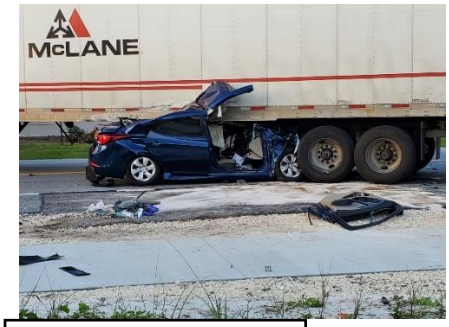

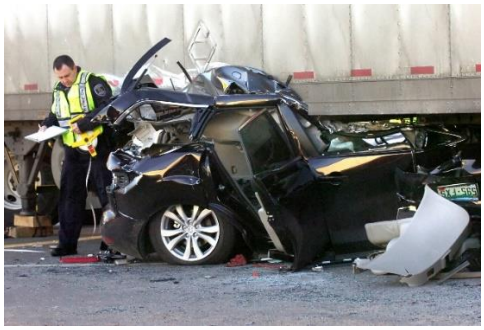

FARS Case Listing

Year: 2018
Crash Month: October
Crash Day: 15
State: Texas
Unique Crash ID: 482615
Unique Vehicle ID: 2

Traffic Control Device Functionin	Trafficway Description	Trailer Vin (1)
Device Functioning Properly	Two-Way, Not Divided	1T9TA4328E18

Trailer Vin (2)	Trailer Vin (3)	Travel Speed
???????????	???????????	Not Reported

Underride/Override	Unit Type	Vehicle Configuration
No Underride or Override Noted	Motor Vehicle In-Transport (Inside or Outside the Trafficway)	Truck Tractor/Semi-Trailer

Vehicle Identification Number	Vehicle Model Year	Vehicle Number
1M1AN07Y2FM0	2015	2

An evaluation of the accuracy of side underride crash Case Listings in the Fatality Analysis Reporting System using internet-based articles

Abstract

The purpose of this study is to evaluate the accuracy of side underride collision Case Listings (crash records) within the Fatality Analysis Reporting System (FARS), the National traffic census covering all fatal motor vehicle crashes in the United States. Internet searches were conducted using Google to locate and confirm 40 articles that reported fatalities resulting from side underride crashes with semitrailers. Photos and/or descriptions from the articles were used to validate that each side underride crash, if accurately recorded, should be coded as an "Underride" in FARS. Thirty-nine of 40 Case Listings for the side underride crashes were located in FARS, which included 58 fatalities. The remaining Case Listing, which resulted in three fatalities, was missing from FARS, and was apparently never recorded. Of the 39 Case Listings, every underride data element was inaccurately coded in FARS as "No Underride or Override Noted", demonstrating that FARS significantly undercounts crashes and fatalities that result from side underride crashes with semitrailers.

Eric Hein, November 15, 2022

Introduction

The Fatality Analysis Reporting System (FARS) is a voluntary information collection of fatal motor vehicle traffic crashes maintained by the National Highway Traffic Safety Administration ((NHTSA) 2022)). The FARS, which became operational in 1975, collects data from all 50 States, the District of Columbia, and Puerto Rico under Cooperative Agreements to report a standard set of data elements on each fatal crash within their jurisdictions (e.g., see NHTSA 2022a; 87 FR 19573). To be included in FARS, a crash must involve a motor vehicle traveling on a traffic way customarily open to the public and must result in the death of a vehicle occupant or a nonoccupant within 30 days.

The Cooperative Agreements are managed by the National Center for Statistics and Analysis (NCSA) within NHTSA. Trained State employees, called FARS analysts, are responsible for gathering, translating, and transmitting their State's data into NCSA's standard format (NHTSA 2014; see also Government Attic 2018). FARS is populated from the States' Police Accident Reports of all fatal motor vehicle traffic crashes in the United States. FARS analysts code more than 140 FARS data elements, including one element relating to whether the crash resulted in an underride with a large truck or semitrailer (NHTSA 2022). The specific data elements may be modified slightly each year to conform to changing user needs, vehicle characteristics, and highway safety emphasis areas.

An underride crash occurs when a vehicle collides with a semitrailer even at low speeds, due to the height differential, bypassing the vehicle's safety features because the point of impact is the passenger compartment, not the front bumper. Frequently, the vehicle goes partially or completely under the semitrailer causing the passenger compartment to be crushed when it contacts the semitrailer, resulting in death or severe injuries for the occupants. NHTSA's (2022b) FARS definition for an underride is "…a crash in which any portion of a passenger vehicle slides under the body of a larger truck or trailer as an underride crash".

NHTSA (2022b) reported that the availability of accurate underride crash data is critical in identifying and analyzing crash trends and developing countermeasures and strategies to mitigate and prevent these types of crashes. In fact, the FARS database is the sole source for tracking deaths in the United States from underride crashes. In FARS, "…the data element UNDERIDE [sic] is dependent on the data contained in the police crash report" and "…identifies this vehicle's involvement in an underride or override during the crash" (NCSA 2022). Still, the NCSA (2022) reported that an analysis of the 1994-1996 FARS and the 1997 Trucks in Fatal Accident file revealed that underrides are generally not identified on the state data crash reports. Peer-reviewed articles also substantiate the problem of undercounting the number of underride crashes and fatalities in FARS (Blower and Campbell 1999; Braver, et al. 1997a; Braver et al. 1997b; Brumbelow 2012; and Padmanaban 2013). Moreover, the U.S.

Government Accountability Office (GAO 2019) found that truck underride crashes are in need of improved and more consistent data collection.

Since 1993, the U.S. Department of Transportation (USDOT) has issued cost-benefit guidance on valuing the reduction of fatalities and injuries by regulations or investments (USDOT 2022). A cost-benefit analysis provides estimates of the anticipated benefits that are expected to accrue over a specified period and compares them to the anticipated costs to evaluate whether, for example, a regulation would be considered cost effective (e.g., see Hein *et al*. 2022). This USDOT guidance ensures that the economic costs and benefits of road safety measures can be monetized and compared, leading to informed decision making (USDOT 2022). Because the FARS database is known to underreport underride crashes and fatalities, if a cost-benefit analysis uses inaccurate estimates of side underride crashes and fatalities, the cost-benefit analysis will underrepresent the potential economic and societal benefits of side underride guards in preventing fatalities and minimizing serious injuries.

Despite NHTSA's long history of knowledge that underrides are generally not identified in state crash reports, and therefore not accurately recorded in FARS, the agency did nothing for decades to improve the accuracy of underride data collection. Yet, NHTSA (2016) reported that one of the important uses of FARS data was to "…estimate the potential effectiveness of new technology, especially crash avoidance technology", which would include side underride guards for semitrailers. Considering the importance of accurate underride fatal crash records (e.g., used in a cost-benefit analysis to determine if rulemaking is cost effective) and the known underreporting of data on decedents in all states, side underride crash fatalities were chosen to investigate the extent of this underreporting problem in FARS. To my knowledge, none of the previous studies investigated the magnitude of side underride crash underreporting within FARS using internet-based information.

On November 15, 2021, the Infrastructure Investment and Jobs Act became public law and within Section 4405, prescribes various components on semitrailer underride protection. For example, the law requires: 1) the Secretary of the USDOT to complete additional research on side underride guards to better understand the overall effectiveness of such guards, and if warranted, develop performance standards; 2) assess the feasibility, benefits, and costs associated with installing side underride guards on newly manufactured trailers and semitrailers with a gross vehicle weight rating of 10,000 pounds or more; 3) report to Congress on the results of the assessment/research and a determination whether to develop performance requirements for side underride guards, including any analysis that led to such determination; and 4) not later than November 15, 2022, the Secretary shall implement the recommendations described in GAO (2019) entitled "Truck Underride Guards: Improved Data Collection, Inspections, and Research Needed" (Infrastructure Investment and Jobs Act 2021).

Under the Cooperative Agreements that NHTSA maintains with all States, crash report forms and crash investigation procedures differ in whether underride crash-related information is gathered and reported in FARS (NHTSA 2022b). For example, variations exist in underride data

definitions and therefore, the underride data element, collected by each state (NHTSA 2022b; e.g., many states lack a underride checkbox in their standardized Police Accident Reporting forms).

Consequently, the purpose of this study is to investigate the prevalence of underreporting of side underride crash fatalities in FARS Case Listing records, which would improve the accuracy of death data for cost-benefit analyses, research, and determinations required by the USDOT under the Infrastructure Investment and Jobs Act (2021). As an example, this would help ensure that the Secretary of USDOT uses the best information when evaluating whether mandating side underride guards on semitrailers is warranted to prevent deaths and reduce the number of serious injuries from these crashes.

Methods

To examine the extent of underreporting of side underride crashes within FARS, internet searches were performed using Google to locate and confirm the first 40 articles that reported fatalities resulting from side underride crashes with semitrailers. Searches were not filtered or restricted to find ambiguous side underride crash records, but were limited to crashes occurring in 2020 or earlier because FARS data is only currently available from 2006 to 2020. The main search strategy used combinations of key words to find side underride crashes including: "under semi" OR "underneath semi" OR "beneath semi" OR "wedged under semi" OR "pinned under semi" OR "stuck under semi"; in combination with "dead", "fatal", "died", or "killed." Crashes were selected if the article contained at least one photo or, in articles where a photo was unclear or lacking, contained an unambiguous description where at least one death occurred after a vehicle became lodged under a semitrailer and the crash conformed to NHTSA's (2022b) underride definition when "…any portion of a passenger vehicle slides under the body of a larger truck or trailer."

Once a fatality was verified to be from a side underride crash, FARS was queried using the Fatality and Injury Reporting System Tool for the corresponding "Case Listing" (i.e., crash record) (USDOT 2022a). Each FARS Case Listing was easily located using the following crash information: Date, State, County, and whether the resulting fatality involved a large truck. Finally, each FARS Case Listing was examined to determine whether the underride crash data element was coded as an "Underride" or "No Underride or Override Noted" (NCSA 2022).

Results

Forty articles were located and confirmed that reported at least one fatality resulting from side underride crashes with semitrailers (Appendix 1; Table 1). Photographs and/or descriptions (Appendix 1; Table 1) (Appendix 2; Table 2) were used to confirm that each crash clearly conformed to NHTSA's (2022b) definition of an underride crash, and specifically, a side underride crash, where a passenger vehicle slides under the side body of a semitrailer. Case Listings for 39 of the 40 side underride crashes with semitrailers were located in FARS, which

included 58 fatalities. Inexplicably, one side underride crash that resulted in three fatalities was entirely missing from FARS, and was apparently, never recorded (see Table 1; December 20, 2020; Alameda County, CA). Of the 39 Case Listings, every underride data element was inaccurately coded in FARS as "No Underride or Override Noted", meaning none of the 39 Case Listings resulting in 58 fatalities from these side underride crashes were accurately coded as an "Underride" (Appendix 1; Table 1).

Discussion

The comparison of side underride crash fatalities reported via internet-based articles to Case Listings in FARS revealed a universal discrepancy in accurately cataloging underride fatalities in FARS. The inaccurate coding of the underride data element in each of the Case Listings demonstrates that the National traffic census data in FARS significantly undercounts the number of crashes and fatalities that result from side underride crashes with semitrailers. This study confirms that using internet-based articles is a robust investigatory tool to evaluate the extent of inaccurate coding of side underride crashes in FARS.

Since the 1990s, underreporting of underride fatalities in the FARS database has been documented by several studies (Blower and Campbell 1999, Braver, et al. 1997a, Braver et al. 1997b, Brumbelow 2012, GAO 2019, and Padmanaban 2013). In fact, GAO (2019) recommended that NHTSA "…update the [vehicle crash data elements in FARS]…to provide a standardized definition of underride crashes and to include underride as a recommended data field." Unfortunately, the extensive history of underreporting side underride crash fatalities has not encouraged NHTSA to develop methods to improve the quality and completeness of these data in FARS. As an example, NHTSA (2022b) waited over 25 years to even publish a standard definition of what they consider an underride crash, which is believed to be a significant contributory cause of underreporting.

Oddly, NHTSA still does not require the data element for underride crashes on the state data crash reports, even though this data element could be added to the mandatory reporting form for fatal traffic crashes required under the Cooperative Agreements with the 50 States, the District of Columbia, and Puerto Rico. FARS data is used extensively by NHTSA, States and local jurisdictions, the highway research community, and Congress (NHTSA 2022c). The quality and details of the side underride fatality information recorded on State police crash reports determine the accuracy of mortality statistics and the validity of research findings and decisions concerning vehicle safety programs based on these data. It is likely that inaccurate coding of these side underride crashes and fatalities stemmed from a combination of the lack of a mandatory checkbox on some State police crash reporting forms, the lack of a standard underride definition, no overarching directive to report the underride data element under Cooperative Agreements with States, and inadequate training of State police who generally complete the crash reporting forms.

This inclusion of a mandatory underride data element for each state could be approved during the clearance process with the Office and Management and Budget (OMB) when FARS information collection is authorized (e.g., see NHTSA 2022a; 87 FR 19573; NHTSA 2022c; 87 FR 43380). Before a federal agency can collect certain information from the public, it must receive approval from OMB under procedures established by the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq*.). However, including a mandatory underride data element on each of State police crash reporting forms would be a relatively straight-forward request for OMB to approve.

Brumbelow (2012) reported that deaths and injuries from side underride collisions into heavy trucks and trailers are a significant public health issue. The current study confirms this finding. Side underride guards are designed to engage car safety systems (e.g., airbags, crumple zones, seat belts) during a collision to reduce the degree of passenger compartment intrusion (Mattos *et al*. 2021). Significant expenses went into developing these car safety systems, but without a side underride guard these systems are rendered useless.

A lack of side underride guards on semitrailers is undoubtedly a causal factor in these motor vehicle crash fatalities. Side underride guards are a solid or flexible metal frame or cable/nylon webbing that can be affixed onto the sides of semitrailers to prevent vehicles from going under the semitrailer. Side underride guards would mitigate the main risk factor in underride collisions: a geometric height difference between passenger vehicles and semitrailers. Side underride guards engage a vehicle's airbags, crumple zones, crash avoidance sensors, and other safety features to minimize fatalities and reduce the potential for serious injuries to occur (Brumbelow 2012, Insurance Institute for Highway Safety (IIHS) 2017, Mattos *et al*. 2021).

IIHS (2017) crash tests demonstrate that side underride guard technology is a simple solution to the known risk of side underride collisions, preventing almost all underride collisions at a speed differential of 40 mph (note: side underride guards would prevent underride occurrences when the vehicle and semitrailer are travelling at highway speeds, because their speed differential would almost always be less than 40 mph; IIHS 2017). Additional testing and modeling demonstrate that side underride guards are expected to be highly effective and reduce the risk of annual fatalities and serious injuries by up to 89 percent (Brumbelow 2012, Mattos *et al*. 2021, National Transportation Safety Board (NTSB) 2014). Hein *et al*. (2022) reported the cumulative 15-year societal benefits of installing side underride guards on new semitrailers would save at least 3,560 lives and prevent 35,598 serious injuries. Therefore, side underride guards offer significant benefits to society by reducing the risks and associated costs of semitrailer and vehicle underride crashes.

Conclusion

This study conclusively demonstrates that underreporting of side underride fatalities in FARS is extensive. FARS is the National database that is NHTSA's and many States' principal means of tracking trends in fatalities and quantifying potential problems in highway safety, including

underride crashes and fatalities. Clearly, new methods are needed to increase the accuracy of FARS side underride death data.

Therefore, it is recommended that:

1. NHTSA include a mandatory underride data element on all State police crash reports required under the FARS reporting requirements of the Cooperative Agreements with the 50 States, the District of Columbia, and Puerto Rico. NHTSA should also further refine the data element into rear, side, or front underride categories so each of these types of underride crashes can be enumerated. This new underride reporting requirement could be approved during the next clearance process with OMB to authorize the standard set of FARS information and data elements collected (e.g., see NHTSA 2022a; 87 FR 19573; NHTSA 2022c; 87 FR 43380). This recommendation aligns with USDOT's (2022b) National Roadway Safety Strategy to address roadway safety and is consistent with NHTSA's mission to save lives, prevent injuries, and reduce economic losses resulting from motor vehicle crashes by providing the agency vital information about fatal crashes. The importance of accurately reporting underride crashes could also be highlighted during FARS data input training by NHTSA's FARS contractor (e.g., see GAO 2019).

2. NHTSA establish a process to correct inaccurate underride data element records in FARS using photos or other documentation that demonstrates a crash should have been coded as an underride. According to NHTSA's retention plan for NCSA data collection systems, States are instructed to only retain information for the current year plus three previous years (NHTSA 2022d). Currently, NHTSA (2022d) will not even attempt to update FARS Case Listing records beyond this retention schedule. Because FARS is critical in identifying and analyzing crash trends, making decisions concerning vehicle safety programs, and developing countermeasures and strategies (e.g., to mitigate and prevent side underride crashes), including cost-benefit analyses for possible future rulemaking, not having a process to correct underride data >3 years old is untenable and should be changed.

3. An investigation be conducted to comprehensively evaluate the accuracy of side underride data in at least the last 10 years of FARS Case Listing records using the same methods as this study (i.e., using Google to search and locate articles that reported fatalities resulting from side underride crashes with semitrailers and comparing these verified side underride crashes to FARS Case Listings).

4. These methods also be used to investigate the prevalence of underreporting of both rear and front underride crash fatalities with semitrailers and the prevalence of underreporting of underride fatalities involving Single Unit Trucks (front, side, rear) in FARS Case Listing records.

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Appendix 1

Table 1. Side underride crash fatalities confirmed to be inaccurately coded in the Fatality Analysis Reporting System.

FARS Case Listing	Crash Date	Fatalities	County	State	Vehicle	Basis for confirming that crash was a side underride	Internet address of crash description
120467	March 1, 2019	1	Palm Beach	FL	Tesla Model 3	See Photograph in Appendix 2 Description: "The car hit the left side of the semitrailer just aft of the trailer's midpoint. The roof of the car was sheared off as the vehicle underrode the semitrailer and continued south."	https://www.foxnews.com/auto/feds-investigating-fatal-tesla-model-3-crash-in-florida https://www.ntsb.gov/investigations/Pages/HWY19FH008.aspx
120532	March 11, 2014	3	Polk	FL	Buick Century	See Photograph in Appendix 2 Description: "…The car lodged underneath the trailer and was dragged for about 400 feet."	https://www.theledger.com/story/news/2014/03/11/parents-child-killed-in-polk/8169310007/
120918	May 7th, 2016	1	Levy	FL	Tesla Model S	See Photograph in Appendix 2 Description: "Because of the high ride-height of the trailer, as well as its positioning across the road, the Model S passed under the trailer and the first impact was between the windshield and the trailer."	https://www.nytimes.com/interactive/2016/07/01/business/inside-tesla-accident.html https://www.theverge.com/2016/6/30/12072408/tesla-autopilot-car-crash-death-autonomous-model-s https://static.nhtsa.gov/odi/inv/2016/INCLA-PE16007-7876.PDF https://www.ntsb.gov/investigations/AccidentReports/Reports/HAR1702.pdf
170962	November 30, 2020	4	Berkeley	IL	unk	See DashCam in Link and Photograph in Appendix 2 Description: "…the driver went through the stop sign and crashed into the semitrailer…"	https://www.cbsnews.com/chicago/news/police-dashcam-video-captures-crash-that-killed-3-in-berkeley/ http://www.theindependentnewspapers.com/2020/12/three-teens-killed-in-crash-while-fleeing-berkeley-police-driver-collides-with-semitrailer-at-taft-bohlander-fourth-teen-later-dies-from-injuries/

121219	May 19, 2018	1	Orlando	FL	2009 four-door Ford	Description: “The Ford struck the semi’s right side, before passing under its trailer.”	https://www.orlandosentinel.com/news/breaking-news/os-man-killed-john-young-parkway-taft-vineland-20180519-story.html
122375	October 31, 2016	1	Lake County	FL	pickup truck	See Photograph in Appendix 2 Description: “A car was lodged under a semi-truck [trailer] at the scent of a fatal crash…” “A pickup driven by Kevin Cottle, 21, of Leesburg hit the side of the tractor-trailer and drove underneath it.”	https://www.dailycommercial.com/story/news/local/2016/11/01/fog-could-have-contributed-to-fatal-5-vehicle-crash/24642934007/ https://www.wftv.com/traffic/incidents/one-killed-in-groveland-crash-involving-tractor-trailer-/462327986/
170500	July 11, 2017	1	La Fayette	IL	2014 Jeep Patriot	Description: “In the impact sequence, Corrina’s jeep traveled into the side of the trailer, under the trailer, and came to a rest west of the trailer...”	https://acrobat.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3A7ca1d170-6359-4d20-a710-f34966422394&viewer%21megaVerb=group-discover https://www.pjstar.com/story/news/courts/2021/11/30/peoria-county-awards-fatal-2017-killed-stark-county-woman/8797745002/
180041	February 3, 2019	1	Putnam County	IN	pickup truck	See Photograph in Appendix 2	https://www.wishtv.com/news/1-dead-after-semi-pickup-collide-on-us-40/
180150	March 28, 2012	5	Oaktown	IN	Cadillac sedan	Description: “…the car they were riding in became wedged under a semitrailer and burst into flames…” “Lockard apparently crossed from the northbound lanes of U.S. 41 into the southbound lanes and drove under the semi’s trailer, triggering an explosion and fire that engulfed her car and the trailer…”	https://www.heraldtimesonline.com/story/news/2012/03/30/2-toddlers-mother-among-5-dead-in-us-41-crash/47148855/
180562	October 4, 2019	3	Lake	IN	Dodge Charger	See Photograph in Appendix 2 Description: “…Two of the three people killed in a deadly crash after a car became jammed underneath a semi…”	https://abc7chicago.com/crash-i-8094-semi-northwest-indiana/5590913/ https://www.youtube.com/watch?v=3Uoqb2OxW-o

180648	October 29, 2018	1	Kosciusko County	IN	2011 Orange Dodge SUV	See Photograph in Appendix 2 Description: "…upon arrival found a passenger vehicle had under rode a semi-trailer…"	https://www.inkfreenews.com/2018/10/29/fatal-crash-on-us-30-kills-one/
180730	December 16, 2019	2	Marshall County	IN	sedan	See Photograph in Appendix 2 Description: "…vehicle ended up under the trailer of a westbound Volvo semi."	https://www.wndu.com/content/news/2-dead-after-crashing-into-semitrailer-566246081.html
210303	July 6, 2020	1	Boone County	KY	Toyota Corolla	See Photograph in Appendix 2 Description: "…leading her to spin out of control and end up under the trailer of a semi."	https://www.wymt.com/2020/07/06/21-year-old-floyd-county-woman-killed-in-collision-with-tractor-trailer/ https://local12.com/news/local/one-dead-in-i-71-crash-in-boone-county-cincinnati
220249	May 5, 2009	1	Caddo Parish	LA	Suburban	See Photograph in Appendix 2 Description: "…Beane's Suburban struck the side of the UTM trailer at a ninety degree angle, causing his Suburban to travel beneath (a collision the plaintiff describes as a "side underride") the trailer."	https://scholar.google.com/scholar_case?case=4275706816494743715&q=Beane+v.+Utility+Trailer&hl=en&as_sdt=6,38&as_vis=1 https://www.ktbs.com/news/truck-driver-ticketed-in-wreck-that-killed-deputy/article_2e988d28-5280-5235-a233-a138eea5e73c.html https://www.kplctv.com/story/10308815/update-deputy-killed-in-crash-with-18-wheeler/
260701	October 6, 2017	1	Mason County	MI	2007 Pontiac G5	Description: "…Pontiac G5 failed to stop for the stop sign at U.S. 31 and struck a northbound tractor-trailer…" "…The vehicle went under the trailer and was dragged down the road…"	https://www.mlive.com/news/muskegon/2017/10/driver_16_killed_in_crash_with.html https://www.shorelinemedia.net/ludington_daily_news/ludington-area-school-district-community-mourn-loss-of-student-henry-macdougall-following-semi-vs-car/article_559ac00c-ab7c-11e7-b309-279a0eb77569.html
270248	September 20, 2017	1	Remer Township	MN	2012 Jeep Grand Cherokee	Description: "The semi-truck was backing into a private drive on the south side of the highway when a 2012 Jeep Grand Cherokee heading east hit the truck's trailer."	https://www.cbsnews.com/minnesota/news/cass-county-fatal-crash/
320002	January 7, 2017	1	Clark County	NV	2005 Ford	See Photograph in Appendix 2	https://www.ktnv.com/news/car-lodged-under-semi-truck-trailer-near-pecos-and-sunset

					Focus wagon	Description: "…the Ford failed to stop at a red light, thus crashing into the left side of the semi. The Ford became lodged under the trailer."	
360487	July 5, 2017	4	Oswego	NY	Subaru Impreza and Mercury Sable	Description: "The incident, which involved multiple passenger vehicles sliding underneath a jackknifed tractor trailer, triggered lawmakers to propose legislation that would require tractor trailers to be equipped with side underride guards…"	https://www.baumhedlundlaw.com/blog/2019/june/truck-accident-lawsuit-renews-calls-for-underrid/ https://www.schumer.senate.gov/newsroom/press-releases/following-fatal-accident-on-i-81_schumer-launches-a-major-effort-to-make-truck-rigs-safer-for-cars-sharing-the-roads-trucks-should-be-equipped-with-energy-absorbing-underride-guards-to-protect-drivers-and-passengers-from-crashes---could-help-prevent-future-fatal-accidents-
370614	June 5, 2018	2	Charlotte	NC	Nissan Murano	See Photograph in Appendix 2 Description: "…a Nissan Murano struck the side of a tractor-trailer in the intersection. The vehicle had come to rest under the trailer…"	https://www.wsoctv.com/news/local/medic-2-killed-after-car-collides-with-tractor-trailer-in-north-charlotte/763250290/ https://www.wbtv.com/story/38350444/driver-passenger-killed-in-northeast-charlotte-crash-identified/
390821	October 11, 2017	1	Sandusky Township	OH	2012 Cadillac SRX4 SUV	See Photograph in Appendix 2 Description: "…Mayle's 2012 Cadillac struck Mugridge's 2013 Peterbilt semi and was trapped under the trailer."	https://www.thenews-messenger.com/story/news/local/2017/10/11/1-dead-suv-semi-crash-cr-138-and-us-20/753124001/
40906	December 26, 2019	1	Maricopa County	AZ	2008 Infiniti QX5 SUV	See Photograph in Appendix 2 Description: "…an SUV collided with a commercial truck, ending up underneath the big rig's trailer with its top sheared off."	https://www.12news.com/article/news/local/valley/suv-stuck-under-semi-truck-after-crash-in-phoenix/75-9283db78-0ee0-41d6-a783-c1a84049c265 https://www.fox10phoenix.com/news/driver-killed-after-suv-gets-wedged-under-semi-truck-in-phoenix
421040	October 28, 2020	1	Bucks County	PA	Honda CRV	See Photograph in Appendix 2 Description: "…sport utility vehicle was pinned under a tractor-trailer…"	https://www.mcall.com/news/police/mc-nws-bucks-fatal-20201229-qhis3bacergmzjdcbqm2qmcx2y-story.html
450487	July 18, 2018	2	Spartanburg	SC	unk	See Photograph in Appendix 2	https://www.wspa.com/news/driver-dies-days-after-chase-crash-that-killed-passenger-in-spartanburg-co/1315406775/

						Description: "…The vehicle ran a red light at the intersection of Highway 221 and I-85 and hit a tractor trailer."	https://www.wyff4.com/article/driver-dies-days-after-crash-police-chase-that-also-killed-passenger/22507613
460116	November 9, 2020	1	Pennington County	SD	sedan	See Photograph in Appendix 2 Description: "…The vehicle was wedged underneath the semi…"	https://www.kotatv.com/2020/11/09/serious-crash-redirects-traffic-at-elk-vale-road-as-police-investigate/
470489	November 18, 2014	1	Shelby	TN	SUV	Description: "Higginbotham's SUV was going east on Walnut Grove when he plowed into the trailer portion of the truck…"	https://archive.commercialappeal.com/news/crime/1-dead-in-crash-with-tractor-trailer-on-interstate-240-walnut-grove-ep-782224975-324296031.html/
480069	January 15, 2015	1	Bexar County	TX	Subaru	See Photograph in Appendix 2 Description: "…the semi had nearly completed its turn when a Subaru traveling in the opposite direction crashed into the trailer and became wedged underneath…"	https://www.ksat.com/news/2015/01/15/driver-killed-after-car-gets-stuck-under-semi-trailer-2/
480777	March 20, 2016	1	Harrold	TX	2012 Chevrolet pickup truck	See Photograph in Appendix 2 Description: "…the Chevy crashed head-on into the side of the trailer, wedging the front of the pickup under the trailer…"	https://www.texomashomepage.com/news/local-news/one-killed-in-semi-truck-crash/406057150/ https://www.timesrecordnews.com/story/news/local/2016/03/21/fatal-wreck-one-killed-in-crash-at-harrold/92573828/
480926	April 11, 2017	1	Polk	TX	Kia Soul	See Photograph in Appendix 2 Description: "…a 21-year-old college student killed by a side underride collision with an owner operated 18-wheeler…" "…Chapla's vehicle was fully lodged under Adair's trailer as the 18 wheeler pulled off the highway to Loop 116 dragging the car…"	https://www.mcabw.org/news-room/245-wham-and-rogers-verdict-receives-top-recognition https://montgomerycountypolicereporter.com/woodlands-woman-killed-polk-county-crash-18-wheeler/
481868	July 17, 2020	1	Harris County	TX	sedan	See Photograph in Appendix 2 Description: "…One person was killed when a car ended up wedged under a semi…"	https://abc13.com/houston-traffic-in-texas-now-i-10-i-45/6321663/

482615	October 15, 2018	2	Burleson	TX	Dodge minivan	Description: "…a big rig pulling a saltwater tank was turning onto Highway 21 from FM 1362 when a Dodge minivan hit the trailer."	https://www.kbtx.com/content/news/DPS-investigating-major-accident-on-Hwy-21-in-Cooks-Point-497563711.html https://www.montgomeryfirm.com/news/leslie-sophie-rosenberg-fatal-crash/
490023	February 23, 2017	1	Box Elder County	UT	1995 Ford Escort	See Photograph in Appendix 2 Description: "That impact sent his car under the semi-trailer."	https://www.hjnews.com/allaccess/clarkston-man-killed-in-collision-with-semi-near-willard/article_6493984c-44df-55b3-8587-9fe53519f3e0.html
490075	June 1, 2019	1	Utah County	UT	Chevy pickup	See Photograph in Appendix 2 Description: "…the vehicle ended up wedged beneath the semi-trailer…"	https://gephardtdaily.com/local/pickup-driver-killed-in-fiery-crash-off-i-15-in-springville/
60565	April 13, 2016	1	San Diego County	CA	Toyota 4Runner	See Photograph in Appendix 2 Description: "…vehicle struck the back of the eastbound semi broadside, winding up wedged beneath it…" "…the SUV he was driving slammed into the cargo trailer of a trash-hauling big rig…"	https://www.10news.com/news/one-dead-after-car-gets-jammed-under-semi-on-sr-52-in-santee https://www.cbs8.com/article/news/man-killed-after-suv-smashed-into-semi-truck-on-sr-52-identified/509-80716977-74e6-4d1a-883e-676136389757
60573	April 30, 2016	1	Los Angeles County	CA	Chevrolet pickup truck	See Photograph in Appendix 2 Description: "Murillo and the driver of the pickup were trapped inside as the truck was lodged underneath the 18-wheeler."	https://abc7.com/armando-murillo-killed-in-vernon-hit-and-run-man/1317398/
60888	March 1, 2020	1	Apple Valley	CA	Ford Focus	See Photograph in Appendix 2 Description: "…the Ford Focus failed to stop at the stop sign at Johnson Road, causing the vehicle to collide into the trailer the semi-truck was pulling…"	https://www.vvng.com/coroner-identifies-woman-killed-after-crashing-into-semi-truck-in-apple-valley/ https://www.vvdailypress.com/story/news/local/desert-dispatch/2020/03/02/woman-dead-after-sunday-night/1603564007/

61133	July 9, 2017	1	Riverside	CA	Honda Accord	Description: "the decedent…was unable to bring the vehicle he was operating, a 2011 Honda Accord, to rest prior to the collision with the underside of the tractor trailer…" "…the Honda operated by decedent went directly under the side of the trailer…" "…The first arriving engine company reported that one vehicle was underneath a semi-truck with one victim trapped."	https://annaleahmary.com/wordpress/wp-content/uploads/2019/09/VALENZUELA.First-Amended-Complaint-conformed.pdf https://www.youtube.com/watch?v=lSoljL5w5_s
80020	January 25, 2011	1	Boulder County	CO	2010 Mazda CX-7 crossover SUV	See Photograph in Appendix 2 Description: "…Feda's 2010 Mazda CX-7 crossover SUV smashed underneath the trailer."	https://www.dailycamera.com/2011/01/25/man-killed-in-louisville-crash-identified-as-longmont-resident-daniel-c-feda-57/
80204	June 4, 2020	2	El Paso	CO	Ford sedan	See Photograph in Appendix 2 Description: "…this caused the Ford sedan to crash into the side of the semi-trailer-truck and become lodged underneath…"	https://www.koaa.com/news/covering-colorado/fatal-crash-shuts-down-all-lanes-at-south-academy-east-fountain-boulevards https://gazette.com/news/crime/public-safety/crash-wedges-car-under-semi-leaves-2-dead-in-colorado-springs/article_0541ce1c-a65f-11ea-94d3-675b44b57c37.html
80299	July 2, 2108	1	Weld County	CO	Dodge van	See Photograph in Appendix 2 Description: "…The van appeared to be wedged underneath the semi…"	https://www.greeleytribune.com/2018/07/02/crews-responding-to-crash-involving-semi-car-at-u-s-34-and-weld-county-road-49/
No FARS record	December 21, 2020	3	Alameda	CA	Mercedes-Benz	Description: "…the car, a white Mercedes, went underneath the trailer slicing the car in half."	https://www.ktvu.com/news/3-killed-in-livermore-crash-between-car-big-rig https://www.pleasantonweekly.com/news/2021/03/02/livermore-triple-fatal-crash-investigation-complete-case-now-under-review-by-da

Appendix 2

Photographs used to confirm that a side underride crash occurred with a semitrailer.

FARS Case Listing: 40906

FARS Case Listing: 60565

FARS Case Listing: 60573

FARS Case Listing: 60888

FARS Case Listing: 61133

FARS Case Listing: 80020

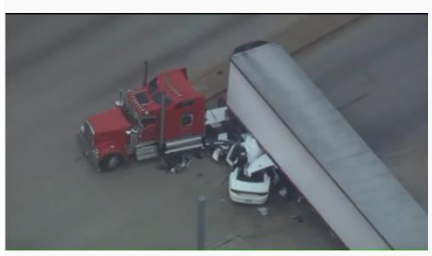
FARS Case Listing: 80204

FARS Case Listing: 80299

Figure 7. Closeup view of impact damage to the right side of the Utility semitrailer. The arrow indicates a segment of front windshield trim from the Tesla entrapped in the forward-most area of damage.

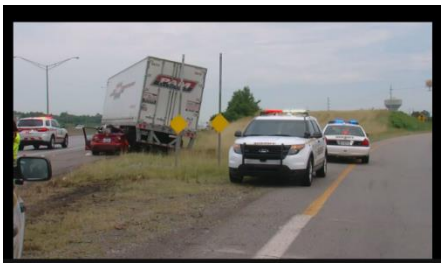
FARS Case Listing: 120532 FARS Case Listing: 120918

FARS Case Listing: 120962 FARS Case Listing: 122375



FARS Case Listing: 180041 FARS Case Listing: 180562

FARS Case Listing: 180648 FARS Case Listing: 180730



FARS Case Listing: 210303

FARS Case Listing: 220249

FARS Case Listing: 320002

FARS Case Listing: 370614

FARS Case Listing: 390821

FARS Case Listing: 421040

FARS Case Listing: 450487

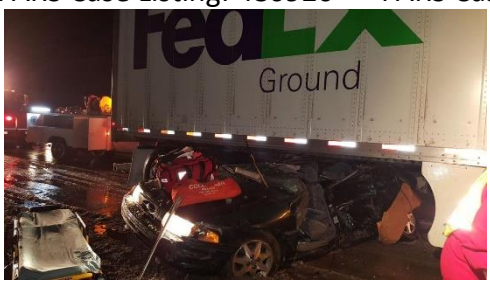
FARS Case Listing: 460116

FARS Case Listing: 480069

FARS Case Listing: 480777

FARS Case Listing: 480926

FARS Case Listing: 481868



FARS Case Listing: 490023

FARS Case Listing: 490075

No Record in FARS (Date: December 21, 2020; 3 fatalities)

Eric Hein worked throughout the United States as a wildlife biologist. He was an endangered species scientist and policy leader for the U.S. Fish and Wildlife Service, recently retiring after 30 years. Eric's truck safety advocacy began in 2015, when his 16-year-old son Riley Eric Hein was tragically killed due to the lack of a side underride guard on a 2016 semitrailer produced by Utility Trailer Manufacturing Company. Eric is a passionate, fact-based advocate who understands the Federal regulatory system and now educates the public and elected officials about the safety and financial benefits of side underride guards, campaigning for them to be mandatory on semitrailers and single-unit trucks. He is also on the Board of Directors of the Institute for Safer Trucking, a nonprofit organization focused on educating the public on truck safety issues and the data-driven solutions to address them. Eric earned his Master of Science degree in Wildlife Biology in 1992 from Colorado State University and has a Bachelor of Science in Geography with a minor in Zoology from Southern Illinois University.