acceptance.¹² “On-board safety monitoring is the ultimate in behavioral observation, but the challenges are to win driver acceptance and establish a positive reward system to reinforce desired performance.”¹³

A 1995 study by Penn + Schoen Associates, Inc., found that commercial drivers were “wary of technologies perceived as invasions of privacy or as diminishing the role of driver judgment,” and were skeptical of new technology. The study also showed that on-board monitoring was “the least accepted technology by the drivers, even though they generally acknowledged its potential safety benefits.”¹⁴

The TRB report notes that it may be possible to improve acceptance of on-board monitoring systems by using them to provide positive feedback and rewards, not just discipline. The report also suggests allowing drivers to engage in self-feedback by allowing only the driver, not management, to review the data captured by on-board monitoring devices.¹⁵ A 2002 study by Hickman and Geller found that instructing short-haul truck drivers to use self-management strategies to monitor their driving behavior resulted in “significant decreases in at-risk driving behaviors (extreme braking and overspeed).”¹⁶

The authors recommend emphasizing that on-board monitoring data could potentially be used to exonerate the driver following a crash or other incidents, and to capture potential security incidents. However, the report also acknowledges that video footage could increase liability if the driver is at fault.¹⁷

The TRB report states that on-board safety monitoring systems are “potentially superior” to existing safety and accident reporting procedures because:

- They can provide objective data on crashes, incidents, and violations, as well as the specific driving behaviors that occurred.
- Drivers can receive reports on their successes, rather than receive reports compiled solely on negative events.
- Detailed individual driving statistics can be used to reward drivers for safe driving behaviors (i.e., incentive programs)

- On-board monitoring can replace time-consuming ride-alongs.
- They allow drivers the opportunity to receive weekly, and even daily, feedback on their driving performance.
- They can be used to address safety behavior and performance issues before a crash, incident, or violation occurs.¹⁸

The authors conclude that “[On-Board Safety Monitoring] technology and behavioral applications are underused in truck and bus transport in relation to their safety potential,” and that the technology should be used in safety training programs to demonstrate that unwanted driving behaviors that are likely to increase the likelihood of an accident.¹⁹

Effectiveness Video-Based Driver Risk Management Systems

Though there have been no formal studies to date examining the effectiveness of video-based driver risk management systems on improving safety in the transit industry, at least one formal study has examined the technology’s impact on safety in the trucking industry.

In April 2010, the Federal Motor Carrier Safety Administration (FMCSA) funded a study conducted by the Virginia Tech Transportation Institute that provides an independent evaluation of the DriveCam video-based driver risk management system at two private trucking firms.²⁰

The report, published in June 2010, evaluated the effectiveness of DriveCam at two firms, labeled “Carrier A” and “Carrier B”. Carrier A was a long-haul carrier located in the Southeastern United States that primarily delivered dry goods, and a total of 50 drivers had the DriveCam system installed in their trucks. Carrier B was a local/short-haul carrier located in the Northwestern United States that primarily delivered beverages and paper goods, and DriveCam was installed in 50 trucks.²¹

Participating drivers drove a vehicle equipped with DriveCam for 17 consecutive weeks while they made their normal deliveries. During a four-week Baseline phase, the cameras recorded safety-related events; however, the feedback light on the driver risk management system was disabled and safety managers did not have access to the recorded incidents to provide feedback to drivers. During the 13-week Intervention phase, the feedback light on the driver risk management system was activated so that drivers knew when an event had been triggered for review, safety managers had access to the recorded safety-related events, and they followed up by coaching drivers on how to prevent potentially unsafe behaviors captured by the DriveCam system.²²

The study found that Carrier A reduced the mean frequency of recorded safety-related events per 10,000 vehicle miles traveled by 37 percent from Baseline to Intervention phase, while Carrier B reduced the mean frequency of recorded safety-related events per 10,000 vehicle miles traveled from Baseline to Intervention

phase by 52.2 percent. The authors of the study state, “The results suggest the combination of onboard safety monitoring and behavioral coaching were responsible for the reduction in mean frequency of events/miles traveled at Carriers A and B.”²³

The study did not show a statistically significant reduction in the severity of safety-related events because the low number of severe events. However, the mean rate of severe safety-related events per 10,000 vehicle miles traveled at Carrier A dropped by 59.1 percent in the Intervention phase compared to the Baseline phase. Drivers at Carrier B reduced the mean rate of severe safety-related events per 10,000 vehicle miles traveled during the Intervention phase by 44.4 percent compared to the Baseline phase.²⁴

The study also showed that, though installation of the DriveCam system alone led to safety benefits, the recommended coaching program improved the results even further, based on feedback received from driver surveys. “The coaching sessions where drivers reviewed a video of a safety-related event resulted in significant safety benefits, whereas the feedback light alone and/or coaching sessions without videos were less robust.”²⁵

The authors of the study concluded that, “Safety benefits on the scale found in this study highlight the potential for [video-based driver risk management systems] to have a robust impact in reducing truck crashes on our nation’s highways.”²⁶

The authors recommended that follow-up research be conducted to determine the cost-benefit and return on investment of the DriveCam equipment, including the costs associated with implementing and maintaining the system, as well as the direct (e.g., damage, health care, etc.) and indirect (e.g., legal fees, insurance costs, etc.) costs associated with reduced crashes and violations.²⁷ The authors of the study state, “If it can be shown that there a significant safety benefit from [DriveCam] and associated cost savings to carriers due to the associated reduction in safety events, then a strong case may be made for the efficacy of [the] program.”²⁸

In 2009, Loomis Armored conducted a six-month pilot study of the SmartDrive system, a competitor to DriveCam, involving more than 2,800 drivers and more than 1,000 vehicles, recording 700,000 events. Loomis saw a 53 percent reduction in collision frequency during the pilot program. They reported “significant per-driver improvements across four important metrics that are leading factors in collisions.” Distracted driving dropped 54 percent, fatigue behind the wheel dropped 56 percent, non-use of seatbelts dropped 68 percent and speeding dropped 53 percent.²⁹

Finally, a 2007 study conducted by the University of Iowa examined the impact of installing the DriveCam system in the cars of newly licensed drivers. Twenty-six drivers, age 16 and 17, were recruited were from a small Midwestern high school in rural Iowa. The DriveCam equipment used in this study was similar, but not identical, to that used in transit buses, and recorded 20-second video clips of each triggered event (10 seconds before, 10 after).³⁰

During the nine-week baseline phase of the study, DriveCam recorders were installed and drivers were informed that a 20-second video clip may be recorded if triggered by abrupt braking or steering maneuvers, but no parental or system feedback was provided. The lights on the DriveCam unit were disabled so drivers had no way of knowing if a video clip was being captured or not. During the six-month intervention phase, drivers received two different types of feedback: from the red and green LED lights on the DriveCam unit that blinked whenever the system was triggered by unusual lateral or longitudinal forces, and from parental feedback based on video clips and a weekly “report card” provided to each driver’s family.³¹

The study found a significant reduction in the number of safety-relevant events during the first nine weeks of the intervention phase, with drivers reducing their rate of safety-related events from an average of 8.6 events per 1,000 miles during the Baseline phase to 3.6 events per 1,000 miles, or approximately 58 percent during the Intervention phase. The group further reduced its rate of safety-related events to 2.1 per 1,000 miles in the following nine weeks (weeks 10 through 18), achieving a 76 percent reduction from the Baseline.³²

The study’s authors conclude that an event-triggered video system, paired with feedback in the form of a weekly graphical report card and video review, can result in a significant decrease in unsafe driving behaviors.³³

On-Board Video Cameras and Right to Privacy

Based on a review of past news articles and discussions with transit agencies using DriveCam, there has been little public debate regarding transit operator privacy concerns related to installation of video-based driver risk management systems in buses. However, the privacy issue has been raised by several transit agencies that have opted not to install cameras, in part because there was fear of union opposition to the systems that would complicate contract negotiations.³⁴ Recently, however, installation of a video surveillance system on a southern California commuter railroad prompted a public debate that pitted employee privacy versus public safety.

In October 2009, the Metrolink commuter rail system began installing “inward-facing” cameras in its locomotives that provided a view of the engineer while operating the train. The Metrolink camera systems, manufactured by Chicago-based Railhead Vision Systems, include three cameras per locomotive – an outward-facing camera to record activity in front of the train and two inward-facing cameras to record the control panels and human activities inside the locomotive cab, including audio.³⁵

Metrolink managers use the cameras to randomly test for compliance with three specific safety regulations: compliance with rules governing use of electronic devices, sleeping, and unauthorized persons in the cab. In addition, camera footage is used to investigate accidents or suspected rules violations.³⁶

The cameras were installed in response to a catastrophic head-on collision between a Metrolink commuter train and a Union Pacific freight train in the city of Chatsworth in 2008 that triggered a widespread ban on electronic devices in the transit industry after the Metrolink engineer was reportedly text messaging when he ran a red signal, causing the crash.

Unlike the video-based driver risk management systems installed on transit buses, the Metrolink cameras save all footage recorded. The footage is available in the event of an incident, and is also randomly reviewed by Metrolink management to test compliance with operating rules.

Shortly after Metrolink installed the cameras, the Brotherhood of Locomotive Engineers and Trainmen (BLET), the union representing Metrolink engineers, issued a statement saying that they had taken legal action in State and Federal Court in California to “halt Metrolink’s illegal audio and video surveillance of its union members inside locomotive cabs.”³⁷

An October 20, 2009 BLET press release states that “installing video cameras inside the locomotive cabs is an invasion of privacy,” and argues that video cameras in the locomotive cab are “an ineffective deterrent to cell phone use and there are far less intrusive and less expensive measures readily available that actually would prevent such use to accomplish Metrolink’s purported goal of improving safety.” Instead of cameras, the BLET proposed installation of a cell phone jamming system that would block all incoming and outgoing calls and messages on personal electronic devices.³⁸

Shortly after Metrolink crash in Chatsworth in 2008, the Federal Railroad Administration addressed the issue of cell phone use by locomotive engineers by issuing Emergency Order No. 26, which prohibits the use of cell phones inside locomotive cabs, except under very specific circumstances.³⁹

The BLET’s lawsuit in Federal court charges that the installation of video cameras inside locomotive cabs violated the Railway Labor Act and that the cameras were installed in violation of the Metrolink’s collective bargaining agreement with the BLET. The union also asserted that the installation of cameras violates federal wire tap laws as well as the Federal Rail Safety Act of 1970, and that Federal law “pre-empts Metrolink’s attempted safety and policy making efforts.”⁴⁰ The federal case is still pending.

In the state court, the BLET asserted that in-cab cameras represent a “severe breach of the State of California’s constitutional right to privacy, and that they violate the due process rights of BLET members, the California Labor Code, and that SCRR/Metrolink lacks rulemaking authority under California law.”⁴¹ In June 2011, a Los Angeles Superior Court Judge ruled that there was no evidence that Metrolink had violated its engineers’ constitutional rights to privacy and due process by installing in-cab cameras. The judge dismissed the BLET’s breach of privacy allegation, saying that the union “cannot reasonably expect to establish that the cameras are highly offensive and violate social norms” especially when installation of

the cameras was “prompted by the legitimate goals of protecting the public and determining the cause of any accident.”⁴²

The National Transportation Safety Board (NTSB) had a much different view of Metrolink’s move to install cameras capable of monitoring engineers, publically lauding the action. In a January 2010 report on the Metrolink Chatsworth crash, the NTSB acknowledges the concern that the cameras may intrude on a railroad employee’s individual right to privacy, but argues that public safety takes precedence:

Concerns about individual privacy have typically influenced decisions about the installation and use of audio or image recorders to record crewmembers at work. However, the NTSB does not believe that employee privacy should take precedence over public safety given the many accidents and incidents, in all transportation modes, that the NTSB has investigated that involved vehicle operator distraction. Workers in safety-critical positions in all industries should expect to be observed in the workplace, just as most employees should expect their employers to be able to monitor such activities as e-mail and Web browsing during work hours. The argument for complete privacy in settings such as a locomotive cab, where lives of many are entrusted to the care of one, is not persuasive.⁴³

In her concurring statement on the 2010 NTSB report on the Metrolink crash in Chatsworth, NTSB Chairman Deborah A.P. Hersman notes that “Today, video recorders are everywhere, and we accept them. Video cameras record us at the ATM and record bank tellers at work. Whether we are in a casino in Las Vegas or at Walmart, there are cameras recording our every move. Even our Board meetings are webcast so that others may observe our work and monitor how well we are doing our job.”⁴⁴

Hersman goes on to state that in transportation, cameras have long been accepted for safety and security purposes: “In many cities, our children and their bus drivers are recorded on school buses for behavioral reasons ... Motor coaches have inward facing cameras, which we have used in our investigations to correlate driver actions, vehicle performance and evidence from the roadway.”⁴⁵ Chairman Hersman goes on to conclude that in-cab cameras may be considered an intrusion, but that they are a necessary one in the eyes of the NTSB:

Yes, it’s an intrusion. Yes, it affects privacy. But when individual behaviors endanger the lives of the traveling public, we are obligated to do everything possible to ensure their safety. ... Professionalism is doing the right thing when nobody is watching. But as the Chatsworth investigation uncovered, this particular engineer was not likely to do the right thing unless he thought somebody was watching.⁴⁶

The 2009 pilot study of the SmartDrive system at Loomis Armored prompted similar privacy concerns by drivers at the company. In an interview with a trucking industry trade publication, Loomis' senior vice president of risk management stated that, "We had a concern on how employees would react to the possibility of 'Big Brother' looking over their shoulders ... However, I found there is no substitute for good communications ... We knew not everyone would be 100 percent sold on the idea ... We had to make sure we explained the benefits to them." Video surveillance of professional drivers is "to put it nicely, resented across much of this industry," according to the article's author, who goes on to state, "most drivers consider themselves professionals and are deeply offended when the talk turns to the use of in-cab video to monitor their performance on a second by second basis."⁴⁷

Union Viewpoint

Unions representing transit operators appear to have mixed feelings about the use of video-based driver risk management systems to monitor transit operator performance. In general, however, unions are accepting of the technology if it is used primarily for training and coaching purposes, and not as a discipline tool.

The Amalgamated Transit Union (ATU) is the largest labor union representing transit workers in the United States and Canada, with more than 190,000 members in 264 local unions spread across 44 states and nine provinces.⁴⁸ ATU Communications Director Shawn Perry stated that use of DriveCam is considered by ATU on a case-by-case basis in each individual contract. However, he stated that when DriveCam is used, contracts typically explicitly state that the cameras are there to ensure operator safety and not to be used for disciplinary purposes.⁴⁹

Teamsters Local 952, which represents Veolia operators providing paratransit service in Orange County, Calif., first became acquainted with DriveCam in 2006 when Veolia was hired by the Orange County Transportation Authority to provide its ACCESS paratransit service. The Teamsters stated that they are often wary of new technology that could potentially hurt union members, and that they agreed to use of DriveCam as a training and accident investigation tool, not a means to impose disciplinary measures. However, if an operator commits an egregious violation, or is involved in an at-fault accident, DriveCam footage can be used to support disciplinary measures, though the union still maintains the right to grieve and arbitrate any disciplinary measure imposed on one of its members.⁵⁰

The Teamsters acknowledged that there was initially a lot of distrust and suspicion about the DriveCam system, but over time, its members have come to understand how DriveCam operates and how it can work to their benefit, so that they are no longer "afraid of DriveCam." They said it was important to control who has access to DriveCam footage, however, to protect transit operator privacy.

The Teamsters stated that DriveCam has proven beneficial in the case of accidents involving its members. Previously, they said, transit operators were often blamed for

accidents and had no way of proving their innocence. Since DriveCam was installed, there have been a number of incidents where the video footage clearly showed the transit operator was not at fault. The Teamsters believe that DriveCam has “helped more than hindered” its members, and that the majority of the time DriveCam footage actually exonerates the transit operator after an accident or passenger complaint.

PROBLEM STATEMENT

Although several past research studies have explored the impact of using behavior-based techniques, including video recording devices, to improve safety in the trucking and motorcoach industries, there have been no published reports regarding the use of such technology in the public transit industry. This report attempts to synthesize data from the U.S. transit agencies currently utilizing video-based driver risk management systems to determine if there is a pattern that indicates the cameras are an effective tool to enhance safety by preventing risky driving behaviors, thus reducing the frequency and severity of collisions and injuries. In addition, this report will attempt to identify best practices that could contribute to the success of video-based driver risk management systems if implemented in the transit industry on a more widespread basis.

RESEARCH FINDINGS

The following section includes case studies of six public transit agencies in the United States currently using video-based driver risk management systems on their directly operated fixed-route bus fleets: Capital Metro (Austin, Texas), Los Angeles County Metropolitan Transit Authority (Metro), New Jersey Transit, Pace Suburban Bus (suburban Chicago), San Francisco Municipal Railway (Muni), and Washington Metropolitan Area Transit Authority (WMATA).

In addition, it includes information gathered from three private firms providing contracted fixed-route and paratransit bus service to public agencies: First Transit, MV Transportation and Veolia Transportation. With the exception of Metro in Los Angeles, all agencies profiled use the DriveCam system.

Case study findings are based primarily on interviews conducted safety or operations managers at each agency, as well as on publicly available documents and news articles. Unless otherwise stated, opinions in this section represent views of the individual agencies being described, not the author of this report.

Table 1: List of U.S. transit agencies using video-based driver risk management systems

Agency	City	# of Vehicles	Date installed	Camera system
MV Transportation	Multiple	4,700	2004* 2009	DriveCam
New Jersey Transit	Multiple	800	2005** 2007	DriveCam
Veolia	Multiple	3,400	2005-2010	DriveCam
Pace Bus	Suburban Chicago	700	2006** Early 2010	DriveCam
First Transit	Multiple	6,000	Late 2006***	DriveCam
Capital Metro	Austin, Texas	400	Late 2007	DriveCam
SF Muni	San Francisco	860	Late 2009	DriveCam
LA Metro	Los Angeles	2,411	Early 2010	SmartDrive
WMATA	Washington, D.C.	1,500	Late 2010	DriveCam

*Began with self-review model in 2004, transitioned to managed services model in 2009

**Initial installation as pilot program with limited number of vehicles

***Began with self-review model, in process of transitioning all vehicles to managed services model

Capital Metro⁵¹

Agency Overview

Capital Metro provides public transit service to the city of Austin, Texas. It operates a fleet of more than 400 buses on 90 routes serving 3,300 stops, and provides an average of 140,000 trips each weekday.⁵²

System Implementation

Capital Metro opted to move forward with installation of the DriveCam system in August 2007, when the agency's Board of Directors approved a \$785,000 contract with DriveCam for the purchase of DriveCam's Driver Risk Management solution. Capital Metro currently has the DriveCam system installed on approximately 400 fixed-route and paratransit buses, as well as non-revenue vehicles. The DriveCam system went into operation in November 2007.

At first, Capital Metro struggled to gain union acceptance of DriveCam. They also struggled with vandalism of the cameras, with operators attempting to move or obstruct the cameras, or even smear grease on them.

Capital Metro uses DriveCam primarily as a training and coaching tool, but also imposes disciplinary measures for egregious unsafe driving behaviors captured by the system. Capital Metro also instituted a program to reward "event-free" driving. Each month, operators who "keep it green" by not triggering the DriveCam system and avoid preventable accidents are entered into a drawing, and 30 operators receive gift cards. In addition, Capital Metro staff selects six exhibits of superior driving behavior each month captured on DriveCam and awards each driver featured with a gift card.

Capital Metro relies heavily on DriveCam footage in its quarterly safety meetings. Each quarter, Capital Metro staff introduces a theme for the safety meeting and pulls DriveCam clips supporting the topic. They have found that seeing a video of a peer driver engaging in a risky driving behavior – or a commendable one – is an extremely effective training tool. Staff does conceal the operator's face before the clip is shown in training to prevent any harassment of the operators featured, though they noted that often, operators will voluntarily stand up and admit they are the one in the video.

Results

When it approved the installation of DriveCam, Capital Metro stated that DriveCam would allow the agency to "improve its level of safety by predicting and preventing unsafe driving habits, ultimately lowering collision rates."⁵³ They estimated that the system would reduce operating and collision costs, resulting in savings to the agency of at least \$940,000 over five years.⁵⁴

Officials at Capital Metro report that, though they have seen a reduction in insurance costs and the severity of accidents since the implementation of DriveCam, it has not fully accomplished all of the initial goals set for the system, and detailed above. However, DriveCam has proven to be a valuable training tool and has given Capital Metro insight into issues with operators that they would not have known about before DriveCam.

Capital Metro has seen a reduction in the frequency of “scored events” since DriveCam was implemented, and has captured operators falling asleep, violating traffic laws, and using personal electronic devices while driving that likely would not have been caught otherwise. Though they stated they haven’t seen a clear reduction in the frequency of accidents, Capital Metro has seen a noticeable reduction in accident severity. Capital Metro officials noted that they were surprised when they saw an increase in accident frequency when DriveCam was first installed, but believe that was because minor accidents that previously went unreported by transit operators were now being captured by DriveCam and reported.

Lessons Learned

Capital Metro said they have struggled with DriveCam’s event scoring system, and in October 2010, hired a part-time retired bus operator to begin reviewing all DriveCam triggered events, rather than relying on DriveCam to review and score all events before Capital Metro receives them through the managed services program. Capital Metro currently receives about 100 triggered events per day, but must sort through them individually, as many turn out to be “non-events”.

Officials at Capital Metro stressed the importance of clearly communicating with operators about what DriveCam is and how it will be used, and providing continual education about how to improve driving habits. They also recommended a so-called carrot and stick approach that balanced any disciplinary measures for unsafe driving behavior captured by DriveCam with a rewards program for good behavior. In addition, they recommended limiting access to DriveCam to the safety and training departments rather than giving full access to the operations department to protect privacy and help improve driver acceptance of the system.

NTD Safety Data Trends

Capital Metro collision and passenger injury data recorded in NTD’s Safety and Security Time Series show that collisions per million vehicle revenue miles on Capital Metro’s directly operated fixed-route fleet fell by nearly 50 percent between 2007 and 2009, but increased back to 2007 levels in 2010. Passenger injuries per million vehicle revenue miles decreased by 53 percent between 2007 and 2010. Though further analysis should be conducted after DriveCam has been in place at Capital Metro longer, there appears to be a correlation between the implementation of DriveCam in November 2007 and the subsequent decrease in reportable accidents and passenger injuries.

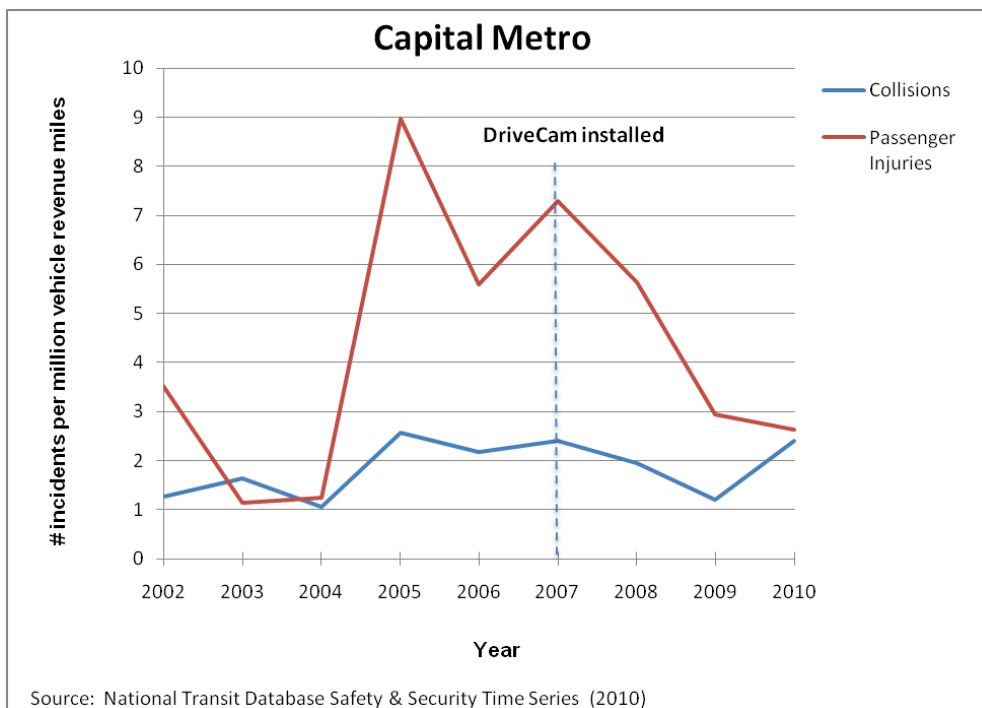


Figure 5: Capital Metro collisions and passenger injuries per million vehicle revenue miles (2002-2010).

Los Angeles County Metropolitan Transportation Authority⁵⁵

Agency Overview

The Los Angeles County Metropolitan Transportation Authority (Metro) operates a fleet of more than 2,400 buses serving a 1,433 square mile area of Los Angeles County on 183 bus routes, with nearly 366 million annual boardings, or more than 1.1 million boardings each weekday.⁵⁶

System Implementation

Metro currently has 2,411 buses equipped with the SmartDrive camera system, which it started to deploy in September 2009. Similar to DriveCam, SmartDrive continuously records footage of the bus operator, but a video clip is saved only when g-forces exceed a predetermined threshold due to sudden movements such as swerving and braking, the bus exceeds 72 mph, or operator uses the manual event button to trigger a video to be saved.

Like DriveCam, the SmartDrive recorder is attached to the windshield behind the rearview mirror and contains a forward and inward facing wide-angle camera with a 280-degree view. The recorder captures video, audio, speed, and location, and each event is recorded for a total of 30 seconds, 15 seconds before and after each incident.⁵⁷

Metro notes that in contrast to a video surveillance system, which saves 100 percent of captured video, driver risk management systems like SmartDrive and DriveCam typically save less than 1 percent of the video recorded, and the number of incidents saved tends to decline as operators adjust their behavior in response to the system's presence, so the system is actually less intrusive than most other video surveillance systems.⁵⁸

The main objective of Metro's "inward-facing" camera program was to improve operational safety and reduce traffic accidents by increasing operators' awareness of their unsafe driving habits and coaching them to modify these unsafe driving behaviors. It is also used as a bus operator training tool and is an additional resource for accident investigations.

Metro currently only uses SmartDrive for training purposes, but noted that executive management is working with bus operator unions to be able to use SmartDrive video for disciplinary action as well.

Results/Lessons Learned

Since SmartDrive was installed, Metro says it has seen a significant reduction in the number of triggered events, and up to a 30 percent reduction in events with safety concerns. However, they have not yet seen a significant or consistent reduction in

accidents that can be attributed to implementation of SmartDrive.

Some Metro bus operators were strongly opposed to the system and saw it as an invasion of privacy. However, they noted that new operators are typically much more receptive to the system as a tool to help them identify, modify and improve their unsafe driving behavior, while more senior operators see it as just another way for management to look over their shoulder.

NTD Safety Data Trends

The most recent NTD data available at the time this report was prepared included accident and injury reports through calendar year 2010. Metro did not fully deploy DriveCam on its bus fleet until early 2010, so the data will not yet show a meaningful trend.

New Jersey Transit⁵⁹

Agency Overview

Covering a service area of 5,325 square miles, New Jersey Transit (NJ Transit) is the nation's third largest provider of bus, rail and light rail transit, linking major points in New Jersey, New York and Philadelphia. The agency operates a fleet of 2,150 buses, 711 trains and 45 light rail vehicles. NJ Transit provides nearly 223 million passenger trips each year on 236 bus routes and 11 rail lines statewide.⁶⁰

System Implementation

NJ Transit first tested DriveCam as a pilot program in 2005-06 before moving to a wider implementation in 2007. Currently, approximately 800 of NJ Transit's 2,150 buses are equipped with DriveCam. They eventually plan to equip the entire fleet with DriveCam. They estimated that it cost approximately \$2,500 to equip each bus with DriveCam and \$600 per bus in annual operating costs.

NJ Transit initially faced some union opposition to DriveCam due to privacy concerns and fears that DriveCam would lead to more strict disciplinary measures. However, the union representing NJ Transit bus operators ultimately decided that DriveCam was likely to help operators as much as hurt them, and that DriveCam provided an added safety measure for operators because they could manually trigger a video clip to be saved with an emergency switch.

Results/Lessons Learned

Since the implementation of DriveCam, NJ Transit reports a "significant" decrease in scored events, and noted that they have seen an especially noticeable reduction "egregious" safety violations. Before DriveCam, NJ Transit staff had to follow up on complaints about risky driving by sending staff on undercover rides. They stated that NJ Transit has approximately 3,700 bus operators and only two staff members doing undercover ride-alongs.

Officials at NJ Transit noted that DriveCam is a very effective training tool, both in one-on-one training with operators, as well as a "show and tell" exhibit at regular safety meetings that all bus operators are required to attend.

NJ Transit stated that DriveCam has helped reduce claims costs, though they could not quantify exact reductions. They said that they have found DriveCam to be a valuable risk management tool by minimizing or eliminating fraudulent or exaggerated injury and accident claims. They could not provide return on investment statistics for DriveCam, but said it tends to fluctuate from quarter to quarter.

According to NTD statistics, NJ Transit saw a reduction in the number of collisions on its directly operated fixed-route buses from 175 in 2007 to 66 in 2010. In addition,

the number of passenger injuries fell from 331 in 2007 to 95 in 2010.

Because less than half of the NJ Transit fleet is currently equipped with DriveCam, NJ Transit officials noted that some operators intentionally bid on jobs out of garages where buses are not yet equipped with DriveCam. The ultimate goal is to equip all buses with DriveCam, as they feel only having a portion of the bus fleet equipped with DriveCam is less effective than 100 percent coverage.

NTD Safety Data Trends

NJ Transit collision and passenger injury data recorded in NTD's Safety and Security Time Series show that collisions per million vehicle revenue miles on NJ Transit's directly operated fixed-route fleet fell by nearly 59 percent between 2006 and 2010, and passenger injuries per million vehicle revenue miles decreased by nearly 45 percent during the same period. Though NJ Transit has only deployed DriveCam on about half of its fixed-route buses, there appears to be a correlation between the implementation of DriveCam in early 2007 and the subsequent decrease in reportable accidents and passenger injuries. Further analysis should be conducted after DriveCam has been in place at NJ Transit longer, especially if it is expanded to the entire fixed-route fleet.

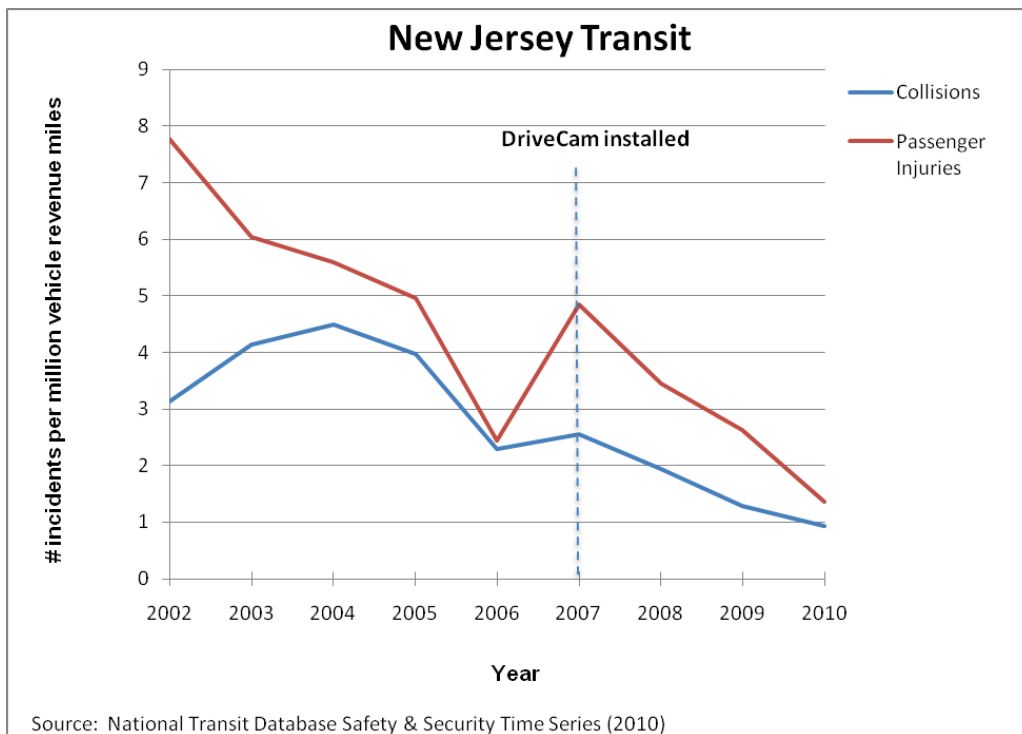


Figure 6: NJ Transit collisions and passenger injuries per million vehicle revenue miles (2002-2010).

Pace Suburban Bus Service ⁶¹

Agency Overview

Pace Suburban Bus Service (Pace) provides public transit service over a 3,500 square mile area in Chicago suburbs, including fixed-route bus service, vanpools and Dial-a-Ride paratransit programs. Pace operates 193 bus routes with an annual ridership of more than 35 million.⁶²

System Implementation

Pace first launched the DriveCam program in 2006 as a pilot project at one of its nine operating divisions, installing cameras on 40 of its approximately 700 fixed-route buses. The division where DriveCam was installed previously had the highest percentage of preventable accidents, but saw a noticeable decrease in incidents after DriveCam was installed.

As a result of the successful pilot program, in early 2010, Pace approved equipping the remainder of its fleet of 700 buses with DriveCam, and is also considering installing DriveCam on its paratransit fleet, which is currently operated by a private contractor.

Pace initially introduced DriveCam as a training and learning tool for bus operators, which is still its primary purpose. However, if DriveCam catches a flagrant rule violation or traffic infraction, a progressive discipline report is filed against the operator.

A safety manager at each of the nine Pace operating divisions is assigned to review DriveCam clips on a daily basis and provide coaching to operators on scored events, ideally within four days. The Executive Director of Pace also has access to DriveCam and likes to keep tabs on coaching efficiency at each division to ensure that frontline managers are taking action on incidents captured by DriveCam and providing coaching and training.

Pace uses DriveCam to recognize good behavior as well as bad, and has a “Zero Accident Challenge” with prizes to the safest operators. They also present a certificate to operators who demonstrate safe, defensive driving during an incident captured by DriveCam. Though Pace uses DriveCam clips in training, they generally don’t use clips from their own agency due to privacy concerns, as they believe DriveCam clips could be considered part of an operator’s personnel record.

Results/Lessons Learned

Pace reported that they have now seen 15 consecutive months of reductions in preventable accidents compared with the same month the previous year, as well as a “dramatic decrease in number and frequency of risky driving behaviors,” which Pace officials say “plummeted” after DriveCam was installed on the entire fixed-route fleet.

Pace reported few issues with DriveCam's analysis of triggered events, stating that though they sometimes disagree with DriveCam's assessment and scoring of an individual event, "more often than not DriveCam is right."

As at other transit agencies using DriveCam, Pace reported some union issues with the program, including several outstanding grievances that have been filed, but said, by and large, union acceptance of DriveCam was not a major sticking point.

Pace also saw some backlash from operators after cameras were installed, including operators pulling down sun visors to block the camera lens and attempting to tamper with or disable the cameras. Pace officials report that a lot of their operators were "disgruntled" when the cameras were installed because they did not want their every move captured on video.

Pace reports that DriveCam has been useful in combating fraudulent claims from passengers and operators, and that video footage has even helped dismiss traffic tickets. They cited an example where a Pace bus operator was ticketed for a red light violation, but was able to pull DriveCam footage to show that the light was in fact not red when he entered the intersection. Though Pace acknowledged that having a video of an incident could be a potential liability in some cases, they said they would rather know exactly what happened, and if a Pace operator is at fault, have all the facts so they can reach a settlement in the case.

NTD Safety Data Trends

The most recent NTD data available at the time this report was prepared included accident and injury reports through calendar year 2010. Pace Bus did not fully deploy DriveCam on its bus fleet until mid-2010, so the data will not yet show a meaningful trend.

San Francisco Municipal Railway⁶³

Agency Overview

The San Francisco Municipal Railway (Muni) is the seventh-largest public transit system in the United States, as measured by ridership. Muni has approximately 700,000 boardings on an average weekday. Its fleet of about 1,000 vehicles, over half of which are electric, consists of subway-surface light-rail vehicles (Metro streetcars), electric trolley buses, diesel buses, and the world-famous cable cars.⁶⁴

System Implementation

In November 2009, Muni activated DriveCam on its “rubber-tire” fleet of 860 fixed-route buses operating out of five separate bus divisions.

Muni planned to use DriveCam as a tool to improve driving behavior, assess liability from collisions, and reduce expenses incurred from incidents including vehicle damage, and worker’s compensation and personal injury claims.⁶⁵

Muni approved a \$1.2 million contract with DriveCam that covered the installation of cameras and a one-year subscription to the DriveCam service which includes technical support and analysis. “This state-of-the-art system is an important new tool to improve the safe operation of Muni vehicles,” said Nathaniel P. Ford Sr., SFMTA Executive Director, in a press release. “The activation of DriveCam represents a continuation of the ongoing commitment to the safe and reliable operation of Muni.”⁶⁶

“Operators who engage in unsafe behavior must be trained or disciplined,” said James Dougherty, Muni Director of Safety, Security and Enforcement, in the press release. “DriveCam will serve as a vital component of our training system.”⁶⁷

Muni uses DriveCam’s managed services program, where all triggered events are screened at a DriveCam review center, and valid events are analyzed and scored based on the severity of the risky driving behavior. However, Muni conducts a second level of review once the clips are made available by DriveCam. They employ two part-time employees, both retired traffic officers from the San Francisco Police Department, who review the log of events scored by DriveCam staff for accuracy at all five bus divisions each day. The two employees sort out vehicle code violations from Muni policy violations, which are handled separately.

Muni staff noted that when DriveCam was first introduced, there was a lack of driver training and awareness, and many misconceptions about the purpose of the cameras, including that managers could watch video feed real-time to “spy” on operators. DriveCam was initially presented to the union representing Muni bus operators purely as a training and safety tool for the operators. Operators could push a manual button to record an event if they were harassed or assaulted by a passenger to keep a record of the event.

When the system was introduced, Muni instituted a grace period of several months where no actions taken on the events captured by DriveCam until operators became more comfortable with it. Muni said they did not have specific goals for DriveCam in terms of accident reduction, but believed that the program would improve safety and drive down overall risk.

Results

At first, the DriveCam program was not welcomed by managers in the bus operations department because it was viewed as “entailing a lot more work.” Word quickly spread among operators that management would not actively follow up on risky events captured by DriveCam, and Muni did not see a noticeable decline in the number and severity of scored events. According to Muni staff, the agency was not using DriveCam to its full extent for the first six months or so.

After several managers in the bus operations department retired and new managers were hired, Muni management’s view of DriveCam began to change. A new superintendent of bus operations was hired who was much more aggressive about taking action on incidents captured by DriveCam that previously had been ignored.

Instead of simply being sent to the training department, all clear vehicle code violations captured by DriveCam are now sent to division superintendents in bus operations for action according the Muni progressive discipline policy, which, per the collective bargaining agreement, requires that management has 14 days from the incident date to take action.

Once Muni began taking action on the incidents they were seeing on the DriveCam system, they saw dramatic results, including a significant decline in scored events, which dropped by more than half. Muni staff reported that during the first several months DriveCam was in place, they were seeing 200 to 300 scored events per day of operators exhibiting risky behavior. After word got out to operators that Muni was serious about following up on scored events, the number dropped to between 20 and 30 incidents per day. Cell phone violations were not easily tracked before DriveCam, but now have fallen to one a month.

In July 2010, Muni stated that the agency had seen a 33 percent reduction in the number of “scored events” captured by DriveCam and a 35 percent decrease in the severity of the incidents. Muni also used DriveCam footage to establish a driver recognition program called “Champions of Safety,” identifying 250 operators who had exhibited exemplary driving skills captured by DriveCam.⁶⁸

Muni’s most common violation used to be rolling through stop signs, which was captured by DriveCam an average of 100 times per day. At the time, the protocol was that a driver who rolled through a stop sign should be coached to avoid the behavior in the future. Now, Muni sends these, and all other vehicle code violations such as running a red light, excess speed, or cell phone use, directly to disciplinary

proceedings. As a result, Muni now sees an average of two to three stop sign violations per day on DriveCam.

Lessons Learned

Discipline has been the key to seeing results, according to Muni staff. However, tying disciplinary measures to DriveCam has also prompted objections from the union representing Muni operators, which is “attempting to negotiate DriveCam out of existence.”

Though Muni is generally pleased with the results they have seen after implementing DriveCam, they noted that they often disagree with the event assessment and score provided by DriveCam and have to ask DriveCam to rescore events that they feel were not accurately categorized. For example, Muni buses are permitted to make “flag stops” which are designated with a pavement marking, rather than a bus pole. Operators making flag stops were being flagged by the DriveCam system as making unsafe stops at least 50 to 60 times a day. DriveCam had to revise the software to account for this unique feature of the Muni system.

Muni found a similar problem with its electric buses, which operate on rubber tires, but are powered by poles extending from the roof of the bus to overhead wires. When the power pole disconnects from the wire, operators are instructed to stop immediately where they are to ensure wires are not damaged. DriveCam was scoring these unanticipated stops as “risky and unsafe,” and Muni stated that they have been working with DriveCam to eliminate such “detrimental language.”

Though Muni acknowledges that video can be a liability in some instances if the Muni driver is shown to be at fault in an accident, they have found that the majority of the time the video footage exonerates Muni and helps them reduce costs.

Overall, Muni states that they have been very happy with DriveCam and that the system has definitely met expectations and been a positive development for the agency. However, they hope to work to customize the system, and particularly the DriveCam event assessment and scoring system, to address the specific operating conditions and rules at Muni.

NTD Safety Data Trends

According to NTD statistics, Muni saw a reduction in the number of collisions on its directly operated fixed-route buses from 37 in 2009 to 19 in 2010. In addition, the number of passenger injuries fell from 140 in 2009 to 38 in 2010.⁶⁹

Muni collision and passenger injury data recorded in NTD’s Safety and Security Time Series show that collisions per million vehicle revenue miles on Muni’s directly operated fixed-route fleet fell by 49 percent from 2009 to 2010, and passenger injuries per million vehicle revenue miles decreased by nearly 73 percent during the

same period. Though this dramatic decrease in collisions and passenger injuries supports the type of results cited by Muni staff after the implementation of DriveCam, the cameras must be in place for a longer time period in order to identify any meaningful trends related to safety improvements.

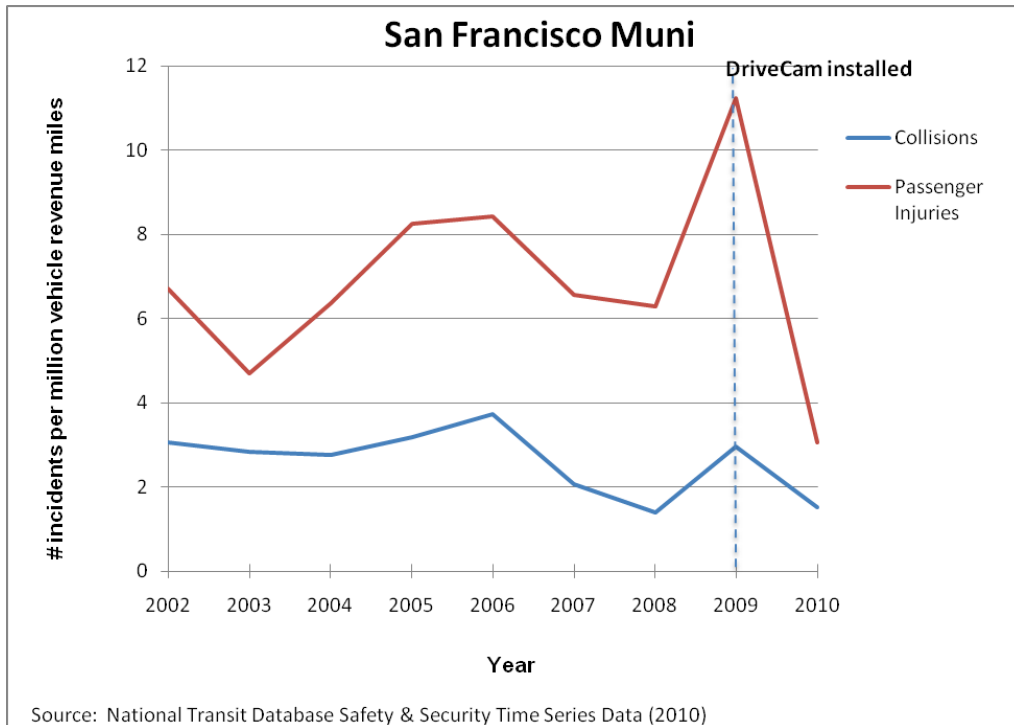


Figure 7: Muni collisions and passenger injuries per million vehicle revenue miles (2002-2010).

Washington Metropolitan Area Transit Authority⁷⁰

Agency Overview

The Washington Metropolitan Area Transit Authority (WMATA) operates the second-largest rail transit system and the sixth-largest bus network in the United States, providing 123.7 million trips in 2010. Metrobus operates 24 hours a day, seven days a week with 1,500 buses on 319 routes. WMATA transports more than a third of the federal government employees to work and takes millions of tourists to local landmarks. Metrorail and Metrobus serve a population of 3.5 million within a 1,500 square-mile area in the District of Columbia as well as Maryland and northern Virginia.⁷¹

System Implementation

WMATA began installing the DriveCam system in August 2010, and by the end of 2010, had rolled out DriveCam on its entire fleet of approximately 1,500 buses.⁷² The installation of DriveCam was part of a five-year, \$3 million program to monitor bus driver performance and improve safety.⁷³

“Because the operator knows the camera will be watching him or her, they will try to minimize the times the system is triggered, and it will lead them to be more alert,” said Jack Requa, Metro’s assistant general manager of bus service in a press release announcing the installation of DriveCam. “When we had the opportunity to do both [security cameras and DriveCam], we jumped on it, because we know others had used it and it had a pretty drastic impact on reducing accidents,” he said. Along with the training and safety benefits, Metro officials said, the system is expected to help prevent damage to buses, and reduce workers’ compensation claims and injuries.⁷⁴

WMATA officials reported an initial investment of approximately \$3 million to equip 1,500 buses with the DriveCam system. This included the cost of installing the cameras as well as three years of call center support. WMATA reports that ongoing operations and maintenance costs associated with the DriveCam system as about \$1.2 million for hardware maintenance and \$800,000 for annual monitoring costs. Under WMATA’s agreement with DriveCam, all camera maintenance is performed by a third party.

WMATA looked at past accident records to determine how to phase in DriveCam at its nine bus divisions, starting with the divisions that had this highest number of incidents. Most Metro buses were already equipped with separate security camera systems focused on the passenger seating areas.⁷⁵

WMATA officials reported that the agency’s interest in implementing a driver risk management system stemmed from a couple major accidents involving its buses. They were looking for a tool that would make a “positive impression” on the safety

culture of the agency, reduce accidents and exposure to claims, and positively affect the agency's image, which had been tarnished by its past safety record.

WMATA first used DriveCam to grade existing operators on a scale of 0 to 5 stars. They opted not to begin using DriveCam to discipline operators until they had been trained and coached to improve to a grade of 4 or 5 stars. WMATA reports that it has been able to achieve an average 4 to 5 star rating in all of its bus divisions.

WMATA officials met with the Amalgamated Transit Union (ATU), which represents WMATA bus operators, prior to installing DriveCam and reported no significant union opposition to installation of the cameras. WMATA officials noted that it helped to explain that the cameras would primarily be used as a coaching and training tool, though they could also be used to discipline operators when the circumstances warranted.

ATU Local 689, which represents most Metro transit operators, did not object to the cameras, but said they were too narrowly focused on driver skills. They argued broader safety measures are needed, including assigning more police officers to prevent assaults on bus operators.⁷⁶

However, WMATA reported some tampering and attempted disabling of cameras by operators, and implemented a rule that imposes a one-day suspension after the first tampering offense and termination after the second offense.

Results

In general, WMATA officials report that the DriveCam system has exceeded expectations. They were especially impressed with the "real-time metrics" that the system provides, which allows prompt follow-up after any triggered events. They report that an upcoming version of the DriveCam system will also offer vehicle location and speed.

After the first three months using DriveCam, WMATA officials reported a "dramatic drop" in risky driving behavior, which they believe will lead to a reduced number of collisions and passenger injuries in the future. They expect to see a return on investment through reduced claims and lower fuel costs due to less aggressive driving. Each WMATA division has individual goals tied to a reduction of accidents.

After installing DriveCam on its bus fleet, WMATA opted to expand the system to its non-revenue vehicles, as well, including supervisor and maintenance vehicles and police cars.

Lessons Learned

Like other transit agencies using DriveCam, WMATA officials noted the importance of training and “coaching” in achieving results with the DriveCam system. WMATA attempts to provide coaching to operators within four days of a triggered incident.

WMATA noted that in implementing DriveCam, it was important to establish a strong program manager role, as well as technical staff behind the scenes. WMATA officials also said that there needed to be some consequence through progressive discipline tied to the implementation of DriveCam in order to spur behavior change, coupled with leadership metrics that recognized positive behaviors.

NTD Safety Data

The most recent NTD data available at the time this report was prepared included accident and injury reports through calendar year 2010. WMATA did not fully deploy DriveCam on its bus fleet until August 2010, so the data will not yet show a meaningful trend.

First Transit⁷⁷

Overview

First Transit is the nation's leading bus transportation provider, operating 75,000 buses in North America. It provides fixed-route, paratransit and shuttle bus service for public transit agencies throughout the United States. With more than 50 years of experience across North America, First Transit has customers including transit agencies in Los Angeles and Houston; universities such as Texas State and Princeton; and state transportation departments such as Illinois and Connecticut. First Transit transports 300 million passengers each year and logs more than 313 million annual fleet miles.⁷⁸

System Implementation

First Transit began using DriveCam in late 2006, just prior to purchasing competitor Laidlaw Transit in 2007. First Transit currently has DriveCam installed on approximately 6,000 buses at transit agencies across the United States, including 3,700 using the DriveCam managed services program and 2,300 on the older self-review system. They are planning to convert all vehicles to the managed services system by the end of the calendar year. First Transit is also helping to develop and pilot an updated version of the DriveCam system for the transit industry that includes more visual indicators that provide the transit operator with instantaneous feedback and allow him to track his driving performance real time.

First Transit uses DriveCam primarily for coaching and training purposes rather than discipline, but managers will take disciplinary action on serious events captured by DriveCam. They have created "leagues" that allow each transit operator to see how he/she compares with peers at the same agency based on DriveCam driving performance data, while keeping personal information anonymous. First Transit uses data from DriveCam to reward and incentivize employees for greener and safer driving.

First Transit relies on DriveCam to reinforce the five keys of the Smith System for safe driving⁷⁹, however, they do not use clips from their own agency during safety meetings, as they want to avoid having DriveCam become a "shaming tool." They did not experience any major complaints from unions related to the roll-out of DriveCam.

Results

First Transit's senior vice president of safety stated that he believes "very strongly" in DriveCam technology and believes it can have "transformational power" at transit agencies when implemented correctly. He stated that DriveCam brings an extensive database of driving behavior to the table, including more than 2.5 billion miles traveled and 20 million examples of collisions and precursors to collisions.

First Transit said it has seen much better results at properties using DriveCam's managed services program compared with those using the self-review program. They believe this is because the managed services model reduces the workload for the management team assigned to each transit agency and allows them to focus on critical events captured by DriveCam to ensure they are dealt with appropriately. They also claim DriveCam has helped First Transit improve fuel savings.

First Transit stated that they have seen up to a 50 percent reduction in risky driving behavior at transit agencies that have implemented DriveCam after only two months. For example, First Transit properties that had an accident frequency rate of 10 collisions per million miles traveled saw a decrease to 6 collisions per million miles traveled after the implementation of DriveCam.

First Transit pointed to the city of Houston's fixed-route bus system as an example of a "smashing success" where DriveCam helped to improve safety and drive down accident rates. Before DriveCam was implemented, Houston was one of the worst-performing transit properties in the First Transit system with a high number of collisions. After DriveCam was implemented on Houston's fixed-route fleet in 2007, Houston's accident frequency rate dropped dramatically, nearly in half. First Transit stated, "Without a doubt, DriveCam reduced accidents [in Houston] in a significant way." NTD data supports this assertion, as the number of collisions dropped steadily from 40 in 2006 to 20 in 2009 while vehicle revenue miles remained consistent across the four-year period.

Lessons Learned

Representatives at First Transit believe the primary hurdle to overcome with DriveCam is ensuring that the management team is prepared to act on the wealth of information that the DriveCam technology makes available. At First Transit, every member of the management team has access to the DriveCam dashboard at the local, regional or corporate level, depending on their position, so they can track performance and compare their group's performance to properties in other areas of the nation.

First Transit also emphasized that transit agencies planning to implement DriveCam should engage unions and transit operators early to explain the system, its goals, and dispel any misconceptions. Rollout of DriveCam should not be rushed, and they recommend that managers work closely with employees to alleviate any fears or concerns.

MV Transportation⁸⁰

Overview

MV Transportation (MV), based in Fairfield, Calif., operates contracted fixed-route and paratransit bus services for more than 100 cities, counties, municipalities and private entities across North America. Nearly half of MV's contracts are in fixed-route transit – from small, rural systems to large, urban systems.⁸¹

System Implementation

MV started installing DriveCam in its vehicles in 2004 under a self-review model, and transitioned to DriveCam's managed services program in 2009. MV currently operates approximately 4,700 fixed-route and paratransit vehicles equipped with DriveCam at dozens of transit agencies throughout the United States.

MV's vice president of safety noted that the design of the DriveCam program supports H.W. Heinrich's theory on industrial safety that states for every 300 unsafe acts that do not result in an accident or injury, there will be 29 minor to moderate injuries and 1 major injury or fatality. By proactively identifying and discouraging small, unsafe behaviors, DriveCam helps drive down the risk that those behaviors will ultimately lead to accidents and injuries.

MV uses DriveCam clips during both for individual coaching sessions with operators, as well as at group safety meetings, and has found it to be a valuable training tool. MV acknowledged that operators were "not thrilled" with DriveCam when it was first introduced because they felt that it was a case of "big brother" watching their actions. They experienced a number of cases of tampering with the system, especially after it was first installed at each agency. However, MV noted that the safety benefits of the program outweighed any perceived privacy concerns, and that operator acceptance of the program had improved over time.

Results/Lessons Learned

MV reports a significant reduction in accidents since implementation of DriveCam, though the actual results vary by property. MV's vice president of safety said, "There is no question in my mind that we have seen a 30 percent to 40 percent reduction in accidents since DriveCam." MV also stated that DriveCam has been useful in litigation by providing valuable evidence that has allowed MV to settle or dismiss claims faster and at a lower overall cost.

DriveCam has proved most valuable in allowing MV supervisors to observe and correct risky driving behaviors before they lead to accidents or injuries. MV's vice president of safety said the introduction of DriveCam at MV caused "a quantum change," and was the most significant development in the transit safety industry in years.

Officials at MV stated that DriveCam has proven itself and believe it will drive incident rates and insurance costs down at transit properties that decide to implement it. In 2010, MV actually received a refund on its insurance premiums due in part to the implementation of DriveCam.

“Our partnership with DriveCam has resulted in some very positive results in the overall safety performance at MV,” said Kevin Klika, MV Transportation Chief Operating Officer, in a press release. “We’ve always seen good results with DriveCam, but with Managed Services, our ROI has increased dramatically. We look forward to even better results in the future.”⁸²

Veolia Transportation⁸³

Overview

Veolia Transportation (Veolia) is the largest private provider of contracted transportation services in North America, with 18,000 employees working on 200 contracts. Veolia provides a range of public transportation services, including bus, rail, paratransit, taxi and shuttle. Veolia's Transit Division operates public bus systems in Las Vegas, Phoenix, Denver, San Diego, Atlanta, Baltimore, and suburbs of Washington, D.C., and Toronto, among others.⁸⁴

System Implementation

Veolia began using DriveCam in 2004-05 and currently has approximately 3,400 of its 7,500 vehicles equipped with DriveCam at 62 transit properties throughout the United States, with an ultimate goal to equip all vehicles with video-based driver risk management systems. More than half of Veolia's vehicles are part of DriveCam's managed services program, with the remaining vehicles part of the self-review program. In 2011, Veolia awarded a contract to SmartDrive, a competitor of DriveCam, and will be transitioning all its vehicles to the SmartDrive system in the coming years.

Veolia initially rolled out DriveCam as a behavior modification tool to address unsafe behavior behind the wheel and provide coaching in an effort to avoid future collisions, but did not tie it to disciplinary measures.

DriveCam videos from each transit property are reviewed by local managers and safety teams, and used for analyses, reports, and coaching tips for operators. DriveCam clips can be used to retrain a driver who has been involved in an accident in an effort to demonstrate what he or she did wrong, and how he or she could have avoided the accident in the first place.⁸⁵

Veolia incorporated DriveCam into a comprehensive companywide safety program called "300:29:1", which "focuses employee attention on identifying and eliminating the small, unsafe acts that can accumulate and can lead to an accident." This is based on a theory by H.W. Heinrich that says for every 300 unsafe acts that do not result in an accident or injury, there will be 29 minor to moderate injuries and 1 major injury or fatality. DriveCam supports the safety principle that preventing minor unsafe acts before they result in accident or injury is best way to reduce the number of accidents.

DriveCam also allows Veolia to compare data from different transit properties they operate throughout the country, allowing each location to track their safety performance against their peers. Veolia has motivational programs in place tied to

DriveCam that reward operators for “keeping the light green” by not engaging in risky driving behaviors.⁸⁶

Veolia calls DriveCam “an invaluable safety training tool,” and uses DriveCam clips in driver training and safety meetings to illustrate risky driving behaviors and errors, as well as provide examples of safe, defensive driving techniques. The DriveCam clips “provide a basis for operators to discuss alternate safe methods they might employ under the same circumstances.”⁸⁷

Results

At the beginning of the program, Veolia saw good results on behavior changes at some properties, but not at others. Officials at Veolia stated that the key to the success of DriveCam was not simply installing the cameras in buses, but how well and frequently managers used DriveCam to provide feedback to operators.

Veolia has had trouble calculating a clear return on investment for the DriveCam program, but overall has been pleased with the results, especially in terms of risk mitigation. They noted that at one Veolia-operated SuperShuttle property, the insurance carrier began paying for DriveCam because they viewed it as an effective accident prevention measure.

Since the introduction of DriveCam and the associated “300:29:1” safety initiative, Veolia has seen a clear decrease in accident frequency and severity, though they note it is difficult to pinpoint if DriveCam alone was caused the improvement, or the overall safety program.

Veolia said they had some issues with operators tampering with and vandalizing the cameras at first, including trying to cover the cameras up with gum, but have not had as many problems since they introduced strict penalties for operators who attempt to disable the cameras.

Lessons Learned

Veolia said it was important to make a formal announcement prior to introducing DriveCam so that operators and managers understood the intent of the program, and to avoid any misperceptions about why the cameras were being installed. Veolia emphasized that training was the primary key to the success of DriveCam, and that transit agencies had to ensure DriveCam was managed properly.

In retrospect, officials at Veolia say that rolling out DriveCam solely as a training tool without a disciplinary component was probably not best way to use the system. As a result, they did not see the results they hoped for in terms of accident and injury reduction during the first several years in the DriveCam program.

However, Veolia stated that DriveCam was great for risk mitigation, and that in the early years of the program, DriveCam video clips helped clear Veolia of liability in several “huge litigious events,” which alone more than paid for the DriveCam system.

ANALYSIS OF FINDINGS

The following section provides an analysis of the findings from interviews conducted with the six public transit agencies and three private contracted operators currently using video-based driver risk management systems in transit buses within the context of the research discussed in the literature review as well as the NTD statistics and preliminary data provided by DriveCam. It includes a discussion of the overall effectiveness of video-based driver risk management systems in improving transit safety and a summary of best practices from the agencies that have implemented the technology.

Safety Impacts of Driver Risk Management Systems

Based on the qualitative feedback provided by transit operators that have installed video-based driver risk management systems, as well as the quantitative data obtained from NTD reports and DriveCam records, it is clear that video-based driver risk management systems have enhanced transit safety through a reduction in risky driving behaviors, as well as the frequency of collisions and injuries that ultimately result from those risky behaviors.

In some cases, it appears that accident rates actually increased slightly immediately after the systems were installed; however, according to several transit agencies, this is likely due to the fact that minor accidents that previously went unreported were now being captured and logged.

Because several of the transit agencies profiled have installed video-based driver risk management systems relatively recently, it is difficult to identify clear trends in NTD data that show the systems have helped reduce the frequency of accidents and injuries. However, the agencies that have had the DriveCam system in place for at least a year have seen up to a 50 percent decrease in collisions following implementation of DriveCam, according to the NTD data cited in the Research Findings section of this report.

Interviews with individual transit agencies revealed that all agencies believed they had seen a reduction in the frequency and severity of “scored events” captured by video-based driver risk management systems, indicating that transit operators were adapting their driving habits to avoid the risky behaviors that trigger the system, even if the agencies had not yet seen quantifiable reductions in accidents and injuries.

Information provided by DriveCam and included in Appendix B of this report supports that conclusion, as it shows that the number of monthly “scored events” per event recorder at five anonymous transit agencies has declined at a relatively steady pace since the implementation of DriveCam. This also indicates that transit operators are changing their behavior because of the DriveCam system and learning to avoid the risky driving behaviors that cause an event to be captured and scored.

Based on Heinrich's theory, as discussed earlier in this report, a reduction in risky driving behaviors captured by a video-based driver risk management system as "scored events" will ultimately lead to an improvement in overall safety, as these risky behaviors are the precursors to more serious accidents and injuries in the future.

The transit agencies utilizing video-based driver risk management systems were nearly universal in their view that adoption of the system must include a comprehensive training and coaching component. Though the sheer act of installing cameras may have some safety benefits because transit operators are aware that risky behaviors will be caught on camera, most agencies cite the ability to use video footage as a training tool – on either an individual or group basis – as one of its main benefits.

The majority of the transit agencies profiled in this report introduced video-based driver risk management systems as a training and coaching tool, and downplayed any potential use for disciplinary purposes. However, it appears that the agencies that have implemented these systems with a carrot and stick approach have seen the best results by rewarding desirable driving behavior and imposing discipline to discourage undesirable behavior.

Video-based driver risk management systems can be effective at encouraging safer driving on a number of levels:

1. As a group training tool showing peers engaging in risky driving behaviors, as well as commendable ones
2. As an incentive to drive safer due to the awareness that any risky behaviors will be captured on video
3. As a self-training tool by encouraging operators to engage in self-evaluation by using the lights on the camera equipment that notify the operator when the system has captured a risky driving behavior
4. As an individual training tool to help transit managers identify and correct risky driving behaviors that eventually will lead to accidents and injuries
5. As a means to observe clear traffic code or transit policy violations committed by operators such as running a red light, not wearing a seatbelt, or using a personal electronic device in order to take disciplinary measures

Though there is an upfront capital cost and ongoing operation and maintenance cost associated with implementing video-based driver risk management systems like DriveCam and SmartDrive, the transit agencies included in this report were unanimous in their opinion that, over time, the systems would more than pay for themselves through reduced costs and claims associated with accidents and injuries, and in some cases, reduced insurance premiums. However, none of the agencies were able to provide a specific calculation of return on investment for the systems.

Addressing Privacy Concerns

One of the main barriers to implementing video-based driver risk management systems identified by transit agencies was the perception, particularly by transit operators and the unions that represent them, that installing cameras to monitor driving behavior is an invasion of privacy. However, these systems are actually much less intrusive than other types of video surveillance systems found in banks, hotels, department stores, and countless other public places.

Though cameras are continuously recording, the systems only save video footage when triggered by g-forces that exceed a predetermined threshold – due to hard braking, swerving, a sharp turn, or a collision. The footage provided by video-based driver risk management systems cannot be viewed real-time by transit managers and cannot be randomly inspected – it must be triggered by a potentially risky event, or manually by the transit operator. This arguably offers transit operators a greater degree of privacy than video surveillance systems used in most other settings.

In an industrial or factory environment, workers can be continuously monitored by their supervisors because they are working in a central location and can be observed visually by managers, who can provide immediate feedback if they see workers engaging in a potentially risky behavior. In the transit industry, it is simply not feasible to have a manager constantly monitoring each bus operator. Before implementing video-based driver risk management systems, transit agencies used ride-alongs by administrative staff or “secret shopper” programs to observe transit operators. However, at most transit agencies, the number of staff assigned to observe transit operators was dwarfed by the number of transit operators, especially at large agencies like the ones profiled in this report.

As a result, ride-alongs typically occur only with transit operators who have already been singled out by passenger complaints for risky behaviors, and there is very little random monitoring for potentially risky behaviors.

Transit operators already work in a very public setting where they must interact directly with passengers. Their activities are already in plain view, so it is difficult to understand the argument that video-based driver risk management systems somehow “violate” a transit operators right to privacy when they should have no expectation of privacy to begin with, especially when video cannot be randomly or remotely reviewed by managers, and does not capture images while operators are on break or layover.

All the transit agencies using video-based driver risk management systems acknowledged that they have received comments or complaints from transit operators and unions regarding the cameras, generally expressing the displeasure that “Big Brother” is looking over their shoulder. However, the proven safety benefits of video-based driver risk management systems should clearly outweigh any perceived privacy concerns.

Impacts on Risk Management

One of the frequently-touted benefits of video-based driver risk management systems is their ability to decrease liability and reduce claim costs by exonerating operators in the case of a collision or other incident that results in a driver or passenger injury. However, some fear the presence of cameras can lead to even greater liability in cases where the transit operator is found to be at fault.

The FMCSA report on Effective Commercial Truck and Bus Safety Management Techniques observes that, “In situations of litigation, the data could be used to exonerate or lessen the liability of drivers. Unfortunately, event-data recorders could also be a liability threat to commercial drivers and their companies in at-fault crash situations, and this perceived vulnerability has limited the use of event-data recorders by commercial fleets.”⁸⁸

Based on the interviews conducted as part of this report, there seems to be some disagreement among risk managers in the transit industry regarding whether focusing cameras on transit operators is more of a help or a hindrance in the aftermath of a collision.

The transit agencies currently using video-based driver risk management systems all stated that they had been useful in combating fraudulent claims and exonerating transit operators in collisions. However, Muni and Pace also acknowledged that DriveCam could potentially be a liability in cases where the video footage showed the transit operator was at fault. Still, there was general consensus among the agencies interviewed that, at least thus far, footage from these systems has helped dismiss claims, fight traffic tickets and reduce liability more often than it has implicated the agency.

Several agencies noted that, even if the video footage showed the transit agency was at fault, they would rather have all the facts upfront and settle at-fault situations quickly, rather than pay accident reconstruction and legal fees to fight it out in court. But as the FMCSA report points out, the view that video systems are a potential liability have helped convince some agencies not to pursue installation of video-based driver risk management systems.

The Orange County Transportation Authority (OCTA) in southern California installed cameras in its bus fleet in 2006 to monitor activities in the passenger compartment of the bus, as well as the entry doors and immediately outside the vehicle for security reasons. However, OCTA has not actively pursued a video-based driver risk management system, in part because of the perceived liability the cameras would present.

OCTA’s risk manager argues that transit agencies typically defend more cases than they prosecute, and believes that, more often than not, “reasonable doubt” works in the transit agency’s favor. He said most fraudulent claims are small dollar value

incidents, and that, “It will take a lot of small fraudulent claims to make up for one large loss.” He noted that videos of collisions and injuries are typically very compelling to juries and could end up costing transit agencies even more in at-fault incidents if the plaintiff is aware of the video and wants to take the case to court rather than settle.⁸⁹

RECCOMENDATIONS AND CONCLUSION

Video-based driver risk management systems have proven an effective safety improvement measure for each transit agency that has implemented them to date. Based on transit agency interviews and the limited quantitative data currently available, it seems clear that these video systems have helped to drive down the frequency of collisions and injuries, as well as the risky driving behaviors that contribute to them, by more than 50 percent in some cases.

Video-based driver risk management systems serve as valuable training tools that provide real-world examples of the consequences of both good and risky driving behaviors. Public transit agencies should strongly consider investing in video-based driver risk management systems on their bus fleets as one component of an overall safety and training program.

Based on past academic research regarding the use of on-board video systems in behavior-based safety programs in the trucking and motorcoach industry, and the experiences of public transit agencies that have implemented video-based driver risk management systems, a number of best practices have emerged.

1. Transit agency managers should communicate early and often with transit operators about the purpose of the video-based driver risk management systems to combat misperceptions and resentment, as well as equipment tampering. Managers should emphasize the benefits to bus operators, particularly as a defense in the event of accidents and customer complaints.
2. Simply installing cameras is not enough; the camera systems are most effective when tied to a comprehensive coaching and training program that recognizes safe driving habits and provides timely coaching to prevent repetition of risky behaviors.
3. Video-based driver risk management systems are valuable training tools to reinforce both desired and undesired driving behaviors, and video clips can be used as effective visuals in group training meetings, though individual driver identities should be concealed to avoid embarrassment.
4. Though video-based driver risk management systems are valuable solely as a training tool, safety statistics will likely improve if use of the system is also tied to a progressive discipline program that imposes penalties on transit operators for violations of agency safety policies like use of electronic devices, and flagrant traffic violations.
5. In addition to taking disciplinary action, transit agencies should use video-based driver risk management systems as a tool to recognize and reward transit operators who demonstrate exemplary skills to avoid a collision, and to encourage

competition among bus operators to avoid triggering the system by avoiding risky driving behaviors by implementing an incentive program with rewards to the safest drivers.

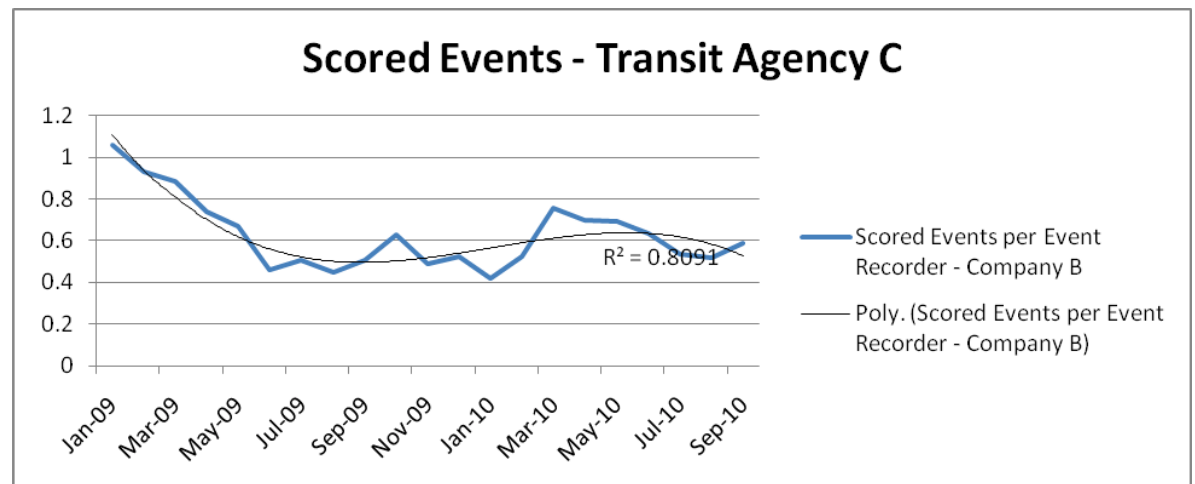
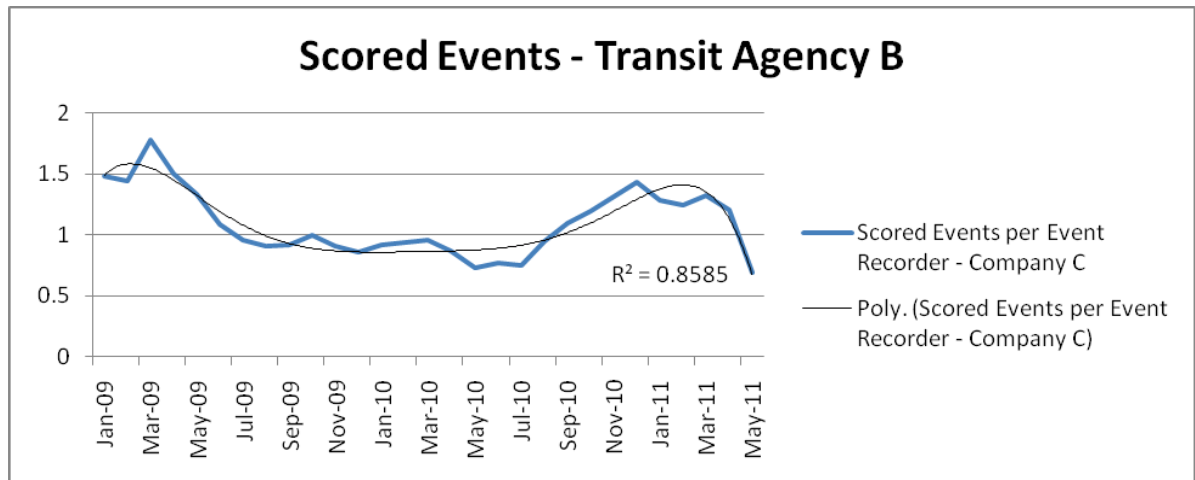
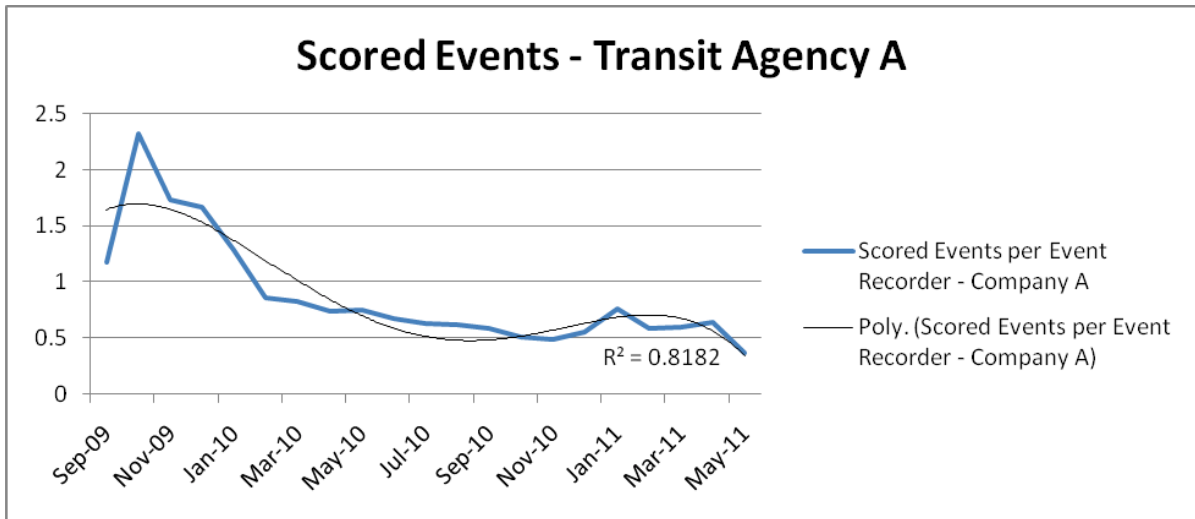
6. Transit agencies should ensure there is clear management and union buy-in about how video-based driver risk management systems will be used (training, discipline, etc.) and who will have access to the footage (chain of custody).
7. Transit agencies should carefully weigh the potential liabilities and benefits of implementing video-based driver risk management systems from a risk management perspective, though there appears to be general consensus that cameras have generally reduced transit agency liability where they have been implemented, rather than increased it.

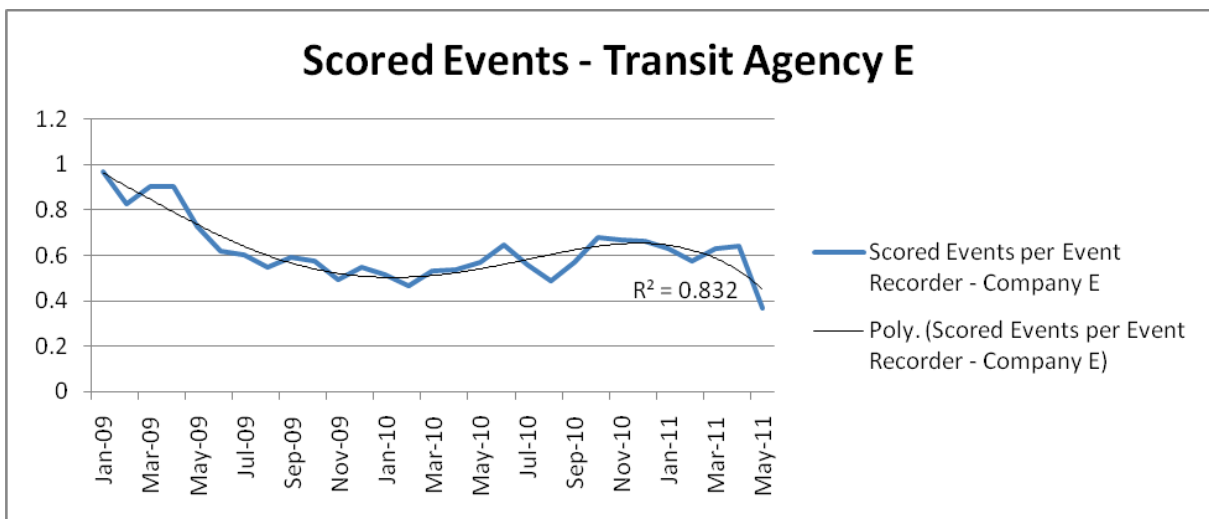
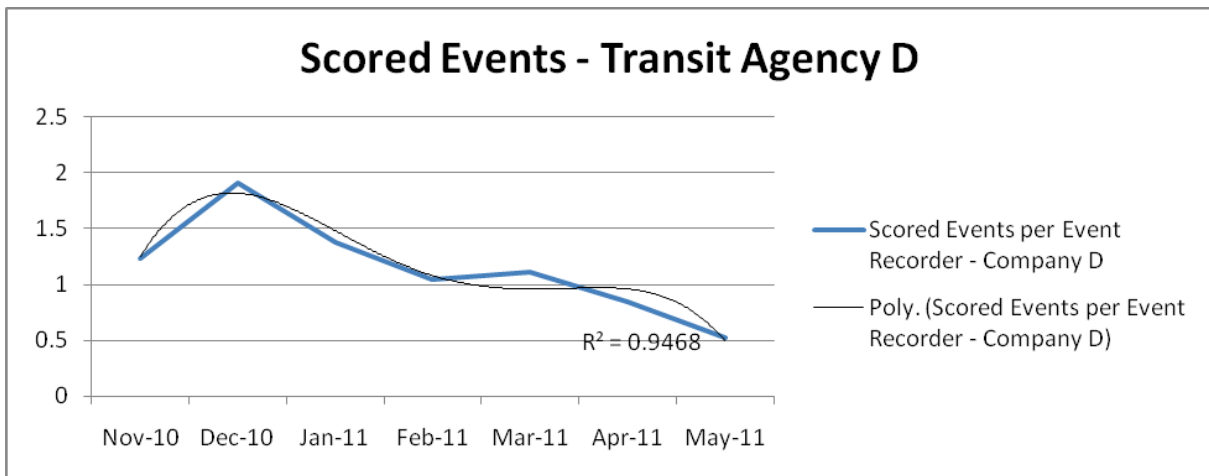
Based on the experience of transit agencies who have implemented video-based driver risk management systems thus far, it appears the technology is a promising addition to the transit industry's arsenal of potential safety measures. However, additional research should be conducted to better quantify the longer-term impact of the systems on accident and injury rates, as well as the return on investment that transit agencies have seen due to reductions in claims and insurance premiums.

APPENDIX A: COMPLETE LIST OF TRANSIT AGENCY INTERVIEW QUESTIONS

1. What is your total fleet size? How many vehicles are equipped with video-based driver risk management systems? Fixed-route? Paratransit? Non-revenue?
2. How long have the cameras been in place?
3. What are the capital and ongoing operating costs related to the camera program?
4. How does the camera system work? Continuously recording, or event-based, triggered by overspeed, sudden acceleration/braking, or swerving?
5. Were there specific reasons your agency opted to install the cameras to monitor driver performance? Did you have specific goals or metrics you hoped to achieve?
6. Do you use the cameras to monitor operator compliance with bans on use of electronic devices while on duty?
7. How do you use the cameras? Training, discipline, incentive/rewards?
8. Who reviews the footage? Who has access to footage?
9. What have been the results so far? Have cameras met expectations? ROI?
10. What changes have you seen safety/risk management statistics since the cameras have been installed? Number of accidents? Severity of accidents? Number of injuries? Reduction in claims or insurance costs? Change in operating expenses?
11. Have you seen a reduction in the number of triggered events since installing the cameras?
12. What has been the general reaction from operators and the union to the cameras? Was there much resistance to being “watched”?
13. How did you introduce the program to employees?
14. How often has the camera footage exonerated an operator versus confirming that he or she was engaging in unsafe behavior?
15. Any best practices or lessons learned you would share with other transit agencies considering this technology?

APPENDIX B: DRIVECAM SCORED EVENTS PER TRANSIT AGENCY





Source: DriveCam, Inc. (May 20, 2011)

ENDNOTES

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- ⁷ Ibid, 41.
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