Fleetworthy™

LITERATURE REVIEW

In-Cab Alerts for Commercial Vehicles

How real-time driver alerts reduce speed, prevent crashes, and make highways safer

Updated 2026 | Now includes proprietary Fleetworthy control group data

Contents

Abstract

In-cab alerts for commercial vehicles give drivers real-time warnings about congestion, sudden slowdowns, and work zones, delivered directly through their ELD or mobile app. This report reviews three independent academic studies conducted in Ohio and Indiana that measured whether those alerts change driver behavior.

The short answer: they do. Drivers who received alerts slowed down faster, more often, and at lower severity thresholds than the road conditions alone would have produced.

In 2026, Fleetworthy added a critical new dimension to this evidence. Enhancements to the Black Box behavioral data model now capture data from commercial drivers traveling the same corridors at the same time but without an alert. That simultaneous control group moves the evidence from correlation to causation. For the first time, state DOTs can compare what alerted drivers do against what non-alerted drivers do in the same conditions.

Introduction

Commercial vehicle crashes are a persistent, costly problem on U.S. highways. Large trucks logged more than 320 billion vehicle miles in 2022, representing roughly 10% of all miles traveled, yet were involved in nearly 13% of all roadway fatalities. The physics are unforgiving: trucks need far longer to stop than passenger vehicles, making advance warning of hazards ahead disproportionately valuable.

Traditional tools like Dynamic Message Signs (DMS) have real limitations. High speeds, installation constraints, and message complexity all reduce their effectiveness with commercial drivers. In-cab alert systems address these gaps by putting the right information directly in front of the driver, at the right moment.

Most early evidence for in-cab alert effectiveness came from before-and-after crash comparisons or single-cohort speed analysis. Both methods are useful. Neither can definitively answer the question agencies most want to answer: would those drivers have slowed down anyway?

In 2026, Fleetworthy addressed that gap. The updated Black Box behavioral data model identifies commercial vehicles traveling through active alert corridors that did not receive an alert and measures their behavior using the same methodology used with alerted drivers. The result is a true, simultaneous control group. It is the first of its kind at scale for this category of technology.

This report presents all four evidence layers in sequence: the three academic studies, followed by the Fleetworthy control group findings.

Key Findings

22%
of alerted drivers slowed ≥5 mph within 30 seconds (Ohio)

29%
reduction in secondary crashes involving CMVs (Ohio)

84%
of alerted drivers avoided hard braking (Indiana)

$22.56
return for every $1 invested with $14M in estimated savings (Ohio)

Study 1:

Quantifying the Impact of In-Cab Alerts on Truck Speed Reductions in Ohio

Desai et al. (2024 May) set out to quantify how in-cab alerts change truck driver behavior on Ohio's highways. The research focused on evaluating speed reductions following congestion and dangerous slowdown alerts, using deceleration as a proxy for characterizing driver response.

Methodology

The study collected data over a 47-day period in Fall 2023 for Interstates in Ohio, analyzing truck speeds before and after receiving in-cab alerts.

The researchers analyzed:

- Nearly 3,000 instances of trucks receiving alerts
- Over 800,000 truck waypoints, including speed, geolocation, and acceleration
- Driver behavior from 60 seconds before an alert through 5 minutes after

Key Findings

Speed Reduction

22% of drivers who received Dangerous Slowdown alerts reduced their speed by at least 5 mph within 30 seconds after receiving the alert.

For drivers already traveling at or above 70 mph, that figure climbed to 26%.

Alert Type Impact

Dangerous Slowdown alerts produced a higher percentage of trucks reducing their speeds compared to Congestion alerts.

Congestion alerts were more common in urban corridors; Dangerous Slowdown alerts were more spatially distributed, including rural interstates.

Overall Compliance

At low-speed reduction thresholds (0.01 mph reduction), more than 60% of alerted drivers slowed after Dangerous Slowdown alerts, and 56% slowed after Congestion alerts.

What It Means

In-cab alerts produce measurable speed changes before drivers can see what's ahead. That advance adjustment matters most for high-speed scenarios where late reaction means severe crashes.

Note: This study measured behavior within the alerted population only. The Fleetworthy control group data presented in Section 4 now provides the non-alerted baseline that directly answers whether the alert, not road conditions, caused the behavior change.

Study 2:

Determining the Effectiveness of Commercial Vehicle Safety Alerts

Kidando et al. (2024 September) evaluated the Ohio Department of Transportation's partnership with Drivewyze (now Fleetworthy) to assess the effectiveness of real-time in-cab safety alerts in improving highway mobility and safety. It sought to quantify the benefits of congestion and sudden slowdown alerts through a data-driven approach.

Methodology

The research combined data analysis and surveys and culminated in a financial evaluation of the deployment.

Data Analysis

- Historical alert data from Fleetworthy examined
- Crash data and speed/travel time records analyzed
- Pre- and post-implementation comparison (2018-2019 vs. 2022-2023)

Surveys

- 623 truck drivers interviewed at 15 rest areas across Ohio
- State transportation agencies and trucking companies surveyed
- Alert penetration and driver perception assessed

Benefit-Cost Analysis

- Crash prevention estimated using KABCO injury classifications
- Economic benefits monetized from crash reductions
- Delays associated with congestion-related crashes calculated.

Key Findings

1. Secondary crashes involving CMVs decreased by an average of 10 crashes in the post-implementation period, representing a 29% decrease in secondary crashes involving CMVs.
2. Reductions were observed across all injury categories except serious injury cases.
3. The reduction in crashes generated approximately $14 million in economic benefits for Ohio DOT.
4. The benefit-cost ratio resulting from the reduction in congestion-related crashes was 22.56, meaning $22.56 in savings for every $1 ODOT invested in the program.
5. Smart Roadways alerts reduced delays by an average of 20.5 hours per mile in the post-implementation period.
6. 89% of surveyed drivers said Sudden Slowdown alerts were effective; 51% rated them "very effective."
7. Surveyed trucking companies reported that in-cab alerts were effective tools for improving driver behavior and had significantly reduced at-fault crashes.

Study 2:

What It Means

The study provided strong evidence for the cost-effectiveness of implementing in-cab alert systems. A 22.56 benefit-cost ratio is exceptional by any infrastructure investment standard. The $14 million in estimated savings came from crash reductions documented in Ohio's crash records.

Note: This study's pre/post methodology was the strongest available evidence at the time. It could not isolate the alert as the sole cause of behavior change. The Fleetworthy control group data now provides that isolation.

Study 3:

Impact of In-Cab Alerts on Connected Truck Speed Reductions in Indiana

Desai et al. (2024 October) replicated and extended the Ohio speed analysis across 44 corridors in Indiana, adding a new element: independent dash camera validation of actual road conditions at the alert location and approaching the slowdown, enabling researchers to verify the conditions drivers encountered when they did or didn't respond.

Methodology

Analysis focused on 14,585 alerts recorded from April through June 2024. Individual truck trajectories were studied, with independent dash camera images used to verify conditions at alert receipt and as the driver approached the incident.

Key Findings

Short-Term Response (30 seconds after receiving the alert)

- 15% of trucks receiving Congestion alerts reduced speed by at least 5 mph.
- 21% of trucks receiving Dangerous Slowdown alerts reduced speed by at least 5 mph.
- Researchers documented a pattern of "anticipatory braking": drivers slowing before congestion was visible, preparing for actual conditions 1 to 3 minutes ahead. That proactive adjustment produced smoother speed transitions and reduced abrupt stops.

Longer-Term Response (Up to 5 minutes after receiving the alert)

- The percentage of trucks reducing speed after Congestion alerts increased over time, reaching 80–85% within 5 minutes.
- For Dangerous Slowdown alerts, the peak was approximately 55% at 2 minutes, declining to about 30% at 5 minutes.
- 43% of trucks receiving Dangerous Slowdown alerts never reduced speed below 45 mph. proactive adjustment produced smoother speed transitions and reduced abrupt stops

Hard Braking

Among trucks that received a Dangerous Slowdown alert and went on to reach the back of the queue, only 16% recorded a hard-braking event at any point in their trip. The other 84% slowed without hard braking, the smooth deceleration these alerts are designed to produce.

Study 3:

What It Means

This study built upon the findings of the Ohio research, confirming similar patterns of driver response to in-cab alerts.

The anticipatory braking finding is particularly valuable. Drivers weren't just reacting to congestion they could see. They were preparing for it. That behavior is precisely what in-cab alerts are designed to produce, and the camera data confirms it's happening.

The study also surfaced a calibration opportunity: some alert timing and threshold settings may need adjustment to ensure drivers receive alerts only when the hazard is genuinely relevant to their location and direction of travel.

Note: Fleetworthy's Black Box control group data is directly useful here. Because it captures non-alerted driver behavior in the same corridors simultaneously, it creates a continuous, real-world signal for calibrating alert thresholds, without relying on assumptions.

Section 4: Fleetworthy Control Group Analysis

Why This Data Is Different

The three studies above establish a strong directional case for in-cab alert effectiveness. Each measured what alerted drivers did. None could directly answer the core question agencies ask: would those drivers have slowed down anyway?

In 2026, Fleetworthy addressed this gap with enhancements to its Black Box behavioral data model. For the first time, the platform captures driving behavior from commercial vehicles traveling through the same alert corridors at the same time but without receiving an alert. This creates a true, simultaneous control group.

Methodology

The Black Box model identifies non-alerted drivers and measures their behavior using the same metrics applied to alerted drivers:

- Percentage of drivers who slowed ≥5 mph at the incident
- Percentage of drivers who slowed ≥10 mph at the incident

Non-alerted drivers are defined as commercial vehicles present in an alert corridor during an active alert event who did not receive the alert. This group travels on the same road, at the same time, under the same conditions. This makes direct behavioral comparisons valid.

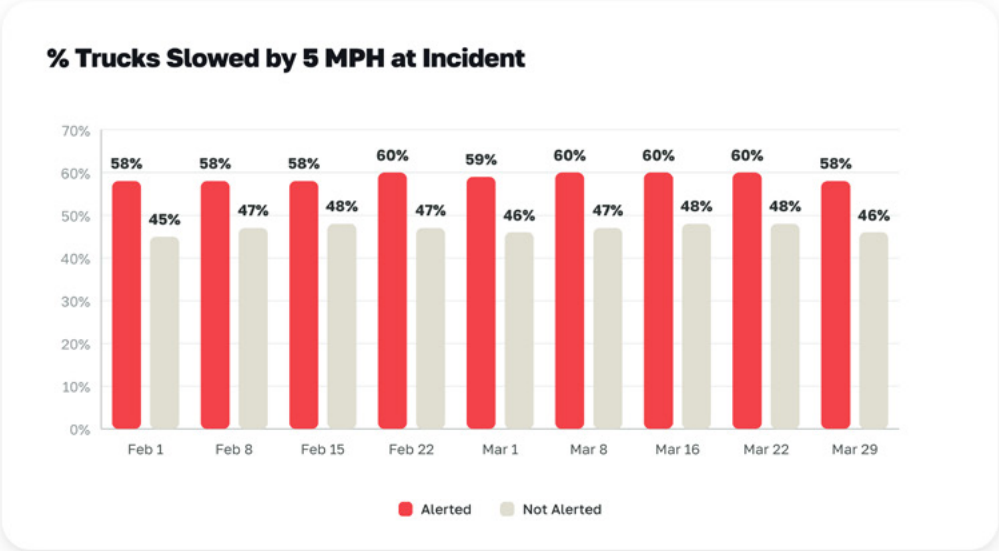
Both cohorts are observed simultaneously, on the same corridors, in the same conditions. Alerted drivers are commercial vehicles with the free Fleetworthy Foundations alert system enabled. Non-alerted drivers are connected commercial vehicles, most commonly weigh station bypass subscribers, that have not enabled Foundations.

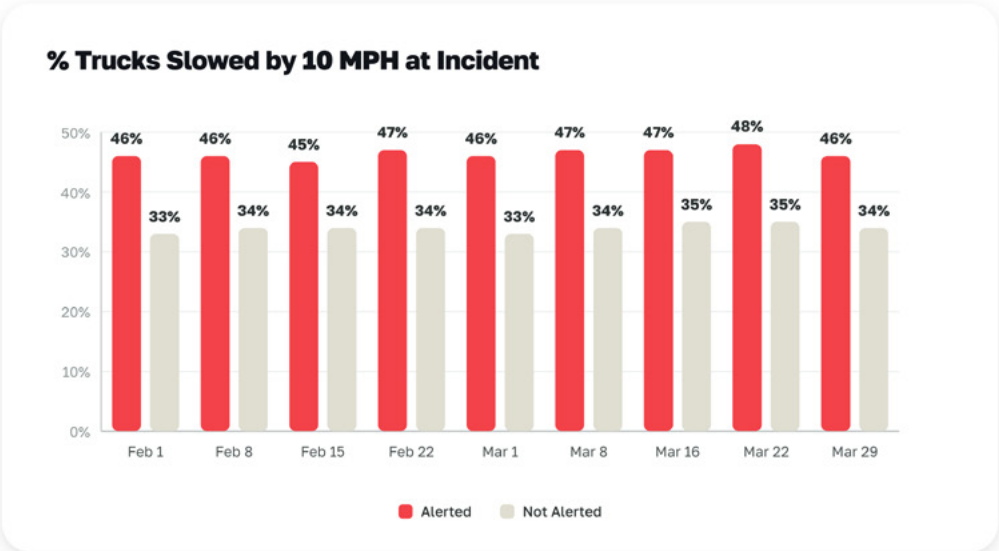
Fleetworthy compared the behavior of 297,720 drivers who did not receive an alert to 378,289 drivers who did receive an alert across 16 states.

Key Findings

Aggregated data from 16 states where Smart Roadways Traffic Slowdown Alerts were deployed in February and March 2026 shows a consistent pattern: Alerted drivers slow down more frequently than non-alerted drivers across every threshold. About a quarter more alerted drivers slowed by at least 5mph, and roughly a third more slowed by at least 10mph. This improvement appeared every week measured for both thresholds.

The charts below show alerted drivers (red) versus non-alerted drivers (tan). The difference between the bars shows how much more often alerted drivers slowed than non-alerted drivers in the same conditions. This difference is harder to achieve than it looks. Every driver slows down once they hit traffic, whether they got a warning or not. What separates the two groups is what happens before traffic forces the slowdown. Alerted drivers are already slowing while non-alerted drivers are still at speed. A consistent double-digit difference means the alerts are changing driver behavior.





Red bars = alerted drivers. Tan bars = non-alerted drivers traveling the same corridors simultaneously.

Conclusion

The body of evidence for in-cab alert effectiveness is now stronger than it has ever been. Three independent academic studies across Ohio and Indiana establish consistent, directional proof that alerts change driver behavior. Fleetworthy's 2026 control group data moves that proof from correlation to causation.

Key Takeaways:

1. **Driver Behavior Modification:** Within 30 seconds of an in-cab alert, typically before reaching the slowdown, 15% to 26% of commercial drivers have already cut their speed by at least 5mph. The top of that range comes from the trucks needing the most stopping distance: 26% of drivers traveling 70mph or faster slowed within 30 seconds.
2. **Safety Impact:** In-cab alerts produced a 29% reduction in secondary crashes involving commercial vehicles in Ohio. That finding delivers direct economic value.
3. **Cost-Effectiveness:** A benefit-cost ratio of 22.56:1, with $14 million in estimated savings, makes this one of the higher-return safety investments available to state DOTs.
4. **Driver Acceptance:** 89% of surveyed drivers rated in-cab alerts as effective, indicating strong user acceptance that will support continued adoption.
5. **Alerted vs. Non-Alerted:** At the incident, about a quarter more alerted drivers slowed by at least 5 mph than non-alerted drivers on the same corridors at the same time, and roughly a third more made 10 mph reductions.

Note: The Fleetworthy Black Box behavioral data model provides the only simultaneous, program-specific comparison of alerted vs. non-alerted driver behavior available to state DOTs. This data lives in existing dashboards and is updated continuously, giving agencies an always-on evidence base to understand, demonstrate, and refine the impact of their in-cab safety alert programs.

Future research should focus on refining alert timing thresholds, expanding coverage to additional hazard types, and integrating in-cab alerts with broader intelligent transportation and connected vehicle safety systems.

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