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TRUCK MIRRORS, FIELDS OF VIEW, AND SERIOUS TRUCK CRASHES

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16. Abstract

The driver's direct field of view in a truck is significantly more restricted than that in other vehicles, especially in passenger vehicles. The federal standard that regulates mirror systems on trucks is Federal Motor Vehicle Safety Standard (FMVSS) 111, which requires only a planar mirror on each side of the cab with an area of at least 323 square centimeters. This report analyzes currently available data to examine the traffic safety problems that may be related to truck mirror systems. Analysis of crash data, measurements of fields of view, and observational data on the variety and distribution of mirror configurations in the truck population suggest a need for improved driver vision to address specific truck crash types.

"Mirror-relevant" crash types are defined, identifying crashes in which the truck driver would likely need to use mirrors to maneuver safely. These crash types include lane change/merge (LCM) left, LCM right, left turn with the conflict vehicle approaching from the rear, right turn with the conflict vehicle approaching from the rear, start-up with a pedestrian/nonmotorist in front of the vehicle, and backing. Mirror-relevant crashes account for almost 20 percent of all truck crash involvements. LCM right crashes occurred over four times more frequently than LCM left crashes. Similarly, turn-at-intersection crashes in which the conflict comes from the rear are over four times more frequent as right turns than as left. These results illustrate a safety problem in the area where the driver's view is more restricted.

Observational data indicate that about 70 percent of trucks with conventional cabs have right fender mounted mirrors, which can fill in the driver's view along the front right side. Preliminary results from the Large Truck Crash Causation Study (LTCCS), the first to include mirror configuration, suggest that trucks without a right fender mirror may be significantly overinvolved in crashes.

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Contents

Introduction

In a large truck, the driver's view around the vehicle is significantly more restricted than in other vehicles, especially in passenger vehicles. In trucks, the driver's view of the near-field is significantly obstructed by the structure of the vehicle. The rear of the cab and the cargo body obstructs the view directly to the rear, even with mirrors. The driver can directly view the area along the left side of the vehicle by a head turn in some cases, though even that view is restricted by the width of the cargo body and the design of the cab. Along the right side of the vehicle, the driver's view is almost entirely dependent on indirect vision, using mirrors. The width of the vehicle limits the angular size of the field in the mirror to the right, and because of the height of the vehicle the driver's direct view of the lane next to the truck can be blocked by the part of the door below the window. In similar fashion, the view of the area immediately in front of the truck is obstructed, particularly by the hood of a conventional cab. Even in cabovers (truck cabs with a flat front in which the cab is over the engine; abbreviated COE), the height of the cab in combination with the driver eye position obstructs the view immediately in front of the vehicle (see Burger, Mulholland, Smith, & Bardales, 1980; Henderson, Smith, Burger, & Stern, 1983; Olson & Post, 1979; Reiss, Lunenfeld, & Morton, 1972; Sivak & Ensing, 1989; Smith, Mulholland, & Burger, 1985). Because of the differences between conventional cabs and cabovers in structure and mirror location, and because COEs are so uncommon that crash data on them are very limited, the current study focuses on conventional cab trucks only.

The regulatory requirements for mirror systems on trucks are minimal in comparison to common practice. Federal Motor Vehicle Safety Standard (FMVSS) 111 requires only that there be a planar mirror on each side of the cab with an area of at least 323 square centimeters. There are no federal requirements for other mirrors or that pertain to blind zones around the vehicle. The number of mirrors that are commonly used in addition to those required show that many truck operators have attempted to address the problem. Truckers often add convex mirrors near the planar mirrors, look-down mirrors on the passenger side door, and fender/hood-mounted convex mirrors, mounted to fill in the blind zone along the side of the vehicle, or to provide a view of the area immediately in front.

This report analyzes several types of data to examine the traffic safety problems that may be related to truck driver vision using mirror systems. Analysis of crash data, measurements of fields of view, and observational data on the variety and distribution of mirror configurations in the truck population suggest that there is a need for improved driver vision to address specific truck crash types. Fundamentally, truck cab design, the configuration of trailers, and the cargo-carrying elements produce certain areas around the truck in which the driver does not have a direct view and must rely on mirrors or other devices. Analysis of crash data suggests that these blind zones present a safety hazard that is reflected in an overrepresentation of crashes in which the truck driver must use mirrors to determine if a maneuver is safe. However, since the crash data used do not include mirror configuration, the relationship is suggestive only. Further research is proposed using data that have recently become available that will permit a study of the relationship between specific mirror configurations and crash types.

Method

Data

Crash data files for use in the analysis were created from the Trucks Involved in Fatal Accidents (TIFA) file, which is compiled by UMTRI, and from the National Automotive Sampling System, General Estimates System file (NASS GES, referred to simply as GES hereafter), compiled by the National Highway Traffic Safety Administration (NHTSA). Data files for seven years, 1994-2000, were used.

The TIFA file is a survey of all medium and heavy trucks[1] involved in fatal traffic accidents in the United States. The accidents included are all those in which one or more persons are fatally injured; the fatality may occur to a truck occupant, an occupant of another vehicle, or a nonmotorist. For 1999 and 2000, TIFA is a census file, meaning there is a record for each truck involved in a fatal crash. For 1994-1998, trucks were sampled to reduce the number of cases processed. For those years, about 60% of trucks involved in a fatal crash were sampled. Weights were determined that allow correct national estimates of population totals. The TIFA file provides the most accurate and detailed data available on trucks involved in fatal crashes.

The GES crash file is a nationally representative sample of police-reported crashes, covering all types of vehicles involved in traffic accidents, not just trucks. GES data are coded from police reports, without any additional investigation or use of other sources. Cases are selected for the GES file through a complex sampling procedure with clustering, stratification, and weighting that allows calculation of national estimates. The GES data are then coded from the sampled police reports.

The GES data are used in this report to estimate the number of trucks in nonfatal crashes. The GES file is known to underestimate fatal truck involvements by approximately 25-30 percent. Since the TIFA data are known to be a substantially more accurate representation of fatal truck crash involvement, TIFA data are used for fatal crash involvements and GES data are used to estimate nonfatal crash involvements. To facilitate the work, an analytical file was built that combines TIFA and GES data, with

[1] The term *trucks* is used to refer to all class 3 and above vehicles.

TIFA data covering fatal involvements and GES covering nonfatal involvements. Care was taken to ensure that the variables combined were compatible, or recoded to be compatible.

Figure 1 shows schematically the composition of the combined data file: The TIFA file covers fatal crash involvements while the GES sample file covers all other crash severities. The components are not to scale: Fatal crashes account for only 1.3 percent of truck crash involvements. However, given their severity and the additional detail the TIFA file supplies, fatal crashes are an important subject of study.

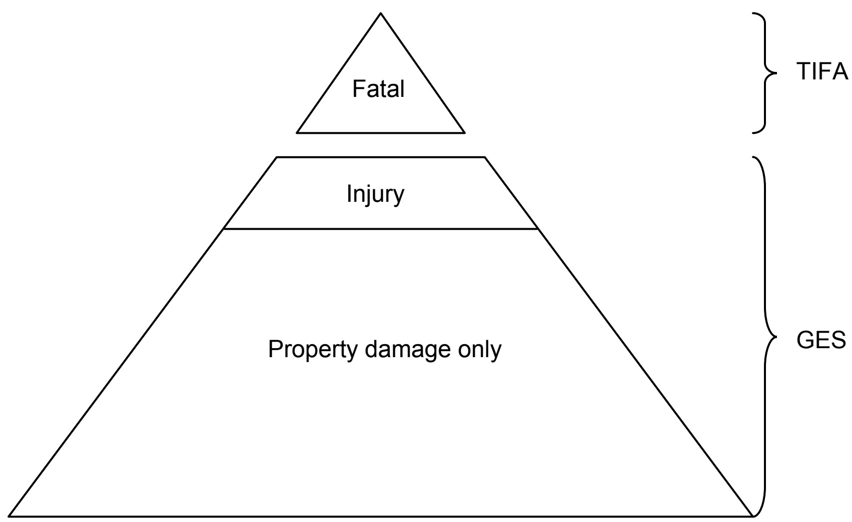

Figure 1. Composition of analysis file: TIFA and GES, 1994-2001.

Crash types

To identify crash types of interest, a set of variables was used that provides information on the vehicle's movements prior to the crash, the relative position of the truck and the crash partners, and the location of the first contact in the crash. The primary information used for this purpose is an accident type variable that captures the relative position and movement of the vehicles prior to the crash. This variable is available in both the TIFA and GES crash data. The TIFA accident type variable is modeled on the accident type variable in the GES file, so they are fully compatible. The accident type variable is of particular use in the present study because it provides critical information on how the crash occurred and, accordingly, the approximate lines of sight to the conflict just prior to collision. Variables that code vehicle maneuvers prior to the crash and the location of the first impact were used to supply additional detail and to validate the crash types. For example, if the crash type is lane change left (meaning the crash occurred when the truck changed lanes to its left), we would expect the first impact to be on the left side of the vehicle.

Table 1 shows the definitions for the mirror-relevant crash types. The goal in developing the definitions was to identify crashes that occurred in areas where the truck driver would have to use the truck's mirrors to successfully complete a maneuver. The crash types are defined in complementary pairs, so that similar maneuvers are identified to the left and to the right. This was done because the driver's vision is significantly degraded in many areas to the right in comparison with corresponding areas to the left. Defining the crash types in a symmetrical fashion allows a comparison to determine whether the side to which the driver's vision is degraded is overrepresented in the crash population.

Each bullet point in the definitions in Table 1 corresponds to a set of code values for a particular variable. Since crashes as they actually occur do not readily sort themselves into neat categories, and since crash investigators can make mistakes, consistency was required across multiple variables to increase the probability that crashes assigned to a particular category were roughly similar. For example, in the case of lane change/merge right, certain codes in the accident type variable set the boundaries for the crash type. But in some of those right-side cases, the first impact was recorded as on the left or rear of the vehicle, and in some the movement prior to the crash was recorded as a left turn. Such cases might be coding errors, or the crash itself may have been anomalous. But whatever the explanation, crashes with such obvious inconsistencies were excluded to avoid contaminating the category. Note that in both the left and right turn categories, the collision was with a vehicle approaching from the rear of the truck.

Table 1
Identification of mirror-relevant or indirect driver vision crashes.

Crash type	Definition
Lane change/merge right	• Same trafficway, same direction accident type move to right • First impact on right side • Prior move is lane change, merge, or going straight
Lane change/merge left	• Same trafficway, same direction accident type move to left • First impact on left side • Prior move is lane change or merge
Right turn	• Change trafficway, accident type is turn to right, with other vehicle approaching from behind • First impact on right *or* • First harmful event is collision with pedestrian or pedalcyclist • First impact on right side • Prior move is right turn
Left turn	• Change trafficway, accident type is turn to left, with other vehicle approaching from behind • Prior move is left turn • Impact point on left
Backing	• Accident type is backing • First harmful event is collision
Start up	• Prior move is stopped or starting up in traffic lane • First harmful event is collision with pedestrian or pedalcyclist • At intersection or intersection-related

The primary goal in developing the crash configuration classification defined in Table 1 was to identify crashes in which the conflict occurred in areas that the truck driver would have to rely on mirrors to view, and in which the truck driver initiated the action. In other words, these are crashes where the truck driver's use of mirrors may have been of primary relevance to avoiding the crash. Because the truck driver initiated the maneuver in each case, the movement of the truck was into a definable viewing area. For example, in lane change/merge right crashes, the truck driver was changing lanes or merging with traffic to the right of the truck. Cases in which the other vehicle changed lanes into the truck's lane are excluded from the mirror-relevant crash types, because the truck driver's mirrors are not primarily at issue.

The selection of crashes in which the truck was turning illustrates the effort to identify crashes in which the truck driver would have to use the mirrors in order to determine if the maneuver was safe. The turning crashes do not include all crashes in which the vehicle was turning, but instead include only those in which the crash partner vehicle was approaching from the rear on the appropriate side, or was in that area when the truck driver initiated the turn. Similarly, the startup crashes are limited to those in which the truck was starting from a stopped position and the crash partner was a pedestrian or bicyclist, both of which may not be visible to the truck driver because of the hood of the vehicle. (See Figure 3 for an illustration of the area in front of a truck with a conventional cab where the driver's view is obstructed by the hood.) Small passenger vehicles may in some cases be obscured by the hood, but those cases are much more unusual and cannot be identified with confidence from accident reports.

All other crash configurations are regarded as "not truck mirror-relevant," encompassing crash types in which the driver would not normally have to rely on the mirrors to view the area of impending conflict.

Results

Mirror-relevant crashes

Table 2 shows the results for crash types as defined above. The table provides counts of the mirror-relevant and other crash types. The frequencies are estimated from the seven years of crash data (1994-2000) but are annualized to show average yearly estimated totals. Thus, for the seven years, there was an average of just over 380,000 trucks involved in a traffic accident each year. About 75,000, or 19.7 percent of the total, fall into one of the mirror-relevant crash types. It is possible that mirrors were relevant in some fraction of the remaining crash types, but there was not sufficient information in the coded crash data to be able to identify such cases reliably.

Table 2
Mirror-relevant crash involvements, TIFA-GES 1994-2000.

Crash type	Frequency	%
Mirror-Relevant Crash Types		
Lane change/merge right	25,828	6.8
Lane change/merge left	5,867	1.5
Right turn, other in blind zone	13,539	3.5
Left turn, other in blind zone	3,216	0.8
Start up	31	0.0
Backing	26,621	7.0
Subtotal	75,102	19.7
All other crash types	304,528	79.8
Unknown	2,045	0.5
Total	381,675	100.0

In all of the mirror-relevant crash involvements, a maneuver by the truck initiated the crash. In most of these crashes, the conflict was relatively close to the truck, since the truck was either in a low speed maneuver, as in the *start up*, *backing*, or *turning* crashes; or the relative speeds of the vehicles was low, as in the *lane change/merge* crash types.

Among the mirror-relevant crashes, note the overrepresentation of crash types in which the truck is moving to the right rather than the left, particularly in lane change/merge (LCM) crashes. LCM right crashes occur 4.4 times more frequently than LCM left crashes. Similarly, right turn crashes are significantly more frequent than left turn crashes. There are 4.2 mirror-relevant right turn crashes for every mirror-relevant crash while turning left. Clearly truck drivers are having much more trouble in maneuvers to the right than to the left. Crashes in which the truck started from a stopped position and struck a pedestrian or bicyclist were fewer than anticipated, given the view obstruction from the hood. However, start-up crashes were very hard to identify using available variables. The number is likely to be an underestimate. (Retting [1993a, 1993b] found a greater incidence by directly examining police reports rather than trying to locate them in coded crash data.)

The crash type variable uses existing information to identify the movement of vehicles prior to the collision to identify crashes where the conflict was not in the driver's direct field of vision. The crash types generally locate the conflict to the left or right of the vehicle, but cannot more specifically locate the conflict vehicle along the side of the truck. That is, the data used identify whether the conflict vehicle was to the left or right, but not more precisely where along the length of the truck the vehicle was at the moment when the driver initiated the maneuver. The TIFA file includes a variable that identifies the first point of contact on the truck. The variable uses a clock-face metaphor to identify the position, such that 12 is the front plane, 1 o'clock the right front quarter, and so on. It should be understood that, since the vehicles are in motion and not mutually constrained, impact on the right front quarter does not indicate that the other vehicle was there when the driver initiated the maneuver. There are, of course, cases in which the other vehicle was overtaking the truck at a significantly higher speed, so that it may have been behind the truck when the driver started the lane change, and then alongside the cab when the truck encroached into its lane.

However, the distribution of impacts along the truck in the lane change/merge crashes is consistent with a blind zone on the right front of the cab. Figure 2 shows the distribution of initial impact point on the truck in fatal crashes in which the truck was making a lane change or merging either to the right or left. (Nonfatal crash involvements could not be included because the GES file includes only the side of impact, not the location along the side.) The figures of the trucks are adapted from the coding manual used by FARS analysts to record the data. A tractor-semitrailer diagram is shown, but both straight trucks and tractor-semitrailers are included in the data. It is important to remember that only the first contact point is recorded, so the movement and position of the other vehicle prior to impact is not reflected. Thus, we do not know if the other vehicle was moving alongside the truck at a steady state or rapidly overtaking the truck. Nevertheless, the distribution of contact points is strikingly and suggestively different when the truck is moving left than when the truck is moving right.

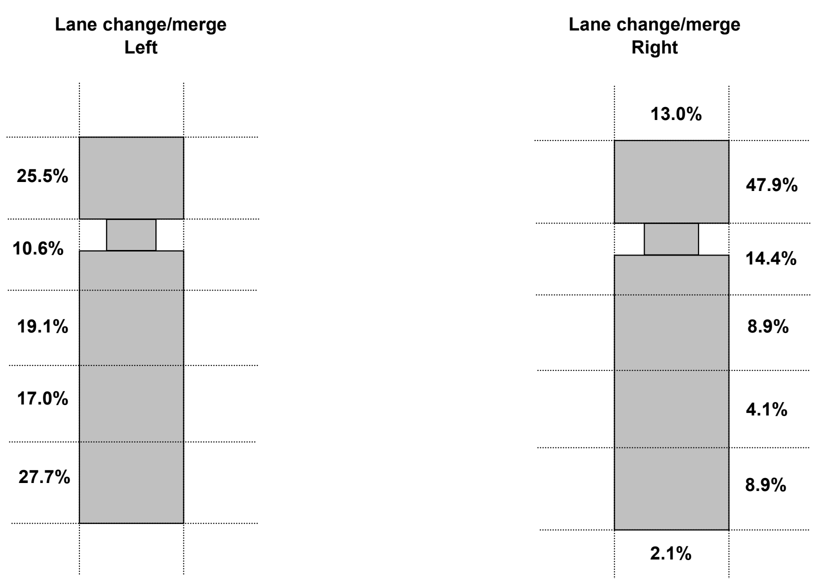

Figure 2. Distribution of initial impact on truck in two crash types. (Fatal crashes only, total N = 200, TIFA 1994-2000.)

Driver field of view

Measurements of the driver's field of view from the cab of a combination vehicle show restrictions in critical areas around the vehicle, and are consistent with the results from the crash data. Figure 3 shows the direct fields of view using different mirrors in one truck, a tractor-semitrailer with a conventional cab (hood out in front) and an integral sleeper.

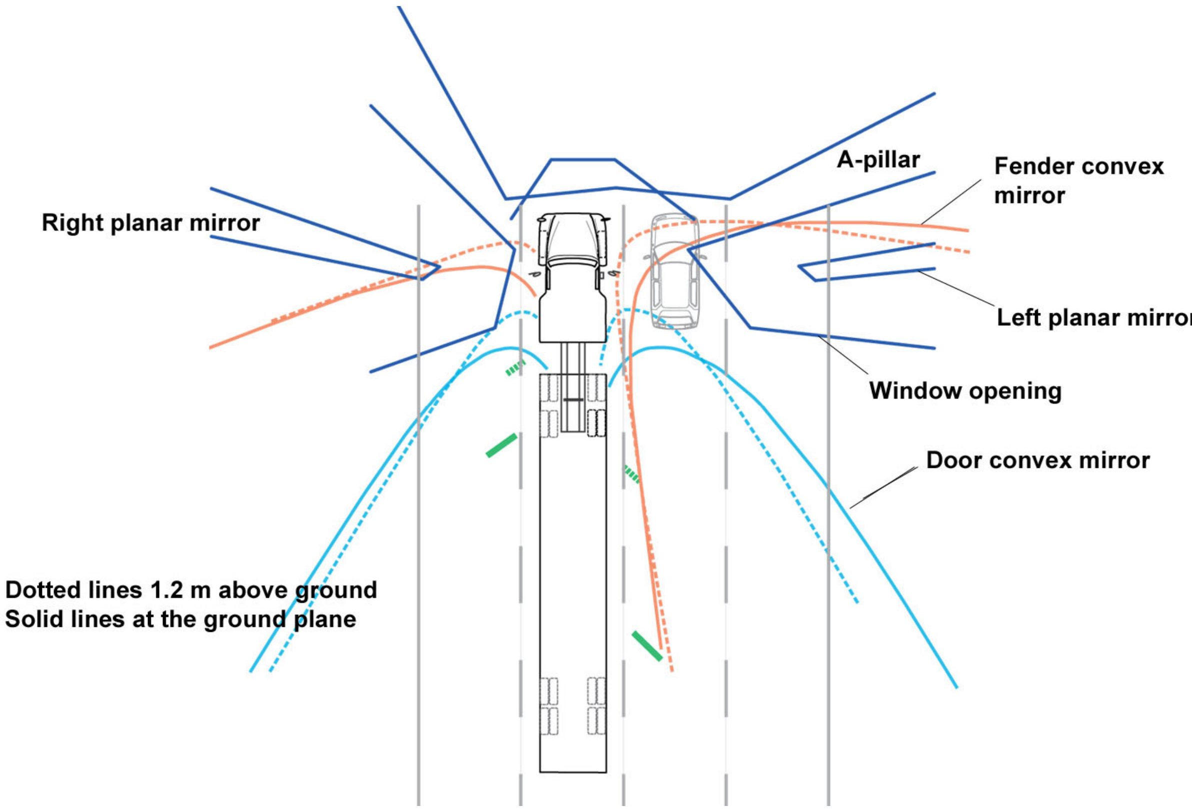

Figure 3. Mirror and direct fields of view in one truck.

The straight blue lines in Figure 3 show the boundaries of obstructions by the left and right planar mirrors, the A-pillars and rear of the cab, and the hood of the vehicle. The light blue curves outline the view provided by left and right door-mounted convex mirrors and the light orange curves show the view using fender-mounted convex mirrors. Solid lines show the field at ground level and the dotted lines at 1.2 meters above ground level. The driver has direct view forward, above the level of the hood and inside the A-pillars. To the left and right, areas of the driver's field of view are obstructed by the door, the A-pillars, and the right and left planar mirrors. Particularly to the right, the diagram shows that without a hood-mounted right convex mirror, the driver is unable to view the lane immediately to the right of the cab. The diagram includes a drawing showing that a typical passenger vehicle can fit fairly comfortably in an area that the driver can only view using a fender-mounted mirror. The door structure and hood almost entirely occlude the driver's view of this area. Only a small part of the left rear of the vehicle would be visible in the right door-mounted convex mirror, and a small piece of the hood of the vehicle would be visible to the driver through the window opening. To the left, the driver has direct vision through the window opening to the lane immediately left of the cab, but has to rely on mirrors for the lane to the left behind the cab. Thus, even with a full set of mirrors properly adjusted, there is a significant blind zone to the right front of the truck cab. One notes also that the quality of the image in the mirrors is not addressed here, but that could also affect the driver's ability to identify other vehicles or road users around the vehicle.

The results from the crash data analysis are consistent with the hypothesis that truck crash involvements are overrepresented in crashes in which the driver has to rely on mirrors to maneuver safely. Measurements of truck driver fields of view show reduced fields of view along the right side of the truck, especially along the right front of the vehicle if there is no fender/hood mounted mirror. The next step is naturally to determine the distribution of the types and locations of mirrors on trucks operating on the roads.

Observational survey of mirror configuration

There is limited information about the configurations of mirrors in the general population of trucks. FMVSS 111 only requires left and right planar mirrors with an area of at least 323 square centimeters. But truck operators may add a wide variety of additional mirrors to the cab to improve the driver's view around the truck, including convex door-mounted mirrors, fender/hood-mounted convex mirrors, front cross-view mirrors (for the area immediately in front of the hood), and door-mounted look-down mirrors on the passenger side. Table 3 provides the results of an informal field survey of the prevalence of right and left fender/hood mounted mirrors (adapted from Way and Reed, unpublished). Only the results for conventional cab trucks are shown. The survey was performed by driving along selected Interstate and Interstate-quality roads and recording the mirror configurations observed. About 30 percent of the trucks observed had no fender/hood-mounted mirrors, while the remaining 70 percent had fender/hood-mounted mirrors on the right, including roughly 43 percent (ranging from 36 to 54 percent) that had fender/hood mirrors on both sides.

Table 3
Prevalence of fender/hood mirrors.

State (n)	Right & Left	Right Only	None
OH (615)	45.4%	26.8%	27.8%
PA (577)	41.8%	29.6%	28. 6%
NJ, NY, CT (271)	54.2%	17.7%	28.0%
MI (500)	36.0%	27.0%	37.0%
Overall (1,963)	43.1%	26.4%	30.4%

The survey provides reasonable estimates of the prevalence of fender/hood-mounted mirrors in the truck population. It should be kept in mind that the survey was conducted on Interstate-quality roads, and so included primarily trucks that are used in long-haul service. Trucks used in more local operations, which spend less time on the highways and so are less likely to be included in the survey, may have a different prevalence of fender/hood mirrors. Even so, it is noteworthy that the estimates are relatively consistent from state to state, with the largest difference in the New Jersey, New York, Connecticut region, in which over half the vehicles observed had mirrors on both sides. But the crucial point is the prevalence of right fender/hood-mounted mirrors, which is fairly consistent between 63 and 72 percent.

Large Truck Crash Causation Study

The only crash data that include information about truck mirrors are those from the Large Truck Crash Causation Study (LTCCS) of the Federal Motor Carrier Safety Administration (FMCSA). Analysis of the LTCCS data was not a major part of the present study, but a preliminary summary of information about the prevalence of fender/hood-mounted mirrors in the LTCCS crash file is presented because it is the only crash population for which mirror configuration is known. The LTCCS crash file was compiled from in-depth investigations of 963 crashes involving 1,123 trucks in serious (fatal, incapacitating, or nonincapacitating injuries) traffic crashes. Crashes for the LTCCS were sampled from 24 locations in 17 states. When a crash meeting the selection criteria occurred, a team consisting of a trained crash investigator and a state truck inspector conducted an extensive investigation. Data collected include a complete description of the vehicle, including its configuration and mechanical condition. The description of the vehicle includes the presence of any mirrors at each door and on each side of the hood. In addition, extensive information was collected about the events of each crash, including a crash reconstruction, allowing the role of each vehicle in the crash to be described at a reasonable level of detail.

Figure 4 shows the distribution of fender/hood-mounted mirrors on conventional cab trucks in the LTCCS crash file data. Well over half, or 61.7 percent, of the conventional cab trucks in the LTCCS crashes had no fender/hood mirrors on either side. About one-quarter of the trucks had them on both sides, and another 13.2 percent had a convex mirror on the right side of the hood only. In total, a bit more than one-third (37.2 percent) of the trucks had a fender/hood-mounted mirror on the right side of the vehicle.

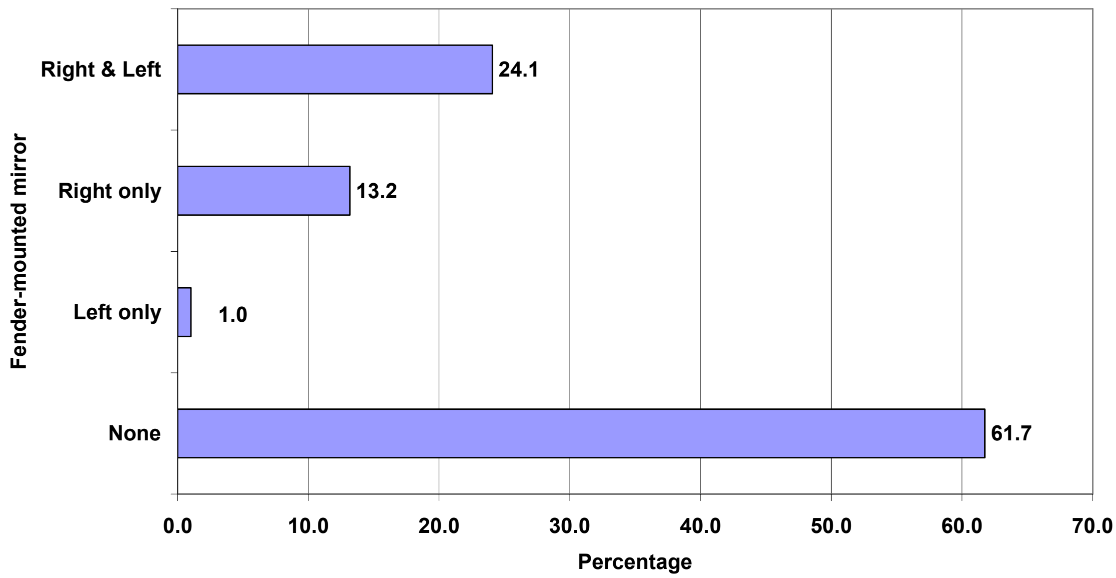

Figure 4. Prevalence of fender/hood-mounted mirrors on trucks involved in serious crashes, conventional cabs only (LTCCS data).

The proportion of trucks with right fender mounted mirrors in the LTCCS crash population may be compared with the proportion in the truck population as represented in the road survey reported above (see Table 4). In the road survey, roughly 70 percent of the trucks had right fender-mounted mirrors, and 30 percent did not, while in the crash population about 37 percent had such mirrors and 62 percent did not. Expressed in terms of an involvement ratio, trucks without right fender-mounted mirrors were about twice as likely to be involved in a serious crash as trucks in the whole population (62/30 = 2.1).

Table 4
Prevalence of fender/hood mirrors in crashes and truck population.

Fender-mounted mirrors	Crashes (LTCCS)	Population (Survey)	Involvement ratio
None	61.7%	29.9%	2.1
Left only	1.0%	0.0%	undefined
Right only	13.2%	26.8%	0.5
Right & Left	24.1%	43.3%	0.6
Right	37.2%	70.1%	0.5

The involvement ratio of 2.1 for conventional cab trucks without right fender-mounted mirrors in serious crashes should not be over-interpreted. A number of cautions may be noted. The two sources of data may not be well-matched, i.e., cover the same population. The estimate of the incidence of fender mirrors in the truck population, which is taken as the measure of exposure, may be overestimated. The survey was conducted on Interstate-quality roads, and the population of trucks on such roads may not be representative of the whole truck population. Trucks used in local operations may have a different prevalence. Moreover, the LTCCS crashes include all road types, not just high-speed freeways. Again, trucks that are used primarily on local roads by small carriers may not be as likely to have extra mirrors. In addition, the LTCCS cases are produced by a stratified, hierarchical sampling procedure which produces relatively large sampling errors. This means that the estimate of about 62 percent of crashed trucks without right fender-mounted mirrors has an associated confidence interval that is relatively large. However, this finding is certainly consistent with the findings from the mass crash data and the measurements of driver fields of view.

Summary and Discussion

Mirror-relevant crashes account for almost 20 percent of all truck crash involvements, that is, crashes in which the truck driver needed to use mirrors to maneuver safely. In most of the mirror-relevant crash types, the crashes involved relatively low closing speeds, either because the truck was moving slowly, as in start up and turning crashes, or because both vehicles were moving in the same direction on the same roadway and the truck maneuvered into the other vehicle, as in lane change crashes. In these crashes, the conflict was close to the truck and the driver had to rely on the truck mirrors to determine where the other vehicle or nonmotorist was.

Truck crashes in which the driver must rely on a mirror to move to the right are significantly overrepresented in comparison with left moves. Analysis of the mass crash data showed that, in lane change/merge crashes, trucks are much more likely to be involved when moving to the right than when moving to the left. LCM right crashes occurred over four times more frequently than LCM left crashes. Similarly, turn-at-intersection crashes (turn right crashes) in which the conflict comes from the rear are over four times more frequent in right turns than in left. The distance to the mirror and relatively smaller image makes maneuvers to the right much more risky than similar maneuvers to the left.

Measurements of the driver's fields of view identify a blind zone to the right front of the cab large enough for a standard passenger vehicle, which can be filled in by using a right fender/hood-mounted mirror. While the only required mirrors are planar mirrors on both sides of the cab, many truck operators supplement those mirrors with convex mirrors on the doors. In addition, many trucks have convex mirrors mounted on the fender or hood, which have the capability to fill in the front blind zones. There are no comprehensive data on the prevalence of different mirrors, especially the fender/hood-mounted mirrors, but a road survey by UMTRI showed that about 70 percent of conventional cab trucks on Interstate-quality roads have right fender/hood-mounted mirrors.

The field of view measurement data illustrate that a truck driver's field of view particularly to the right of the vehicle is restricted and, without mirrors on the fender, there is a substantial blind zone to the right front. The analysis of the crash data shows an overrepresentation of mirror-relevant crash types in which the maneuver is to the right in comparison with the same maneuver to the left. In combination with the field of view data, this is highly suggestive of a safety problem that could be addressed by improved mirrors.

The crash data available to date do not include any information about mirror configuration, so they cannot be used to directly test whether the truck mirror configuration is associated with certain crash types. The LTCCS crash data file has recently become available from the FMCSA. The LTCCS data are the only known crash data that include mirror configuration. Preliminary analysis indicates that the crash population represented by the LTCCS cases has a lower prevalence of fender-mounted mirrors than the UMTRI survey of the population of trucks on Interstate-type roads estimated. Using the observational data as a measure of exposure, conventional cab trucks without right fender mirrors may be significantly overinvolved in crashes, but the conclusion must be regarded as tentative, pending further research.

The LTCCS data could be used to explore the hypothesis that truck mirror configuration is related to crash type, e.g., that trucks without a right fender-mounted mirror are more likely to be involved in right-going mirror-related crashes. The file is complex, consisting in the public release of 43 data tables in a relational schema. Moreover, there is the challenge of developing the means to extract crash types of interest from the wealth of detail about crash events. However, the LTCCS is the only crash data resource available in which the effect of mirror configuration on truck crashes may be studied. The next logical step would be to use the LTCCS resource to examine the relationship between truck mirrors and the risk of truck crashes.

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