U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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April 24, 2014

The Honorable John Mica
Chairman
Subcommittee on Government Operations
Committee on Oversight and Government Reform
House of Representatives

The Honorable Mark R. Warner
United States Senate

The Honorable Mario Diaz-Balart
The Honorable Lois Frankel
House of Representatives

Federal Vehicle Collisions and Aftermarket Collision Avoidance Technologies

The federal government can be liable for vehicular damages and the costs of injuries resulting from accidents involving vehicles that are owned or leased by federal agencies. The General Services Administration (GSA) plays a key role in helping agencies manage their vehicle fleets, and agencies can purchase and lease vehicles from GSA. However, federal agencies are ultimately responsible for acquiring, maintaining, and managing those vehicles in a cost-effective manner, and in fiscal year 2012, federal agencies—civilian, defense, and the U.S. Postal Service—reported owning or leasing about 650,000 motor vehicles at a cost of almost $4.4 billion. Recently, new technologies have become available that may help reduce the frequency of accidents as well as the costs of accidents that occur. These technologies, called collision avoidance technologies, use sensors, such as cameras and radar, to observe a vehicle's surroundings and issue warnings to drivers when certain types of collisions may be imminent. While such technologies have increasingly become available as factory-installed options on vehicles, aftermarket collision avoidance technologies have also become available that may offer similar benefits but cost less than factory-installed options.

You asked us to examine how much accidents involving federal vehicles cost the government each year as well as whether aftermarket collision avoidance technologies might help to reduce the number of accidents and the associated costs. We briefed your staff on the preliminary results of our review on March 26, 2014; this report formally transmits the briefing slides we provided at that time (see enclosure I). This report discusses what is known about (1) the extent to which federal vehicles were reported to have been involved in accidents from fiscal years 2008 through 2012 and the cost of those accidents to the government, and (2) the potential of aftermarket collision avoidance technologies to help reduce vehicle accidents.

To describe what is known about the extent to which federal vehicles were reported to have been involved in accidents from fiscal years 2008 through 2012 and the cost of those accidents to the government, we reviewed GSA and agency-specific guidance regarding reporting vehicle

accidents; prior GAO reports on the federal fleet;[1] and interviewed knowledgeable officials from GSA and the Department of Transportation (DOT). We also reviewed GSA's fiscal year 2012 Federal Fleet Report, the most recent available, which provides statistics on federally owned and leased vehicles, and National Highway Traffic Safety Administration (NHTSA) traffic statistics, which provide information on accident rates in the United States. We have previously assessed the reliability of data from these sources by reviewing documentation related to how the data are collected, processed, and used and interviewing agency officials who are knowledgeable about these data sources.[2] We found these data to be sufficiently reliable for the limited purpose of providing context for the data we present. We also obtained information and interviewed officials from three civilian agencies: the Departments of Agriculture (USDA), the Interior (Interior), and Veterans Affairs (VA). We selected these agencies because they reported among the highest number of accidents to GSA from fiscal years 2008 to 2012.

We assessed whether various federal data sources might allow us to quantify the number of accidents involving federally owned and leased vehicles or analyze comprehensively the costs of those accidents to the federal government. The data sources we assessed include GSA's Comprehensive Accident Reporting System, GSA's Federal Motor Vehicle Registration System, NHTSA's National Automotive Sampling System General Estimates System, NHTSA's Fatality Analysis Reporting System, the Department of Labor's Office of Workers' Compensation Programs, and the Bureau of Labor Statistics' Occupational Injuries/Illnesses and Fatal Injuries Program. We assessed the reliability of GSA's Comprehensive Accident Reporting System by reviewing the data to identify anomalies and reviewing GSA's responses to questions about how the data are collected, processed, and used. We determined that data from GSA's Comprehensive Accident Reporting System were sufficiently reliable for the purposes of our report—that is, to provide information on the number, type, and costs billed to the government of accidents for GSA-leased vehicles and the number of injuries and fatalities that resulted from these accidents. We did not assess the other data sources for reliability because we determined they did not have information that would allow us to identify the number of accidents or analyze the costs of accidents involving federally owned or leased vehicles. See the appendix to enclosure I for our assessment of each of these sources.

To describe what is known about the potential of aftermarket collision avoidance technologies[3] to help reduce vehicle accidents, we reviewed relevant federal studies and reports, such as those issued by DOT. We reviewed relevant industry literature regarding the costs, benefits, and limitations of aftermarket collision avoidance technologies. We also interviewed knowledgeable officials at GSA, DOT, USDA, Interior, and VA, to obtain their perspectives on aftermarket collision avoidance technologies. In addition, we interviewed representatives from a company that provides aftermarket collision avoidance technologies and several organizations with experience with aftermarket technologies that we identified during our research and interviews with federal agencies. These organizations include the National Transportation Safety Board, the Insurance Institute for Highway Safety, two national fleet management organizations, and a foreign automotive insurance firm. The results of our discussions with agency officials and

[1]See the Related GAO Products section at the end of this report for our recent reports on the federal fleet.

[2]For Federal Fleet Report data, see GAO, *Federal Fleets: Overall Increase in Number of Vehicles Masks That Some Agencies Decreased Their Fleets,* GAO-12-780 (Washington, D.C.: Aug. 2, 2012). For NHTSA data GAO, *Motorcycle Safety: Increasing Federal Funding Flexibility and Identifying Research Priorities Would Help Support States' Safety Efforts*, GAO-13-42 (Washington, D.C.: Nov. 14, 2012).

[3]There are other types of collision avoidance technologies that interact with a vehicle, such as by applying the brakes, which are not discussed in this report.

industry representatives are not generalizable, but do provide insights regarding federal vehicle accidents and aftermarket collision avoidance technologies.

As part of our work, we conducted a literature review of scholarly journal articles, government reports, industry reports, and other studies published worldwide in English in the past 10 years. We searched several resources including Transportation Research International Documentation, ProQuest, and the National Technical Information Service (NTIS). Our search of these databases identified more than 170 articles that discussed various aspects of collision avoidance technologies and how they might prevent accidents. We identified nine studies that were relevant and applicable for our purposes. We reviewed the methodologies of these studies and determined that they were sufficiently reliable for describing the potential of these technologies to reduce vehicle accidents. Because of assumptions made by these studies, however, it was not possible to predict how many collisions might be avoided if the technologies were installed in a fleet of vehicles or whether investing in the technology would be cost-effective. For further information on these studies, see enclosure III.

We conducted this performance audit from October 2013 to April 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

In summary, we found that limited data are available on federal vehicle accidents and their associated costs. Available data sources do not allow comprehensive measurement of either the number of accidents involving federally owned or leased vehicles or the associated costs. Data on the number of accidents involving GSA-leased vehicles, which represent about 29 percent of the federal fleet, show that from fiscal years 2008 through 2012, about 23,000 vehicles were involved in accidents in which the government was at fault; costs for repaired and totaled GSA-leased vehicles to the federal government amounted to about $53.6 million. Annual costs related to vehicle damage have decreased from about $12 million in fiscal year 2008 to about $8.6 million in fiscal year 2012, though GSA's data do not allow us to determine the reason for this decrease because it does not include data on specific cost elements, such as parts and labor.[4] Similarly, comprehensive data are not readily available for costs beyond those related to the GSA-leased vehicles. For example, information on the type of injury or costs of injuries and fatalities is not available from GSA. However, according to NHTSA, lost productivity and medical costs account for a large percentage of total accident costs relative to property damage costs, which account for less than one third of total accident costs. Officials from USDA, Interior, and VA told us that the information necessary to accurately determine the number and cost of accidents involving their leased and owned vehicles is either unavailable or would be time consuming to collect.

We also found that limited information exists on the potential of aftermarket collision avoidance technologies to reduce vehicle accidents. For example, our literature review yielded no studies of the costs and benefits of aftermarket collision avoidance technologies, and we were unable to verify any claims of benefits associated with the technologies. In addition, none of the agencies we contacted—GSA, DOT, USDA, Interior, or VA—use these technologies in their vehicle fleets. GSA does not currently offer these technologies as options for purchased or leased vehicles, citing a lack of demand from its customers.

[4]The $8.6 million in annual costs related to vehicle damage in fiscal year 2012 represents a small percentage of the $1.1 billion in costs to acquire, operate, and maintain GSA-leased vehicles.

For additional information on the results of our work, please see the briefing slides provided in enclosure I. We are not making any recommendations in this report.

Agency Comments

We provided a draft of this report to GSA, DOT, USDA, Interior, VA, the Department of Labor, and the National Transportation Safety Board for review and comment. On April 14, the Deputy Director of Audit Relations, within DOT's Office of the Secretary of Transportation, provided comments via email on a draft of our report. In those comments, DOT stated that while our report focused on aftermarket collision avoidance technologies, data do exist on the effectiveness of collision avoidance technologies that are factory-installed. DOT also stated that while factory-installed collision avoidance technologies have historically only been available on luxury vehicles, those technologies are starting to become available on mid-priced vehicles due to factors such as consumer demand. In its comments, which are reprinted in enclosure II, Interior stated that it agreed with our observation that information on the cost of accidents involving its vehicles was either unavailable or would be time consuming to collect but noted that information on the number of accidents is available through a departmental safety system. GSA provided technical comments that we incorporated where appropriate. USDA, VA, the Department of Labor, and the National Transportation Safety Board did not have comments on the report.

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We are sending copies of this report to the appropriate congressional committees, the Administrator of GSA, the Secretary of Transportation, the Secretary of Agriculture, the Secretary of the Interior, the Secretary of Veterans Affairs, the Secretary of Labor, and the Chairwoman of the National Transportation Safety Board. This report will also be available at no charge on the GAO website at http://www.gao.gov.

Should you or your staff have questions concerning this report, please contact me at (202) 512-2834 or rectanusl@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report were Derrick Collins (Assistant Director), Owen Bruce, Pamela Davidson, Leia Dickerson, Colin Fallon, Katherine Hamer, David Hooper, Wesley A. Johnson, Terence Lam, Joshua Ormond, Madhav Panwar, and Jessica Wintfeld.

Lori Rectanus
Acting Director, Physical Infrastructure Issues

Enclosures

Enclosure I:

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Federal Vehicle Collisions and Aftermarket Collision Avoidance Technologies

Briefing to Congressional Staff

March 26, 2014*

*These slides were updated on April 14, 2014, to incorporate minor changes in response to agency comments.

For more information, contact Lori Rectanus at rectanusl@gao.gov Page 1

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Introduction and Engagement Objectives

- In fiscal year 2012, federal agencies—civilian, defense, and the U.S. Postal Service—reported owning or leasing about 650,000 motor vehicles at a cost of almost $4.4 billion.
- The federal government can be liable for vehicular damages and the costs of injuries resulting from accidents involving those vehicles when federal employees are at fault.
- Recently, new technologies have become available that issue warnings to drivers when certain types of collisions may be imminent. While such technologies have increasingly become available as factory-installed options on vehicles, technologies have also become available on the aftermarket that offer similar benefits, but may cost less than factory-installed options.
- We are conducting this work for the Chairman of the Subcommittee on Government Operations, House Committee on Oversight and Government Reform, and other members of Congress.
- This briefing describes what is known about:
  1) the extent to which federal vehicles were reported to have been involved in accidents from fiscal years 2008 through 2012 and the cost of those accidents to the government, and
  2) the potential of aftermarket collision avoidance technologies to help reduce vehicle accidents.

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Results in Brief

Limited data are available on federal vehicle accidents and their associated costs. Data on the number of accidents involving General Services Administration (GSA)-leased vehicles, which represent about 29 percent of the federal fleet, show that from fiscal years 2008 through 2012 there were about 23,000 vehicle accidents where the government was at fault; repairs to these GSA-leased vehicles cost the federal government about $53.6 million. However, comprehensive data are not readily available for costs beyond repair of the GSA-leased vehicles. For example, information on the type of injury or costs of injuries and fatalities is not available from GSA.

Limited information exists on the potential of aftermarket collision avoidance technologies to reduce vehicle accidents. We were unable to verify any claims of benefits. In addition, none of the agencies we contacted are presently using these technologies in their vehicle fleets. GSA officials told us that presently there is no demand from its customer agencies for these technologies.

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Scope

- For this review, we identified:
  - available federal data sources on accidents involving vehicles owned and leased by federal agencies from fiscal years 2008 through 2012, and
  - information on aftermarket collision avoidance technologies and use of these technologies by selected federal agencies.
- To provide additional information on agency accident management practices and data collection, we contacted selected civilian agencies that reported among the highest number of accidents to GSA during fiscal years 2008 to 2012. These include the Departments of Agriculture (USDA), the Interior (Interior), and Veterans Affairs (VA).

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Methodology

- To describe what is known about the extent to which federal vehicles have been reported to be involved in accidents from fiscal years 2008 through 2012 and the cost of those accidents to the government, we assessed whether various federal data sources might allow us to quantify the number of accidents involving federally owned and leased vehicles or comprehensively analyze the costs to the federal government of those accidents.
    - One data source we used was GSA's Comprehensive Accident Reporting System, which provides information on the number and type of accidents involving GSA-leased vehicles (about 29 percent of the federal fleet), the associated costs billed to the government for the GSA vehicle, and the number of injuries and fatalities that resulted from accidents involving GSA-leased vehicles. Using this database we determined the number of accidents by faulty party, the number of injuries and fatalities, and the amount billed for vehicle towing and repair costs. We assessed the reliability of these data by reviewing GSA responses to questions about how these data are collected, processed, and used. We determined that these data were sufficiently reliable for the purposes of providing limited information on the federal collision experience and providing contextual information.
- To provide context for the data we present, we reviewed GSA's Federal Fleet Report, which includes statistics such as the number of miles reported driven for vehicles owned and leased by federal agencies, and National Highway Traffic Safety Administration (NHTSA) traffic statistics, which provide information on accident rates in the United States. We previously assessed the reliability of data from these sources by reviewing documentation related to how these data are collected, processed, and used, and interviewing agency officials who are knowledgeable about these data sources. We determined that these data sources were sufficiently reliable for the limited purpose of providing context for the data we present.

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Methodology (cont.)

- To describe what is known about the potential of aftermarket collision avoidance technologies to help reduce vehicle accidents, we:
  - reviewed scholarly journal articles, government reports, industry reports, and other studies published worldwide in English in the past 10 years regarding the costs, benefits, and limitations of aftermarket collision avoidance technologies;
  - interviewed knowledgeable officials at GSA, the Department of Transportation (DOT), USDA, Interior, and VA;
  - interviewed representatives from a company that provides aftermarket collision avoidance technologies;[1] and
  - contacted representatives of organizations that have experience with aftermarket collision avoidance technologies that we identified during our review, such as the National Transportation Safety Board and the Insurance Institute for Highway Safety.

- The results of our discussions with agency officials and industry representatives are not generalizable, but do provide insights regarding federal vehicle accidents and aftermarket collision avoidance technologies.

- We obtained technical comments from agencies on the contents of this briefing.

[1] During the course of our audit work, we identified a single provider of aftermarket collision avoidance technologies in the United States.

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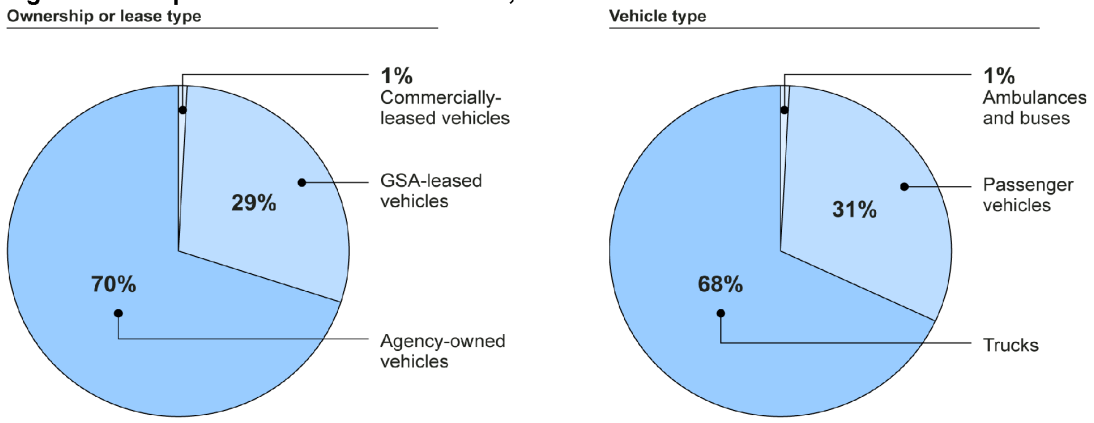
Background: Composition of the Federal Fleet

- In FY 2012, federal agencies—civilian, defense, and the U.S. Postal Service—reported owning or leasing about 650,000 motor vehicles.

Figure 1: Composition of the Federal Fleet, Fiscal Year 2012



Source: GAO analysis of GSA data.

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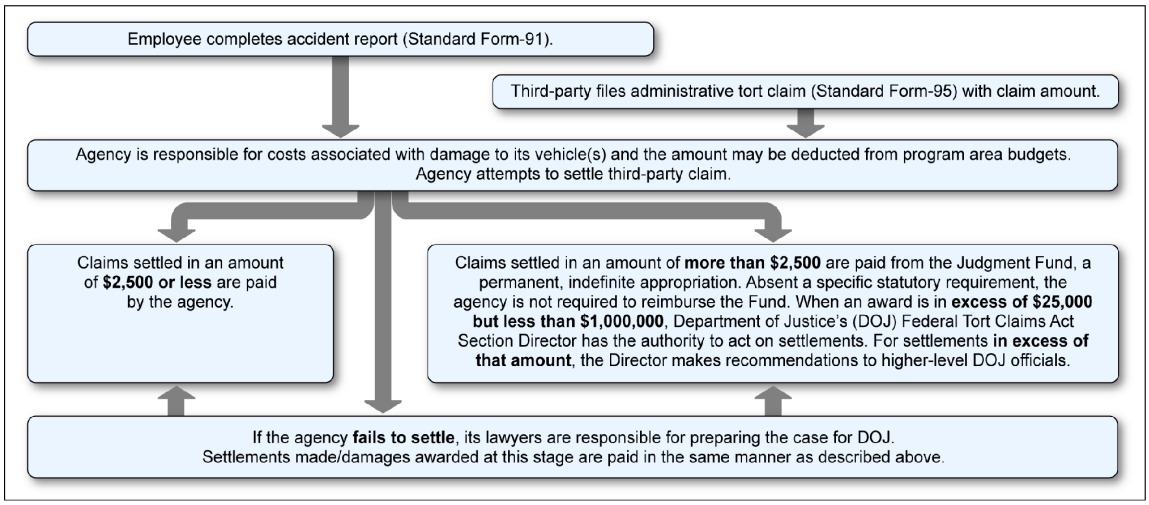
Background: Resolution Process for Accidents Involving GSA-Leased Vehicles When the Government is At-Fault

Figure 2: Accident Resolution Process Involving GSA-Leased Vehicles When the Government is At-Fault



Source: GAO.

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Additional Information on the Resolution Process for Accidents where a Third Party is At-Fault

- When a third party is at fault:
  - For vehicles leased through GSA, GSA initiates the claims recovery process with the third party or their insurer.
  - For federally owned or commercially leased vehicles, the agency seeks payment from the third party or their insurer.
  - For vehicles owned by a federal employee used for official government business, the head of an agency may pay for a claim the employee brings against the U.S. Government for damages to, or loss of, a vehicle incident to service. For claims involving third-party liability insurance, the claim must first be filed with the insurance carrier before the claim is filed with the U.S. Government.

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Background: Aftermarket Collision Avoidance Technologies

- Collision avoidance technologies, including aftermarket technologies, use sensors, such as cameras or radar, to warn drivers when certain types of collisions may be imminent. For example, they can warn drivers if they are driving too close to the vehicle in front of them, thereby possibly preventing a front-end collision, or warn drivers if their vehicle passes over a lane marker without signaling a lane change.

- Aftermarket collision avoidance technologies generally provide drivers with an audio or visual alert when a collision may be imminent, as illustrated in figure 3. In contrast, other types of collision avoidance technologies exist, which are not discussed in this report, that interact with a vehicle, such as by applying the brakes.

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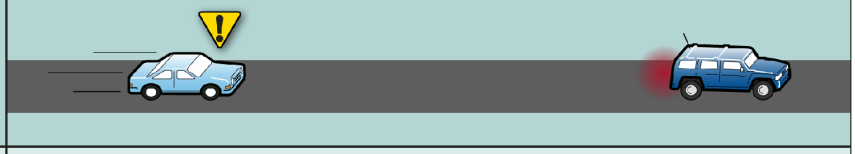
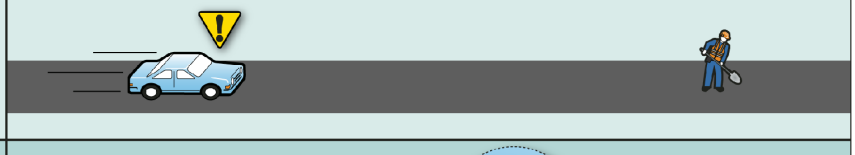
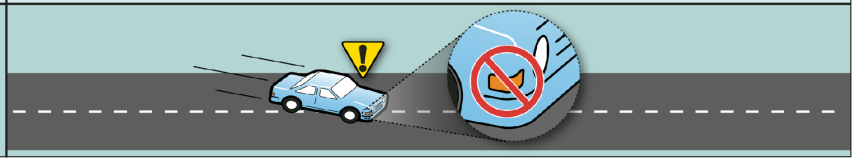
Background: Aftermarket Collision Avoidance Technologies (cont.)

Figure 3: Examples of Scenarios in Which Aftermarket Collision Avoidance Technologies Warn Drivers to Help Prevent Accidents

Warning type	Scenario example
Forward collision warning Approaching a vehicle that is decelerating or stopped triggers an alert.	
Pedestrian collision warning The presence of a pedestrian in the road triggers an alert.	
Lane departure warning Crossing over the center line without using turn signals triggers an alert; an oncoming car in the other lane does not need to be present.	

Source: GAO.

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Objective 1: Federal Vehicle Collisions – Limited Data Available

Available Data Cannot Be Used to Comprehensively Measure Federal Vehicle Accidents or Associated Costs

- To comprehensively measure the number of accidents involving federal vehicles and the associated costs, we would require basic data on the number of federally owned, GSA-leased, and commercially leased vehicles involved in accidents. These data would also need to provide information about
  - the vehicles involved, any property damage, and which party was at fault;
  - any injuries sustained; and
  - any costs incurred for repair or replacement of the federal vehicle; any medical costs of federal employee(s) involved, including disability payments; amount in third-party claim settlements and damages awarded, if any; and any additional costs including loss of productivity.

- We identified and assessed six potential sources of those data and determined that they do not provide the information necessary, alone or in combination. See the appendix for information on the data sources we assessed and the limitations we identified.

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Objective 1: Federal Vehicle Collisions – Limited Data Available

Collision Data on Federally Leased Vehicles

- Data on collisions involving GSA-leased vehicles—which represents about 29 percent of the entire federal fleet—provide a limited view of federal vehicle collisions. We note:
  - These data include, among other things, information on the costs to repair federally leased vehicles, information on the number of injuries and fatalities associated with the accident, and information on the type of accident.
  - These data do not include costs beyond initial costs for repairs or totaled vehicles billed to the government for the federally leased vehicle.
  - These data do not include costs of repairs to the third-party's vehicle.
  - These data do not allow for estimation of further costs due to limited information on injuries.
  - These data are limited to GSA-leased vehicles, and the analysis cannot be generalized to all federally owned and leased vehicles.
- To present the data on collisions involving GSA-leased vehicles, we excluded accidents associated with acts of nature, theft, and vandalism—which accounted for less than .25 percent of accidents involving federal agencies—because they are not associated with a motor vehicle accident.
- For context, we provided some national statistics from NHTSA on accident, injury, and fatality rates. However, these statistics are not directly comparable due to differences in reporting practices. For example, NHTSA statistics are based on police-reported accidents, and would not include accidents that aren't reported to the police, whereas GSA's accident data may include accidents that would not typically be reported to the police.

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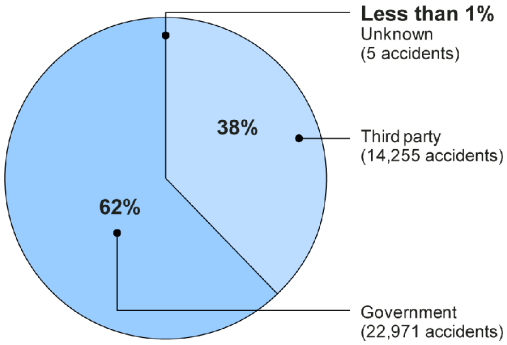
Objective 1: Federal Vehicle Collisions – Limited Data Available

Vehicle Accidents Involving GSA-leased Vehicles

- From fiscal years 2008 through 2012, GSA-leased vehicles traveled about 9.7 billion miles and were at fault in about 23,000 accidents, as shown in figure 4.

Figure 4: Accidents by Faulty Party, Fiscal Years 2008-2012



Source: GAO analysis of GSA accident data.

Note: Totals may not add due to rounding.

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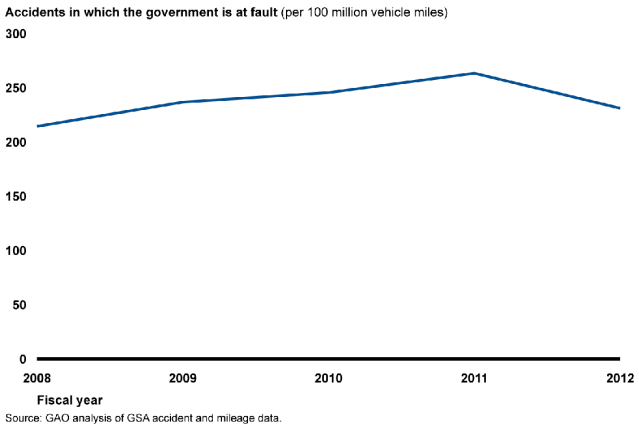
Objective 1: Federal Vehicle Collisions – Limited Data Available

- From fiscal years 2008 through 2012, the government was reported to be at fault in an average of about 238 accidents per 100 million vehicle miles, as shown in figure 5.

Figure 5: Accidents Involving GSA-leased Vehicles in Which the Government Was at Fault per 100 Million Vehicles Miles, Fiscal Years 2008-2012



Source: GAO analysis of GSA accident and mileage data.

Notes: For context, according to NHTSA traffic safety statistics for 2012, the national accident rate was approximately 190 accidents per 100 million vehicle miles. However, these data points are not directly comparable to GSA's data because of differences in reporting practices. For example, GSA's data may include accidents that would not typically be reported to police, such as an accident in which a vehicle collides with a tree stump or other stationary object.

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Objective 1: Federal Vehicle Collisions – Limited Data Available

- Among accidents in which GSA-leased vehicles were reported to be at fault, approximately 93 percent involved a collision with another vehicle, as shown in table 1. GSA's data does not provide further details regarding the type of collision that occurred.

Table 1: Accident Types Involving GSA-leased Vehicles, Fiscal Years 2008-2012

Accident type	Number of accidents
Collision with another vehicle	21,385
Struck a stationary object	524
Ran off road	288
Damage found at inspection	109
Struck an animal	68
Struck a pedestrian	41
Other	556
Total	**22,971**
Total Accidents per 100 million miles	**238**

Source: GAO analysis of GSA accident and mileage data.
Notes: "Other" includes accidents that did not match these categories or where GSA had incomplete information. For context, according to NHTSA traffic statistics for 2012, the national accident rate was approximately 190 accidents per 100 million vehicle miles. However, these data points are not directly comparable to GSA's data because of differences in reporting practices.

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Objective 1: Federal Vehicle Collisions – Limited Data Available

- Costs for repairs or totaled GSA-leased vehicles averaged about $2,300 per accident from fiscal years 2008 through 2012, as shown in table 2. Annual costs related to vehicle damage have decreased from about $12 million in fiscal year 2008 to about $8.6 million in fiscal year 2012, though GSA's data does not allow us to determine the reason for this decrease because it does not include data on specific cost elements, such as parts and labor.[2] However, according to NHTSA data on the economic impact of motor vehicle crashes,[3] property damage costs, which include vehicle repair costs, represent less than one-third of total accident costs.

Table 2: Costs for Repairs or Totaled Vehicles for Accidents Involving GSA-leased Vehicles in which the Government was At-Fault, Fiscal Years 2008-2012

	Amount billed to agencies	Number of accidents	Average Accident Cost Billed to Agencies
Total	**$53,557,306**	**22,971**	**$2,332**

Source: GAO analysis of GSA accident and mileage data.
Notes: These data do not include costs beyond those to repair the government leased vehicle and costs due to totaled leased vehicles, such as costs to repair vehicles owned by third parties, other property damage, medical, and legal costs.

[2] The $8.6 million in annual costs related to vehicle damage in fiscal year 2012 represents a small percentage of the $1.1 billion in costs to acquire, operate, and maintain GSA leased vehicles.
[3] L. Blincoe et al, *The Economic Impact of Motor Vehicle Crashes 2000* (Washington, D.C.: National Highway Traffic Safety Administration, 2002).

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Objective 1: Federal Vehicle Collisions – Limited Data Available

- Among accidents in which the government was reported to be at fault, there were 1,466 injuries and 49 fatalities reported from fiscal years 2008 through 2012, as shown in table 3. Information on the type of injury or costs of injuries or fatalities is not available from GSA. However, according to NHTSA data on the economic impact of motor vehicle crashes, loss in market productivity and medical and legal costs generally account for a large percentage of total accident costs relative to property costs.

Table 3: Injuries and Fatalities Related to Accidents Involving GSA-leased Vehicles in which the Government Was At-Fault, Fiscal Years 2008-2012

	Number of injuries	Injuries per 100 million vehicle miles	Number of fatalities	Fatalities per 100 million vehicle miles
Total	1,466	15.16	49	0.51

Source: GAO analysis of GSA accident and mileage data.
Notes: According to NHTSA data on police reported accidents, in 2012 the national accident injury rate was about 80 injuries per 100 million vehicle miles and the national fatality rate was about 1.1 fatalities per 100 million vehicle miles. However, these data may not be directly comparable to data on accidents involving federally leased vehicles due to differences in reporting.

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Objective 1: Federal Vehicle Collisions – Limited Data Available

Selected Agencies Collect Limited Data on Collisions Involving Their Leased and Owned Fleets

- Officials at USDA, Interior, and VA told us that the information necessary to accurately determine the complete number and cost of accidents involving their leased and owned vehicles is either unavailable or would be time consuming to collect. For example:
    - All three agencies reported collecting either the same amount or less data on collisions involving their owned vehicles than for leased vehicles collected by GSA.
    - All three agencies stated that they either could not determine or were unsure if they could determine information on the type of injury sustained in collisions.
- Further, in July 2013 we reported that, of the 9 component agencies with fleet management information systems that we reviewed, 8 lacked complete data in their fleet management information systems and that the type of data missing most frequently are data on costs associated with the agencies' fleets.[4]

[4] GAO, *Federal Vehicle Fleets: Adopting Leading Practices Could Improve Management*, GAO-13-659 (Washington, D.C.: July 31, 2013). In this report, we reviewed the fleet management practices of USDA, Interior, the Department of Homeland Security, VA, the Air Force, and the Army Corps of Engineers. Among those, we also reviewed 10 component agencies, 9 of which had fleet management information systems.

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Objective 2: Aftermarket Collision Avoidance Technologies – Limited Information Exists

Literature Review Yielded No Information on the Costs and Benefits of Aftermarket Collision Avoidance Technologies

- Through our literature review we identified more than 170 articles that discussed various aspects of collision avoidance technologies and how they might prevent accidents; however, none discussed the costs and benefits of aftermarket technologies. To explore this issue further, we expanded our literature review to include studies of technologies that are comparable to aftermarket technologies in that they either warn drivers if a forward collision is imminent or if their vehicle passes over a lane marker without signaling a lane change, but do not otherwise interact with the vehicle. We identified nine studies that analyzed the potential benefits of comparable technologies. These studies relied on statistical modeling, simulations, and related methods to project collision reductions and, as such, the results were sensitive to assumptions made, thus limiting our ability to generalize many of the results to real-world driving scenarios using aftermarket technologies.
- While all nine studies projected a reduction in collisions, they made different assumptions—for example, regarding system effectiveness or driver response. As a result, it is not possible to predict how many collisions might be avoided if the technologies were installed in a fleet of vehicles or whether investing in the technology would be cost-effective.
- We identified one organization currently undertaking a research project aimed at determining the road safety benefits of aftermarket collision avoidance technologies. The project involves a year of data collection followed by analysis for a foreign insurance company and is scheduled to be completed by June 2015.

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Objective 2: Aftermarket Collision Avoidance Technologies – Limited Information Exists

Claims of Benefits for Aftermarket Collision Avoidance Technologies Could Not Be Verified

- We reviewed documentation and studies from a company that provides aftermarket collision avoidance technologies to assess the validity of general claims of benefits associated with these technologies. We did not attempt to verify all of the data cited or calculate the return on investment; instead, we reviewed selected documentation and studies that are most relevant to supporting claims of benefits for the technologies. We could not verify claims of benefits because:
  - First, estimates of the return on investment, a measure of benefits with respect to costs, are sensitive to assumptions made and the parameters used in estimating the costs of accidents. Because the cost of an accident can vary widely depending on the type and severity, different assumptions about the average costs of accidents can generate, in some cases, substantially different estimates of the return on investment.
  - Second, due to the inherent differences between types of vehicles that may significantly affect calculations of the costs and benefits for these technologies, estimated benefits for one type of vehicle may not be directly transferrable to other types of vehicles.
  - Finally, caution should be exercised when making direct comparisons of the driving habits and conditions in the United States and other countries. For example, factors such as a given country's culture towards driving safety, driver behavior, and road design can limit the usefulness of other countries' studies of these technologies to the United States.

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Objective 2: Aftermarket Collision Avoidance Technologies – Limited Information Exists

Aftermarket Collision Avoidance Technologies Are Not Available Through GSA and Are Not Used by Federal Agencies

- GSA does not offer aftermarket collision avoidance technologies as options for purchased or leased vehicles. GSA officials told us they have conducted some research on aftermarket collision avoidance technologies but have not extensively researched them or sought information from the private sector due to lack of demand from GSA's customers. GSA officials also noted that obtaining collision avoidance technologies as options on new vehicles is preferable to purchasing aftermarket products.
- GSA officials told us that the automotive products purchased by GSA meet all federal motor vehicle safety standards and that GSA would rely extensively on test evaluations, data, and regulatory guidance from DOT and NHTSA before offering aftermarket collision avoidance technologies to its customers.
- Officials from GSA, DOT, USDA, Interior, and VA told us they are not using these technologies in their vehicles, and GSA officials told us they were not aware of any agencies that are.
- Agency officials told us aftermarket collision avoidance technologies may not prevent the types of accidents in which their vehicles are involved. For example, USDA representatives told us they did not feel aftermarket technologies would prevent accidents in rural conditions or at night.

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Objective 2: Aftermarket Collision Avoidance Technologies – Limited Information Exists

Aftermarket Collision Avoidance Technologies Have Limitations

- During our review, we identified some limitations of selected aftermarket collision avoidance technologies. For example:
  - Features such as lane departure warnings require a clear center line in the road and may have reduced functionality in some road conditions, such as snow or mud-covered roads.
  - Features such as pedestrian collision warning only work during daylight, may not work during periods of limited visibility, and cannot detect certain objects or animals in the road.

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Appendix: Data Sources Assessed

- To comprehensively measure accidents involving federal vehicles and their associated costs, we assessed the following data sources for this work:

Data Source	Vehicle Information	Injury Information	Cost Information	Limitations
Comprehensive Accident Reporting System, General Services Administration	Information on GSA leased vehicles.	Occurrence of injuries or fatalities.	Contains information on the cost to tow and repair the GSA leased vehicle.	•No information on federally owned or commercially leased vehicles. •No information on the extent or cost of injuries.
Federal Motor Vehicle Registration System, General Services Administration	Vehicle identification numbers of federally owned and leased vehicles.	None	None	•Not sufficiently reliable for our purposes due to manual data entry and minimal data quality assurance procedures for vehicles owned or leased prior to 2009. As a result, database is an incomplete source of information on all federally owned and leased vehicles.

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Appendix: Data Sources Assessed (cont.)

Data Source	Vehicle Information	Injury Information	Cost Information	Limitations
National Automotive Sampling System General Estimates System, National Highway Traffic Safety Administration	Information on a nationally representative sample of police-reported accidents.	Information on the injury severity of persons associated with the accident.	None	•Cannot identify accidents involving federally owned or leased vehicles. •Limited ability to estimate vehicle repair or injury cost.
Fatality Analysis Reporting System, National Highway Traffic Safety Administration	Information on all fatal accidents.	Information on injuries sustained by all persons involved in the accident.	None	•Cannot identify accidents involving federally owned or leased vehicles •Limited to fatal accidents. •Limited ability to estimate vehicle repair or injury cost.

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Appendix: Data Sources Assessed (cont.)

Data Source	Vehicle Information	Injury Information	Cost Information	Limitations
Office of Workers' Compensation Programs, Department of Labor	None	Limited injury information.	Cost information for the federal employee making the claim.	•Cannot determine if accident occurred in a federally owned or leased vehicle. •No vehicle repair cost information. •No information regarding third-party vehicle repair or injury costs. •Data reliability concerns due to incomplete information.
Occupational Injuries/Illnesses and Fatal Injuries Program, Department of Labor's Bureau of Labor Statistics	None	Fatalities of federal employees occurring on-the-job.	None	•Limited to federal employee fatalities. •No information on non-fatal injuries to other federal employees, if any, involved. •No information on costs related to federal vehicle damage. •No information regarding third-party vehicle repair or injury costs. •Cannot determine if accident occurred in a federally owned or leased vehicle.

Source: GAO analysis of agency information.

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Enclosure II: Comments from the Department of the Interior

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, DC 20240

APR 11 2014

Memorandum

To: Derrick Collins
Assistant Director, Physical Infrastructure
Government Accountability Office

From: Debra E. Sonderman, Director
Office of Acquisition and Property Management

Subject: Comments on Draft GAO Report, *Federal Vehicle Collisions and Aftermarket Collision Avoidance Technologies* (Report No. GAO-14-408R)

Thank you for the opportunity to comment on the subject draft report. We note that the last sentence at the bottom of page 4 states that "Officials from the USDA, Interior, and VA told us that the information necessary to accurately determine the number and cost of accidents involving their leased and owned vehicles is either unavailable or would be time consuming to collect." It would be helpful to clarify that Department of the Interior (DOI) policy requires motor vehicle accidents to be reported to the Safety Management Information System, and information on the number of accidents is available through that system. However, DOI agrees with GAO's observation that information on the cost of accidents is either unavailable or would be time consuming to collect.

If you have any questions, please contact Kathy Bender of my staff on (202) 513-0693 or by e-mail at Kathryn_L_Bender@ios.doi.gov.

Enclosure III: Studies GAO Identified as Relevant and Applicable to Aftermarket Collision Avoidance Technologies

Purpose	Vehicle type	Projected a reduction in collisions?	Cost effective?	Limitations
This study estimated the number of preventable crashes assuming a fleet of vehicles was fully equipped with a lane departure warning system. The study used computer simulations that drew on national crash data as well as naturalistic driving and test data.[a]	Passenger vehicles	Yes	Not discussed	The results are sensitive to assumptions the computer model made on simulated driving behaviors.
This study estimated the average annual number of preventable crashes and return on investment assuming widespread use of forward collision warning systems in the trucking industry. The study utilized national crash data and industry-specific cost data.[b]	Heavy-duty trucks	Yes	In some instances only	The projections are only applicable to the heavy-duty trucking industry due to the inherent differences between heavy-duty trucks and passenger vehicles.
This study estimated the average annual number of preventable crashes and return on investment assuming widespread use of lane departure warning systems in the trucking industry. The study utilized national crash data and industry-specific cost data.[c]	Heavy-duty trucks	Yes	In some instances only	The projections are only applicable to the heavy-duty trucking industry due to the inherent differences between heavy-duty trucks and passenger vehicles.
This study estimated the annual crash reductions in Australia and potential cost effectiveness assuming widespread use of lane departure warning systems and 75 percent effectiveness. The study used police-reported crash data and national crash cost estimates.[d]	Passenger vehicles, trucks, and motorcycles	Yes	Not cost effective	The projections may not be applicable to the U.S. due to factors such as a given country's culture towards driving safety, driver behavior, and road design.

Using an automobile simulator, this study compared the number of collisions test subjects had when driving with and without a warning device comparable to a forward collision warning system.[e]	Passenger vehicles	Yes	Not discussed	Driver simulators do not replicate real-world road conditions, system functioning, or driver behavior.
This study projected the annual reduction in road departure crashes assuming widespread use of a lane departure warning system with multiple cameras and warnings that are available 55 percent of the time. The study drew on national crash data as well as test drive data.[f]	Passenger vehicles	Yes	Not discussed	The projections may be an over-estimate since the technology under study is more advanced than after-market technologies and may be more effective at detecting critical events.
This study estimated the reduction in heavy-vehicle rear-end crashes on U.S. highways by deploying a forward collision warning system across the national fleet of heavy vehicles. The study relied on simulations of collision avoidance behavior and statistical models using field data, as well as national crash data and naturalistic driving data.[g]	Heavy-duty trucks	Yes	Not discussed	The projections are only applicable to the heavy-duty trucking industry due to the inherent differences between heavy-duty trucks and passenger vehicles.
This study projected the annual reduction in all crashes and severe crashes in Germany assuming widespread use of lane departure warning systems. The study used the German national crash database.[h]	Passenger vehicles	Yes	Not discussed	The projections may not be applicable to the U.S. due to factors such as a given country's culture towards driving safety, driver behavior, and road design.
This study projected the maximum potential reduction in passenger vehicle collisions and fatal crashes in the U.S. assuming the widespread and effective use of forward collision and lane departure warning systems. The study drew on	Passenger vehicles	Yes	Not discussed	The projections may over-estimate benefits since they assume 100 percent system effectiveness

national crash data on collisions and crash fatalities.[i]				and driver compliance.

Source: GAO analysis.

[a]U.S. Department of Transportation, National Highway Traffic Safety Administration, *Advanced Crash Avoidance Technologies (ACAT) Program—Final Report of the Volvo-Ford-UMTRI Project: Safety Impact Methodology for Lane Departure Warning—Method Development and Estimation of Benefits*, DOT HS 811 405 (Washington, D.C.: 2010).

[b]U.S. Department of Transportation, Federal Motor Carrier Safety Administration, *Analysis of Benefits and Costs of Forward Collision Warning Systems for the Trucking Industry*, FMCSA-RRT-09-021 (Washington, D.C.: 2009).

[c]U.S. Department of Transportation, Federal Motor Carrier Safety Administration, *Analysis of Benefits and Costs of Lane Departure Warning Systems for the Trucking Industry*, FMCSA-RRT-09-022 (Washington, D.C.: 2009).

[d]Centre for Automotive Safety Research, *Analysis of Crash Data to Estimate the Benefits of Emerging Vehicle Technology*, CASR094 (The University of Adelaide, Australia: 2011).

[e]A. Kramer, N. Cassavaugh, W. Horrey, E. Becic, and J. Mayhugh, "Influence of Age and Proximity Warning Devices on Collision Avoidance in Simulated Driving," *Human Factors: The Journal of the Human Factors and Ergonomics Society*, vol. 49, (2007): 935-949.

[f]U.S. Department of Transportation, National Highway Traffic Safety Administration, *Evaluation of a Road-Departure Crash Warning System*, DOT HS 810 854 (Washington, D.C.: 2007).

[g]H. Rakha, G. Fitch, M. Arafeh, M. Blanco, and R. Hanowski, "Evaluation of Safety Benefits from a Heavy-Vehicle Forward Collision Warning System," *Transportation Research Record: Journal of the Transportation Research Board*, no. 2194, Transportation Research Board of the National Academies, Washington, D.C: (2010) 44-54.

[h]B. Gottselig, V. Eis, T. Wey, and R. Sferco, "Developments of Road Safety Trends—Identification of the Potential Effectiveness of Modern Safety Systems Using an Integrated Approach," Proceedings of the Technical Congress, Verband der Automobilindustrie, Germany (2008): 173-184.

[I]J.Jermakian, "Crash Avoidance Potential of Four Passenger Vehicle Technologies," *Accident Analysis and Prevention*, vol. 43 (2011): 732-740.

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Related GAO Products

GAO. *Federal Vehicle Fleets: Adopting Leading Practices Could Improve Management*. GAO-13-659. Washington, D.C., July 31, 2013.

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GAO. *Federal Energy and Fleet Management: Plug-in Vehicles Offer Potential Benefits, but High Costs and Limited Information Could Hinder Integration into the Federal Fleet*. GAO-09-493. Washington, D.C., June 9, 2009.