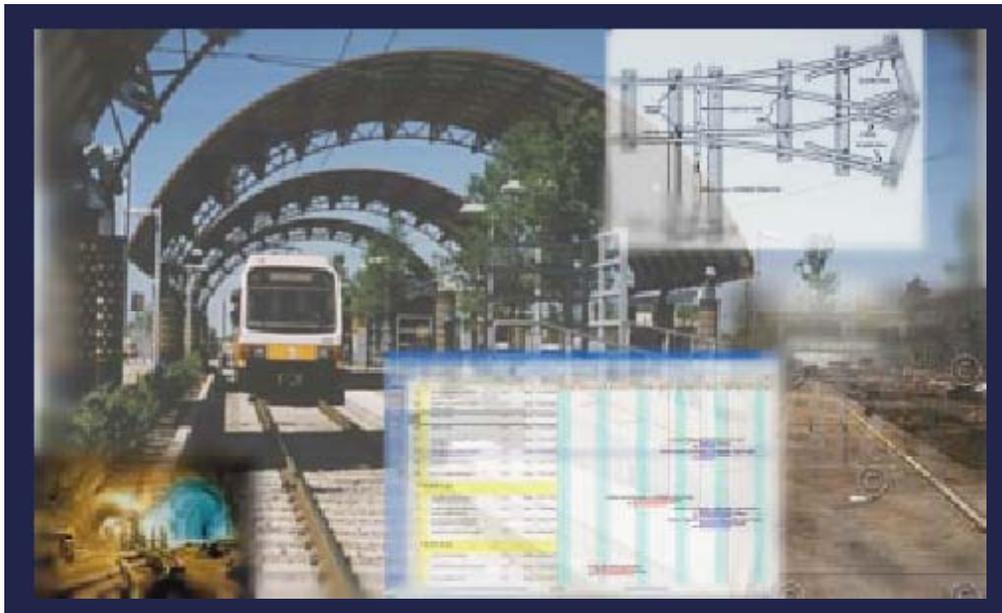




U.S. Department  
of Transportation  
**Federal Transit  
Administration**

# Rail Transit Safety Action Plan

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Office of Safety and Security  
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## Chapter 1: Introduction

The Federal Transit Administration (FTA) safety program for rail transit is increasingly guided by the evaluation of industry data, trends in safety measurables, and the results of on-site assessments, audits and reviews. FTA attempts to direct both its safety oversight and technical assistance efforts toward those areas involving the highest risks for rail transit agencies. FTA also uses the evaluation of industry data to determine the effectiveness of its own programs and to identify where improvements can be made.

The rail transit industry has a strong safety record. The National Transportation Safety Board (NTSB), in its Safety Report for 2004, shows that of the 44,870 transportation fatalities that occurred in the United States in 2004, only 186 (or 0.41 percent) are attributed to commuter rail, heavy rail and light rail. When this number is further broken down to include just rail transit fatalities, only 0.2 percent of all transportation fatalities are rail transit-related. If suicides and trespasser-related deaths are removed from the NTSB figures, rail transit is responsible for less than 0.1 percent of all transportation-related fatalities.

However, significant accidents continue to occur, and the accident rate has not shown substantive improvement in recent years. Moreover, recent accidents have highlighted specific issues that need prompt government and industry attention. In addition, the strong growth of rail transit and highway traffic continues to drive up the exposure of motorists, pedestrians and trespassers at highway-rail grade crossings and along the right-of-way.

### Purpose of Rail Transit Safety Action Plan

FTA has prepared this *Rail Transit Safety Action Plan* to focus attention on those safety incidents of greatest concern in the rail transit industry. The objectives of the Rail Transit Safety Action Plan are to:

- target the most frequent, highest risk causes of rail transit accidents;
- direct FTA's oversight and technical assistance resources to address these high-risk causes; and
- accelerate industry awareness, spotlighting activities and practices that have the potential to mitigate the largest risks.

To accomplish these objectives, FTA has conducted an extensive analysis of available safety data from the National Transit Database (NTD) and the State Safety Oversight Annual Reporting Program. This data has been analyzed to determine the number and types of safety incidents that are occurring in the rail transit industry, the impacts of these incidents in terms of fatalities, injuries and property damage, and the probable causes of a select sub-set of the most serious of these incidents. In this plan, FTA uses the results of this analysis to establish:

- the most common causes of rail transit accidents;
- top ten priorities to guide FTA's safety program and focus industry attention;
- FTA initiatives to support accident reduction and to address FTA's top ten priorities;
- performance measures to track the rail transit industry's safety record and to monitor progress in addressing FTA's priorities and achieving target goals; and
- performance measures and target goals for the State Safety Oversight Program to support implementation of FTA safety initiatives.

## Organization of Rail Transit Safety Action Plan

FTA's plan is organized in the following Chapters:

- **Chapter 1: Introduction** – provides background on the purpose of the plan and its organization; describes methodology used by FTA to conduct its safety data analysis; and provides an overview of the rail transit industry.
- **Chapter 2: Number and Types of Incidents to Occur** – provides the results of FTA's safety analysis regarding the number and types of safety incidents to occur, including 10-year trends for collisions, derailments, personal injury events (primarily slips, trips and falls), and fires.
- **Chapter 3: Impacts of Incidents to Occur** – provides total numbers and rates for fatalities, injuries and property damage resulting from incidents reported to FTA.
- **Chapter 4: Probable Causes of Rail Transit Incidents** – provides the results of FTA's safety analysis regarding the probable causes of those most serious incidents to occur in the rail transit environment.
- **Chapter 5: Safety Priorities** – presents the Top Ten Safety Priorities identified by FTA based on its analysis, and describes initiatives being undertaken by FTA to address them.
- **Chapter 6: Monitoring Implementation of the Safety Action Plan** – provides FTA's plan for monitoring industry performance in addressing the safety priorities.

## Safety Action Plan Methodology

To identify the most common causes of rail transit accidents and to assess their severity and frequency, FTA initiated a comprehensive review of available safety data, including:

- **10-year trends** from FTA's National Transit Database (NTD) Non-Major Summary Reporting Module (Form S&S-50) and Major Safety and Security Incident Reporting Form (S&S-40) for the period 2002 to 2004 combined with results from FTA's previous Safety Management Information System (SAMIS) database for 1995 through 2001.
- **In-depth review** of rail transit agency reports (Form S&S-40) submitted to FTA's NTD Major Safety and Security Incident Reporting Module between January 1, 2003 and June 30, 2005. Reports reviewed during this 30-month study period include 1,147 incidents, which resulted in 137 fatalities, 903 injuries, and over \$8 million in property damage.
- **Probable cause reports** from State Safety Oversight Agency Annual Reporting Templates, 2002 to 2004, which provide probable causes from investigations conducted or reviewed and adopted by the State Oversight Agencies for the rail transit agencies in their jurisdiction.

It should be noted in reviewing the results of this analysis that reporting thresholds for FTA's NTD system were changed beginning in Calendar Year (CY) 2002. Prior to CY 2002, the NTD **did not collect causal data** on the incidents that occurred in the transit industry. Instead, FTA requested information on the number, location, and type of incidents that occurred and on their impacts in terms of fatalities, injuries and property damage.

Based on an extensive outreach program with industry, the NTD was revised in CY 2002 to better align FTA safety and security reporting thresholds with other U.S. DOT modes; to capture more timely and more detailed information on the most serious safety and security events to occur at transit agencies; and to track incidents that may be indicative of systemic concerns or hazards/vulnerabilities. The revised NTD reduced the "claims-based reporting" nature of the system, making it more in line with information collected and used by rail transit agency safety departments.

This revision changed the focus of the NTD. While FTA was receiving considerably more data on the sub-set of serious incidents reported as "Major Safety and Security Incidents" using the Monthly Form S&S-40, thresholds for reporting the occurrence and impacts of incidents, injuries, collisions, and personal injury events were raised. In response to these threshold changes, total counts of incidents reported on the Form S&S-50 number less than half of what was previously reported to the SAMIS system. **Therefore, unless otherwise noted, graphics used in this report to depict 10-year trends should be viewed in two parts – the seven-year trend from 1995 through 2001, and the three-year trend from 2002 through 2004.** In all graphics illustrating 10-year trends, the three-year trend is shaded in gray for added emphasis.

To complete FTA's analysis for the Safety Action Plan, an Access Database was created to store information entered into the NTD and State Safety Oversight Program from the rail transit agencies:

- **NTD Non-Major Summary Reporting Module Forms S&S-50** for all rail transit agencies were entered into the database and integrated into previous trending reports prepared by FTA from the SAMIS database.
- **Each Form S&S-40** filed during the 30-month study period (January 1, 2003 to June 30, 2005) was opened and reviewed. Data captured from the Form S&S-40 includes the rail transit agency experiencing the event, the mode of service on which the event occurred, a description of the event, the NTD event number, the date of the event, the consequences of the event, the contributing factors of the event, and any supplemental information filed by the rail transit agency regarding the disposition of the event or the determination of its cause.
- Information was also entered into the Access Database from **Annual Reporting Templates** submitted by State Safety Oversight Agencies summarizing the impacts and probable causes of investigations conducted for accidents meeting the thresholds of FTA's 49 CFR Part 659.

Reports and analysis were then generated showing 10-year trends, probable causes for the 30-month study period from the NTD Major Safety and Security Incident Reporting Module, and probable causes reported by State Safety Oversight agencies for accident investigated in their jurisdictions. Combing the results of this information, FTA was able to identify:

- the most common types of accidents to occur in the rail transit environment,
- the causes of accidents that occur, and
- priorities for accident reduction, based on both accident frequency and severity.

**Appendix A** provides additional information on the sources of data used in FTA's analysis.

## Overview of Rail Transit Industry

Through its State Safety Oversight Program (49 CFR Part 659) and on-going technical assistance program, FTA is responsible for monitoring and supporting the safety of 43 rail transit agencies, that combined, provide more than **3 billion annual passenger trips** or roughly one-third of all trips taken on public transportation. Approximately 80 percent of all trips on rail transit are provided by six large, urban rail transit agencies, including New York City Transit (NYCT), Washington Metropolitan Area Transit Authority (WMATA), Massachusetts Bay Transportation Authority (MBTA), Chicago Transit Authority (CTA), Southeastern Pennsylvania Transportation Authority (SEPTA), and Bay Area Rapid Transit (BART). New light rail systems that initiated service within the last decade are also showing strong ridership, averaging between 15 and 25 million annual passenger trips.

**Exhibit 1** provides estimated daily ridership averages for the 43 affected rail transit agencies. Weekend trips are figured into these daily averages, since for smaller agencies, weekend ridership may exceed weekday ridership.

Review of 10-year trends for data reported from rail transit agencies shows that there has been **a steady growth in rail transit ridership** from 2.3 billion passenger trips in 1995 to 3.2 billion passenger trips in 2005. Ridership gains were reversed in 2002 and 2003, resulting in the first years of declining ridership in more than two decades. However, these declines, which may have been related to the events of 2001 and the corresponding economic slow-down, have been overcome and ridership steadily rose again in 2004 and 2005 to its highest levels ever.

Over the last decade, much of the increase in annual passenger trips is attributable to gains in ridership made by NYCT and WMATA, the opening and expansion of the LACMTA subway and light rail systems, and the eleven (11) new light rail systems that opened for service or expanded their operations between 1995 and 2004 (Salt Lake City UTA, Denver RTD, Portland Tri-Met, Dallas DART, NJ Transit Hudson Bergen, St. Louis Metro, Houston MetroRail, Sound Transit, Charlotte Area Transit System, Central Arkansas Transit Authority, and Metro Transit Hiawatha).

Over the last decade, there has also been **a steady growth in annual vehicle miles** from 572 million miles in 1995 to 706 million miles in 2004. Between 1995 and 2004, annual light rail vehicle miles almost doubled from 35 million miles to 64 million miles, due in large part to extensions at existing agencies and the opening of several new light rail systems. Heavy rail vehicle miles also increased significantly from 537 million miles to 643 million miles. This shows that not only are rail transit agencies moving more passengers than ever before, but also they are providing more vehicle miles of revenue service.

**Exhibit 2** provides a visual illustration of total passenger trips for the rail transit industry between 1995 and 2004. **Exhibit 3** highlights the growth in heavy rail passenger trips during that decade. **Exhibit 4** presents total vehicle miles between 1995 and 2004. **Exhibit 5** shows the increase in light rail transit vehicle miles.

**Exhibit 1: Rail Transit Agency Average Daily Ridership, 2005**

<b>Rail Transit Agency</b>	<b>Mode</b>	<b>Average Daily Trips</b>
Bay Area Rapid Transit District (BART)	HR	270,221
Cambria County Transit Authority (CCTA)	IP	213
Central Arkansas Transit Authority (CATA)	LR	741
Charlotte Area Transit System (CATS)	LR	391
Chattanooga Area Regional Transportation Authority (CARTA)	IP	1,189
Chicago Transit Authority (CTA)	HR	406,336
Dallas Area Rapid Transit (DART)	LR	46,655
Denver Regional Transportation District (RTD)	LR	27,475
Detroit People Mover (DPM)	AG	1,918
Galveston Island Transit (GIT)	LR	115
Greater Cleveland Regional Transit Authority (GCRTA)	LR	7,492
	HR	13,821
Hillsborough Area Regional Transit Authority (HART)	LR	1,158
Jacksonville Transportation Authority (JTA)	AG	1,828
Kenosha Transit	LR	161
Los Angeles County Metropolitan Transportation Authority (LACMTA)	LR	98,486
	HR	92,840
Metro Transit, Hiawatha	LR	15,632
Metropolitan Transit Authority of Harris County (MTA-HC)	LR	21,084
Massachusetts Bay Transportation Authority (MBTA)	LR	163,620
	HR	333,330
Memphis Area Transit Authority (MATA)	LR	3,176
Metropolitan Atlanta Rapid Transit Authority (MARTA)	HR	192,438
Maryland Transit Administration (MTA-MD)	LR	12,870
	HR	35,313
Miami-Dade Transit (MDT)	AG	23,798
	HR	43,802
New Orleans Regional Transit Authority (NORTA)	LR	20,527
Niagara Frontier Transportation Authority (NFTA)	LR	15,028
New Jersey Transit - Hudson Bergen Light Rail (HBLR)	LR	16,668
New Jersey Transit - Newark City Subway (NCS)	LR	14,388
New Jersey Transit - River Line (RL)	LR	4,998
New York City Transit (NYCT)	HR	4,954,909
Port Authority of Allegheny County (PAAC)	LR	18,658
	IP	1,916
	IP	936
Port Authority Transit Corporation (PATCO)	HR	25,068
Portland Streetcar	LR	5,315
Sacramento Regional Transit District (SRTD)	LR	33,576
Saint Louis Metro	LR	40,986
San Diego Trolley, Inc. (SDTI)SDTI	LR	78,828
San Francisco Municipal Railway (MUNI)	LR	122,803
	CC	21,145
Santa Clara Valley Transportation Authority (SCVTA)	LR	17,015
Seattle Center Monorail	AG	5,766
Sound Transit (Tacoma Link)	LR	2,176
Southeastern Pennsylvania Transportation Authority (SEPTA)	LR	49,103
	HR	238,953
Tren Urbano, San Juan	HR	19,466
Tri-County Metropolitan Transportation District of Oregon (Tri-Met)	LR	82,836
Utah Transit Authority (UTA)	LR	31,446
Washington Metropolitan Area Transit Authority (WMATA)	HR	703,742

HR=Heavy Rail; LR=Light Rail; AG=Automated Guideway; IP=Inclined Plane; CC=Cable Car

Exhibit 2: Passenger Trips, 1995 to 2004



Exhibit 3: Heavy Rail Passenger Trips, 1995 to 2004

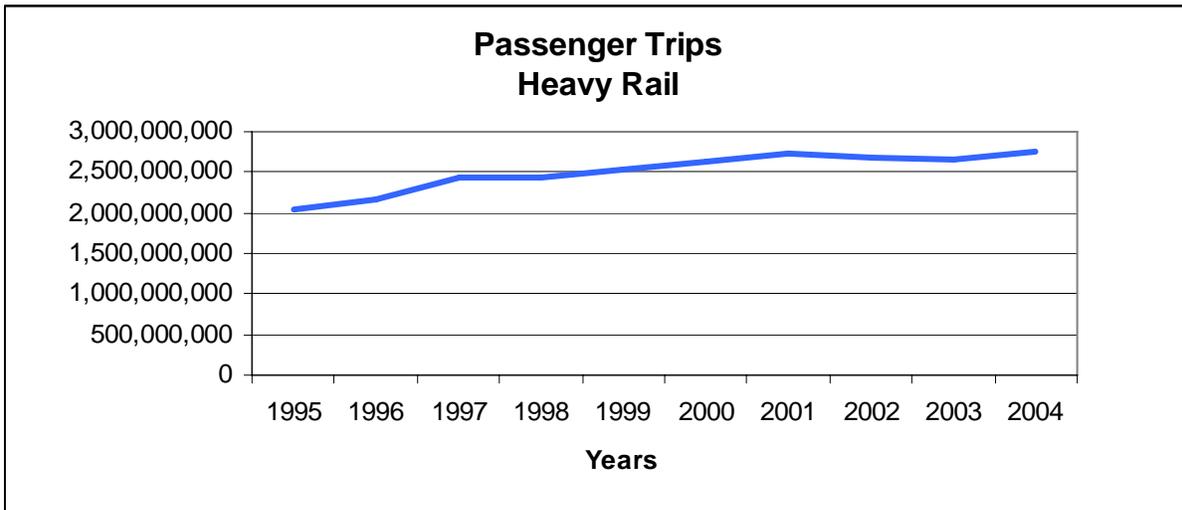


Exhibit 4: Vehicle Miles, 1995 to 2004

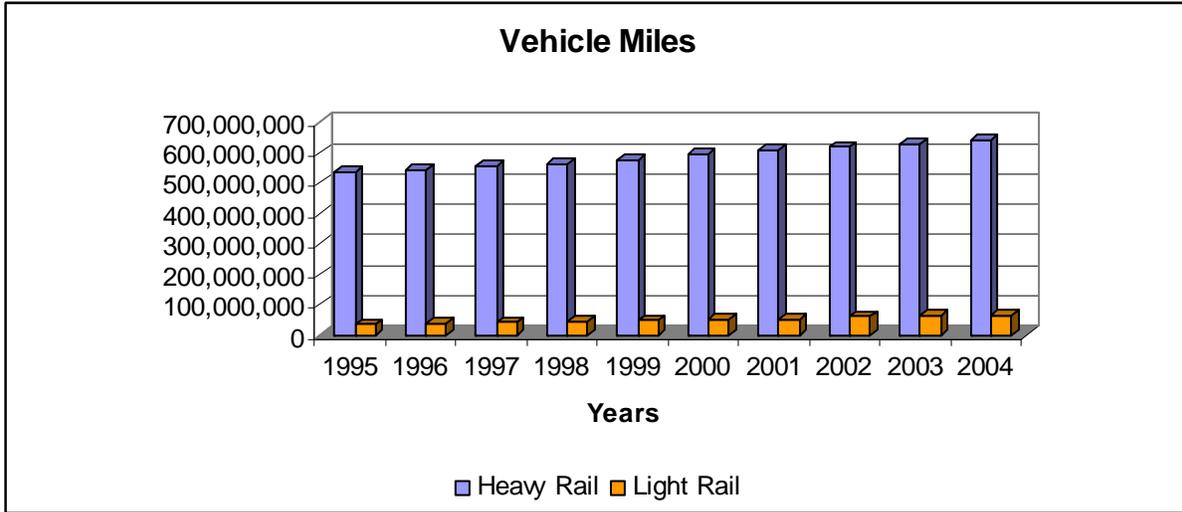
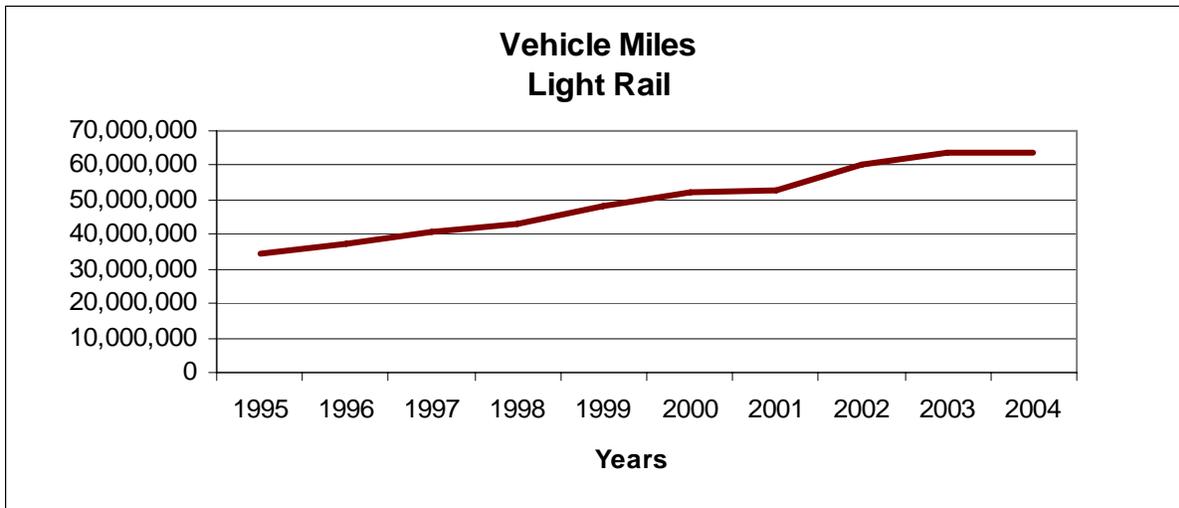


Exhibit 5: Light Rail Vehicle Miles, 1995 to 2004



## Chapter 2: Number and Type of Incidents to Occur

During the decade between 1995 and 2004, the rail transit industry experienced **124,127 incidents** reported either to FTA’s SAMIS database or the NTD’s Non-Major Summary Reporting Module and the NTD’s Major Safety and Security Incident Reporting Module. The majority of these incidents were minor in nature, resulting in property damage between \$1,000 and \$25,000; a single-person injury reported to the rail transit agency, or a trash fire occurring on the tracks or in trashcans in transit stations.

After 2002, changes made to the NTD raised both the property damage threshold (to an amount equal to or exceeding \$7,500) and the single-person injury threshold (now requiring immediate medical attention away from the scene). These two changes reduced the total numbers of incidents reported by rail transit agencies by 64 percent.

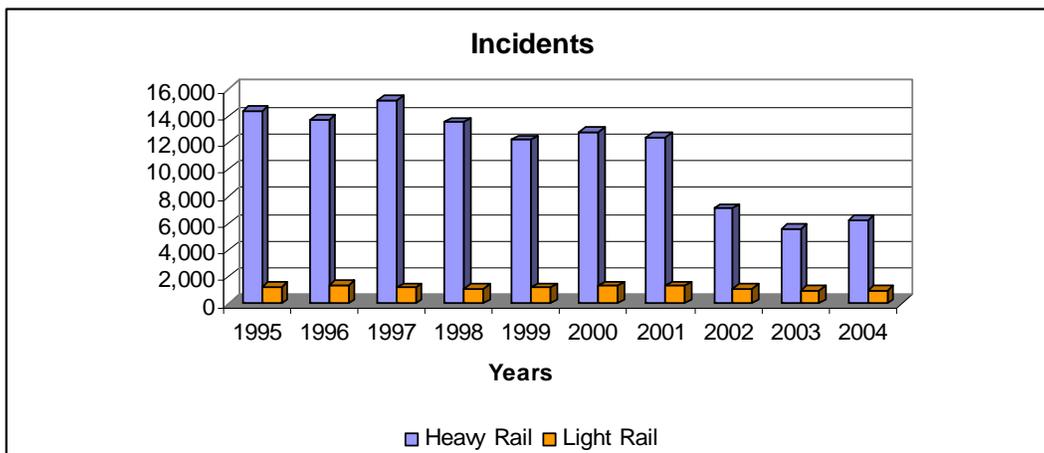
**Exhibit 6** shows the categorization of all reported incidents as collisions, derailments, personal injury events (primarily slips, trips and falls), and fires. **Exhibit 7** shows the incident totals for each year between 1995 and 2004. **Exhibit 8** shows the rate of incidents per ten million passenger trips between 1995 and 2004.

While much of the reduction in the total number of reported incidents can be related to changes made by FTA in the NTD reporting thresholds, as evidenced in Exhibit 8, since 1995, there has been a strong downward trend in the total number of incidents to occur. Due to changes in NTD thresholds, it is impossible to tell if the downward trend would have continued between 2002 and 2004, or if increases would have been reported.

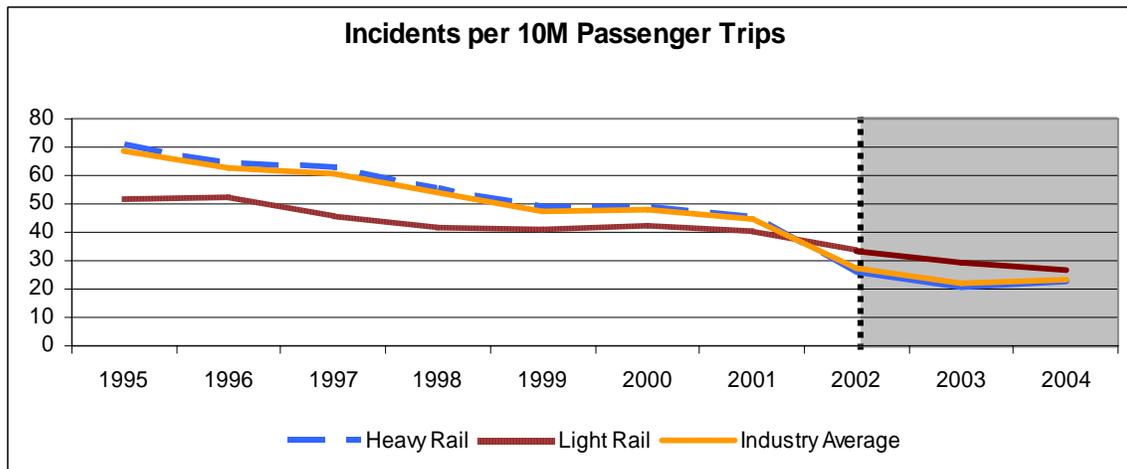
**Exhibit 6: Type of Rail Transit Incidents, 1995 to 2004**

Type of Incident	Heavy Rail	Light Rail	Total
Collision	2,940	3,679	6,619
Derailment	255	267	522
Personal Injury Event	84,759	7,042	91,801
Fire	24,501	684	25,185
<b>Total</b>	<b>112,455</b>	<b>11,672</b>	<b>124,127</b>

**Exhibit 7: Rail Transit Incidents, 1995 to 2004**



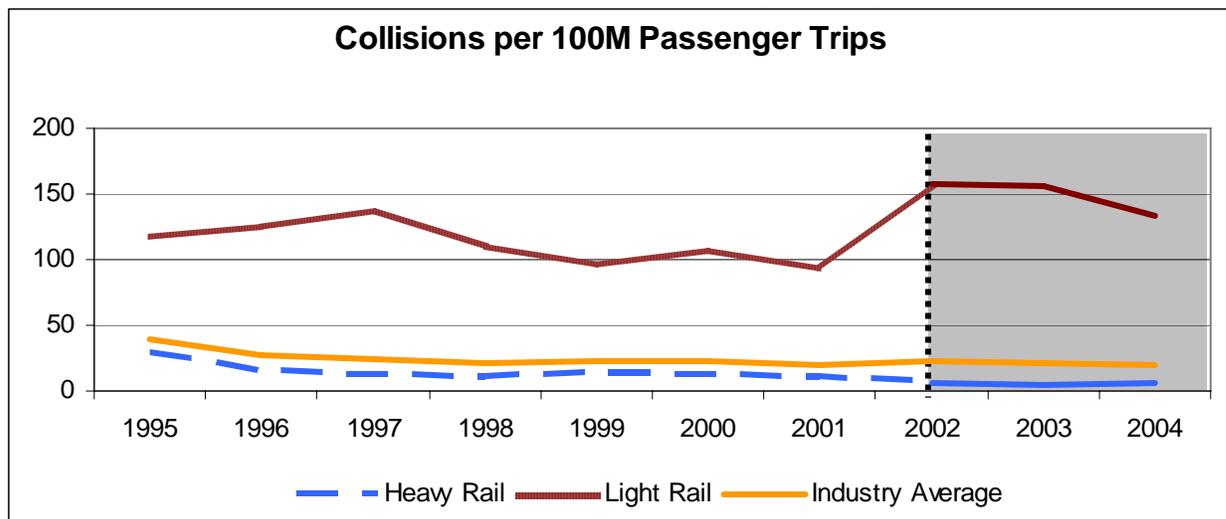
**Exhibit 8: Rail Transit Incidents per Ten Million Passenger Trips, 1995 to 2004**



**Collisions**

In many ways, collisions represent the most serious safety concern for the rail transit industry. **Exhibit 9** shows that even with the reduced reporting requirements implemented by the 2002 NTD Non-Major Summary Reporting Module, light rail agencies are continuing to experience collisions at a much higher rate than heavy rail agencies and that the rate of collisions per ten million passenger trips increased sharply between 2001 and 2002 and still remains well above the lowest rates experienced in 1999.

**Exhibit 9: Collisions per Hundred Million Passenger Trips, 1995 to 2004**



**Exhibit 10** shows that collisions are a growing percentage of total light rail incidents, while heavy rail is experiencing a downward trend. In part, this trend reflects changes in the 2002 NTD reporting thresholds, which required all grade crossing incidents, regardless of injury or property damage to be reported between 2002 and 2004.

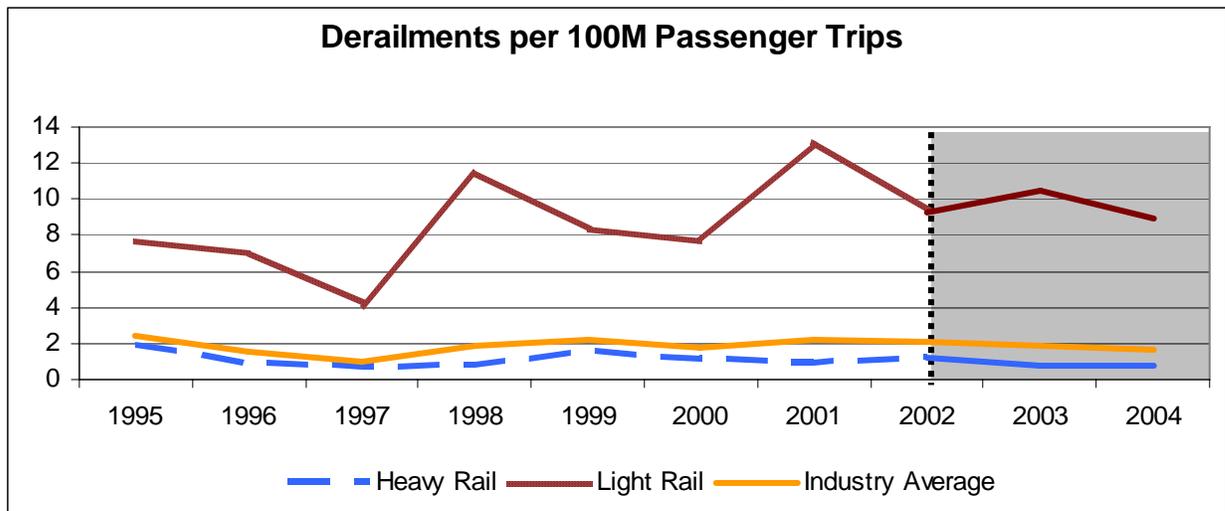
**Exhibit 10: Collisions as a Percentage of Total Incidents**

Year	Light Rail	Heavy Rail
1995	22.73%	4.19%
1996	23.93%	2.39%
1997	30.01%	2.04%
1998	26.49%	2.02%
1999	23.35%	2.94%
2000	25.25%	2.63%
2001	23.17%	2.45%
2002	47.69%	2.12%
2003	53.00%	2.38%
2004	49.30%	2.41%
<b>Average</b>	<b>31.34%</b>	<b>2.60%</b>

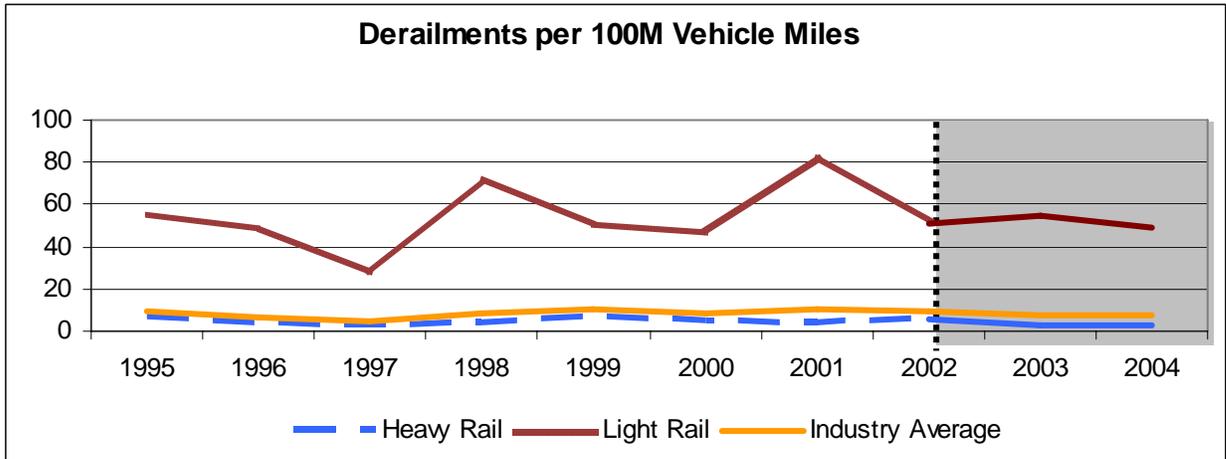
**Derailments**

**Exhibit 11** demonstrates that, for light rail agencies, the rate of derailments per hundred million passenger trips shows a rising trend that has dropped off in recent years. Heavy rail agencies, on the other hand, are showing a decreasing trend. **Exhibit 12** shows the rate of derailment per hundred million vehicle miles. Changes to NTD thresholds in 2002 had minimal impact on derailment reporting.

**Exhibit 11: Derailments per Hundred Million Passenger Trips, 1995 to 2004**



**Exhibit 12: Derailments per Hundred Million Vehicle Miles, 1995 to 2004**

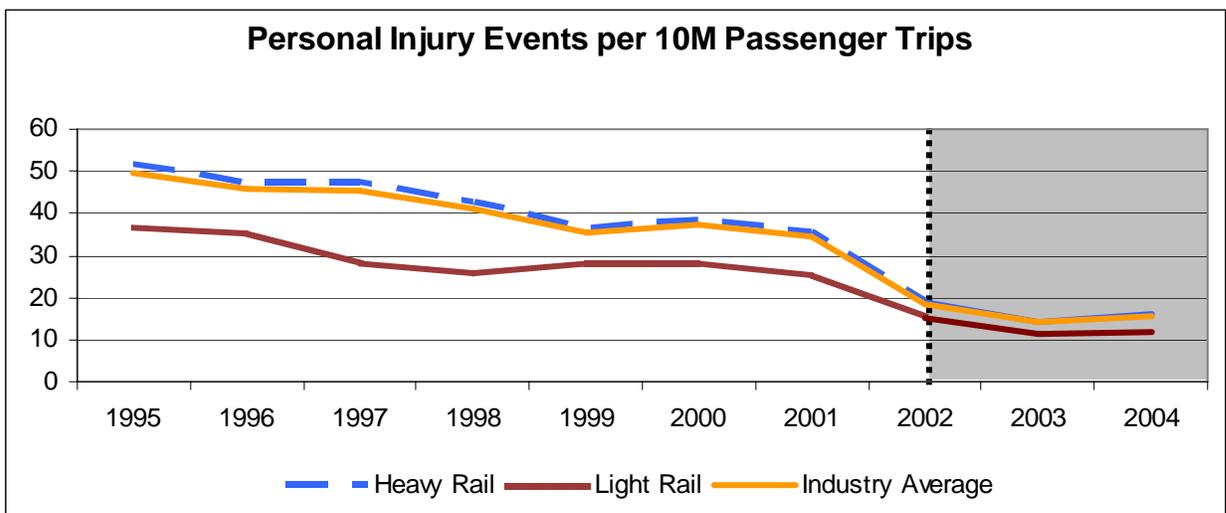


**Personal Injury Events**

Changes to NTD reporting thresholds, which went into effect in 2002, dramatically reduced the number of personal injury events that rail transit agencies were required to report. Only incidents involving immediate medical treatment away from the scene now qualify as NTD-reportable injuries. Previously, any injury reported to the rail transit agency was reported to NTD.

The rate of personal injury events per ten million passenger trips appears in **Exhibit 13**. It is impossible to determine if the downward trend in personal injury events, beginning in 1995, would have continued through 2004 without the change in NTD thresholds.

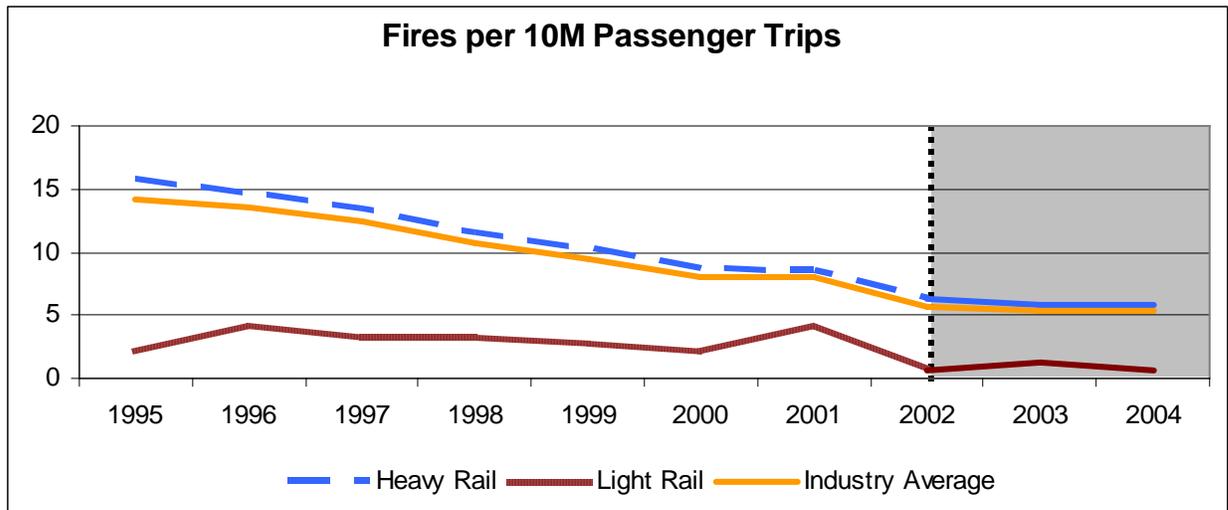
**Exhibit 13: Personal Injury Events per Ten Million Passenger Trips, 1995 to 2004**



Fires

**Exhibit 14** shows the rate of reported fires per ten million passenger trips. Once again, changes in NTD reporting thresholds significantly reduced the number of incidents that rail transit agencies were required to report, removing arson-caused fires from safety reporting forms. Nevertheless, it does appear that a general downward trend is occurring for both heavy and light rail agencies.

**Exhibit 14: Fires per Ten Million Passenger Trips, 1995 to 2004**



### Chapter 3: Impacts of Incident to Occur

This chapter summarizes the results of FTA's analysis regarding the impacts of the incidents to occur between 1995 and 2004.

#### Fatalities

The definition of fatality is one of the few definitions that did not change in the 2002 NTD revision, though suicides are reported on the Non-Major Summary Form (S&S-50), while all other fatalities are treated as "Major Safety and Security Incidents" and are reported on the S&S-40 Form.

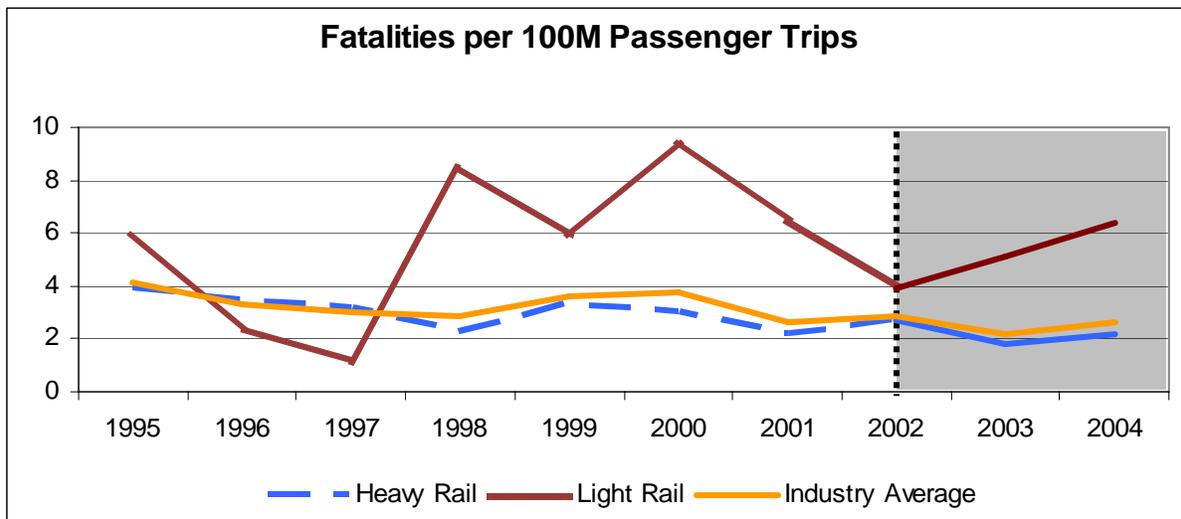
As depicted in **Exhibit 15**, between 1995 and 2004, there were **855 fatalities** in the rail transit industry. More than half of these fatalities were suicides and trespasser-related.

**Exhibit 15: Rail Transit Fatalities**

Year	Heavy Rail	Light Rail	Total
1995	79	15	94
1996	74	6	80
1997	77	3	80
1998	54	23	77
1999	84	17	101
2000	80	30	110
2001	59	21	80
2002	73	13	86
2003	49	17	66
2004	59	22	81
<b>Totals</b>	<b>688</b>	<b>167</b>	<b>855</b>

**Exhibit 16** illustrates fatalities as a rate per hundred million passenger trips.

**Exhibit 16: Fatalities per Hundred Million Passenger Trips, 1995 to 2004**



Since 1995, the fatality rate has saw-toothed between 1.1 per 100 million passenger trips and 9.5 per 100 million passenger trips. This fluctuation reflects the general level of safety in the rail transit environment. A single multi-fatality accident or a moderate increase in the suicide rate impacts the overall rate for the entire industry.

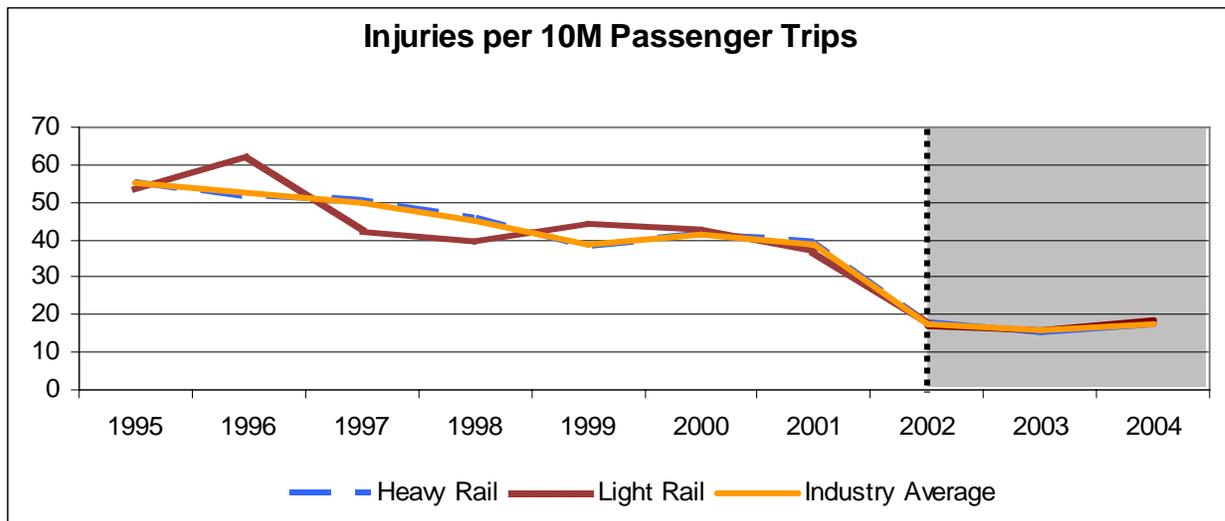
With the exception of 1996 and 1997, light rail agencies have had significantly higher fatality rates than heavy rail agencies, in spite of the reality that most suicides occur at heavy rail agencies. This distinction reflects the comparative dangers of the light rail environment, which does not operate in an exclusive right-of-way, and which interfaces with motor vehicles, pedestrians, and other vehicles and persons each and every day.

Based on this analysis, it does appear that both light rail and heavy rail fatality rates are trending up; however, they remain at lower levels than rates for 1998 and 2000.

**Injuries**

**Exhibit 17** shows the 10-year data for injuries reported by rail transit agencies to FTA. Again, changes made to the NTD reporting thresholds in 2002 significantly reduced the required reporting for the rail transit industry. It is impossible to determine if the general downward trend beginning in 1995 would have continued through 2004.

**Exhibit 17: Injuries per Ten Million Passenger Trips, 1995 to 2004**



**Property Damage**

FTA does not collect claims information from the NTD, and therefore does not have the total amount paid out by rail transit agencies for safety incidents. In addition, for Major Safety and Security Incidents, the property damage information reported in NTD is entered into the database relatively early in the investigation process (within 30 days in most instances). Initial property damage estimates reported to FTA may be made by supervisors, safety managers, or others who do not specialize in this area. Therefore,

FTA anticipates that, in many cases, these figures are lower than the actual expenses paid out by the agencies.

As depicted in **Exhibit 18**, property damage reports made to the NTD indicate that, since 1995, safety incidents are responsible for **over \$95 million** in property damage.

**Exhibit 18: Property Damage Resulting from Rail Transit Incidents**

Year	Heavy Rail	Light Rail	Total
1995	\$2,853,586	\$1,669,265	\$4,522,851
1996	\$6,387,646	\$3,839,037	\$10,226,683
1997	\$8,690,402	\$2,047,011	\$10,737,413
1998	\$10,029,143	\$2,695,505	\$12,724,648
1999	\$2,223,754	\$4,938,769	\$7,162,523
2000	\$5,033,526	\$3,021,849	\$8,055,375
2001	\$20,175,819	\$2,684,714	\$22,860,533
2002	\$2,475,703	\$2,684,714	\$5,160,417
2003	\$5,652,164	\$2,432,328	\$8,084,492
2004	\$3,677,529	\$2,756,920	\$6,434,449
<b>Totals</b>	<b>\$67,199,272</b>	<b>\$28,770,112</b>	<b>\$95,969,384</b>

## Chapter 4: Probable Cause

This chapter presents the results of analysis conducted by FTA to determine the probable causes of “Major Safety and Security Incidents” reported by rail transit agencies during a 30-month period between January 1, 2003 and June 30, 2005. This chapter also provides probable cause analysis from information reported by State Safety Oversight Agencies in their Annual Reports between 2002 and 2004.

### NTD Major Safety and Security Incidents

Between January 1, 2003 and June 30, 2005, the 43 rail transit agencies reported 1,147 “Major Safety and Security Incidents” on Form S&S-40 to the NTD Major Safety and Security Incident Reporting Module. **Exhibit 19** depicts the categories of events reported by these agencies during the 30-month study period.

**Exhibit 19: Categorization of Major Safety and Security Incidents –  
January 1, 2003 to June 30, 2005**

Category	2003		2004		2005 (1/1/05 to 06/30/05)		Totals
	Heavy Rail	Light Rail	Heavy Rail	Light Rail	Heavy Rail	Light Rail	
Derailments	12	24	10	19	3	8	76
Fires	11	2	27	9	3	1	53
Evacuations	11	4	19	3	1	1	39
<b>Collisions</b>	<b>44</b>	<b>249</b>	<b>30</b>	<b>287</b>	<b>22</b>	<b>64</b>	<b>696</b>
Pedestrian/Trespasser – Rail Grade Crossing	1	9	1	16	0	4	31
Pedestrian/Trespasser – Platform/Transit Center	11	2	9	3	5	4	34
Pedestrian/Trespasser – Intersection	0	0	0	7	0	3	10
Trespasser on right-of-way	28	14	15	8	13	3	81
Motor Vehicle -- Rail Grade Crossing	0	176	0	189	1	34	400
Motor Vehicle – Intersection	0	15	0	30	0	7	52
Motor Vehicle – Other	0	6	1	3	0	6	16
Object	0	6	3	9	0	0	18
Other Vehicle (not a motor vehicle)	4	21	1	22	3	3	54
Other	53	11	125	51	35	8	283
<b>Totals</b>	<b>131</b>	<b>290</b>	<b>211</b>	<b>369</b>	<b>64</b>	<b>82</b>	<b>1147</b>

As shown in this exhibit, 696 of these events were collisions. Collisions with motor vehicles at rail grade crossings comprise the most common type of collision, followed by collisions with trespassers, motor vehicle collisions at intersections, pedestrian collisions at platforms/transit centers, and pedestrian collisions at rail grade crossings. "Other" incidents comprise the next most common category, and include a range of events that resulted in injuries to two or more people requiring immediate medical attention away from the scene, such as accidents at escalators/elevators and on stairs; slips, trips and falls in stations; injuries boarding/deboarding rail cars; car door injuries; and injuries resulting from sudden starts and stops. Derailments, fires and evacuations round out the incident categories.

**Exhibit 20** presents the probable causes identified by FTA during its analysis of the 1,147 "Major Safety and Security Incidents" reported during the 30-month study period, including the number of incidents falling into the probable cause category and the impacts of the incidents in terms of property damage, injuries and fatalities. Probable cause was determined from the event descriptions provided by the rail transit agencies and from contributing factors identified by the rail transit agencies on Form S&S-40.

As indicated in **Exhibit 20**, there were **225 incidents** reported, resulting in 257 injuries and over \$1.2 million in property damage, for which insufficient information was entered into the "Major Safety and Security Incident" Reporting Form S&S-40 to determine probable cause. FTA was unable to categorize these incidents due to truncated data in narrative fields, failure to properly fill in all necessary fields, narratives that did not align with other fields in the incident report, and event descriptions without sufficient detail regarding probable cause and/or no contributing factors identified. Examples of these incidents from NTD reports filed by rail transit agencies include:

- "The operator was going through a switch and the train derailed. The cause of the derailment is not known at this time."
- "Train derailed its leading truck wheels while traveling over a track switch."
- "Train was unloaded due to a small fire underneath the train."

There are also **eight (8) incidents for which investigations are still on-going**. Final probable cause determinations have not been entered into the NTD for these eight incidents, which resulted in 23 injuries and five (5) fatalities. Examples of these incidents from NTD reports filed by rail transit agencies include:

- "The main cause of the accident is still under investigation."
- "Unknown, under investigation by NTSB."
- "This incident is still under investigation by Transit Police."

Finally, there were 25 suicide attempts reported on the Form S&S-40, which should have been reported on the Form S&S-50. These incidents resulted in 19 fatalities and five (5) injuries.

FTA continues to work with the rail transit industry to improve the quality of reporting to the NTD.

**Exhibit 20: Probable Cause of NTD Major Safety and Security Incidents –  
January 1, 2003 to June 30, 2005**

Incident Probable Cause Categorization	Number of Incidents	Property Damage (\$)	Injuries	Fatalities
Actions of Motorists (illegal, inappropriate, risky)	371	\$3,256,240	221	15
<b>Insufficient Information Provided to Determine Probable Cause<sup>1</sup></b>	<b>225</b>	<b>\$1,238,110</b>	<b>257</b>	<b>0</b>
Slips and Falls (escalators, sudden stops and starts, stairwells)	123	\$300	161	10
Violations of Operating Rules and Procedures – Operations Employees	84	\$1,614,807	59	0
Equipment Failure	82	\$1,111,385	67	0
Trespassers	73	\$2,100	17	52
Actions of Pedestrians (illegal, inappropriate)	41	\$4,598	31	8
<b>Suicide<sup>2</sup></b>	<b>25</b>	<b>\$700</b>	<b>5</b>	<b>19</b>
Precipitated by Maintenance/Construction Activity in or near ROW	17	\$999,960	9	1
Patrons Leaning into ROW	16	\$2,045	11	4
Imprudent Act by Patron	15	\$0	8	9
Intoxicated Persons on Transit	12	\$0	10	1
Debris on Track	11	\$3,600	12	0
ADA Patron Involved	10	\$1,000	3	2
Violation of Operating Rules and Procedures – Maintenance Employees	8	\$12,200	2	2
Patron Health Issue	8	\$0	1	7
Malicious Mischief	8	\$41,274	5	0
<b>Still Under Investigation<sup>3</sup></b>	<b>8</b>	<b>\$0</b>	<b>23</b>	<b>5</b>
Abandoned Objects	7	\$0	0	0
Employee Health Issue	2	\$0	1	1
Maintenance Training	1	\$0	0	1
<b>Totals</b>	<b>1147</b>	<b>\$8,288,319</b>	<b>903</b>	<b>137</b>

<sup>1</sup>Unable to determine probable cause from information submitted by rail transit agencies.

<sup>2</sup>Suicides should not be reported on the Major Safety and Security Incident Reporting Form (S&S 40).

<sup>3</sup>Unable to determine probable cause, investigations are on-going and updates have not been filed.

As indicated in **Exhibit 20**, the most significant probable cause categories, in terms of impacts, include the following:

- **Collisions with motorists** are responsible for approximately one-third of all “Major Safety and Security Incidents” reported during the 30-month study period, including 15 fatalities and 221 injuries, resulting in almost \$3.2 million in property damage.
- **Trespassers on rail transit right-of-way** were responsible for 73 total incidents resulting in 52 fatalities and 17 injuries.
- **Passenger slips, trips and falls** on escalators, stairwells, platforms, and due to sudden stops and starts on rail vehicles, rail car boarding/deboarding accidents, and car door incidents were responsible for 10 fatalities and 161 injuries.
- **Equipment failure** (including car equipment, track, signal and cable failures and deficiencies) was responsible for 82 incidents, resulting in 67 injuries and over \$1.1 million in property damage.
- **Violations of operating rules and procedures** were responsible for 84 total incidents, resulting in 59 injuries and over \$1.6 million in property damage.
- **Illegal, inappropriate or risky actions taken by pedestrians** were responsible for 41 total incidents, resulting in 31 injuries and 8 fatalities.
- **Imprudent acts by passengers, intoxicated passengers and malicious mischief** engaged in by passengers were responsible for 35 total incidents, resulting in 10 fatalities and 23 injuries.
- **Actions involving the movement or transfer of ADA passengers** were responsible for 10 total incidents, resulting in 3 injuries and 2 fatalities.
- **Passenger and employee health issues** were responsible for 10 combined incidents, resulting in 2 injuries and 8 fatalities.

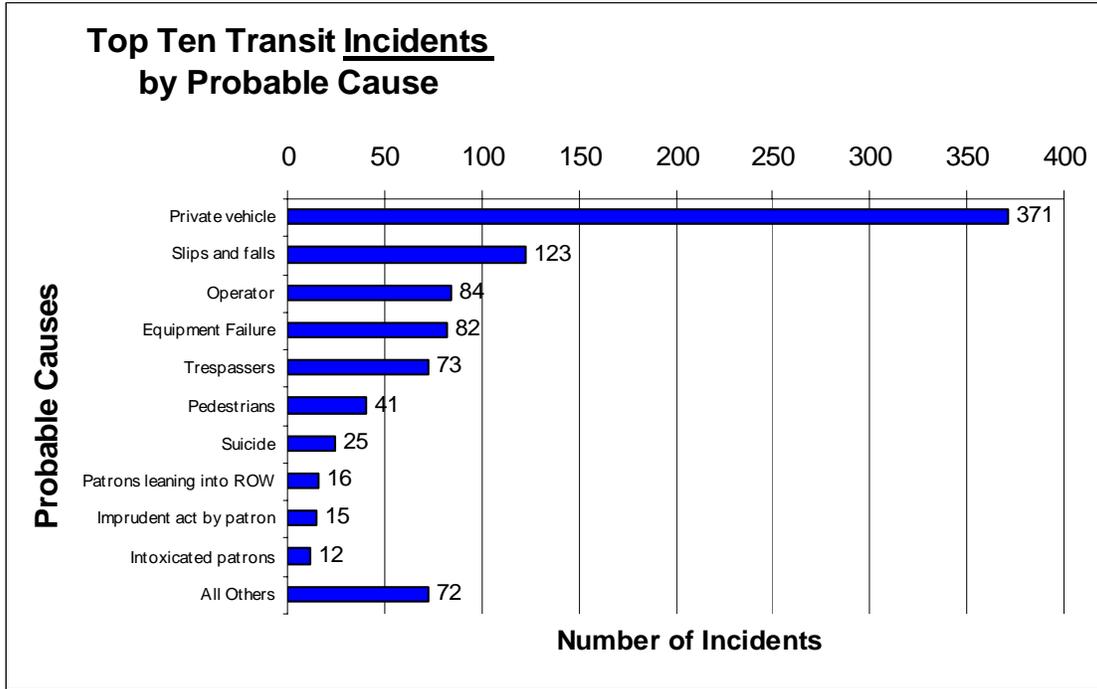
### Top Ten Probable Causes of Major Safety and Security Incidents

FTA performed analysis regarding the Top Ten Probable Causes of Major Safety Incidents reported on the S&S-40 Form by rail transit agencies during the 30-month study period. To perform this analysis, FTA removed those incidents for which insufficient information was available to determine probable cause, leaving a total of 914 incidents. While FTA was not able to determine probable cause of these incidents, as indicated in **Exhibit 19**, information on the incident categorization and impacts was provided. These incidents follow the general distribution of the 914 incidents for which probable cause was determined. FTA does not believe that excluding these incidents artificially skews the overall assessment of the “top ten” probable causes of incidents.

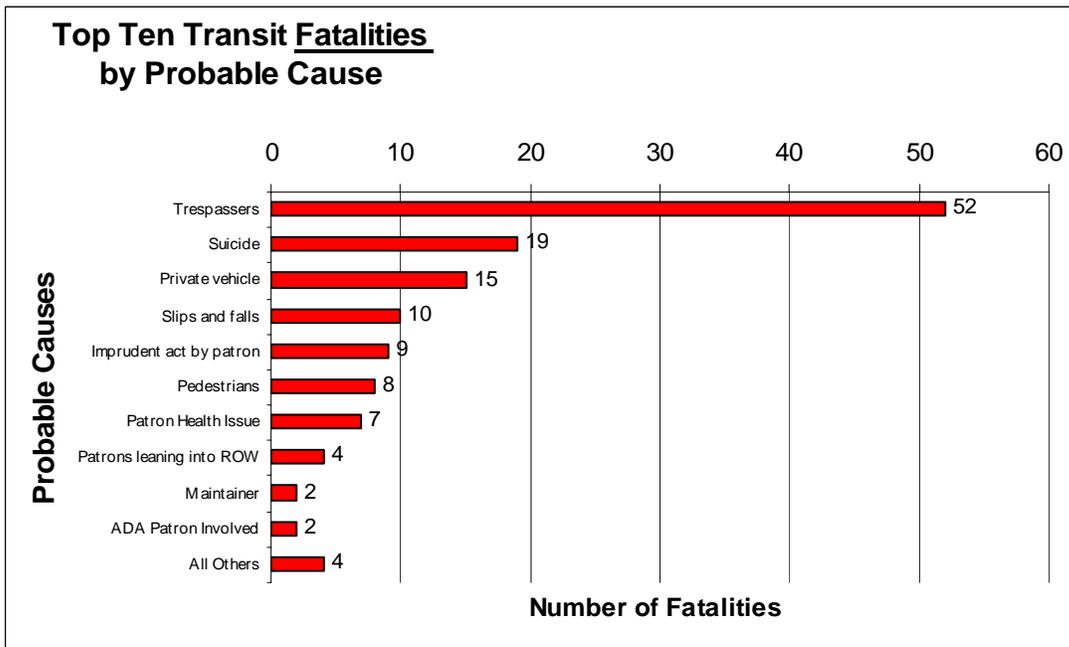
**Exhibit 21** illustrates the Top 10 Probable Causes of the “Major Safety and Security Incidents” reported by the 43 rail transit agencies for those 914 incidents where probable cause was identified. **Exhibit 22** shows the Top Ten Fatalities by Probable Cause for those 914 incidents reported by the 43 rail transit agencies.

**Exhibit 23** shows the Top Ten Injuries by Probable Cause for the 914 incidents where probable cause was identified. Finally, **Exhibit 24** depicts the Top Ten Property Damage by Probable Cause for the 914 incidents reported by the 43 rail transit agencies.

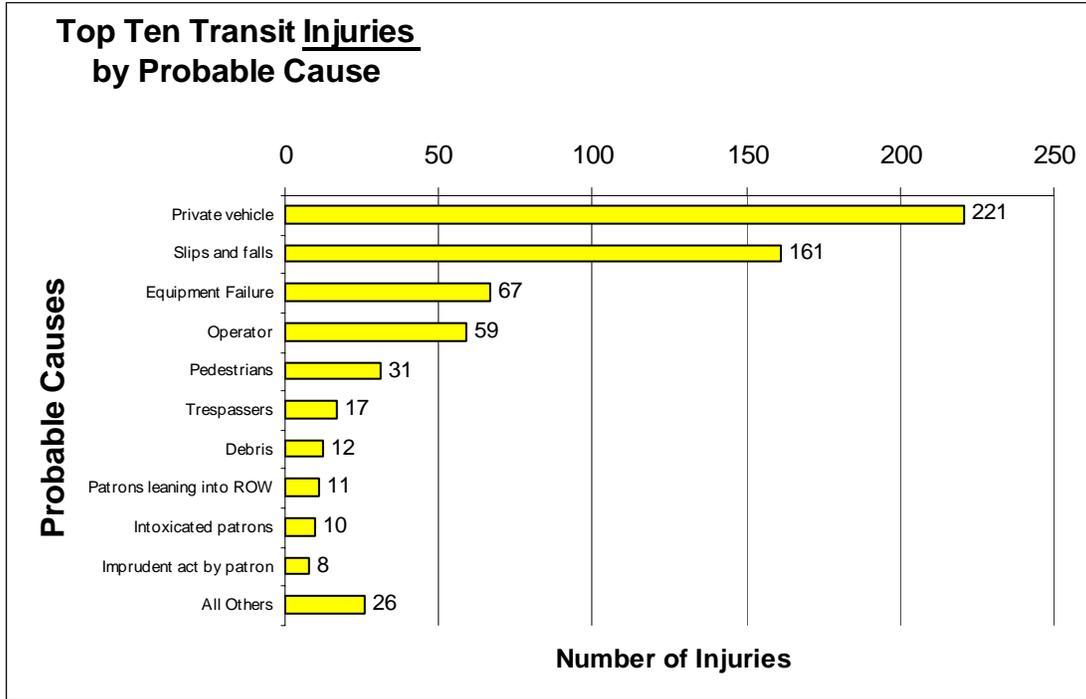
**Exhibit 21: Rail Transit Industry – Top Ten Major Incidents by Probable Cause**



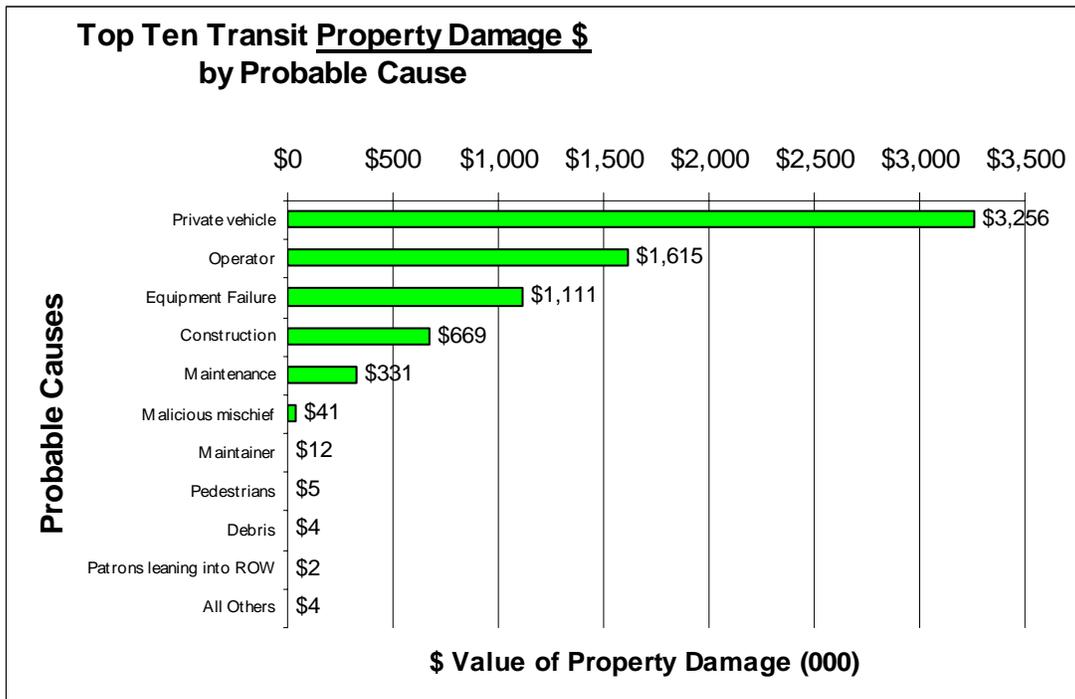
**Exhibit 22: Rail Transit Industry – Top Ten Fatalities by Probable Cause**



**Exhibit 23: Rail Transit Industry – Top Ten Injuries by Probable Cause**



**Exhibit 24: Rail Transit Industry – Top Ten Property Damage by Probable Cause**



Results of this assessment vary considerably for light rail and heavy rail agencies. **Exhibit 25** provides a comparison of the Top Ten Probable Causes of Major Incidents for light and heavy rail agencies. **Exhibit 26** presents this comparison for the Top Ten Probable Causes of Fatalities. **Exhibit 27** highlights this comparison for the Top Ten Probable Causes of Injuries. Finally, **Exhibit 28** provides this comparison for the Top Ten Probable Causes of Property Damage.

Results from this comparison demonstrate that:

- Light rail agencies experience their most serious safety incidents from:
  - collisions with motor vehicles,
  - operator violations of rules and procedures,
  - collisions with pedestrians and trespassers,
  - equipment failures, and
  - slips, trips and falls in stations and while boarding/deboarding trains.
  
- Heavy rail agencies experience their most serious safety incidents from:
  - passenger slips and falls in stations and while boarding/deboarding trains,
  - collisions with trespassers,
  - equipment failure,
  - risky passenger behavior in stations and while boarding/deboarding trains, and
  - operator violations of rules and procedures.

For both light rail and heavy rail agencies, collisions present the most serious potential and actual incidents experienced. To provide additional insights into the types of collisions experienced and their primary causes, **Exhibit 29** provides examples of collisions reported on the NTD S&S-40 Form. **Exhibit 30** summarizes the primary causes of collisions reported in the rail transit industry based on independent assessments conducted through the Transit Cooperative Research Program (TCRP) and information provided on the NTD S&S-40 Form.

As specified in the reports filed by rail transit agencies to the NTD Major Safety and Security Incident Reporting Module, *there is not a single incident attributed to operator fatigue or inattentiveness*. Due to the structure of the NTD Form S&S-40 and the time-frame during which this report is filed, FTA believes that most of these incidents are filed under “operator violation of rules and procedures.” In addition, other incidents attributed to equipment failure are not broken down in sufficient detail to determine specific causes (i.e., track, car equipment, signal or cable failures and deficiencies).

To obtain additional information on these causes of safety incidents, FTA undertook the review of probable cause reports from FTA’s State Safety Oversight Program, which are based on actual investigation reports filed by the rail transit agencies with the State Oversight Agencies. Results from this analysis shed additional light on these topics, and are discussed in the next section.

Exhibit 25: Top Ten Probable Cause of Major Incidents – Light Rail and Heavy Rail

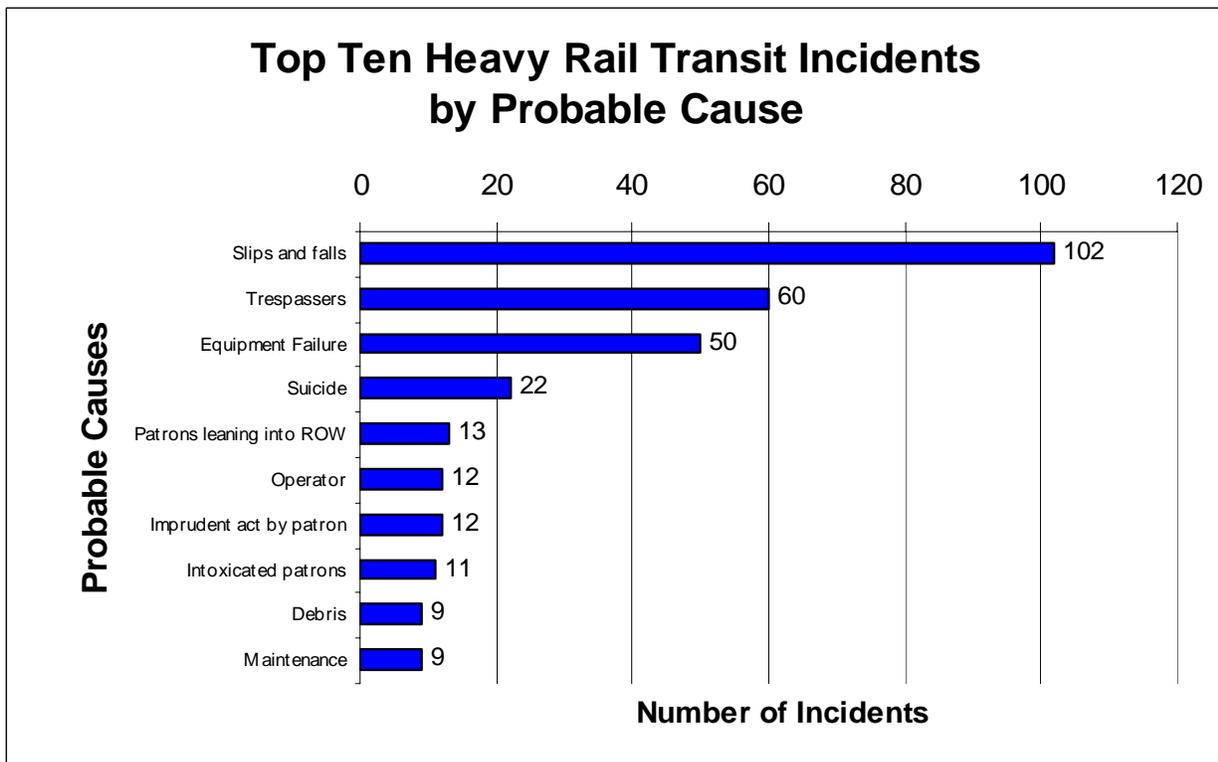
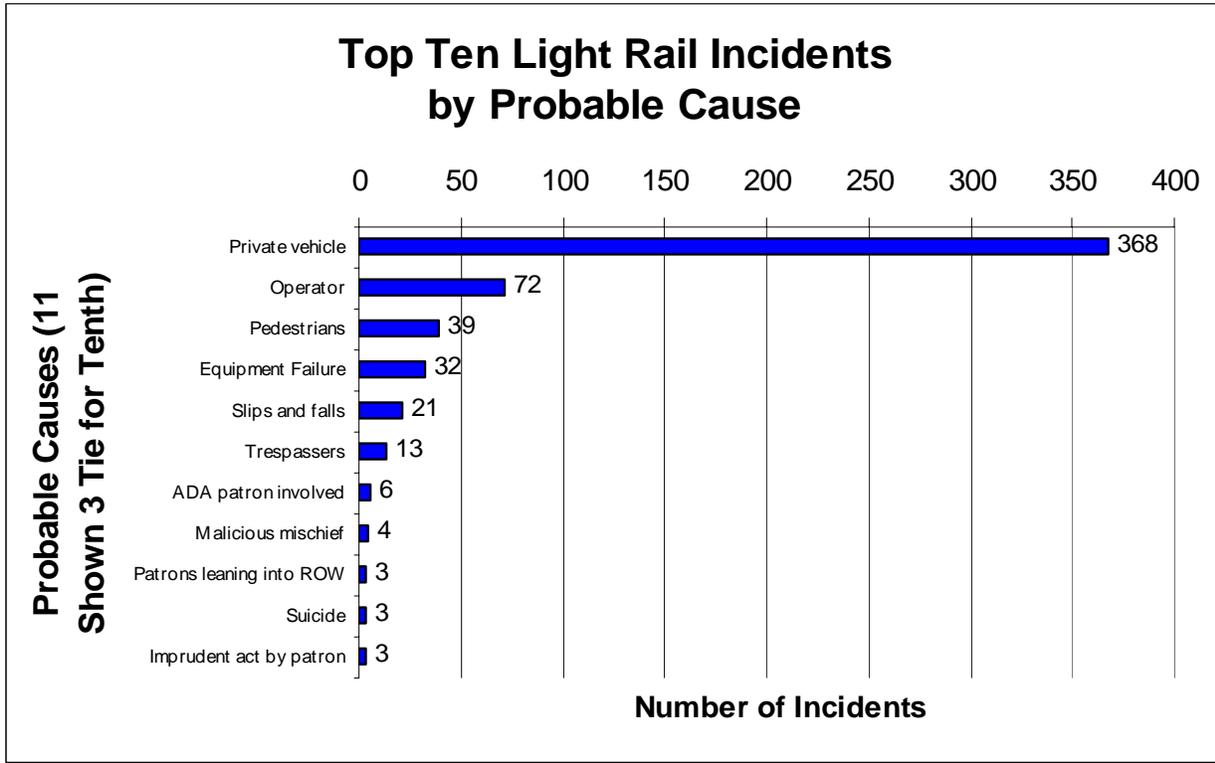


Exhibit 26: Top Ten Probable Cause for Fatalities – Light Rail and Heavy Rail

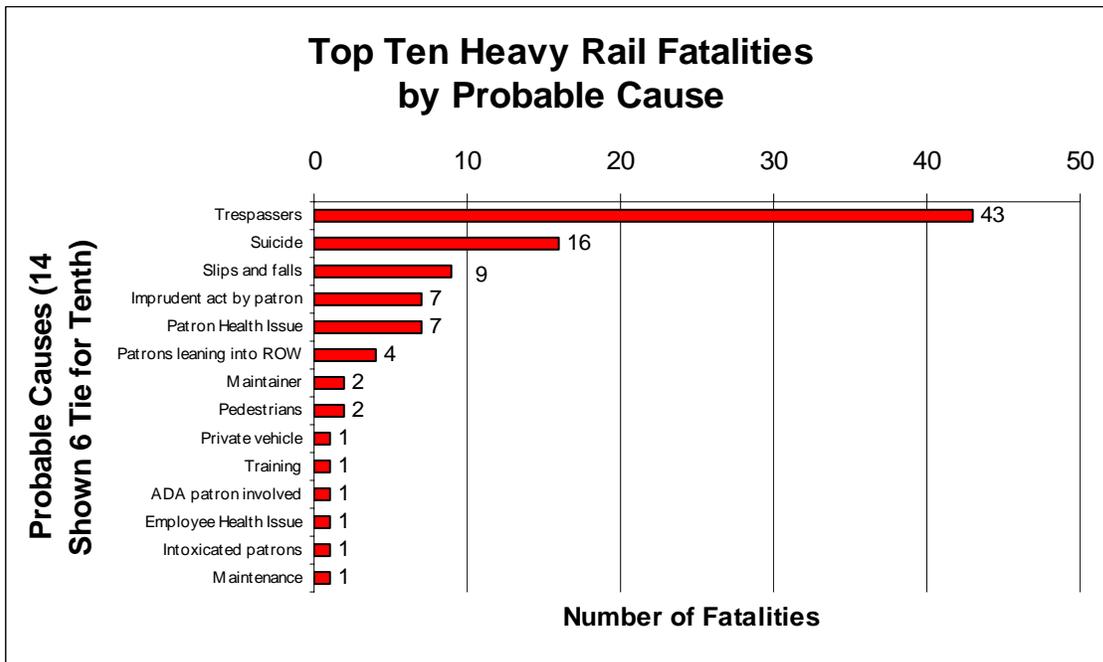
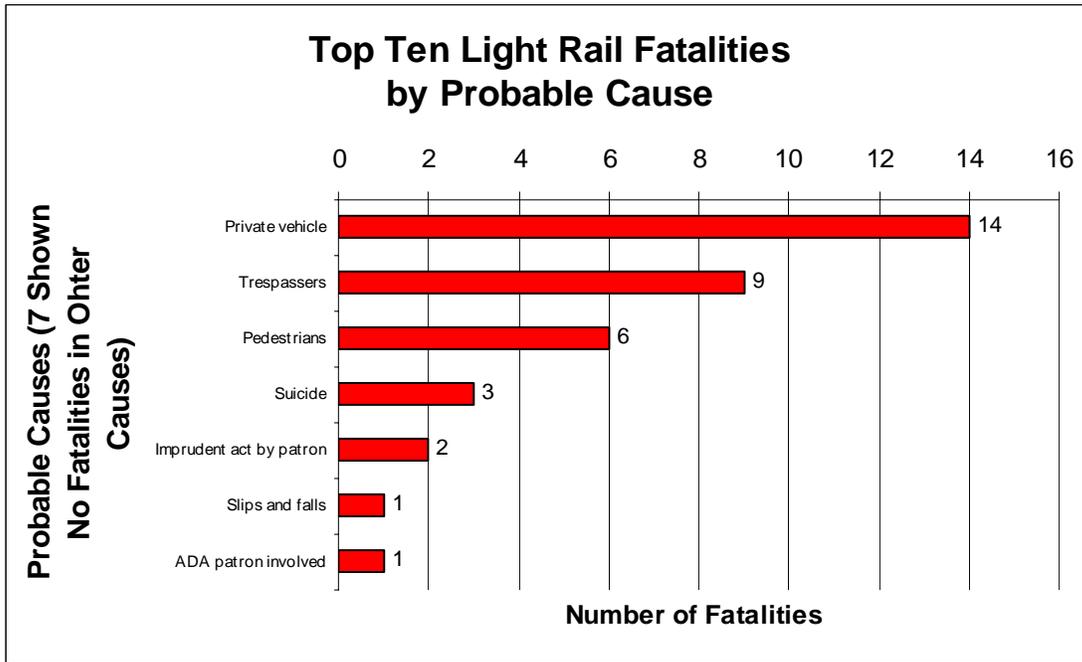


Exhibit 27: Top Ten Probable Cause for Injuries– Light Rail and Heavy Rail

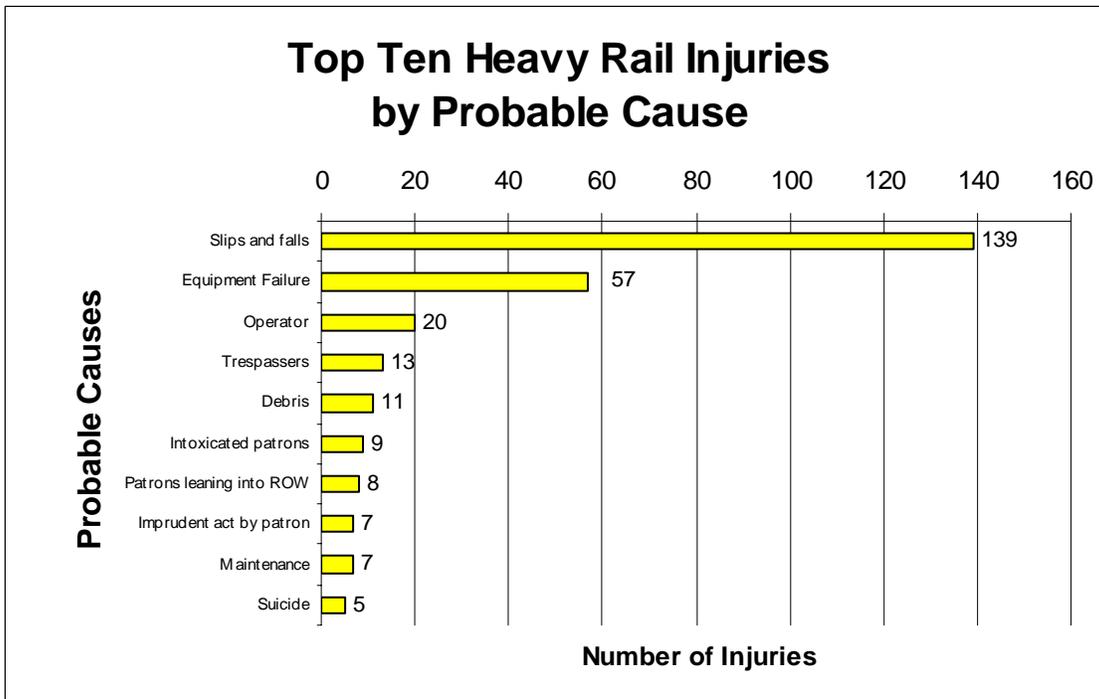
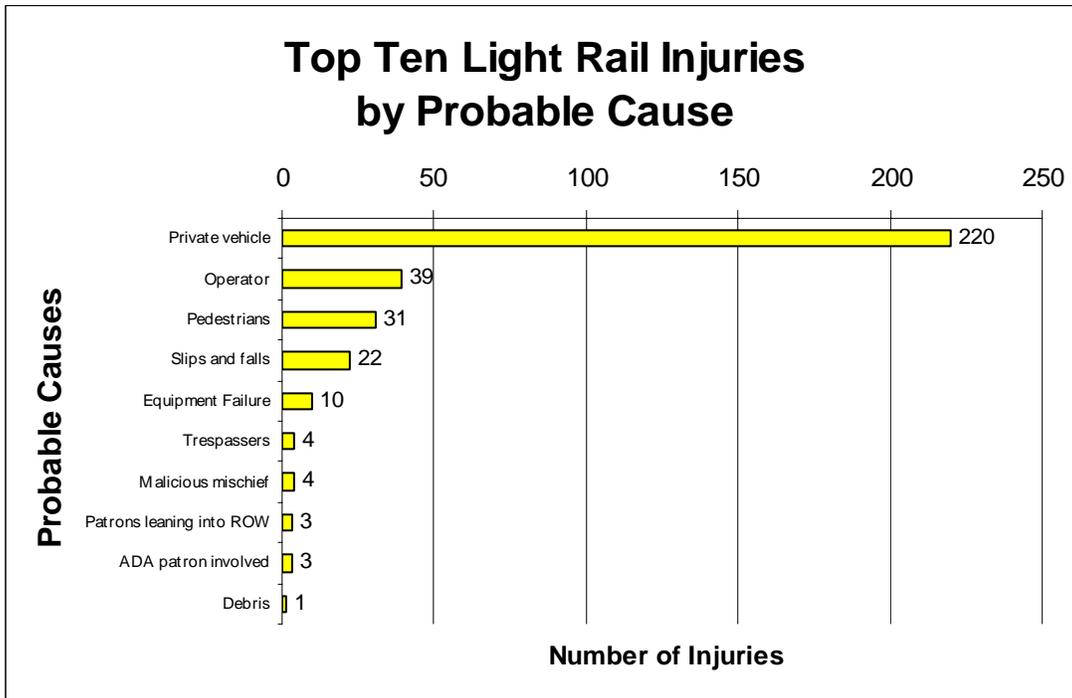
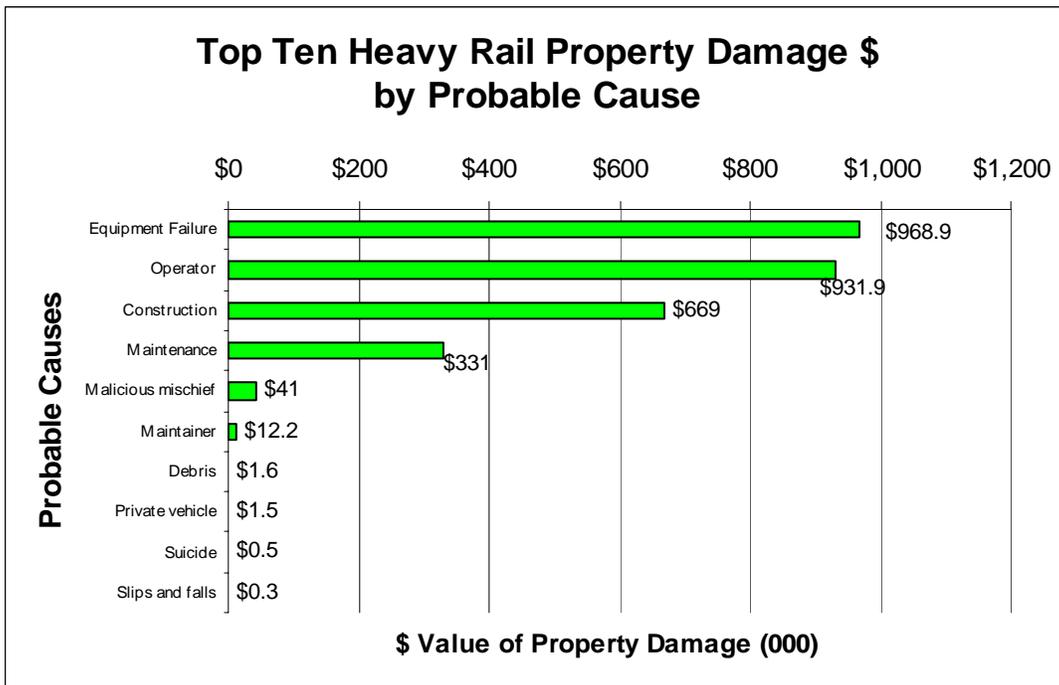
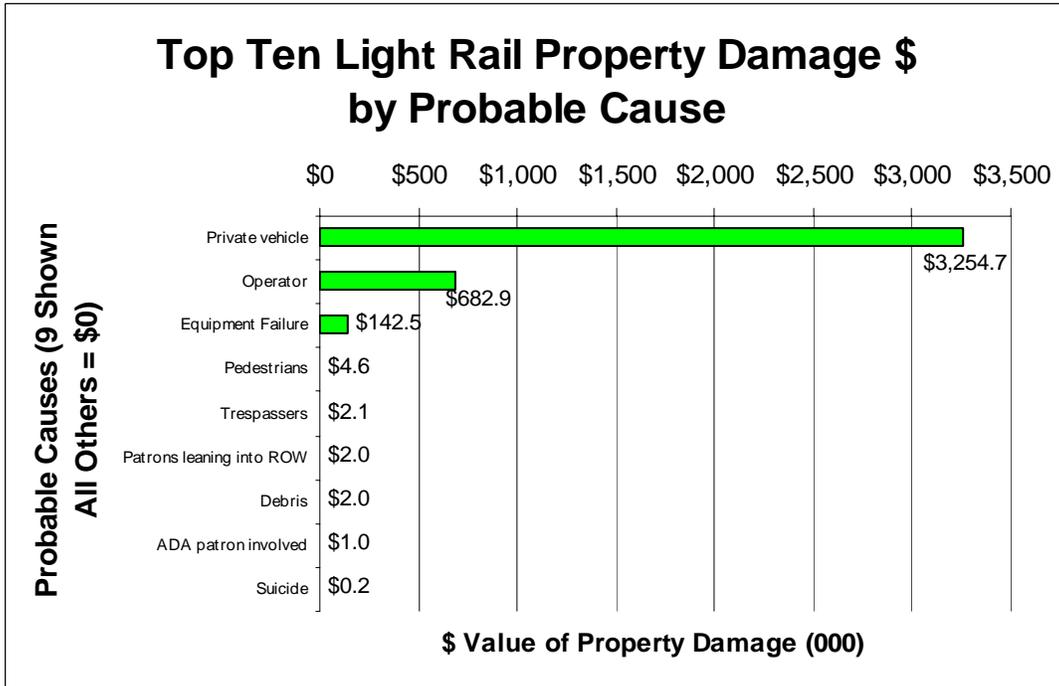


Exhibit 28: Top Probable Cause for Property Damage – Light Rail and Heavy Rail



**Exhibit 29: Examples of Major Collisions Reported on NTD S&S-40 Form**

Types of Collisions	Examples
Collisions with Motor Vehicles	<ul style="list-style-type: none"> <li>• Ambulance failed to yield the right of way during an emergency and ran into LRV consist, which was occupying the intersection. LRV was derailed and driven into a building. The ambulance was also knocked into a building. Two paramedics were injured.</li> <li>• Crossing arms were down and warning lights and bells activated. Trolley operator blew whistle before and through crossing and car failed to stop for crossing arms and pulled out in front of trolley and was struck. No injuries reported.</li> <li>• Westbound train was approaching grade crossing. A Pedi-cab for hire transporting three passengers went around the crossing gate at the crossing and into the path of the train. One person was injured and transported to the hospital.</li> <li>• The car turned left in front of the train which was going same direction. The driver stated he did not know the area, was lost, and did not see the "no left turn" sign. The train stopped about 55' from point of contact with the car. Two passengers were injured.</li> </ul>
Collisions with Pedestrians	<ul style="list-style-type: none"> <li>• Four year old child steps into the path of a light rail vehicle.</li> <li>• Train collided with a pedestrian who attempted to beat the train.</li> <li>• Southbound Train collided into a pedestrian. The pedestrian was traveling eastbound through the pedestrian crossing, had ignored all active and passive-warning signals and was hit by the side of the oncoming southbound.</li> </ul>
Collisions with Trespassers	<ul style="list-style-type: none"> <li>• A male adult entered the trackway, via an emergency exit gate. The subject began to walk on the tracks then subsequently got struck by a train from the rear. It is still unknown as to why the subject entered the trackway.</li> <li>• Trespasser stood in front of the incoming train and was struck by the train causing his fatality.</li> <li>• Intoxicated subject trespassed onto aerial trackway and began walking. He was struck by a revenue train.</li> <li>• Train entering station collided with a male that was coming out from underneath of the platform. The man was transported to the hospital with non-fatal injuries.</li> <li>• Train departing the station made contact with a male on the right-of-way. The male trespasser received fatal injuries as a result of the collision.</li> <li>• Witness stated person was on roadbed trying to climb up to platform when she was struck by train.</li> </ul>

**Exhibit 30: Primary Causes of Major Collisions Reported on NTD S&S-40 Form**

Types of Collisions	Major and Contributing Causes
Collisions with Motor Vehicles	<ul style="list-style-type: none"> <li>• Failure of the motorist to follow traffic rules</li> <li>• Failure of motorist to follow warning signs/signals</li> <li>• Failure of the motorist to stop at a rail grade crossing</li> <li>• Careless/reckless vehicular operations</li> <li>• Motorists making illegal left turns across the light rail transit (LRT) right-of-way immediately after termination of their protected left-turn phase.</li> <li>• Motorists violating red left-turn arrow indications when the leading left-turn signal phase is preempted by an approaching light rail vehicle (LRV).</li> <li>• Motorists violating traffic signals with long red time extensions resulting from LRV preemptions.</li> <li>• Motorists failing to stop on a cross street after the green traffic signal indication has been preempted by an LRV.</li> <li>• Motorists violating active and passive NO LEFT/RIGHT TURN signs where turns were previously allowed prior to LRT construction.</li> <li>• Motorists confusing LRT signals, especially left-turn signals, with traffic signals.</li> <li>• Motorists confusing LRT switch signals (colored ball aspects) with traffic signals.</li> <li>• Motorists driving on LRT rights-of-way that are delineated by striping.</li> <li>• Motorists violating traffic signals at cross streets, especially where LRVs operate at low speeds.</li> <li>• Complex intersection geometry resulting in motorist and judgment errors.</li> </ul>
Collisions with Pedestrians	<ul style="list-style-type: none"> <li>• Careless/reckless behavior on or near the trackway.</li> <li>• Individuals trespassing on side-aligned light rail transit rights-of-way where there are no sidewalks.</li> <li>• Individuals jaywalking across light rail transit /transit mall rights-of-way.</li> <li>• Individual errors in judgment regarding "beating the train" or failing to look for a second train.</li> <li>• Lack of attention and awareness of surroundings.</li> <li>• Failure of individuals to follow rail transit agency rules of conduct on station platforms and at crossings.</li> <li>• Inadequate queuing areas and safety zones for passengers and pedestrians.</li> </ul>
Collisions with Trespassers	

## State Safety Oversight Annual Reports

Between 2002 and 2004, **550 collisions, derailments and fires** were investigated for FTA's State Safety Oversight Program. **Exhibit 31 and 31a** provides a break-down of probable cause for the 175 collision, derailment and fire investigations conducted in 2004. **Exhibit 32 and 32a** provides this information for those 209 investigations conducted in 2003, while **Exhibit 33 and 33a** illustrates this information for those 165 investigations conducted in 2002.

Collectively, these results show the following:

### Light Rail Collisions

Over the three year period, there were **437 light rail collisions** investigated in the State Safety Oversight Program:

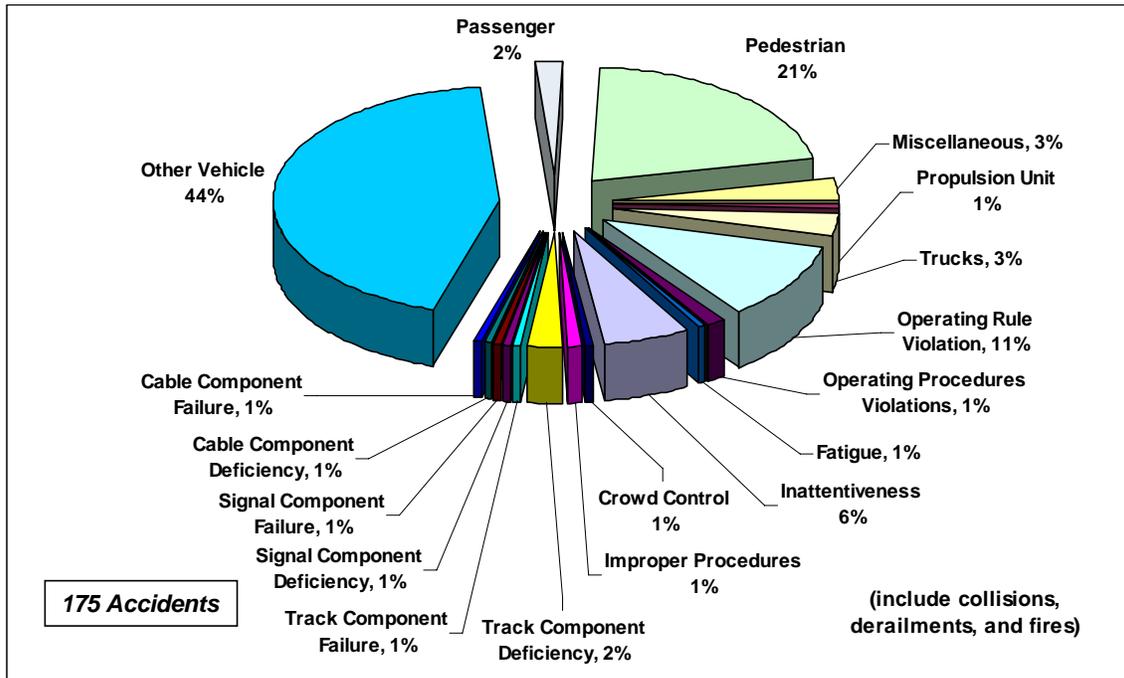
- 249 of these collisions (57 percent) were caused by the **illegal, inappropriate or risky actions of the drivers of other motor vehicles.**
- 92 of these collisions (21 percent) were caused by the **illegal, inappropriate or risky actions of pedestrians.**
- 52 collisions (12 percent) were caused by **operator fatigue and inattentiveness.**
- 22 collisions (5 percent) were caused by the **violation of operating rules.**
- The remaining 22 incidents (5 percent) were caused by **track component deficiencies, crowd control issues, imprudent acts by passengers, and miscellaneous events.**

### Heavy Rail Collisions

Over the three year period, there were **36 heavy rail collisions** investigated in the State Safety Oversight Program:

- Seven of these collisions (19.44 percent) were caused by the **violation of operating rules.**
- Seven of these collisions (19.44 percent) were caused by the **illegal, inappropriate or risky actions of pedestrians.**
- Five of these collisions (13.89 percent) were caused by **operator fatigue and inattentiveness.**
- Five of these collisions (13.89 percent) were caused by application of **inappropriate procedures by operations personnel.**
- Four of these collisions (11.11 percent) were caused by the **inappropriate actions of passengers.**
- Four of these collisions (11.11 percent) were caused by **illegal, inappropriate or risky actions of the drivers of other motor vehicles.**
- Three of these collisions (8.33 percent) were caused by track component deficiencies.
- The remaining collision (2.78 percent) was attributed to miscellaneous causes.

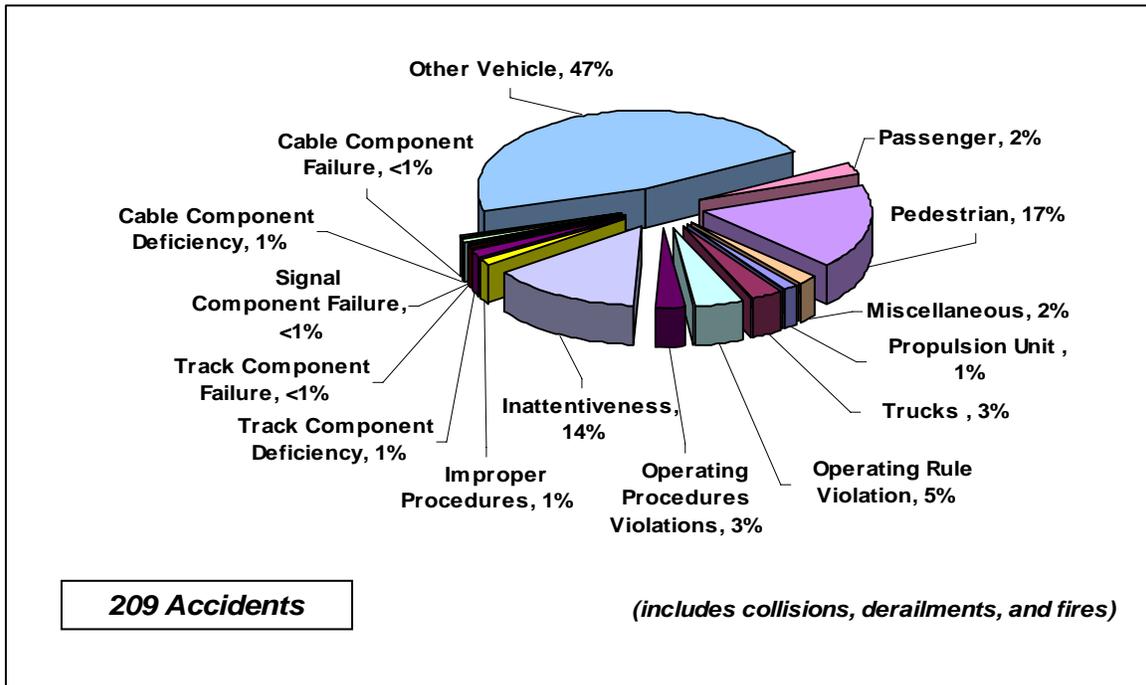
**Exhibit 31: Probable Causes Reported by State Oversight Agencies, 2004**



**Exhibit 31a: Probable Causes Reported by State Oversight Agencies, 2004**

Probable Cause	Heavy Rail			Light Rail		
	Collisions	Derailments	Fires	Collisions	Derailments	Fires
<b>Car Equipment Failure</b>						
Car Body	0	0	0	0	0	0
Propulsion Unit	0	0	0	0	0	1
Trucks	0	5	0	0	1	0
<b>Human Failure</b>						
Operating Rule Violation	1	1	0	17	0	0
Operating Procedures Violations	2	0	0	0	0	0
Drug/Alcohol Violation	0	0	0	0	0	0
Fatigue	0	0	0	1	0	0
Inattentiveness	3	0	0	8	0	0
<b>Operations</b>						
Crowd Control	0	0	0	1	0	0
Improper Procedures	1	1	0	0	0	0
<b>Track</b>						
Track Component Deficiency	1	2	0	1	0	0
Track Component Failure	0	0	0	0	1	0
<b>Signal</b>						
Signal Component Deficiency	0	0	0	0	1	0
Signal Component Failure	0	0	1	0	0	0
<b>Cable</b>						
Cable Component Deficiency	0	0	1	0	0	0
Cable Component Failure	0	0	1	0	0	0
<b>Other Vehicle</b>	0	0	0	77	0	0
<b>Passenger</b>	1	0	0	2	0	0
<b>Pedestrian</b>	0	0	0	37	0	0
<b>Miscellaneous</b>	0	0	2	4	0	0
<b>Total</b>	<b>9</b>	<b>9</b>	<b>5</b>	<b>148</b>	<b>3</b>	<b>1</b>

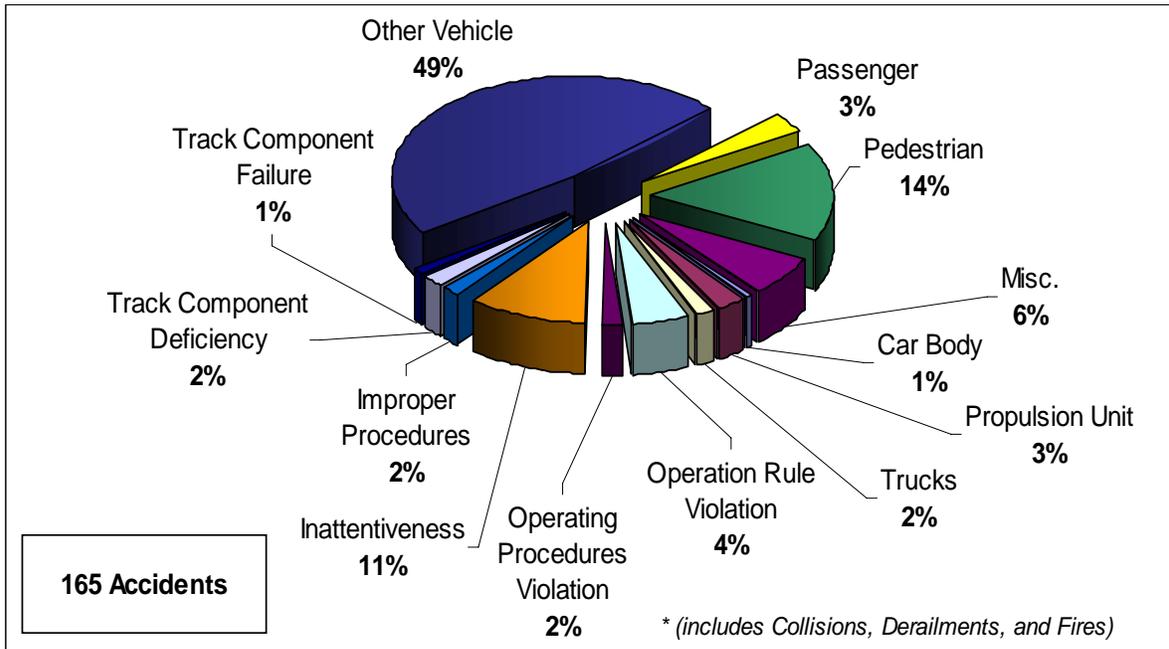
**Exhibit 32: Probable Causes Reported by State Oversight Agencies, 2003**



**Exhibit 32a: Probable Causes Reported by State Oversight Agencies, 2003**

Probable Cause	Heavy Rail			Light Rail		
	Collisions	Derailments	Fires	Collisions	Derailments	Fires
<b>Car Equipment Failure</b>						
Car Body	0	0	0	0	0	0
Propulsion Unit	0	0	2	0	0	1
Trucks	0	3	0	0	3	0
<b>Human Failure</b>						
Operating Rule Violation	0	1	4	0	5	0
Operating Procedures Violations	1	5	0	0	0	0
Drug/Alcohol Violation	0	0	0	0	0	0
Fatigue	0	0	0	0	0	0
Inattentiveness	0	0	0	29	1	0
<b>Operations</b>						
Crowd Control	0	0	0	0	0	0
Improper Procedures	0	0	1	0	2	0
<b>Track</b>						
Track Component Deficiency	0	0	1	1	1	0
Track Component Failure	0	0	0	0	1	0
<b>Signal</b>						
Signal Component Deficiency	0	0	0	0	0	0
Signal Component Failure	0	1	0	0	0	0
<b>Cable</b>						
Cable Component Deficiency	0	0	2	0	0	0
Cable Component Failure	0	0	0	0	0	1
<b>Other Vehicle</b>	2	0	2	94	0	0
<b>Passenger</b>	3	0	1	1	0	0
<b>Pedestrian</b>	7	0	0	29	0	0
<b>Miscellaneous</b>	1	1	1	1	0	0
<b>Total Accidents</b>	14	11	14	155	13	2

**Exhibit 33: Probable Causes Reported by State Oversight Agencies, 2002**



**Exhibit 33a: Probable Causes Reported by State Oversight Agencies, 2002**

Probable Cause	Heavy Rail			Light Rail		
	Collisions	Derailments	Fires	Collisions	Derailments	Fires
<b>Car Equipment Failure</b>						
Car Body	0	0	1	0	0	0
Propulsion Unit	0	0	0	0	1	3
Trucks	0	0	0	3	0	0
<b>Human Failure</b>						
Operating Rule Violation	2	0	0	4	2	0
Operating Procedures Violations	2	0	0	0	1	0
Drug/Alcohol Violation	0	0	0	0	0	0
Fatigue	0	0	0	0	0	0
Inattentiveness	2	1	0	13	1	0
<b>Operations</b>						
Crowd Control	0	0	0	0	0	0
Improper Procedures	3	0	0	0	0	0
<b>Track</b>						
Track Component Deficiency	1	2	0	0	0	0
Track Component Failure	0	1	0	0	1	0
<b>Signal</b>						
Signal Component Deficiency	0	0	0	0	0	0
Signal Component Failure	0	0	0	0	0	0
<b>Cable</b>						
Cable Component Deficiency	0	0	0	0	0	0
Cable Component Failure	0	0	0	0	0	0
<b>Other Vehicle</b>	2	0	0	77	0	0
<b>Passenger</b>	0	0	0	5	0	0
<b>Pedestrian</b>	0	0	0	26	0	0
<b>Miscellaneous</b>	1	0	0	6	2	2
<b>Total accidents</b>	<b>13</b>	<b>4</b>	<b>1</b>	<b>134</b>	<b>8</b>	<b>5</b>

### Light Rail Derailments

**Twenty-four light rail derailments** were investigated in the State Oversight Program between 2002 and 2004:

- Seven of these derailments (29 percent) were caused by the **violation of operating rules** and two additional derailments (8.33 percent) were caused by **the application of improper procedures** by operations personnel.
- Four of these derailments (17 percent) were caused by **truck car equipment failures** and another derailment (4 percent) was caused by a **propulsion unit car equipment failure**.
- Four of these derailments (17 percent) were caused by **track component failures** and one additional derailment (4 percent) was caused by a **track component deficiency**.
- Two of these derailments (8 percent) were caused by **operator inattentiveness**.
- One of these derailments (4 percent) was caused by a **signal deficiency**.
- Two derailments (8 percent) were attributed to **miscellaneous causes**.

### Heavy Rail Derailments

**Twenty-four heavy rail derailments** were investigated in the State Oversight Program between 2002 and 2004:

- Eight of these derailments (33 percent) were caused by **truck car equipment failures**.
- Five of these derailments (21) were caused by **violations of operating procedures**, two derailments (8 percent) were caused by **violations of operating rules**, and one derailment (4 percent) was caused by the **improper use of procedures** by operations personnel.
- Four of these derailments (17 percent) were caused by **track component deficiencies** and an additional derailment (4 percent) was caused by a **track component failure**.
- One derailment (4 percent) was caused by **operator inattentiveness**.
- One derailment (4 percent) was caused by a **signal component deficiency**.
- One derailment (4 percent) was attributed to **miscellaneous causes**.

### Light Rail Fires

There were **eight (8) fires at light rail agencies** investigated in the State Safety Oversight Program between 2002 and 2004.

- Five fires (63 percent) were the result of a **propulsion unit car equipment failure**.
- One fire (13 percent) was the result of a **cable component failure**.
- Two fires (25 percent) were attributed to **miscellaneous causes**.

Heavy Rail Fires

There were **20 fires at heavy rail agencies** investigated in the State Safety Oversight Program between 2002 and 2004:

- Four fires (20 percent) were the result of the **violation of operating rules** and an additional fire (5 percent) was the result of **improper use of procedures** by operations personnel.
- One fire (5 percent) was the result of a **car body failure**.
- One fire (5 percent) was the result of a **signal component failure**.
- One fire (5 percent) was the result of a **cable component failure**.
- Three fires (15 percent) were the result of a **cable component deficiency**.
- Two fires (10 percent) were the result of a **propulsion unit car equipment failure**.
- Two fires (10 percent) were the result of the **actions of another vehicle**.
- One fire (5 percent) was the result of a **passenger**.
- One fire (5 percent) was the result of a **track component deficiency**.
- Three fires (15 percent) were attributed to **miscellaneous causes**.

**Categorization of “Other” Accidents**

Over the three year period between 2002 and 2004, there were **9,325 “other” accidents** investigated through the State Safety Oversight Program. The majority of these accidents were the result of single-person injuries requiring immediate medical treatment away from the scene. **Exhibit 34** categorizes these accidents.

**Exhibit 34: “Other” Accidents Investigated  
in the State Safety Oversight Program, 2002 to 2004**

Categorization	Heavy Rail	Light Rail
Suicides/Attempts	200	24
Slips, Trips, and Falls in Station	5,217	260
Boarding/Deboarding Train	44	127
Car Door Injuries	137	91
Escalators/Stairwells	340	154
Homicides/Assaults/Security Incidents	339	105
Trespassing-related Incidents	205	78
Other (primarily Slips, Trips and Falls in Other Transit Locations and on Vehicles)	1,897	107
<b>Total</b>	<b>8,379</b>	<b>946</b>

## Chapter 5: Safety Action Plan Priorities

This chapter identifies FTA's safety priorities based on the results of the analysis presented in Chapters 2 through 4. This chapter also describes initiatives undertaken by FTA to support improvements in each priority area.

### Top Ten Priorities

The following priorities have been identified for FTA's Safety Action Plan:

- Priority Number 1: Reducing Collisions with Other Vehicles
- Priority Number 2: Reducing Collisions with Pedestrians and Trespassers
- Priority Number 3: Improving Compliance with Operating and Maintenance Rules
- Priority Number 4: Reducing the Impacts of Fatigue on Transit Workers
- Priority Number 5: Reducing Unsafe Acts by Passengers in Transit Stations
- Priority Number 6: Improving Safety of Transit Workers
- Priority Number 7: Improving Safety for Passengers with Disabilities
- Priority Number 8: Removing Debris from Tracks and Stations
- Priority Number 9: Improving Emergency Response Procedures
- Priority Number 10: Improving Safety Data Acquisition and Analysis

In the coming year, FTA will establish a "Top Ten" Safety Priorities website, which will be organized according to these priorities, and which will provide useful information, guidance and recommendations to the rail transit industry and State Oversight Agencies in addressing these priorities.

### FTA Safety Action Plan Initiatives

To address these ten priorities, FTA is building on existing initiatives or establishing new ones in several areas. Each of these initiatives is discussed below.

- **Collision Reduction** – Research, outreach and partnership with other agencies to support collision reduction, including improvements for highway-rail grade crossing and pedestrian and trespasser safety (addresses Priority 1 and 2).
- **Rules/Procedures Compliance** – Integrating rules compliance checks and assessments into on-going rail transit agency safety program activities required in the State Safety Oversight Program (addresses Priority 3).
- **Fatigue Management** – Research, training and outreach for reducing fatigue and inattentiveness among rail transit operations personnel and for responding to recent recommendations from the National Transportation Safety Board (addresses Priority 4).
- **Passenger Safety in and near Rail Transit Stations** – Research for improving passenger safety in and near rail transit stations, including safety for ADA passengers (addresses Priorities 5 and 7).
- **Transit Worker Safety** – Guidance and on-site technical assistance for improving the safety of transit workers and reducing the impacts of construction on operations through the both FTA's Project Management Oversight (PMO) Program and new requirements in FTA's SSO Program (addresses Priority 6).

- **Debris Management** – Through an FTA security initiative, developing standards for housekeeping and the use and design of trashcans in the rail transit environment (addresses Priority 8).
- **Emergency Response to Accidents that Occur** – Continued training on developing emergency response procedures and conducting emergency drills, including reinstatement of the well-received FTA drill grant program, updated to incorporate DHS Exercise program guidance (addresses Priority 9).
- **NTD Training and Enhancements** – New training and outreach for NTD reporting and further integration of SSO Program into NTD reporting system (addresses Priority 10).

## Collision Reduction

To support reductions in collisions, FTA will continue to sponsor research to coordinate with Federal and non-profit agencies and to support the development of standards and recommended practices for use in the rail transit industry.

**Research:** FTA sponsors an extensive program of research conducted by the Transit Cooperative Research Program (TCRP) devoted to the reduction of light rail collisions. To date, FTA has funded three major studies and one research digest:

- *TCRP Project D-10 Audible Signals for Pedestrian Safety in Light Rail Transit Environments* – The objective of this research is to develop a guidebook on the use of audible signals and related operating procedures for pedestrian-crossing safety in a light rail transit environment. The research will address (1) integration of these audible devices with other crossing measures (e.g., signage, channelization, warning and control devices) to maximize safety; (2) pedestrian crossings in various environments (e.g., low-speed street running, at highway-rail grade crossings in semi-exclusive rights-of-way, and at stations); (3) on-vehicle and wayside audible signals; and (4) the needs of disabled individuals. The Final Report due in the summer of 2006. More information is available at: <http://www4.trb.org/trb/crp.nsf/All+Projects/TCRP+D-10>.
- *TCRP Report 17: Integration of Light Rail Transit into City Streets* documents and presents the results of a study to improve the safety of light rail transit (LRT) operations in shared rights-of-way where LRT operates on, adjacent to, or across city streets at low to moderate speeds (35 mph or less). Published in December 1996, the Final Report is available at: [http://trb.org/news/blurb\\_detail.asp?id=2599](http://trb.org/news/blurb_detail.asp?id=2599).
- *TCRP Report 69: Light Rail Service: Pedestrian and Vehicular Safety* documents and presents the results of a study to improve the safety of light rail transit (LRT) in semi-exclusive rights-of-way where light rail vehicles (LRVs) operate at speeds greater than 35 mph through crossings with streets and pedestrians pathways. This report also presents the results of field tests conducted to improve the safety of higher speed LRT systems through grade crossing design. Published in February 2000, the Final Report is available at: [http://trb.org/news/blurb\\_detail.asp?id=2536](http://trb.org/news/blurb_detail.asp?id=2536).

- *TCRP Research Results Digest 51, Second Train Coming Warning Sign: Demonstration Projects* summarizes the results of demonstration projects in Maryland and California concerning second-train-coming warning signs for light rail transit systems. Published in December 2002, this Digest is available at: [http://trb.org/news/blurb\\_detail.asp?id=1032](http://trb.org/news/blurb_detail.asp?id=1032).

TCRP, through FTA sponsorship, has just initiated another research project, entitled *TCRP Project A-30: Improving Safety Where Light Rail, Pedestrians, and Vehicles Intersect*. In this project, FTA is sponsoring this work to build on previous research evaluating safety deficiencies for light rail, at-grade alignments. This research will update and improve upon these past studies by focusing on four sub-areas: compiling data, updating previous studies, analyzing the effectiveness of past practices, and analyzing possible safety enhancements due to technology advancements. To facilitate the compilation of crash figures for this research, a standard form will be developed to enable transit agencies across the country to report comparable at-grade crossing crash data both within and across cities. At a minimum, collision data will include alignment type; type of traffic control devices; train speed; motor vehicle speed (both posted and actual); roadway average daily traffic, roadway and tract geometry; and collision location, time, and date.

FTA is also sponsoring a research project, conducted by Oklahoma State University, to ensure that the results of research regarding effective practices are conveyed to the light rail transit systems in a manner that ensures their implementation. This study, which will conduct before-and-after studies with light rail agencies around the country, will result in a Best Practices Manual and training program, providing “one stop shopping” for those transit personnel planning, designing, and operating light rail systems. This study will also address new practices, new traffic engineering treatments, and new technologies which may have impacts on system safety. For example, Intelligent Transportation Systems (ITS) technology now offer the capabilities both to provide signal pre-emption for light rail transit vehicles and to integrate light rail transit automatic vehicle location systems with traffic signals to reduce queuing in the vicinity of the tracks ahead of light rail transit vehicle arrival.

**Coordination:** FTA also has forged a partnership with Operation Lifesaver (OLI) to address light rail safety public education and outreach and also to support coordination with driver education training program in States around the country. Since 2004, OLI has been testing program materials for public marketing, education, and communications efforts at seven (7) light rail transit agencies across the country. These materials, which are now available to all LRT systems, free of charge, have been designed to meet specific light rail transit system needs. More information on this program is available at: <http://www.oli.org/>.

FTA continues its partnership with the Federal Railroad Administration (FRA), Highway-Rail Grade Crossing and Trespasser Prevention Division, supporting research, action plans, and safety data analysis. Additional information is available at: <http://www.fra.dot.gov>.

**Standards and Recommended Practices:** FTA has also worked closely with the Federal Highway Administration (FHWA), ensuring that recommendations from the TCRP research and light rail transit system experience were addressed in the Manual on Uniform Traffic Control Devices (MUTCD), 2000 Millennial Edition. As a result, many of the traffic control devices and engineering treatments recommended in the TCRP 17 and 69 reports have subsequently been incorporated into *MUTCD Part 10 - Traffic Controls for Highway-Light Rail Transit Grade Crossings*, which is available at: <http://mutcd.fhwa.dot.gov/>. The MUTCD contains standards for traffic control devices that regulate, warn, and guide road users along the highways and byways in all 50 States. FHWA provides interpretations of MUTCD standards and also offers a Peer-to-Peer Program for Traffic Control Devices (P2P TCD), which provides public agencies with short-term assistance to address specific, technical issues on traffic control devices at no cost to the user. FTA will continue to work with FHWA to support subsequent updates to the MUTCD, and to ensure the use of MUTCD standards in new rail transit projects through on-site assistance and monitoring provided by the Project Management Oversight (PMO) Program.

The American Public Transportation Association (APTA) with FTA partnership and funding has developed a set of standards and recommended practices for rail grade crossing inspections, maintenance, public education and trespass prevention, and rail grade crossing safety assessment and warning systems, including the following:

- RT-S-RGC-001-02, Standard for Rail Transit System Highway-Rail Grade Crossing Inspection and Maintenance
- RT-RP-RGC-002-02, Recommended Practice for Rail Transit Grade Crossing Public Education and Rail Trespass Prevention
- RT-RP-RGC-003-03, Recommended Practice for Rail Grade Crossing Safety Assessment
- RT-S-RGC-004-03, Standard for Rail Transit Grade Crossing Warning Systems

More information on these materials is available at: <http://www.apta.com>.

In addition to this work, FTA is also sponsoring research and standards development initiatives to reduce the impact of those collisions that do occur. In recent years, FTA, in sponsoring TCRP Project G-4 and TCRP Project C-17, has supported the development of vehicle standards in partnership with APTA, the Institute of Electrical and Electronics Engineers (IEEE), Rail Transit Vehicle Interface Standards Committee, and the American Society of Mechanical Engineers (ASME), Standards Committee for Rail Transit Vehicles (RT). Addition information is available on these committees at:

- <http://www4.trb.org/trb/crp.nsf/All+Projects/TCRP+C-17>;
- <http://www.apta.com/about/committees/rstand/>; and
- <http://www.tsconsortium.org/>.

The ASME RT Committee is currently developing crashworthiness standards for both light rail and heavy rail vehicles. These standards, which should provide greater protection for passengers, lower the cost of transit railcars and replacement parts, reduce parts inventories, and simplify maintenance, are developed through a consensus-building process. More than 300 individuals representing transit agencies,

manufacturers, suppliers, government agencies, and others have been involved in the process, representing significant in-kind contributions by the transit industry. Draft versions of the crashworthiness standards for light and heavy rail vehicles should be available by the summer of 2006.

The IEEE, Rail Transit Vehicle Interface Standards Committee, under FTA sponsorship, developed eight standards that were formally approved and published by the IEEE:

- a standard for rail transit vehicle passenger information systems;
- a standard for the functioning of and interfaces among propulsion, friction brake, and train-borne master control on rail rapid transit vehicles;
- a standard for communications protocols aboard trains;
- a standard for rail transit vehicle event recorders;
- a standard for communications-based train control performance and functional requirements;
- a standard for auxiliary power system interfaces;
- environmental standards for rail transit vehicles; and
- a standard for verification of vital functions in processor-based systems used in rail transit control.

A number of other draft standards are in various levels of development by the IEEE, Rail Transit Vehicle Interface Standards Committee Working Groups. FTA's PMO program works with rail transit projects undertaking vehicle acquisitions or train control upgrades to address the consideration of these standards in their projects.

Finally, through the State Safety Oversight Program, FTA has established an *Accident Notification and Investigation Working Group* to develop a recommended practice for the notification and investigation of rail transit accidents. Through this recommended practice, FTA will coordinate with State Oversight Agencies and rail transit agencies to improve the quality of data reported to FTA in the NTD and through the State Safety Oversight Program, while recognizing that different types of accidents require the expenditure of different levels of resources from the rail transit agencies.

### **Rules/Procedures Compliance**

In FTA's recent revision of 49 CFR Part 659 (State Safety Oversight Rule), FTA required that each rail transit agency address compliance with operating and maintenance rules and procedures in its System Safety Program Plan (SSPP) and supporting safety program.

49 CFR Part 659.19 (m) requires in the SSPP "a description of the process used by the rail transit agency to develop, maintain, and ensure compliance with rules and procedures having a safety impact, including:

- (1) Identification of operating and maintenance rules and procedures subject to review;
- (2) Techniques used to assess the implementation of operating and maintenance rules and procedures by employees, such as performance testing;

- (3) Techniques used to assess the effectiveness of supervision relating to the implementation of operating and maintenance rules; and
- (4) Process for documenting results and incorporating them into the hazard management program.”

This process must be reviewed and approved by the State Oversight Agency, and audited on-site at the rail transit agency no less than once every three years through the rail transit agency’s internal safety audit process and through the State Oversight Agency’s three-year safety review process.

To support implementation of this requirement, FTA has provided technical assistance to both rail transit agencies and State Oversight Agencies during annual meetings and workshops, and through training programs offered by the Transportation Safety Institute (TSI). In 2007, FTA will establish a “Rules Compliance Working Group” to develop a recommended practice for implementation by the rail transit industry. FTA will also provide training to State Oversight Agency Program Managers during annual invitational workshops.

## **Fatigue Management**

In 1995, the National Transportation Safety Board (NTSB) identified fatigue as a primary cause of a New York City Transit fatal accident on the Williamsburg Bridge. NTSB also found fatigue-related causes for two light rail accidents at Baltimore-Washington International Airport. As a result, the NTSB recommended, and Congress directed, FTA to conduct a continuing program of technical assistance and training in fatigue awareness for transit operators. Major activities performed by FTA to date include:

- Transit Cooperative Research Program (TCRP) Report 81: Toolbox for Transit Operator Fatigue: This report, which was published in 2002, offers a variety of resources, methods and techniques to deal with operator fatigue. A primary goal of the toolbox is to provide a structured process for implementing a fatigue management program (FMP) that incorporates appropriate tools. Some specific tools are geared to the individual operator while others are for use by supervisors and managers involved in aspects of daily service planning and delivery. This report is available at: [gulliver.trb.org/publications/tcrp/tcrp\\_rpt\\_81.pdf](http://gulliver.trb.org/publications/tcrp/tcrp_rpt_81.pdf).
- National Transit Institute (NTI) Workshops: In 2002 and 2003, NTI conducted a series of nine (9) regional workshops on fatigue awareness for transit operators. The highlight of the workshops was the National Rollout of TCRP Report 81: Toolbox for Transit Operator Fatigue. These workshops also included discussion regarding the TCRP report’s “how to” component on the design, implementation, and evaluation of fatigue-mitigation plans. The fatigue-mitigation plans may be used by senior managers, operations managers, safety officials, medical personnel, risk managers, human resource personnel, policymakers, and legal advisers. Model materials and discussions of challenges and opportunities were also provided.

- NTI Training Course -- Toolbox for Transit Operator Fatigue: Putting the Report Into Action: NTI currently offers a training course on fatigue management which builds on the lessons learned from the Workshops. The next scheduled offering is in Anaheim, California in May 2006.
- Transportation Safety Institute (TSI) -- Fatigue Awareness Training Program: TSI developed and offers a training program for the transit industry that consists of three (3) fatigue seminars which are audience-specific and an instructor's course. The three seminars (Fatigue Awareness for Employees Seminar, Fatigue Awareness for Supervisors Seminar, and Fatigue Awareness for Managers Seminar) and the instructor's course are conducted over two consecutive days. These seminars highlight current research data on fatigue and sleep deprivation, and their relation to human performance factors in the transit workplace. The seminars focus on the symbiotic roles that the employees, their families, employers, and the environment play in contributing to fatigue. The physiological and psychological aspects of fatigue are also discussed. The last offering of these seminars was in Tampa, Florida in January 2006.
- U.S. Department of Transportation Fatigue Resource Directory: This directory was originally compiled in conjunction with the *NASA/NTSB Symposium on Managing Fatigue in Transportation: Promoting Safety and Productivity* and is now maintained by the Department of Transportation. The purpose of this Fatigue Resource Directory (FReDi) is to provide transportation-industry members with current, accessible information on resources available to address fatigue in transportation. The directory is available at: <http://human-factors.arc.nasa.gov/zteam/fredi/home-page.html#toc>.

FTA is now working with rail transit agencies and State Oversight Agencies to address a new recommendation issued by NTSB as a result of a collision between two WMATA trains at the Woodley Park-Zoo/Adams Morgan Station on November 3, 2004. This recommendation, which was issued on March 23, 2006, requires FTA to: "Require transit agencies, through the system safety program and hazard management process if necessary, to ensure that the time off between daily tours of duty including regular and overtime assignments, allows train operators to obtain at least 8 hours of uninterrupted sleep."

### **Passenger Safety in and near Rail Transit Stations**

As part of a new security initiative, FTA is expanding its TransitWatch Program to include additional activities to support the safety and security of transit stations. Information on the TransitWatch Program is available at: <http://transit-safety.volpe.dot.gov/security/TransitWatch/>. TransitWatch is a safety and security awareness program designed to encourage the active participation of transit passengers and employees in maintaining a safe transit environment.

During this initiative, FTA will evaluate how program materials and recommended practices can be modified to better identify and manage not only security issues, but also risky behavior by passengers on escalators and elevators, on stairwells, boarding and deboarding trains, leaning into trains, and safely navigating rail car doors. Additional

activities will focus on developing versions of TransitWatch materials in other languages and to support passengers with disabilities. Other FTA initiatives, discussed under debris management, will focus on housekeeping and trash cans, to ensure the cleanliness of transit stations and to remove tripping hazards.

Also, State Oversight Agencies, through the hazard management process required in FTA's revised 49 CFR Part 659.31, will be working with rail transit agencies to monitor trends in safety incidents and to identify hazardous conditions. In its revised rule, FTA specifically discusses the application of this process for managing slips, trips and falls and other sources of single-person injuries.

FTA's hazard management process specifies that the oversight agency "must require the rail transit agency to develop and document in its system safety program plan a process to identify and resolve hazards during its operation, including any hazards resulting from subsequent system extensions or modifications, operational changes, or other changes within the rail transit environment."

As specified in 49 CFR Part 659.31 (b), at a minimum, this process must:

- Define the rail transit agency's approach to hazard management and the implementation of an integrated system-wide hazard resolution process;
- Specify the sources of, and the mechanisms to support, the on-going identification of hazards;
- Define the process by which identified hazards will be evaluated and prioritized for elimination or control;
- Identify the mechanism used to track through resolution the identified hazard(s);
- Define minimum thresholds for the notification and reporting of hazard(s) to oversight agencies; and
- Specify the process by which the rail transit agency will provide on-going reporting of hazard resolution activities to the oversight agency.

## **Transit Worker Safety**

As a term of compliance with FTA grant programs, FTA requires construction safety programs and plans for all major capital projects. FTA's PMO contractors conduct on-site assessments to review the rail transit project's implementation of these requirements. New guidance being developed to address SAFETEA-LU requirements for Safety and Security Management Plans (SSMPs) as part of the Project Management Plan (PMP) provides additional recommendations for these programs. These guidelines will focus on ensuring the safety of contractors and transit employees working on construction projects and on ensuring that construction projects which impact existing rail transit operations have adequate safety protections in place.

In addition, in FTA's revised rule, 49 CFR Part 659.19 (r), FTA requires, as part of the SSPP, a "description of the safety program for employees and contractors that incorporates the applicable local, state, and federal requirements, including: Safety requirements that employees and contractors must follow when working on, or in close proximity to, rail transit agency property; and processes for ensuring the employees and contractors know and follow the requirements."

This program must be reviewed and approved by the State Oversight Agency, and audited on-site at the rail transit agency no less than once every three years through the rail transit agency's internal safety audit process and through the State Oversight Agency's three-year safety review process.

FTA will also continue to address transit worker safety issues during annual meetings and workshops with rail transit agency and State Oversight Agency personnel and through project construction and management training provided by the National Transit Institute (NTI).

### **Debris Management**

Through a new security initiative, FTA is developing standards for the use and design of trashcans in the rail transit environment. Removal and/or changing locations of trash cans (for security reasons) can have a significant impact on the amount of debris in transit stations and track beds. Increasing debris, particularly newspapers, paper bags, and food wrappers, contributes significantly to minor track and stations fires.

The new FTA standards are anticipated to balance safety and security needs regarding debris management, to reduce the likelihood of arson fires in trash cans, and to establish standards for blast resistant trash containers. In addition, it is anticipated that general recommendations for housekeeping will also be developed as part of this initiative.

### **Emergency Response to Accidents that Occur**

Review of the NTD S&S-40 Forms indicates that occasionally rail transit agencies experience challenges in responding effectively to accidents that do occur. FTA is committed to improving the emergency preparedness and response capabilities of rail transit agencies. Through NTI and TSI, FTA will continue to provide a range of different training courses, including a newly developed course on integrating requirements for the National Incident Management System into rail transit emergency response programs.

FTA sponsors a number research and guidelines projects through the Transit Cooperative Research Program devoted to emergency preparedness and response, including the recently released TCRP Report 86, Volume 7, *Public Transportation Emergency Mobilization and Emergency Operations Guide* and TCRP Report 86/NCHRP Report 525, Volume 8, *Continuity of Operations Planning Guidelines for Transportation Agencies*, and the soon-to-be-published TCRP Report 86/NCHRP Report 525, Volume 9, *Guidelines for Transportation Emergency Training Drills And Exercises*.

In the coming year, FTA will also reinstitute its well-received FTA drill grant program, updated to incorporate program guidance developed by the Department of Homeland Security through the Homeland Security Exercise and Evaluation Program (HSEEP). This program will provide funding and guidance to rail transit agencies in conducting annual emergency exercises and drills. This activity will be coordinated with the Department of Homeland Security, Office of Grants and Training.

## NTD Training and Enhancements

FTA's Office of Safety and Security will coordinate with FTA's Office of Budget and Policy to re-institute the training program for filing Safety and Security reports to the NTD. New materials will be developed to reduce errors and improve the accuracy of reports made by rail transit agencies. Data validation and verification initiatives performed by FTA will also be improved.

FTA's revision of 49 CFR Part 659 increased the consistency between State Safety Oversight reporting thresholds and Major Safety and Security Incident Reporting Thresholds used on Form S&S-40. FTA plans to bring the State Oversight Agencies into the NTD monitoring process by providing them with NTD logons, passwords, and training.

FTA's revised rule, 49 CFR Part 659.19 (i) requires rail transit agencies, as part of their SSPP, to include a "description of the process used to collect, maintain, analyze, and distribute safety data, to ensure that the safety function within the rail transit organization receives the necessary information to support implementation of the system safety program."

This process for safety data acquisition and analysis must be reviewed and approved by the State Oversight Agency, and audited on-site at the rail transit agency no less than once every three years through the rail transit agency's internal safety audit process and through the State Oversight Agency's three-year safety review process.

Finally, as described in Chapter 6 of this Safety Action Plan, FTA is undertaking a new program of monitoring the performance of the rail transit agencies and State Oversight Agencies to meet specific goals established by FTA. This monitoring program will rely heavily on NTD data submitted by rail transit agencies and annual reports received from State Oversight Agencies.

## FTA Report on Top Ten Safety Initiatives

**Appendix B** contains a report that will be maintained and periodically published by FTA to document the status of its activities to address each of these safety initiatives.

## Chapter 6: Monitoring Implementation of the Safety Action Plan

To support the initiatives described in Chapter 5, FTA is initiating a program of on-going monitoring for rail transit agencies and State Oversight Agencies. This program will enable FTA to determine how well the rail transit industry and State Oversight Agencies are doing in addressing the priorities established by FTA in this Safety Action Plan.

### Performance Measures – Rail Transit Industry

**Exhibit 35** provides performance measures to be tracked by FTA at annual intervals for the rail transit industry. These measures are based average industry rates from the most recent three-year period for which data is available (2002 to 2004 or 2003 to 2005), with target goals established to reflect a 10 percent reduction in these rates by the end of 2008.

**Exhibit 35: Rail Transit Industry Performance Measures and Target Goals for Improvement**

Performance Measures	3-Year Industry Average Rate		Target Goals for Improvement by 2008	
	Heavy Rail	Light Rail	Heavy Rail	Light Rail
Total Safety Incidents per 10 Million Passenger Trips <sup>1</sup>	23.27	29.86	20.94	26.87
Total Safety Incidents per 1 Million Vehicle Miles <sup>1</sup>	9.96	16.15	8.96	14.54
Major Safety Incidents per 10 Million Passenger Trips <sup>2</sup>	.63	8.58	0.57	7.72
Major Safety Incidents per 10 Million Vehicle Miles <sup>2</sup>	2.74	45.44	2.47	40.90
Total Fatalities per 100 Million Passenger Trips (including suicides and trespasser-related deaths) <sup>1</sup>	2.79	5.51	2.51	4.96
Total Injuries per 10 Million Passenger Trips <sup>1</sup>	16.9	17.1	15.2	15.4
Total Collisions per 100 Million Passenger Trips <sup>1</sup>	5.33	149.08	4.80	134.17
Major Collisions per 100 Million Passenger Trips <sup>2</sup>	1.48	69.44	1.33	62.50
Major Rail Grade Crossing Collisions per 10 Million Passenger Trips <sup>2</sup>	0.01	46.30	0.01	41.67
Major Pedestrian and Trespasser Collisions per 10 Million Vehicle Miles <sup>2</sup>	.56	4.48	0.50	4.03
Fatalities from Major Collisions per 100 Million Passenger Miles <sup>2</sup>	.83	3.8	0.75	3.42
Injuries from Major Collisions per 100 Million Passenger Trips <sup>2</sup>	.77	28.93	0.69	26.04
Total Derailments per 100 Million Passenger Miles <sup>1</sup>	3.92	51.76	3.53	46.58
Total Personal Injury Events per 10 Million Passenger Trips <sup>1</sup>	16.43	12.85	14.78	11.57
Total Fires per 10 Million Vehicle Miles <sup>1</sup>	25.81	4.41	23.23	3.97
Major Fires per 10 Million Vehicle Miles <sup>2</sup>	4.45	.56	4.01	0.50
Average Number of Injuries per Incident	.72	.61	0.65	0.55
<sup>1</sup> As reported on both NTD S&S-40 Form "Major Safety and Security Incidents" and NTD S&S-50 Form "Non-Major Summary Report"				
<sup>1</sup> As reported only on the NTD S&S-40 Form "Major Safety and Security Incidents"				

**Performance Measures – State Oversight Agencies**

**Exhibit 36** provides performance measures to be tracked by FTA at annual intervals for the State Safety Oversight Program. These measures are based on required activities identified in FTA’s safety initiatives and will be assessed through 2009.

**Exhibit 36: State Safety Oversight Program Performance Measures and Target Goals for Improvement**

Performance Measure	Target Goal for Improvement by 2009
Dedicated Personnel	<ul style="list-style-type: none"> <li>• Each State with a single rail transit agency in its jurisdiction that provides more than 15 million unlinked annual passenger trips has a minimum of 1 full-time equivalent devoted to the SSO Program.</li> <li>• Each State with a single rail transit agency in its jurisdiction that provides less than 15 million unlinked annual passenger trips has a minimum of .5 full-time equivalent devoted to the SSO Program.</li> <li>• Each State with more than one rail transit agency its jurisdiction has a minimum of 2 full-time equivalents devoted to the SSO Program.</li> </ul>
Training and Certification	<ul style="list-style-type: none"> <li>• Each State Safety Oversight Program Manager has attended all three invitational workshops to be provided by FTA between 2007 and 2009, and has satisfactorily completed the oversight management training sessions, including completion of written tests.</li> <li>• 70 percent of State Safety Oversight Program Managers have obtained a certificate from the Transportation Safety Institute (TSI), Transit Safety and Security Division, attesting to their completion of five (5) specified rail transit safety and security courses within a consecutive three (3) year time-frame. These courses include:               <ul style="list-style-type: none"> <li>○ Transit System Safety FT00464/Transit Rail System Safety FT00439</li> <li>○ Transit Industrial Safety Management FT00457</li> <li>○ Transit System Security FT00432</li> <li>○ Effectively Managing Transit Emergencies FT00456</li> <li>○ Transit Rail Incident Investigation FT00430</li> </ul> </li> <li>• 50 percent of State Safety Oversight Program Managers have also completed National Transit Institute (NTI) training courses devoted to System Security Awareness for Transit Employees, Terrorist Activity Recognition and Reaction, and Toolbox for Transit Operator Fatigue: Putting the Report into Action.</li> <li>• 40 percent of State Safety Oversight Program Managers have obtained a certificate from the World Safety Organization (WSO), at a minimum classifying them as a Certified Safety Specialist.</li> </ul>
Hazard Management Process	<ul style="list-style-type: none"> <li>• Each State Safety Oversight Agency, as demonstrated through FTA’s SSO Audit Program, oversees a hazard management process that effectively addresses passenger slips, trips, and falls and other single-person injury events at the rail transit agencies within their jurisdiction.</li> </ul>
NTD Training and Participation	<ul style="list-style-type: none"> <li>• Each State Safety Oversight Program Manager has received a NTD logon and password; has received training in how to review NTD reports; and has integrated the use of NTD into their oversight of accident investigations.</li> </ul>
Three-year Safety Reviews	<ul style="list-style-type: none"> <li>• Each State Oversight Agency has performed a three-year review for each of the rail transit agencies in its jurisdiction that meets all FTA requirements; including the review of programs for compliance with operating rules and procedures, transit worker safety, and safety data and acquisition, and has received, reviewed and approved corrective action plans from the rail transit agency to address any findings.</li> </ul>

To provide additional clarification on FTA's first performance measure for the SSO Program, **Exhibit 37** depicts the level of dedicated personnel reported in the SSO Program for 2005 by State Oversight Agency, including the number of rail transit agencies in each State's jurisdiction and the total number of annual unlinked passenger trips reported for 2005.

**Exhibit 37: State Oversight Program Dedicated Personnel**

State Oversight Agency (SOA)	SOA Full Time Equivalent (FTE)	Number of Rail Transit Agencies in SOA Jurisdiction	Unlinked Passenger Trips Provided by Rail Transit Agency(ies) in SOA Jurisdiction	SOA FTE per 10 Million Passenger Trips
Georgia Department of Transportation	0.10	1	70,984,053	0.01
New York Public Transportation Safety Board	4.00	2	1,808,909,807	0.02
Regional Transportation Authority	1.00	1	178,716,456	0.06
Tri-State Oversight Committee	1.85	1	259,430,055	0.07
Massachusetts Department of Telecommunications & Energy	2.00	1	215,787,440	0.09
Louisiana Department of Transportation & Development	0.10	1	8,919,686	0.11
Pennsylvania Department of Transportation	1.50	3	121,410,230	0.12
Texas Department of Transportation	0.40	3	27,768,401	0.14
St. Clair County Transit District	0.25	1	15,648,233	0.16
Oregon Department of Transportation	1.20	1	34,755,147	0.35
Florida Department of Transportation	1.00	3	27,780,935	0.36
California Public Utilities Commission	10.00	6	275,431,248	0.36
Utah Department of Transportation	0.80	1	13,101,791	0.61
Maryland Department of Transportation	1.30	1	18,059,117	0.72
Missouri Department of Transportation	1.30	1	15,648,233	0.83
Minnesota Department of Public Safety	0.75	1	7,901,668	0.95
New Jersey Department of Transportation	2.25	4	23,064,473	0.98
Colorado Public Utilities Commission	1.20	1	11,142,220	1.08
Ohio Department of Transportation	1.00	1	8,236,840	1.21
Tennessee Department of Transportation	0.25	2	1,451,228	1.72
Washington State Department of Transportation	0.50	2	2,765,462	1.81
Michigan Department of Transportation	0.50	1	1,340,646	3.73
Puerto Rico State Emergency and Disaster Management Agency	3.50	1	2,182,668	16.04
North Carolina Department of Transportation	0.50	1	292,339	17.06
Arkansas State Highway and Transportation Department	0.50	1	159,458	31.40
Wisconsin Department of Transportation	0.30	1	58,913	50.92

## Appendix A: Data Sources for FTA's Safety Action Plan

### Rail Transit Safety and Security NTD Reporting

Since 2002, the 43 rail transit agencies in the study have filed five (5) distinct forms with the NTD to support FTA efforts to collect and analyze safety and security data:

- **Mode Service Operated form (MR-10)** – filed annually to collect the number of vehicles operated in maximum service (VOMS) by mode and type of service (TOS) by the transit agency at the beginning of the calendar year.
- **Ridership Activity form (MR-20)** – filed annually to obtain monthly information regarding transit service provided by the transit agency. Information is provided on unlinked trips, passenger car revenue hours, passenger car revenue miles, and passenger cars in operation.
- **Security Configuration form (S&S-30)** – The Security Configuration form (S&S-30) is used to collect information on the number and type of police and/or security personnel used to provide security at a rail transit agency. This form is completed annually at the beginning of the calendar year.
- **Major Incident Reporting form (S&S-40)** – The Major Incident Reporting form (S&S-40) is designed to capture detailed information on the most severe safety and security incidents occurring in the transit environment. One form must be completed for each major incident that occurs at an agency. This form must be filed within 30 days of the incident. Rail transit agencies must file the S&S 40 form for any incident that meets one or more of the following conditions:
  - A fatality other than a suicide;
  - Injuries requiring immediate medical attention away from the scene for two or more persons (at least one injury requiring immediate medical attention away from the scene for a collision at grade crossing);
  - Property damage equal to or exceeding \$25,000 (equal or exceed \$7,500 for a collision at grade crossing);
  - An evacuation of a revenue vehicle due to life safety reasons;
  - A collision at grade crossing resulting in at least one injury requiring immediate medical attention away from the scene or property damage equal to or exceeding \$7,500;
  - A mainline derailment;
  - A collision with person(s) on a rail right-of-way (ROW) resulting in injuries that require immediate medical attention away from the scene for at least one person; or
  - A collision between a rail transit vehicle and another rail transit vehicle or a transit non-revenue vehicle resulting in injuries that require immediate medical attention away from the scene for at least one person.

- **The Non-Major Summary Report form (S&S-50):** The Non-Major Summary Report form (S&S-50) is designed to collect information on less severe safety and security-related incidents than are gathered on the S&S-40. One form is completed per month. Incidents included on the S&S 50 form include any incident resulting in:
  - Injuries requiring immediate medical attention away from the scene for one person;
  - Property damage equal to or exceeding \$7,500 (less than \$25,000);
  - All non-arson fires not qualifying as major incidents; or
  - Suicide.

Safety and security data filed with NTD are not subject to the independent auditor review; however, a Chief Executive Officer (CEO) certification is required by February 28, 2005 certifying the calendar year safety and security data.

Prior to 2002, the rail transit agencies included in the study made annual submissions of Form 405 to the National Transit Database. Information collected in this form is similar to what is now collected in the Non-Major Summary Report (S&S-50). However, there are differences in thresholds. For example:

- Events were reported that caused property damage equal to or in excess of \$1,000.
- Events were reported if an injury was reported to the rail transit agency, whether that injury required immediate medical attention away from the scene.

### State Safety Oversight Annual Reporting

Since 1999, State Oversight Agencies for the 43 rail transit agencies included in the study have filed Annual Reporting Templates to FTA which provide information on the occurrences of all accidents meeting the definition specified in FTA's original SSO Rule, including any event resulting in:

- a fatality;
- a single-person injury requiring immediate medical treatment away from the scene; or
- property damage equal to or exceeding \$100,000.

**Appendix B: Safety Initiatives Status Report**

Safety Initiative	Action Item	Status
Collision Reduction	• TCRP Project D-10 Audible Signals for Pedestrian Safety in Light Rail Transit Environments	Final Report Released
	• TCRP Project A-30: Improving Safety Where Light Rail, Pedestrians, and Vehicles Intersect.	Contract awarded in July 2006; work in progress
	• Okalahoma State University Best Practices Manual and Training Program	Work in progress
	• Operation Lifesaver (OLI) Light Rail Public Outreach and Driver Education Materials	On-going FTA committee participation
	• FRA, (FRA), Highway-Rail Grade Crossing and Trespasser Prevention Division, research, action plans, and safety data analysis	On-going FTA participation
	• Update to MUTCD, 2003, Part 10 - Traffic Controls for Highway-Light Rail Transit Grade Crossings	On-going FTA participation
	• APTA rail grade crossing standards and recommended practices	On-going FTA participation
	• Institute of Electrical and Electronics Engineers (IEEE), Rail Transit Vehicle Interface Standards Committee	On-going FTA participation
	• American Society of Mechanical Engineers (ASME), Standards Committee for Rail Transit Vehicles (RT).	Crashworthiness standard due in Fall 2006
	• FTA <i>Accident Notification and Investigation Working Group</i>	On-going
Rules/Procedures Compliance	• Training session on rules/procedures compliance assessment methods and techniques	2007
	• Working Group established with industry to develop recommended practice	2007
	• Rules/Procedures Compliance Assessment Guidelines developed	December 2007
	• TSI/NTI training	2007
Fatigue Management	• TSI/NTI training	On-going
	• Response to NTSB recommendation	Fall 2006
Passenger Safety in and near Rail Transit Stations	• Training session on addressing passenger safety in and near rail transit stations as part of the hazard management process	2007
	• TransitWatch initiative revised to address risky behavior	2007
	• TransitWatch initiative to address housekeeping	2007
Transit Worker Safety	• Guidelines on addressing passenger safety through the hazard management process	2008
	• Training session on addressing transit worker safety in the SSO Program	2007
	• SSMP Guidelines, including revised Construction Safety and Security technical assistance	2006
Debris Management	• Revised PMO Guidelines on Construction Safety and Security oversight	2007
	• FTA security initiative on the use and design of trashcans in the rail transit environment	2007
Emergency Response	• TSI/NTI training	On-going
	• Reinstitution of the well-received FTA drill grant program	2007
NTD Training and Enhancements	• Training session on NTD safety and security reporting for State Oversight Agency and rail transit agency safety personnel	2007
	• NTD logons and passwords for State Oversight Agency personnel	2007
	• Integration of safety data acquisition and analysis into State Oversight Agency three-year safety review process	On-going
	• FTA reporting on rail transit agency and State Oversight Agency performance measures and target goals	2007
	• FTA "top ten" safety initiatives website	2007