

SAFETY PERFORMANCE DATA

In 1971, the Research and Special Programs Administration (RSPA) of the Department of Transportation (DOT) established the Hazardous Materials Information System (HMIS) to fulfill certain requirements of the Federal Hazardous Materials Transportation Law. RSPA's Office of Hazardous Materials Safety maintains the HMIS, which is the principal source of safety data related to hazardous materials transportation. The system contains comprehensive information on hazardous materials incidents, exemptions and approvals, enforcement actions, and other elements that support the regulatory program.

Each carrier who transports hazardous materials is required to report in writing on [DOT Form F 5800.1 \(Rev. 6/89\)](#) to the Department within 30 days of the date of discovery, each incident that occurs during the course of transportation. The incident data is entered in HMIS and is accessible by DOT, other Federal agencies, state and local governments, industry, researchers, the media, and the public. HMIS data support regulatory evaluation and policy making, training programs, the better understanding of hazardous materials transportation incidents, and identification of possible safety problems.

An incident is defined as **any unintentional release of a hazardous material during transportation** (including loading, unloading, and temporary storage related to transportation). This includes all hazardous substances with a hazard class that is different from the hazard class ORM-E. For hazardous substances with the hazard class ORM-E, any release of the substance in a quantity equal to or greater than its reportable quantity (RQ) is considered a reportable incident. This definition also applies to the release of any quantity of **hazardous waste** discharged during transportation.

In 1993, RSPA's Hazardous Materials Safety (OHMS) created the definition of serious incident to convey the consequences of hazardous materials transportation – i.e., what has resulted, in terms of harm and inconvenience – as unintended consequences of the necessity to transport hazardous materials. The **current definition of a serious accident**, revised in 2002, is:

- a fatality or major injury caused by the release of a hazardous material,
- the evacuation of 25 or more persons as a result of release of a hazardous material or exposure to fire,
- a release or exposure to fire which results in the closure of a major transportation artery,
- the alteration of an aircraft flight plan or operation,
- the release of radioactive materials from Type B packaging,
- the release of over 11.9 gallons or 88.2 pounds of a severe marine pollutant, or
- the release of a bulk quantity (over 119 gallons or 882 pounds) of a hazardous material.

In reformulating the definition of serious incidents, RSPA brought focus to those incidents that result in serious consequences or have a high potential to result in serious consequences. Prior to 2002, the definition of a serious incident was “incidents that involve: a fatality or major injury due to a hazardous material; closure of a major transportation artery or facility or evacuation of six or more persons due to the presence of a hazardous material; or a vehicle crash or derailment resulting in the release of a hazardous material.”

The 2002 redefinition of serious incidents retains some components of the previous definition, drops some others, and adds several new components. The 2002 definition differs from the old definition in several ways.

- The 2002 definition of serious incidents includes incidents resulting in the evacuation of 25 or more employees or responders or any number of the general public when there has been a hazardous material release or exposure to fire. The old definition set the threshold at six or more persons. The next version of the 5800.1 form will identify the types of people evacuated and will enable such a definition.
- All incidents involving a major transportation artery closure were included in the old definition of “serious incident.” The 2002 definition only includes those incidents when the material is released or there is exposure to fire. All transportation artery closures are included in the significant incident definition.
- Vehicle crashes or derailments resulting in the release of a hazardous material are excluded from the new definition (unless other criteria, such as a bulk release, are met) of a serious incident.
- Incidents on board or affecting aircraft are particularly serious, due to the potential for loss of many lives and extremely large economic costs, including aircraft replacement costs.
- Radioactive materials shipped in Type B packaging are not expected to ever release their contents, even under accident scenarios, so any such release is of extreme gravity. Transported infectious substances include a wide range of hazards, from medical waste, such as “sharps,” to highly contagious airborne viruses. Restricting the definition of serious incident to the more serious Risk Group 3 and 4 materials is more appropriate than including all of these materials.
- The release of more than a bulk quantity of a material (defined as 119 gallons or 882 pounds) is also added to the “serious incident” definition, due to the potential for serious consequences. This criterion captures spills from bulk packaging and also includes spills from more than one non-bulk packaging. Even if no other serious consequences such as fatalities, injuries, or large evacuations actually occur when a bulk quantity is released, slight changes in incident scenarios could easily lead to such consequences.
- The rationale for including severe marine pollutants with a quantity release greater than or equal to 11.9 gallons or 88.2 pounds in the serious incident category relates to the criteria for classification of mixtures of materials as marine pollutants. For a solution or mixture to be classified as a marine pollutant, it must be 10 percent or more by weight of a material identified as a marine pollutant in the Appendix B to 49 CFR § 171.101. The percentage falls to 1 percent or more in the case of a severe marine pollutant. A marine pollutant released in bulk quantity (119 gallons or 882 pounds) would be in the serious incident category. Maintaining the same ten-to-one ratio based on hazard, a release of 11.9 gallons or 88.2 pounds of a severe marine pollutant is appropriate for inclusion in the serious incident category.

The HMIS migration from its existing database management system into a more robust environment continued in 2004. RSPA expects this migration to improve system performance, maintenance, and accessibility. Alternative methods of submitting incident reports, including Internet based submissions, will be introduced in 2005. RSPA continues to make more data and reports available to the public on the OHMS Internet Home Page.

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PLEASE NOTE:

The following analysis is based on HMIS Incident Reports received by DOT through May 19, 2004 and may not always reflect the most current incident information. Each month DOT continues to receive and process Incident Reports for the current and previous years.

This report does not reflect a serious incident that occurred on July 2, 2003 in Bonita Springs, Florida which resulted in five fatalities. This incident is currently under investigation and the filing of an incident report is anticipated.

To see the most up-to-date Incident information, please see the "Hazardous Materials Incident Summary Statistics and Data" reached from the SPILLS section of the OHMS web site:

<http://hazmat.dot.gov/spills.htm>

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Summary of 2002 and 2003 Hazardous Materials Incident Statistics

(Data as of May 19, 2004)

The Department of Transportation has received hazardous materials incident reports since 1971. This summary of 2002 and 2003 Hazardous Materials Safety Statistics provides an overview of the reports and graphs. As shown in Table 1.0, the number of reported incidents shows a year-to-year increase from 2000 to 2001, but a substantial drop in 2002 and 2003.

Table 1.0
Comparison of Total Hazardous Materials Incidents
2000 to 2003 by Year and Mode

Transportation Modes	2000		2001		2002		2003	
	Incidents	Mode % of total	Incidents	Mode % of total	Incidents	Mode % of total	Incidents	Mode % of total
Air	1,419	8.1%	1,084	6.1%	734	4.8%	753	5.0%
Highway	15,062	86.0%	15,888	89.0%	13,831	89.5%	13,595	89.6%
Rail	1,058	6.0%	899	5.0%	872	5.6%	813	5.4%
Water	17	<.01%	6	<.01%	9	<.01%	10	<.01%
Total Incidents	17,556		17,877		15,446		15,171	

Each year the majority of reported incidents are highway incidents, and in fact, the increase in total incidents from 2000 to 2001 was caused by a 5.5 percent increase in highway incidents. However, in 2002, a significant decrease in highway incidents resulted in a 14 percent decrease in total incidents. This downward trend continued in the 2003 reporting year.

An analysis of 2002 and 2003 reported incidents by package type shows that the majority of incidents reported to DOT involved non-bulk packages. Non-bulk packaging can be single containers (e.g., metal or plastic drums or pails) or some combination of 4G-fiberboard boxes filled with inner containers (plastic jugs or bottles). Bulk packaging, which accounts for an average of 20% of the unintentional releases of hazardous materials, usually involve highway containers (e.g., cargo tanks) but can also involve rail containers. Typically, the causes of damage to bulk and non-bulk packaging which lead to the unintentional release of hazardous materials differ. Bulk containers are more often damaged as a result of a vehicular crash. Non-bulk packages are more likely to sustain damage as a result of load shift during transport or problems that occur during loading and unloading. These packages are either single containers (e.g., metal or plastic drums or pails) or some combination of 4G-fiberboard boxes filled with inner containers (plastic jugs or bottles). In either case, most spills and releases of hazardous materials are categorized as being caused by human error.

An analysis of the reported consequences of hazardous materials releases by transportation phase shows that a high number of dollar damages were due to en route accidents, which also resulted in the highest number of fatalities. Unloading incidents resulted in the largest number of incidents.

Examining the 2002 and 2003 reported incidents by hazard class shows that corrosive materials and flammable-combustible liquids were involved in the most incidents, accounting for about 80 percent of the total in both reporting years. In 2002 and 2003, these same materials accounted for the majority of total injuries reported.

**Table 2.0
Comparison of Serious Reported Hazardous Materials Incidents and Damages
by Year and Mode**

Transportation Modes	2002 Incidents	2003 Incidents	2002 \$ Damages	2003 \$ Damages
Air	15	13	\$12,000	\$1,715
Highway	387	387	\$31,247,960	\$31,152,746
Rail	68	56	\$6,674,464	\$3,021,760
Water	2	2	\$13,383	\$65,650
Total	472	458	\$37,947,807	34,241,871

The proportion of serious incidents remained flat for 2002 and 2003 at 3.0 percent of all incidents each year. Table 2.0 shows that serious highway incidents were the majority of all serious incidents and resulted in over 80 percent of the total dollar damages in 2002 for all reported serious incidents and 90 percent in 2003.

2002 and 2003 Incidents Resulting in Fatalities

Eight incidents in 2002 resulted in nine fatalities:

- Seven fatalities were the result of six separate vehicle crashes, each causing loads of gasoline to ignite.
- One fatality incident was the result of a train derailment involving 15 tank cars that released anhydrous ammonia.
- One fatality was caused by problems that occurred while loading toluene, a volatile, flammable liquid.

Eight incidents in 2003 resulted in eight fatalities:

- All eight incidents involved flammable liquids transported by highway.
- Seven of the fatalities were caused by separate incidents of vehicle crashes, each causing loads of flammable liquids to ignite.
- One of the above vehicle crashes involved a tanker truck carrying gasoline and resulted in the evacuation of approximately 150 residents of a nearby apartment complex.
- One fatality occurred as a result of improper loading of anhydrous ammonia from a storage tank to a nurse tank.

The charts and tables in this report do not reflect a serious incident that occurred on July 2, 2003 in Bonita Springs, Florida which resulted in five fatalities. This incident is currently under investigation and the filing of an incident report is anticipated.

2002 and 2003 Incidents Resulting in Evacuations

Three rail incidents and four highway incidents in 2002 involved the evacuation of a thousand or more people:

- Twenty-five thousand people were evacuated when a vehicle overturned in Spartanburg, SC and 9,000 gallons of gasoline spilled. This one incident resulted in a major increase in total number of persons evacuated for the year.
- A highway shipment of ammonium nitrate was spilled when a tank truck overturned in Danville, KY. Approximately 1,000 people were evacuated.
- A highway accident in Bloomington, IN resulted in a spill of ammonium nitrate. Approximately 1,500 people were evacuated.
- While unloading a shipment in Pacoima, CA, several punctured drums were discovered in a truck trailer. The resulting spill of toxic solids resulted in the evacuation of 1,000 people.
- Thirty-five rail cars derailed, causing the release of 34,000 gallons of a liquefied petroleum gases in Pottersville, MI. Authorities evacuated approximately 2,200 local residents for about four days.
- As a result of a multi-car derailment in Farragut, TN, various hazardous materials were released and 3,200 people were evacuated.
- A multi-car derailment resulted in two railcars losing or leaking hydrochloric acid and styrene monomer inhibited, which may cause a violent reaction when combined. Approximately 1,200 people were evacuated.

One rail incident in 2003 involved the evacuation of a thousand or more people:

- A train traveling north at Tamora, IL derailed 22 cars, resulting in seven tank cars releasing various types and quantities of hazardous materials. An evacuation of a three-mile radius and the closing of U.S. highway 51 followed the derailment.

The next two highest incidents of evacuation in 2003 involved 600 people. All other evacuation incidents involved less than 500 people.

2002 and 2003 Incidents Resulting in High Damage Costs

In 2002 there were seven reported incidents that resulted in damages greater than \$1 million. Four of these involved railway derailments and three were the result of accidents or loading errors during highway transportation. These seven incidents accounted for over 30 percent of all damages for the year.

High damage cost incidents were further reduced in 2003. Three such incidents were reported: one train derailment and two tank truck crashes resulting in damages greater than \$1 million. The train derailment accounted for 31.3 percent of all damages due to rail and the two tank truck crashes accounted for 10.3 percent of all damages due to highway.

Description of Charts and Graphs (Data as of May 19, 2004)

Exhibit 1.1 summarizes hazardous materials transportation incidents reported to OHMS over the past eight years. Beginning in 1996 the number of reported incidents increased each year, until peaking at

over 17,800 in 2001. In 2002 the number of incidents decreased by 13.6 percent and continued a downward trend into 2003. Highway, clearly the most prevalent mode for incidents, accounted for the majority of incidents (usually averaging over 85 percent each year) in the period from 1996 to 2003. Highway accounted for all fatalities except in 1996 and 2002. In 1996 two rail fatalities were due to one derailment incident that also resulted in 787 minor injuries. A major air incident in 1996 resulted in 110 deaths. In 2002, one rail incident resulted in one fatality.

Exhibit 1.2 summarizes serious incidents reported to OHMS along with fatalities, injuries and dollar damages. Serious incidents have remained relatively steady from 1996 through 2003, with the average number of serious incidents per year being under 470.

Exhibit 1.3 summarizes vehicular accident and derailment incidents reported to OHMS over the past eight years. The average number of incidents per year has been under 350. All fatalities from these incidents were highway-related, except for two rail fatalities that occurred in 1996 and one in 2002.

Exhibit 1.4 summarizes hazardous waste incidents reported to OHMS over the past eight years. While the average number of hazardous waste incidents over the last eight years has been just over 350, in recent years the number of reported incidents has decreased substantially. Reported incidents in 2002 were 42 percent lower than the eight year average, and the number in 2003 decreased by 60 percent. Only one hazardous waste incident resulted in a fatality in a 1996 highway incident. The majority of hazardous waste injuries involved highway and rail modes of transport.

Exhibits 2.1 and 2.2 display reported hazardous materials transportation incidents and fatalities over the past eight years and correspond to data from Exhibit 1.1.

Exhibits 2.3 - 2.6 display the number of incidents reported to OHMS by mode over the past eight years. Exhibits 2.3 and 2.4 also break out the number of bulk vs. non-bulk incidents for highway and rail. The number of bulk incidents has remained fairly steady since 1996, except for noticeable downward trend in bulk rail incidents beginning in 2001. Exhibit 2.5 shows the noticeable increase in reported air incidents in 1998-2000 but a marked downward trend beginning in 2001.

Exhibit 3.1 graphs the hazardous materials incidents reported since 1989. By separating highway incidents from all others, this graph illustrates the major impact highway incidents have on the trend of total incidents. A three year increase in incident reporting from 1999-2001 was followed by a substantial decrease in reported incidents in 2002 and 2003.

Exhibit 3.2 provides a graphical display of the serious hazardous materials incidents reported in relation to total incidents since 1992. Note that serious incidents are measured on a different scale than all incidents. Serious incidents have remained relatively steady for the past ten years.

Exhibit 3.3 illustrates the number of all reported incidents since 1992 that involved commodities shipped in bulk versus non-bulk packaging. The number of bulk incidents has remained fairly constant during this period; most of the variability in the number of incident reports is due to changes in the number of non-bulk incidents.

Exhibits 4.1.1 - 4.1.4 show reported incidents and damages by hazard class for 2002 and 2003. The first four columns of each exhibit present and rank incidents by hazard class. The last four columns present the number of incidents involving dollar damages, damages by dollar amount, percent, and rank. The majority of incidents and damages involved corrosive materials and flammable-combustible liquids. Exhibits 4.1.3 and 4.1.4 graphically depict the distribution of incidents among the top hazard classes.

Exhibits 4.2.1 and 4.2.2 display injuries by hazard class for 2002 and 2003. Also included is a breakdown between major and minor injuries. In 2002, corrosive materials, flammable-combustible liquids, and poisonous materials accounted for more than 75 percent of injuries while in 2003 the same hazard classes accounted for over 70 percent of injuries.

Exhibit 4.3 lists the classes of hazardous materials involved in incidents which resulted in fatalities. One air incident in 1996 involving oxidizers resulted in 110 fatalities. Of the remaining materials, gasoline accounts for the most fatalities each year.

Exhibits 4.4.1 and 4.4.2 rank the 50 top hazardous materials involved in incidents for 2002 and 2003. The 50 materials listed, out of approximately 3,000 hazardous materials identified in the Hazardous Materials Table, 49 CFR §172.101, were involved in 76.0 percent of all incidents reported. The Exhibits list the commodity, corresponding hazard class, number of incidents reported for that commodity, and corresponding percentage.

Exhibits 4.5.1 and 4.5.2 rank the hazardous materials involved in serious incidents. These materials were involved in less than three percent of all incidents in 2002 as well as in 2003. Gasoline accounts for more serious incidents than any other hazardous material. The Exhibits list the commodity, corresponding hazard class, number of incidents reported for that commodity, and corresponding percentage.

Exhibit 5 shows the distribution of incident damages in the five categories that appear on the report form. Carrier damage and decontamination/cleanup costs made up 81.6 percent of the costs associated with incidents involving damages in 2002 and 80.4 percent of those costs in 2003.

Exhibits 6.1 and 6.2 show the breakdown of incident causes by mode of transportation. Human error was the main cause of incidents in both 2002 and 2003. Combined with package failure, these two causes are responsible for over 97 percent of all incidents each year. Note that for accidents and derailments the cause of the crash is not determined.

Exhibits 7.1 and 7.2 display information on incidents involving an evacuation. The incidents are broken down by mode, cause, and consequence. In 2002, one highway incident resulted in an evacuation of 25,000 people, causing a major spike in the total number of evacuations for the year. Human error was the main cause of evacuation incidents in both 2002 and 2003.

Exhibits 8.1.1 and 8.1.2 show the consequences of hazardous materials incidents by transportation phase. Most incidents resulting in high damages were due to en route accidents, which also resulted in the highest number of fatalities. Unloading incidents result in the second largest number of fatalities, the most minor injuries, and by far the largest number of incidents.

Exhibits 8.2.1 and 8.2.2 display the consequences of bulk and non-bulk hazardous materials incidents. Although an approximately equal number of minor injury incidents result from bulk and non-bulk incidents, in 2002 bulk incidents lead to significantly more incidents with major injuries and damages greater than \$50,000, and accounted for all the incidents with fatalities. In 2003 one fatality resulted from a non-bulk incident and evacuations also increased for this packaging type.

Exhibits 8.3.1 and 8.3.2 illustrate the consequences of hazardous materials incidents by time of day.

Exhibits 9.1 and 9.2 show the number of serious bulk and non-bulk hazardous materials incidents by time of day. Most serious incidents occurred between 6 a.m. and 3 p.m.

Exhibits 10.1 and 10.2 display the breakdown of hazardous materials incidents, fatalities, injuries, and damages by state. States with large population centers and industrial cities had the most hazardous materials incidents.

Exhibits 11.1.1 - 11.7.2 display 2002 and 2003 incident data by county. The areas with the greatest concentration of hazardous materials incidents either were industrial centers or included numerous terminal facilities:

Exhibits 11.1.1 and 11.1.2 - location of all incidents reported to RSPA.

Exhibits 11.2.1 and 11.2.2 - origin of reported shipments that resulted in an incident.

Exhibits 11.3.1 and 11.3.2 - location of reported highway incidents.

Exhibits 11.4.1 and 11.4.2 - location of reported rail incidents.

Exhibits 11.5.1 and 11.5.2 - location of reported loading and unloading incidents.

Exhibits 11.6.1 and 11.6.2 - location of reported incidents that occurred en route.

Exhibits 11.7.1 and 11.7.2 - location of reported serious incidents.

Note that the exhibits for rail, en route, and serious incidents use a different classification scheme from the other exhibits.