

Intentionally Set Vehicle Fires

These short topical reports are designed to explore facets of the U.S. fire problem as depicted through data collected in the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS). Each topical report briefly addresses the nature of the specific fire or fire-related topic, highlights important findings from the data, and may suggest other resources to consider for further information. Also included are recent examples of fire incidents that demonstrate some of the issues addressed in the report or that put the report topic in context.

Findings

- Approximately 10 percent of all vehicle fires are intentionally set.
- The incidence of intentionally set vehicle fires peak in the summer months (June–August), especially in mid-summer (July).
- Matches (20 percent) are the leading heat source of intentionally set vehicle fires.
- Ninety-two percent of intentionally set vehicle fires occur in the vehicle area.
- Vehicle seats (34 percent) and uncontained fuel (14 percent) are the items most often first ignited in intentionally set vehicle fires.

From 2004 to 2006, an estimated 27,900 intentionally set vehicle fires occurred each year in the United States. Intentionally set fires account for 10 percent of all vehicle fires. These intentionally set fires resulted in an average of approximately 40 deaths, 75 injuries, and \$169 million in property loss each year.¹ This topical report addresses the characteristics of intentionally set vehicle fires reported to the National Fire Incident Reporting System (NFIRS) between 2004 and 2006. Intentionally set fires are those that are deliberately set and include fires that result from deliberate misuse of a heat source, fires of an incendiary nature (arson), as well as controlled burn fires, such as crop clearing, that required fire service intervention.

The NFIRS data provide information on fires and factors that may have contributed to the fire's ignition. In the case of suspected arson fires, NFIRS allows for the collection of additional information to determine why the fire was set. In the case of intentionally set fires, only 12 percent of the incidents provide information as to the potential motive for these fires.²

This topical report is part of the Intentionally Set Fires Topical Reports series. The first, *Intentionally Set Fires* (Volume 9, Issue 5), presents the overall intentionally set fires problem. Other aspects of the intentionally set fire problem are explored in *Intentionally Set Outdoor Fires* (Volume 9, Issue 6) and *Intentionally Set Fires in Residential Buildings* (Volume 9, Issue 8).

Table 1 presents losses, averaged over this 3-year period, of all reported vehicle fires and intentionally set vehicle fires.³

Table 1. Loss Measures for All Vehicle Fires and Intentionally Set Vehicle Fires (3-year average, 2004–2006)

Measure	All Vehicle Fires	Intentionally Set Vehicle Fires
Average Loss:		
Fatalities/1,000 Fires	2.3	1.7
Injuries/1,000 Fires	4.8	2.9
Dollar Loss/Fire	\$3,522	\$4,797

Source: NFIRS 5.0

Note: Average loss for fatalities and injuries is computed per 1,000 fires; average dollar loss is computed *per fire*.

One of the challenges in the analyses of NFIRS intentional fire data is the large number of unknown, undetermined, or unavailable entries reported. For example, in the analyses of the heat source and items first ignited in intentionally set vehicle fires, these unknown, undetermined, or unavailable entries comprise 52 percent and 45 percent of the data respectively, making it difficult to establish any concrete conclusions.

Incident Types for Intentionally Set Vehicle Fires

Eighty-six percent of intentionally set vehicle fires are passenger vehicle fires. Mobile property vehicle fires account

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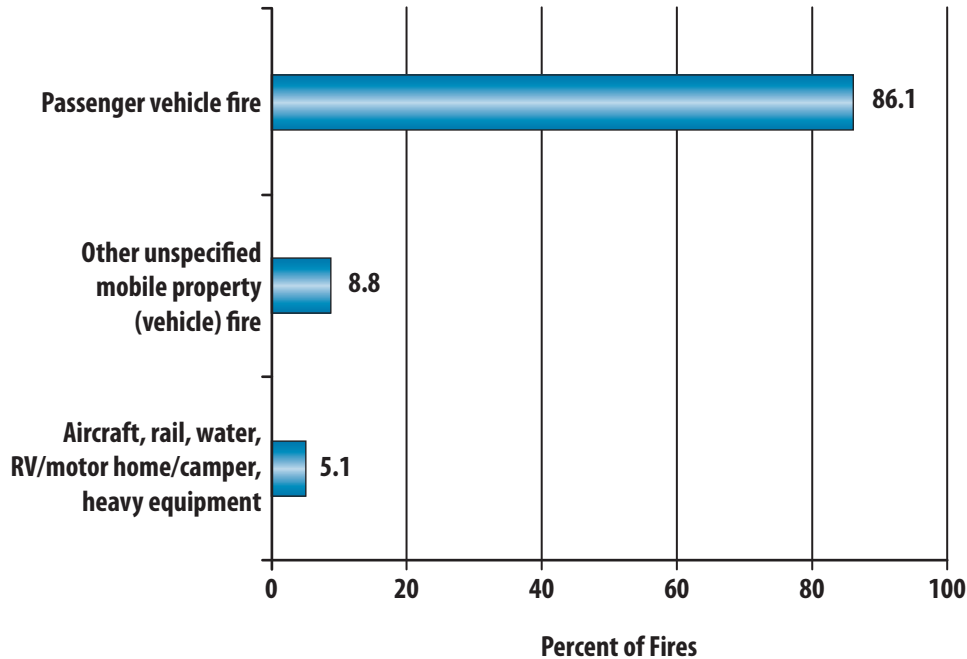
FEMA



for 9 percent of intentionally set vehicle fires, another 2 percent of fires occur in road freight or transport vehicles, and 1 percent of fires occur in camper or recreational vehicles (RV). Approximately 2 percent of intentionally set

vehicle fires include off-road vehicles or heavy equipment, water vehicles, rail vehicles, self-propelled motor homes or RVs, and aircrafts (Figure 1).

Figure 1. Intentionally Set Vehicle Fires by Type of Incident (2004–2006)



Source: NFIRS 5.0

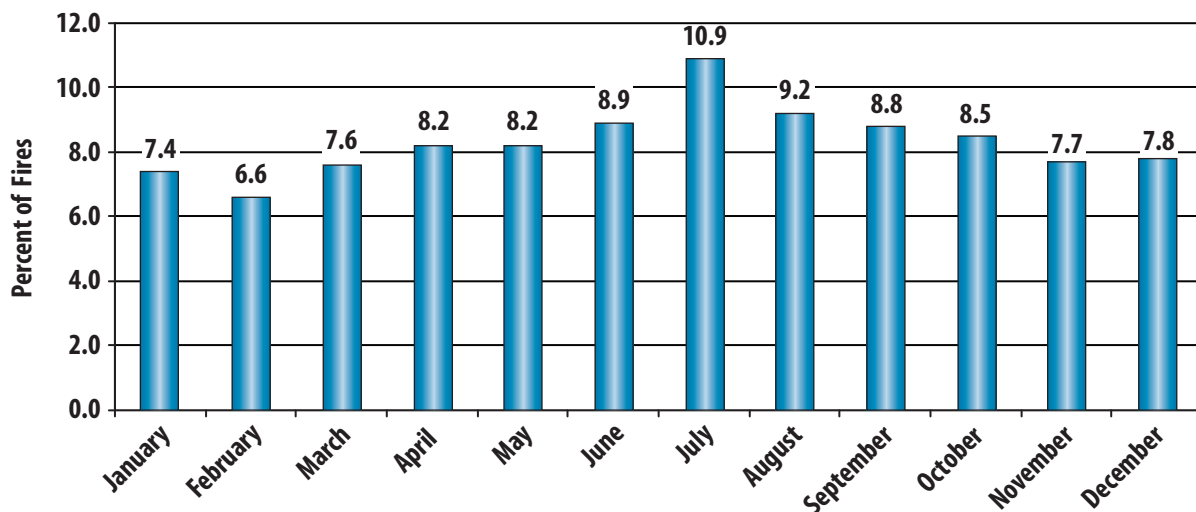
Note: Total may not add to 100 percent due to rounding.

When Intentionally Set Vehicle Fires Occur

Figure 2 illustrates that intentionally set vehicle fires occur differently throughout the year. The maximum numbers of intentionally set vehicle fires occur during the summer months of June, July, and August. Intentionally set vehicle fires peak in July (11 percent) with the largest number of fires occurring on July 4. This peak is not unexpected as

fireworks play a substantial role in the days around the holiday. Twenty-seven percent of intentionally set fires between July 3 and July 5 result from fireworks. Vehicle seats are the item first ignited in 43 percent of the intentionally set fires that occur during this same time period.

Figure 2. Intentionally Set Vehicle Fires by Month(2004–2006)



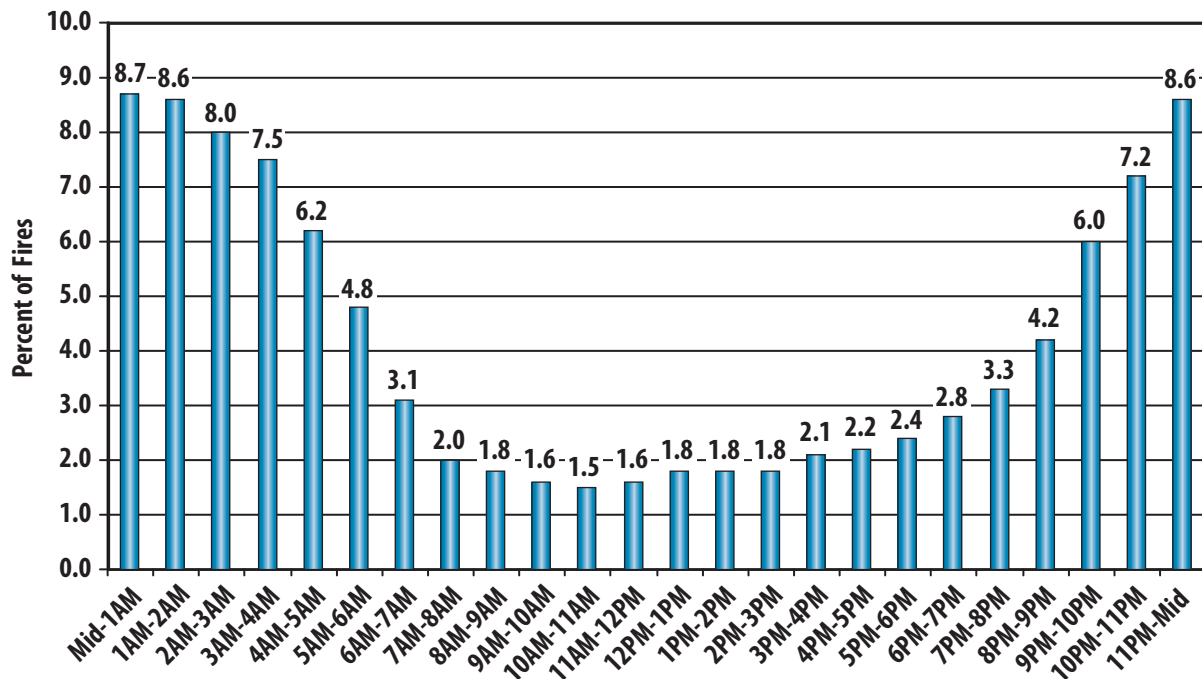
Source: NFIRS 5.0

Note: Total may not add to 100 percent due to rounding.

As shown in Figure 3, intentionally set vehicle fires occur mainly in the late night and early morning hours, peaking from 11 p.m. to 1 a.m. This 2-hour period accounts for 17

percent of intentionally set vehicle fires. Intentionally set vehicle fires occur least often from 7 a.m. to 4 p.m.⁴

Figure 3. Time of Alarm for Intentionally Set Vehicle Fires (2004–2006)



Source: NFIRS 5.0

Note: Total may not add to 100 percent due to rounding.

Where Intentionally Set Vehicle Fires Start (Area of Fire Origin)

Not unexpectedly, 92 percent of intentionally set vehicle fires originate from the vehicle itself. The remaining 8 percent of fires start outside the vehicle (4 percent) and in other miscellaneous areas (4 percent).

The leading areas of fire origin include the operator/

passenger area of transportation equipment (53 percent), non-specified vehicle area (13 percent), and the engine area, running gear,⁵ and/or wheel area (10 percent). Seven percent start on the exterior exposed surface. Approximately 5 percent start in the cargo/trunk area, and 3 percent start in the fuel tank or fuel line (Table 2).

Table 2. Leading Areas of Fire Origin in Intentionally Set Vehicle Fires (2004–2006)

Area of Fire Origin	Percent of Intentionally Set Vehicle Fires
Operator/passenger area of transportation equipment	53.3
Vehicle area, other	12.6
Engine area, running gear, wheel area	9.8
Exterior, exposed surface	7.4
Cargo/trunk area—all vehicles	5.3
Fuel tank, fuel line	3.0

Source: NFIRS 5.0

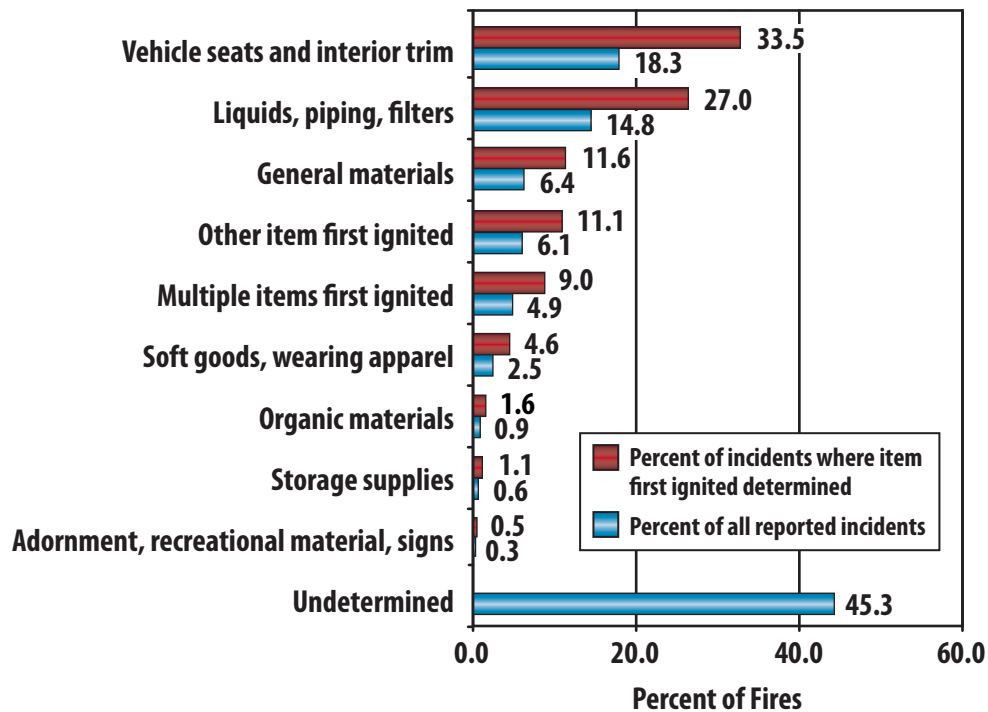
What Ignites First in Intentionally Set Vehicle Fires

Thirty-four percent of the items first ignited in intentionally set vehicle fires are vehicle seats and related upholstery and trim (Figure 4).

The second leading category of items first ignited is liquids, piping, and filters (27 percent). This category includes

atomized, vaporized liquids and aerosols, fuel in or escaping from combustion engines, fuel escaping from a container or pipe, and uncontained fuel and accelerants. Uncontained fuel accounts for 52 percent of all intentional vehicle fires within this category, or 14 percent of all intentionally set vehicle fires.

Figure 4. Item First Ignited in Intentionally Set Vehicle Fires (2004–2006)



Source: NFIRS 5.0
 Note: Total may not add to 100 percent due to rounding.

Type of Material Ignited in Intentionally Set Vehicle Fires

As vehicle seats and uncontained fuel are the leading items first ignited in intentionally set vehicle fires, it is not surprising that fabrics and gasoline are the leading types of materials ignited. Gasoline plays a substantial role in the

ignition of vehicle fires. Moreover, when vehicle area of fire origin excludes the engine and fuel areas, gasoline still accounts for 20 percent of the materials first ignited.⁶

Table 3. Leading Type of Material Ignited in Intentionally Set Vehicle Fires (2004–2006)

Type of Material Ignited	Percent of Intentionally Set Vehicle Fires
Fabric, fiber, cotton, blends, rayon, wool	25.0
Gasoline	20.9
Multiple types of material	10.1
Flammable or combustible liquid, other	8.3
Plastic	8.1
Flammable gas, other	5.6
Fabric, textile, fur, other	5.4

Source: NFIRS 5.0

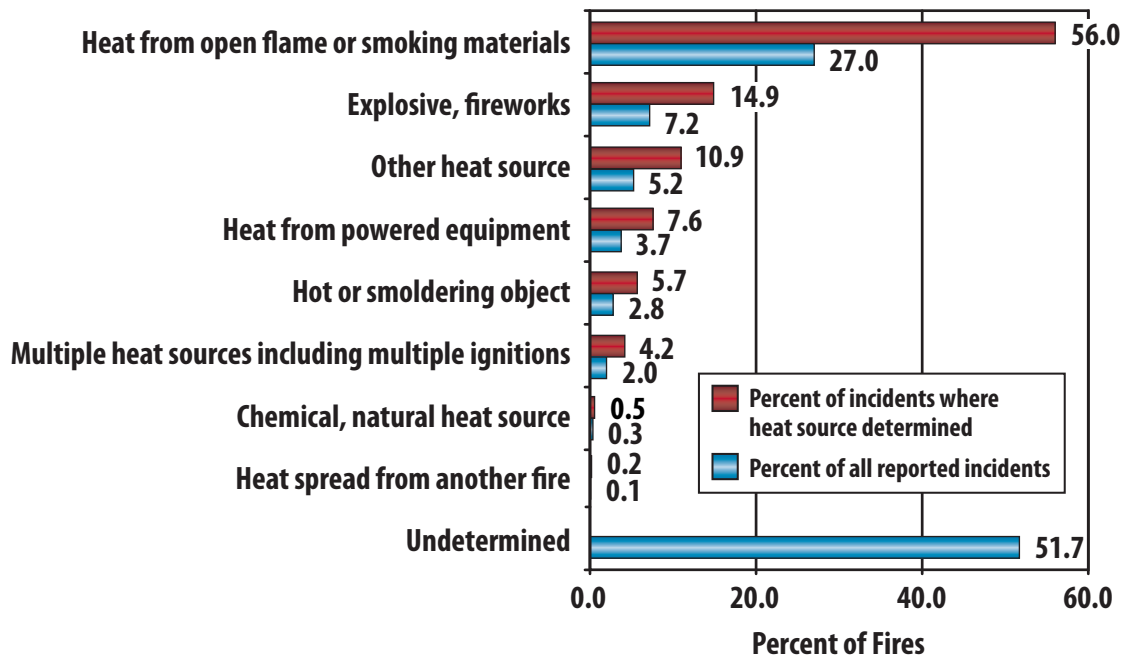
How Intentionally Set Vehicle Fires Start (Heat Source)

Fifty-six percent of intentionally set vehicle fires derive their heat source from open flame or smoking materials (Figure 5), which include cigarettes, pipes or cigars, matches, lighters, candles, and heat from undetermined smoking material. Not surprisingly, one subcomponent of this category comprises the leading source of heat in all intentionally set

vehicle fires—heat from matches (20 percent).

Explosive devices and fireworks account for 15 percent of intentionally set vehicle fires. An additional 11 percent of intentionally set vehicle fires derive their heat source from other heat sources. This category includes other, unspecified heat sources.

Figure 5. Sources of Heat in Intentionally Set Vehicle Fires (2004–2006)



Source: NFIRS 5.0

Note: Total may not add to 100 percent due to rounding.

Factors Contributing to Ignition

A flammable liquid used to kindle fires is the leading factor contributing to the ignition of intentionally set vehicle fires at approximately 16 percent, followed by other misuse of material or product and abandoned or discarded materials

or products, both at approximately 14 percent (Table 4). The largest category is “other factors” (39 percent) which includes unspecified components that did not fit into any other category of contributing ignition factors.

Table 4. Leading Factors Contributing to Ignition for Intentionally Set Vehicle Fires (Where Factor Contributing Specified, 2004–2006)

Factors Contributing to Ignition	Percent of Intentionally Set Vehicle Fires
Flammable liquid used to kindle fire	15.6
Misuse of material or product, other	14.1
Abandoned or discarded materials or products	13.6
Flammable liquid or gas spilled	5.2
Playing with heat source	4.4
Other, unspecified factors contributing to ignition	38.8

Source: NFIRS 5.0

Note: Includes only incidents where factors that contributed to the ignition of the fire were specified. Multiple factors contributing to fire ignition may be noted for each incident.

Examples

The following are some recent examples of intentionally set vehicle fires as reported by the media:

- December 2007: Honolulu firefighters responded to four fires likely linked to fireworks—two tree fires, one wildfire, and one vehicle fire. The vehicle fire incident occurred in a McDonald's parking lot and was extinguished within 10 minutes. It was estimated to have caused \$1,200 in damage. Honolulu police were asked to investigate the incident.⁷
- March 2009: Fond du Lac, Wisconsin, fire and police responding to a vehicle fire call found two burning cars at the scene. Fire and police reported that one car was engulfed in flames and that the front of a second vehicle, a van, was burning. Investigators were examining whether accelerants were used to start the fires.⁸
- March 2009: In a new twist in response to hard economic times, the Columbus Division of Fire says they are seeing more intentional vehicle fires to recoup cash from insurance policies. While intentional car fires are not new, what is new is that owners are burning their own cars. The practice is called “vehicle give-up” whereby car owners set their vehicles ablaze or otherwise allow the car to be destroyed or stolen. The owner reports the vehicle loss to his insurance company and collects on the policy. Insurance coalitions note this as an “economy-driven insurance-fraud trend.”⁹

Conclusion

Intentionally set vehicle fires account for approximately 10 percent of all vehicle fires. The NFIRS data provide

Notes

- ¹ National estimates are based on 2004-2006 native version 5.0 data from the National Fire Incident Reporting System (NFIRS) and vehicle fire loss estimates from the National Fire Protection Association's (NFPA's) annual survey of fire loss. Fires are rounded to the nearest 100, deaths to the nearest 5, injuries to the nearest 25, and loss to the nearest \$million.
- ² The NFIRS Arson module was completed for only 15 percent of intentionally set vehicle fires. Most provide some information as to motive, but the subset is too small to extrapolate intention to the full set of intentionally set vehicle fires.
- ³ The average fire death and fire injury loss rates computed from the national estimates will not agree with average fire death and fire injury loss rates computed from NFIRS data alone. The fire death rate computed from national estimates would be $(1,000 * (40 / 27,900)) = 1.4$ deaths per 1,000 intentional vehicle fires and the fire injury rate would be $(1,000 * (75 / 27,900)) = 2.7$ injuries per 1,000 intentional vehicle fires. In addition, NFPA has a separate estimate for intentional vehicle fires. The fire death rate computed from these estimates for 2005 would be $(1,000 * (40 / 26,000)) = 1.5$ deaths per 1,000 intentional vehicle fires and the fire injury rate would be $(1,000 * (80 / 26,000)) = 3.1$ injuries per 1,000 intentional vehicle fires. (NFPA, *Intentional Fires and Arson*, November 2007).

information on fires themselves but not necessarily why they begin. Data from a study of intentionally set fires in Britain suggests that 50 percent of deliberate primary vehicle fires occur in vehicles that have been reported stolen. The primary motivation for arson in stolen vehicles is the destruction of forensic evidence. For vehicles that have not been reported stolen, intentionally set fires are a means of disposing of the vehicle without identifying the owner.¹⁰ The challenge for communities, the fire service, and police is to pinpoint the reasons why people set intentional vehicle fires and address these issues to prevent future fires from occurring.

NFIRS Data Specifications for Intentionally Set Vehicle Fires

Data for this report were extracted from the NFIRS annual Public Data Release (PDR) files for 2004, 2005, and 2006. Only version 5.0 data were extracted.

Intentionally set vehicle fires were defined as:

- Incident types 130-139;
- The USFA cause hierarchy was used to determine intentionally set fire incidents:¹¹ http://www.usfa.dhs.gov/fireservice/nfirs/tools/fire_cause_category_matrix.shtm; and
- Aid types 3 (mutual aid given) and 4 (automatic aid given) were excluded to avoid double counting of incidents.

To request additional information or to comment on this report, visit <http://www.usfa.dhs.gov/applications/feedback/index.jsp>

- ⁴ For the purposes of this report, the time of the fire alarm is used as an approximation for the general time the fire started. However, in NFIRS, it is the time the fire was reported to the fire department.
- ⁵ The running gear of a vehicle generally refers to components that transfer power from the engine and deliver it to the wheels, e.g., transmission, drive shaft, differential.
- ⁶ There is debate on how to identify the type of material first ignited and the item first ignited. The NFIRS coding instructions for type of material first ignited notes “Be certain to enter the first material ignited by the heat source. For example, if an arsonist poured gasoline on a wooden floor, it was the gasoline and not the wood that was the material first ignited.” The instructions for item first ignited note: “The use or configuration of the item or material first ignited by the heat source. This block identifies the first item that had sufficient volume or heat intensity to extend to uncontrolled or self-perpetuating fire.”
- ⁷ “Four fires likely linked to fireworks,” [the.honoluluadvertiser.com](http://the.honoluluadvertiser.com/article/2007/Dec/31/br/br4198673250.html), December 31, 2007, <http://the.honoluluadvertiser.com/article/2007/Dec/31/br/br4198673250.html>, (accessed March 26, 2009).
- ⁸ “Fond du Lac police investigate vehicle fires,” [www.fdlreporter.com](http://www.fdlreporter.com/apps/pbcs.dll/article?AID=/20090320/FON0101/90320138), March 20, 2009. <http://www.fdlreporter.com/apps/pbcs.dll/article?AID=/20090320/FON0101/90320138>, (accessed March 26, 2009).
- ⁹ Steph Greigor, “Hot Wheels,” [www.theotherpaper.com](http://www.theotherpaper.com/articles/2009/03/25/cover_story/doc49caa37bbccec134419508.txt), March 25, 2009, http://www.theotherpaper.com/articles/2009/03/25/cover_story/doc49caa37bbccec134419508.txt. (accessed March 26, 2009).
- ¹⁰ Steve Merrall and Sylvia Chenery, *Vehicle Fires: Explaining the Rise in Vehicle Arson*, for the Arson Control Forum, Office of the Deputy Prime Minister, London, 2005.
- ¹¹ USFA’s cause hierarchy is designed for structure fires; however, it can be used to determine certain causes for some specific types of fires.