U.S. FIREFIGHTER INJURIES - 2008

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October 2009

National Fire Protection Association
Fire Analysis and Research Division

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Abstract

NFPA estimates that 79,700 firefighter injuries occurred in the line of duty in 2008. Nearly half (45.9%) of the all firefighter injuries occurred during fireground operations. An estimated 14,250 occurred during other on duty activities, while 15,745 occurred at nonfire emergency incidents. The leading type of injury received during fireground operations was strain, sprain or muscular pain (48.8%), followed by wound, cut, bleeding, bruise (15.6%). Regionally, the Northeast had the highest fireground injury rate, more than twice the rate for the rest of the country.

Keywords: fire statistics, firefighter injuries, exposures, injury rates, fireground, non-fire emergencies, type of duty, cause of injury, collisions, community size

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Overview of 2008 Firefighter Injuries

- 79,700 firefighter injuries occurred in the line of duty in 2008, a slight decrease of 0.5% and virtually no change from the year before.

- 36,595 or 45.9% of all firefighter injuries occurred during fireground operations. An estimated 15,745 occurred at nonfire emergency incidents, while 14,250 occurred during other on duty activities.

- Regionally, the Northeast had the highest fireground injury rate with 5.5 injuries occurring per 100 fires; this was more than twice the rate for the rest of the country.

- The major types of injuries received during fireground operations were: strain, sprain, muscular pain (48.8%); wound, cut, bleeding, bruise (15.6%); smoke or gas inhalation (6.2%). Strains, sprains, and muscular pain accounted for 56.5% of all nonfireground injuries.

Background

Firefighters work in varied and complex environments that increase their risk of on-the-job death and injury. A better understanding of how these fatalities, nonfatal injuries, and illnesses occur can help identify corrective actions which, could help minimize the inherent risks.

Each year, the NFPA studies firefighter deaths and injuries to provide national statistics on their frequency, extent, and characteristics. Earlier this year, the NFPA reported 103 firefighters died on duty (See, "2008 Firefighter Fatalities," *NFPA Journal* July/August).

This report addresses 2008 firefighter injuries in the United States. The results are based on data collected during the NFPA Survey of Fire Departments for U.S. Fire Experience (2008). An earlier report measured the national fire experience in terms of the number of fires that fire departments attended and the resulting civilian deaths, civilian injuries, and property losses that occurred[1].

This year's report includes among its results:

- An estimate of the total number of 2008 firefighter injuries.
- Estimates of the number of injuries by type of duty.
- An estimate of the number of exposures to infectious diseases.
- Trends in firefighter injuries and rates.
- Fireground injuries by cause.
- Fire department vehicle accidents and resulting firefighter injuries.
- The average number of fires and fireground injuries per department by population of community protected.
- Descriptions of selected incidents that illustrate firefighter safety problems.

Overall Results

Based on survey data reported by fire departments, the NFPA estimates that 79,700 firefighter injuries occurred in the line of duty in 2008. This is a slight decrease of 0.5% and virtually no change from a year ago. In recent years, the number of firefighter injuries have been considerably lower than they were in the 1980s and 1990s (Figure 1), but this is due in part to additional questions on exposures which allows us to place them in their own categories. Previously some of these exposures may have been included in total injuries under other categories.

The NFPA estimates that there were 10,380 exposures to infectious diseases (e.g., hepatitis, meningitis, HIV, others) in 2008. This amounts to 0.7 exposures per 1,000 emergency medical runs by fire departments in 2008.

The NFPA estimates that there were 20,650 exposures to hazardous conditions (e.g., asbestos, radioactive materials, chemicals, fumes, other) in 2008. This amounts to 18.9 exposures per 1,000 hazardous condition runs in 2008.

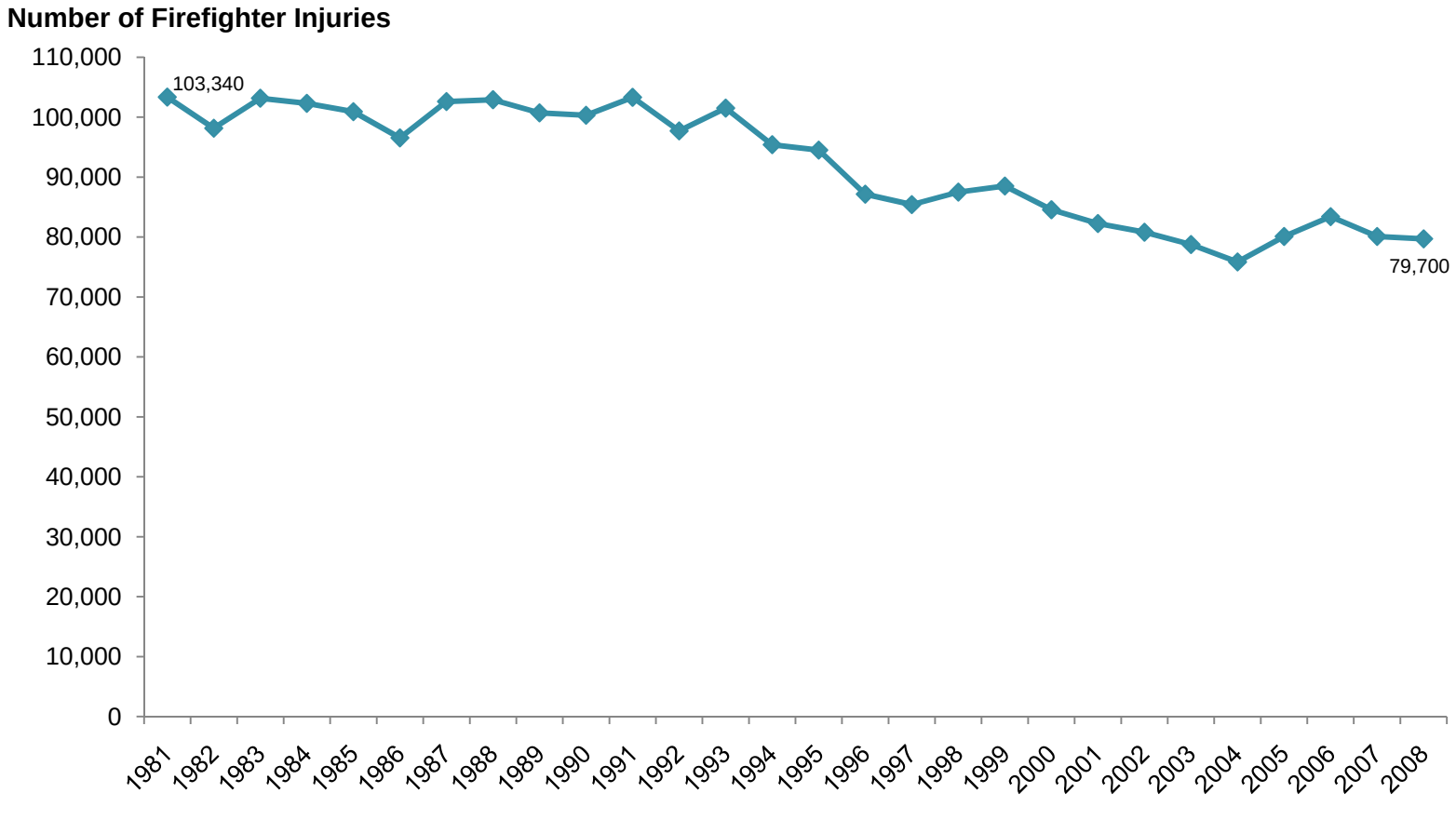
An estimated 15,250 injuries or 19.1% of all firefighter injuries resulted in lost time in 2008.

Injuries by Type of Duty

Estimates of firefighter injuries by type of duty are displayed in Figure 2. As in past reports, type of duty is divided into five categories:

- Responding to or returning from an incident (includes fire and nonfire emergencies).
- Fireground (includes structure fires, vehicle fires, brush fires, etc.), and refers to all activities from the moment of arrival at the scene to departure time (e.g., setup, extinguishment, overhaul).
- Nonfire emergency (includes rescue calls, hazardous calls, such as spills, and natural disaster calls).
- Training
- Other on-duty activities (e.g., inspection or maintenance duties).

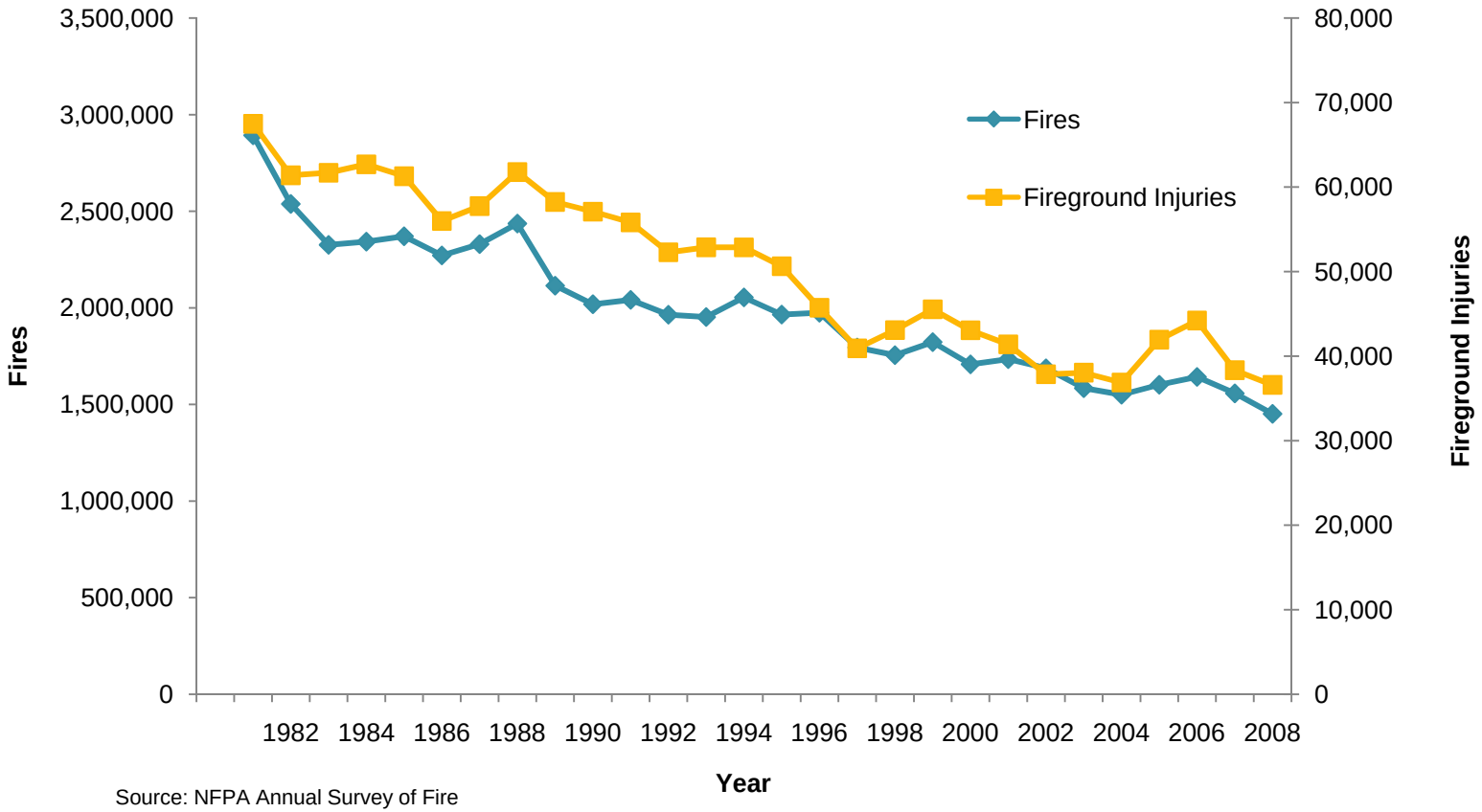
Figure 1
Total Firefighter Injuries by Year (1981-2008)



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (1981-2008)

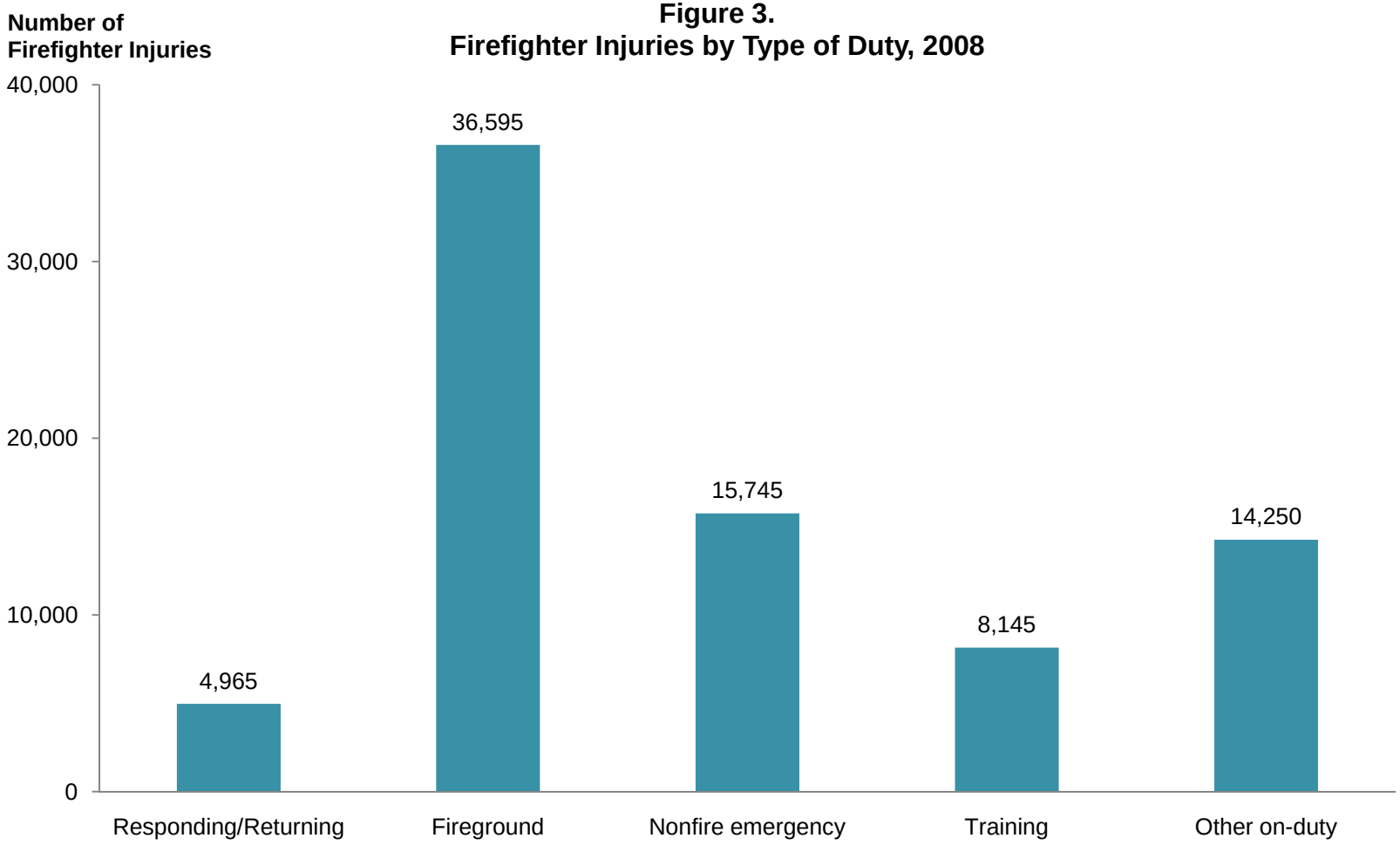
From 1994 on, number of exposures was collected separately

Figure 2
The Decrease in Fireground Injuries is Similar to the Decrease in Fires



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (1981-2008)

Figure 3.
Firefighter Injuries by Type of Duty, 2008



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (2008)

Results by type of duty indicate not surprisingly that the largest share of injuries occurs during fireground operations: 36,595 or 45.9% of all firefighter injuries in 2008 and, the lowest it's been for the 1981 to 2008 period. Table 1 displays firefighter injuries at the fireground and injury rates for the 1981-2008 period. Injuries at the fireground decreased from their high of 67,500 in 1981 to a low of 36,595 in 2008 for a decrease of 54.2%. The rate of injuries per 1,000 fires has not showed any consistent downward trend for the period. This is because the number of fire incidents also decreased a considerable 49.8% for the 1981 to 2008 period (See Figure 2).

In addition to injuries at the fireground, an estimated 15,745 or 19.8% occurred at nonfire emergencies, while 14,250 or 17.9% occurred during other on duty activities.

Nature of Fireground Injuries

Estimates of 2008 firefighter injuries by nature of injury and type of duty are displayed in Table 2. The nature of injury cause categories are based with modifications on NFPA 901, *Uniform Coding for Fire Protection*. Table 2 indicates that the four major types of injuries that occur during fireground operations are strain, sprain (48.8%); wound, cut, bleeding, bruise (15.6%); smoke or gas inhalation (6.2%); burns (6.2%); thermal stress (5.7%).

Results were fairly consistent during all non-fireground activities, with strains, sprains, and muscular pain accounting for 56.5% of all non-fireground injuries, and wound, cut, bleeding, bruise accounting for 16.5%.

Causes of Fireground Injuries

Because fireground injuries are of particular concern their causes were examined (See Figure 4). The definition of cause here refers to the initial circumstance leading to the injury. The cause categories included on the survey were also based on NFPA 901, *Uniform Coding for Fire Protection*. Fall, slip, jump (23.5%), and overexertion, strain (23.1%) were the leading causes of fireground injuries. Other major causes were contact with object (13.0%); and exposure to fire products (12.7%).

Table 1
Firefighter Injuries at the Fireground, and at Nonfire Emergencies, 1981-2008

	At the Fireground		At Nonfire Emergencies	
Year	**Injuries**	**Injuries per 1000 Fires**	**Injuries**	**Injuries per 1,000 Incidents**
1981	67,500	23.3	9,600	1.24
1982	61,400	24.2	9,385	1.17
1983	61,700	26.5	11,105	1.29
1984	62,700	26.8	10,600	1.21
1985	61,300	25.9	12,500	1.38
1986	55,900	24.7	12,545	1.30
1987	57,755	24.8	13,940	1.41
1988	61,790	25.4	12,325	1.13
1989	58,250	27.5	12,580	1.11
1990	57,100	28.3	14,200	1.28
1991	55,830	27.3	15,065	1.20
1992	52,290	26.6	18,140	1.43
1993	52,885	27.1	16,675	1.25
1994	52,875	25.7	11,810	0.84
1995	50,640	25.8	13,500	0.94
1996	45,725	23.1	12,630	0.81
1997	40,920	22.8	14,880	0.92
1998	43,080	24.5	13,960	0.82
1999	45,500	25.0	13,565	0.76
2000	43,065	25.2	13,660	0.73
2001	41,395	23.9	14,140	0.73
2002	37,860	22.4	15,095	0.77
2003	38,045	24.0	14,550	0.70
2004	36,880	22.1	13,150	0.62
2005	41,950	26.2	12,250	0.56
2006	44,210	26.9	13,090	0.57
2007	38,340	24.6	15,435	0.65
2008	36,595	25.2	15,745	0.66

Source: NFPA Survey of Fire Departments
for U.S. Fire Experience (1981-2008)

Table 2
Firefighter Injuries by Nature of Injury and Type of Duty, 2008

	Responding to or Returning from an Incident		Fireground		Nonfire Emergency		Training		Other on-duty		Total	
Nature of Injury	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Burns (Fire or Chemical)	100	2.0	2,270	6.2	105	0.7	320	3.9	195	1.4	2,990	3.8
Smoke or Gas Inhalation	95	1.9	2,265	6.2	195	1.2	95	1.2	85	0.6	2,735	3.4
Other Respiratory Distress	70	1.4	600	1.6	665	4.2	135	1.7	175	1.2	1,645	2.1
Burns and Smoke Inhalation	120	2.4	540	1.5	5	0.0	10	0.1	60	0.4	735	0.9
Wound, Cut, Bleeding Bruise	805	16.2	5,710	15.6	2,450	15.6	1,285	15.8	2,585	18.1	12,835	16.1
Dislocation, Fracture	120	2.4	975	2.7	195	1.2	215	2.6	375	2.6	1,880	2.4
Heart Attack or Stroke	25	0.5	245	0.7	55	0.4	110	1.4	335	2.4	770	1.0
Strain, Sprain Muscular Pain	3,050	61.4	17,855	48.8	9,125	58.0	4,710	57.8	7,460	52.4	42,200	53.0
Thermal Stress (frostbite, heat exhaustion)	100	2.0	2,075	5.7	125	0.8	315	3.9	275	1.9	2,890	3.6
Other	480	9.7	4,060	11.1	2,825	17.9	950	11.7	2,705	19.0	11,020	13.8
	4,965		36,595		15,745		8,145		14,250		79,700	

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2008
Note: If a firefighter sustained multiple injuries for the percent incident, only the nature of the single most serious injury was tabulated.

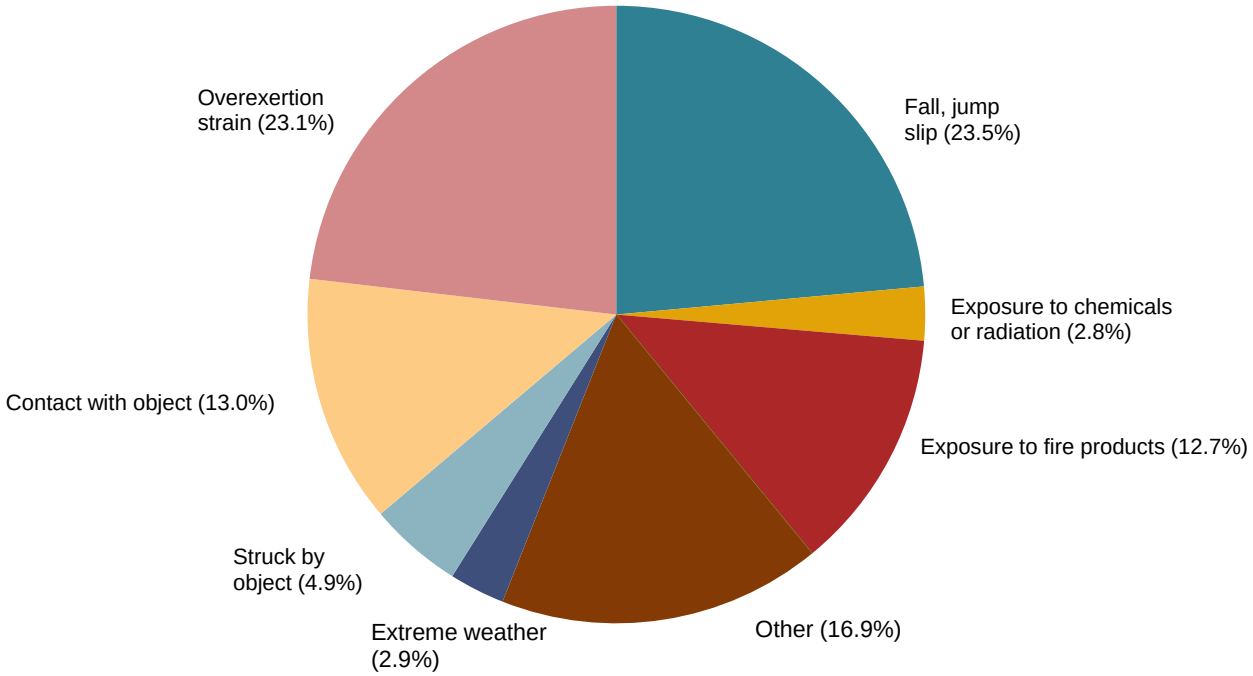
Fire Department Vehicle Collisions

The NFPA reported earlier that 29 firefighters died in motor vehicle collisions in 2008. (See "2008 Firefighter Fatalities" July/August *NFPA Journal*).

In 2008, there were an estimated 14,950 collisions involving fire department emergency vehicles, where departments were responding to or returning from incidents (See Table 3). To put this number in perspective however, fire departments responded to over 25.3 million incidents in 2008 so that the number of collisions represents about one tenth of 1 percent of total responses. However, these collisions resulted in 670 firefighter injuries or 0.9% of all firefighter injuries.

Also, 1,000 collisions involving firefighters' personal vehicles occurred in 2008 while departments were responding to or returning from incidents. These collisions resulted in an estimated 70 injuries.

Figure 4.
Fireground Injuries by Cause, 2008



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (2008)

Table 3

Fire Department Vehicle Collisions and Resulting Firefighter Injuries While Responding to or Returning From Incidents, 1990-2008

Year	Involving Fire Department Emergency Vehicles		Involving Firefighters' Personal Vehicles	
	Collisions	Firefighter Injuries	Collisions	Firefighter Injuries
1990	11,325	1,300	950	175
1991	12,125	1,075	1,375	125
1992	11,500	1,050	1,575	150
1993	12,250	900	1,675	200
1994	13,755	1,035	1,610	285
1995	14,670	950	1,690	190
1996	14,200	910	1,400	240
1997	14,950	1,350	1,300	180
1998	14,650	1,050	1,350	315
1999	15,450	875	1,080	90
2000	15,300	990	1,160	170
2001	14,900	960	1,325	140
2002	15,550	1,040	1,030	210
2003	15,900	850	980	85
2004	15,420	980	1,150	220
2005	15,885	1,120	1,080	125
2006	16,020	1,250	1,070	210
2007	14,650	915	665	120
2008	14,950	670	1,000	70

Source: NFPA Survey of Fire Departments for U.S. Fire Experience (1990-2008)

Average Fires and Fireground Injuries per Department by Population Protected

The average number of fires and fireground injuries per department by population of community protected in 2008 are displayed in Table 4. These tabulations show (1) that the number of fires a fire department responds to is directly related to the population protected, and (2) that the number of fireground injuries incurred by a department is directly related to its exposure to fire, i.e., and the number of fires attended by the department. The second point is clearly demonstrated when we examine the range of the statistic: from a high of 80.4 for departments that protect communities of 500,000 to 999,999 to a low of 0.2 for departments that protect communities of less than 2,500.

A useful way to look at firefighter injury experience and to obtain a reading on the relative risk that departments face is to examine the number of fireground injuries that occur for every 100 fires attended. This takes into account relative fire experience and allows more direct comparison between departments protecting communities of different sizes. The number of fireground injuries per 100 fires is displayed in column four of Table 4. The overall range of rates varied little from a high of 3.2 for departments that protect communities 250,000 to 499,999 to a low of 1.3 for departments that protect communities of 5,000 to 9,999 population. Thus, the wide range noted in average fireground injuries by population protected narrows when relative fire experience is taken into account. The overall injury rate for departments protecting communities of 50,000 population or more was 2.8 injuries per 100 fires or 65% higher than the injury rate for departments protecting communities of less than 50,000 population.

The risk of fireground injury per 100 firefighters by size of community protected was also calculated and is displayed in column five of Table 4. Larger departments generally had the highest rates with departments protecting communities of 250,000 to 499,999 having the highest rate with 7.9 injuries per 100 firefighters. As community size decreases, the rate drops quite steadily to a low of 0.9 for departments protecting less than 2,500 people. That is a more than a eight-to-one difference in risk of injury between communities of 250,000 to 499,999, and the smallest communities (less than 2,500).

An explanation for this difference is that although a department protecting a community with a population of 250,000 to 499,999 has, on average, more than 22 times as many firefighters than a department protecting a population of less than 2,500, the larger department attends more than 100 times as many fires, and as a result, it incurs considerably more fireground injuries.

Table 4

Average Number of Fires, Fireground Injuries and Injury Rates by Population of Community Protected, 2008

Population of Community Protected	Average Number of Fires	Average Number of Fireground Injuries	Number of Fire-ground Injuries Per 100 Fires	Number of Fire-ground Injuries Per 100 Firefighters
500,000 to 999,999	2,946.1	80.4	2.7	7.5
250,000 to 499,999	1,184.3	38.2	3.2	7.9
100,000 to 249,999	539.5	10.7	2.0	4.8
50,000 to 99,999	239.4	6.4	2.7	6.2
25,000 to 49,999	133.7	2.7	2.0	4.2
10,000 to 24,999	65.0	1.1	1.7	2.5
5,000 to 9,999	39.2	0.5	1.3	1.6
2,500 to 4,999	24.2	0.4	1.7	1.5
Under 2,500	11.5	0.2	1.7	0.9

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2008

Average Fires and Fireground Injuries by Population Protected and Region

Table 5 displays the average number of fires and fireground injuries per department by population of community protected and region of the country[3]. As in the nationwide results in Table 4, the results of each region of the country indicate that the number of fires a fire department responds to is directly related to the population protected, and the number of fireground injuries incurred by a department is directly related to the number of fires attended. The Northeast reported a higher number of fireground injuries per 100 fires for most community sizes where all departments reported sufficient data by region. The overall rate for the Northeast was 5.5 injuries per 100 fires more than twice the rate for the rest of the country.

Table 5

Average Number of Fires and Fireground Injuries per Department and Injuries per 100 Fires, by Population of Community Protected, and Region, 2008

Column 1: Average Reported Number of Fires
Column 2: Average Reported Number of Fireground Injuries
Column 3: Number of Fireground Injuries per 100 Fires

Population of Community Protected	Northeast			Midwest			South			West		
	Column 1	Column 2	Column 3	Column 1	Column 2	Column 3	Column 1	Column 2	Column 3	Column 1	Column 2	Column
500,000 to 999,999	*	*	*	*	*	*	3,143.3	41.8	1.3	2,562.2	47.2	1.8
250,000 to 499,999	*	*	*	1,537.3	84.0	5.8	1,152.1	36.3	3.2	1,037.7	17.0	1.6
100,000 to 249,999	540.3	30.2	5.5	541.2	18.4	3.4	670.5	7.3	1.1	383.2	8.2	2.1
50,000 to 99,999	291.2	11.6	4.0	188.9	4.9	2.5	315.5	8.0	2.5	186.3	4.2	2.3
25,999 to 49,999	145.3	5.6	3.9	108.9	2.5	2.3	165.1	2.2	1.3	131.8	1.6	1.2
10,000 to 24,999	60.8	1.5	2.5	54.9	1.1	2.0	86.1	0.8	0.9	59.7	0.6	1.0
5,000 to 9,999	32.5	0.5	1.5	31.9	0.5	1.6	51.2	0.4	0.8	48.7	0.8	1.6
2,500 to 4,999	19.1	0.4	2.1	18.4	0.4	2.2	36.1	0.6	1.7	34.9	0.1	0.3
Under 2,500	9.8	0.3	3.1	9.2	0.2	2.2	20.2	0.2	1.0	8.8	0.1	0.1
Overall Regional Rate	52.4	2.9	5.5	37.9	1.0	2.6	76.2	1.1	1.4	52.1	1.3	2.5

Source: NFPA Survey of Fire Departments
for U.S. Fire Experience, 2008
*Insufficient data

Note: The Midwest was formerly called the Northcentral.

Improving Firefighter Safety

As the statistics in this report and previous reports attest, fire fighting presents great risks of personal injury to firefighters. Moreover, because of the kind of work performed and the hazards of the incident scene environment, it is unlikely that all firefighter injuries can be eliminated. A risk management system and the application of existing technology, however, can offer options to reduce present injury levels and bring about corresponding reductions that are recommended by NFPA that could be taken at the local level. The reference to the appropriate *NFPA Standard* is shown with the example in parenthesis:

- Commitment on the part of top fire service management to reducing injuries *(NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, Section 4.3)*
- Establishment of a safety committee headed by a safety officer to recommend a safety policy and the means of implementing it
  (NFPA 1500, Section 4.5).
- Develop and implement an investigation procedure that includes all accidents, near misses, injuries, fatalities, occupational illnesses, and exposures involving members.
  (NFPA 1500, 4.4.4 and 4.4.5)
- Provision of appropriate protective equipment and a mandate to use it.
  (NFPA 1500, Section 7.1 through 7.8)
- Development and enforcement of a program on the use and maintenance of SCBA
  (NFPA 1500, Section 7.9 through 7.14
- Development and enforcement of policies on safe practices for drivers and passengers of fire apparatus
  (NFPA 1500, Section 6.2 and 6.3)
- Development of procedures to ensure response of sufficient personnel for both fire fighting and overhaul *duties*.
  (NFPA 1500, 4.1.2; NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments; and NFPA 1720, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments)
- Implementation of regular medical examinations and a physical fitness program
  (NFPA 1500, Section 10.1 through 10.3; NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments; and NFPA 1583, Standard on Health-Related Fitness Programs for Firefighters)

- Adoption and implementation of an incident management system.
  (NFPA 1500, Section 8.1; and NFPA 1561, Standard on Emergency Services Incident Management System
- Training and education for all members related to emergency operations
  (NFPA 1500, Chapter 5)
- Implementation of programs for the installation of private fire protection systems, so that fires are discovered at an earlier stage, exposing the firefighter to a less hostile environment
  (NFPA 1, Uniform Fire Code™; NFPA 101®, Life Safety Code®; NFPA 5000® , Building Construction and Safety Code®
- Increased efforts in the area of fire safety educaion programs, so that citizens are made aware of measures to prevent fires and of correct reactions to the fire situation
  (NFPA 1201, Standard for Providing Emergency Services to the Public, Chapter 6)

Efforts need to be made to recognize that firefighter injuries can be reduced. By addressing the priorities listed above Fire Service organizations can make significant strides towards reducing the number and impact of such injuries.

Definition of Terms

Fire: Any instance of uncontrolled burning. Excludes combustion explosions and fires out on arrival (whether authorized or not), overpressure rupture without combustion; mutual aid responses, smoke scares, and hazardous materials responses, e.g., flammable gas, liquid, or chemical spills without fire.

Incident: The movement of a piece of fire service apparatus or equipment in response to an alarm.

Injury: Physical damage suffered by a person that requires (or should require) treatment by a practitioner of medicine (physician, nurse, paramedic, EMT) within one year of the incident (regardless of whether treatment was actually received), or that results in at least one day of restricted activity immediately following the incident.

Description of NFPA Survey and Data Collection Method

The NFPA annually surveys a sample of departments in the United States to make national projections of the fire problem. The sample is stratified by the size of the community protected by the fire department. All U.S. fire departments that protect communities of 50,000 or more are included in the sample, because they constitute a small number of departments with a large share of the total population protected. For departments that protect less than 50,000 population, stratifying the sample by community size permits greater precision in the estimates. Survey returns in recent years have ranged from 2,560 to 3,500 departments annually. The national projections are made by weighting sample results according to the proportion of total U.S. population accounted for by communities of each size. Around any estimate based on a sample survey, there is a confidence interval that measures the statistical certainty (or uncertainty) of the estimate. We are very confident that the actual number of total firefighter injuries falls within 6.3% of the estimate.

The results in this report are based on injuries that occurred during incidents attended by public fire departments. No adjustments were made for injuries that occurred during fires attended solely by private fire brigades, e.g., industrial or military installations.

Data collection for the selected incident summaries was enhanced by a form that was sent to departments requesting information. The form included questions on type of protective equipment worn, age and rank of firefighters injured, and description of circumstances that led to injury.

Footnotes

1. Michael J. Karter, Jr., "2008 Fire Loss in the United States", *NFPA Journal*, Vol. 103, No. 5 (September 2009).

2. Around any estimate based on a sample survey, there is a confidence interval that measures the statistical certainty (or uncertainty) of the estimate. Based on data reported by fire departments responding to the NFPA Survey for U.S. Fire Experience (2008), the NFPA is very confident that the actual number of firefighter injuries falls within the range of 74,700 to 84,700.

3. The four regions as defined by the U.S. Census Bureau include the following 50 states and the District of Columbia:

   Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

   Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

   South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia.

   West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

SELECTED INDIVIDUAL INCIDENTS

(These incidents were selected to illustrate typical firefighter safety problems)

Fall from Apparatus

A 34-year-old firefighter suffered severe injuries when he fell from moving fire apparatus. The victim has been placed on permanent restricted duty unable to perform firefighting duties.

After the victim boarded the pumper sitting behind the officer's seat, the truck pulled out of the fire station turning left onto the street. The victim, who had six-and-a-half years experience, stood up to don his turnout coat. The truck traveled approximately 200' and took another left turn. During the turn the victim's door suddenly opened and he fell from the moving truck and fell to the pavement.

The pumper was manufactured in 2000 and was equipped with seatbelts. The department stated that a review of the door handle was conducted and no defects were found. The truck had a clean maintenance history with no reported problems regarding door handles.

The victim was hospitalized for two weeks with a severe concussion and lacerations to his head. He missed more than six months of work and has permanent neurological damage.

Hazardous Material Incident

The fire department received a 911 call requesting medical aid for a person possibly in cardiac arrest. An engine company with a captain and two firefighters responded. After arriving on scene they discovered a female standing on the outside porch complaining of being lightheaded and becoming lethargic. Firefighter number one stayed with the female while the captain and firefighter number two were directed inside the residence by another family member for the person in cardiac arrest.

The captain and firefighter number two began cardio-pulmonary resuscitation (CPR). Firefighter number one joined the others in performing CPR after stabilizing the female victim on the porch. The captain began to open windows due to an odor of exhaust in the house. During care, firefighter number two stood up and started walking toward the door when he suddenly collapsed. With assistance from firefighter number one and a family member, he was removed from the structure. The captain ordered everyone out of the building and away from the home. He immediately requested assistance and called for a hazardous materials team.

The department investigation revealed that the victim, who died, used a generator within the home for several hours prior to arrival of other family members, who removed the generator from the residence prior to fire department's arrival and did not mention the generator's use in the 911 call. Atmospheric readings 30 minutes after positive pressure ventilation was performed revealed carbon monoxide (CO) levels of 13,000–15,000 ppm. According to NIOSH, 1,200–1,500 ppm is considered immediately dangerous to life and health.

All three firefighters were treated in a hyperbaric chamber. The captain and firefighter number one were released from the hospital later that day following treatment. Firefighter number two remained in the hospital for a day. All returned to full duty within a few days of their exposure.

Apparatus Crash
A civilian driver was killed and a firefighter seriously injured in a crash. The civilian was killed when he drove his tractor trailer truck through a stop sign and collided with the fire engine. The operator of the fire engine was seriously injured with multiple fractures, lacerations, minor burns, and has been unable to work since the crash.

The fire engine was going to a training activity at another fire station and driving at a safe speed under very good weather conditions. The firefighter operating the 1992 fire engine swerved to the left trying to avoid a collision. Upon impact, the front of the trailer truck struck the passenger's side of the fire engine, rolling it over onto its driver's side. The impact caused a fire that consumed the tractor trailer truck. The firefighter was extricated by fire crews before the fire could extend into the crushed cab of the upside-down fire engine.

The 47-year-old fire engine operator was hospitalized for three months and is still being treated for his injuries. He was not wearing a seatbelt or any protective clothing.

Apparatus Mishap
A fire captain suffered a cracked pelvis and a bisected femoral artery after being caught between two apparatus.

After returning from a call and backing into quarters, the captain was acting as a spotter for a fire engine backing into the station. He was positioned between two apparatus standing on the driver's side of the parked truck at the front bumper adjacent to the backing apparatus. The captain signaled for the operator of the engine to begin backing. The operator watched the captain in his passenger window mirror while adjusting his course due to a narrow clearance. He switched his view to the driver's side mirror to check his course and wait for the spotter to emerge on the driver's side of the backing truck. He did not see the captain emerge on the other side and immediately stopped the truck. He then glanced into the passenger's side mirror and saw the captain bent over standing next to the front driver's side corner of the parked engine. He pulled the truck forward 10 feet and parked it. He got out and approached the captain and realized that he was seriously injured and requested medical assistance.

The department provided several safety recommendations, including maintaining situational awareness while conducting backing operations, establishing verbal communication between vehicle operators and spotters, and maintaining appropriate visual communication.

The department did not report on the work status of the victim or on protective clothing. Site conditions were clear and dry with good visibility during the daylight hours.

Communicable Disease Exposure
A regional firefighting training center had an outbreak of Methicillin Resistant Staphylococcus Aureus (MRSA). On the sixteenth day of the recruit academy, a student presented with a red and swollen arm with an accompanying rash. Two days later, a second student was hospitalized and underwent surgery with an infection. In the next four weeks, a total of 10 students out of the class of 15 received evaluations and treatment. Five students had confirmed cases of three different strains of MRSA.

The facilities investigative report stated several factors contributing to the spread of MRSA bacteria. Some of the factors included student personal hygiene habits, communal living, and the background of recruits with family members in the healthcare industry. The exact cause of the outbreak is unknown.

Officials began taking precautions to limit the spread of the bacteria by developing and enforcing infection control protocols, changing living conditions, and learning to live with the colonization of the MRSA at the facility.

Structure Fire
On a clear afternoon with moderate temperatures, neighbors called 911 to report a fire in the home next door. The first-arriving companies arrived on scene eight minutes later and confirmed a working fire in the two-story, 3,300-square-foot, wood-frame, single-family dwelling.

The first engine company staffed with three firefighters arrived on scene and made a decision to perform a search of the dwelling for trapped occupants. Two members from the engine company stretched a 200-foot, 1 ¾" handline to the second story of the structure. Within a few minutes, two members from a ladder company joined the search on the second floor utilizing a thermal imaging camera. The members of the engine took a hard right at the top of the stairs and began extinguishing fire to the rear of the master bedroom, which was the first door on the left several feet down the hallway. The ladder crew, after performing a search of one bedroom, advanced down the hall past the engine crew to search another bedroom. After searching the room the ladder crew returned to the hallway and met up with the engine crew at the master bedroom door.

The interior crews experienced increased heat, and conditions rapidly deteriorated. Fire from the first floor was spreading into the foyer and up the staircase, blocking the primary egress route. The engine officer tried to call a mayday but was unsuccessful. In the post-incident review, the engine officer stated that he heard the low battery alert when trying to transmit. But the investigation found that the lapel microphone had separated from the radio and the radio suffered thermal damage.

The officer of the ladder company successfully called a mayday five minutes after entering the structure. The incident commander immediately activated the rapid intervention team and ordered a building evacuation at the same time after the flashover. However, the rapid intervention crew had arrived 13 seconds prior to the mayday. The investigation concluded the RIT had no effect on the outcome of the incident. Just after the mayday message was transmitted,

a battalion chief reported a structural collapse in the rear of the building. This localized collapse separated the ladder officer from the group.

The firefighter operating the nozzle turned to extinguish the fire coming up the stairs to protect the means of egress. When he opened the nozzle to flow water, water pressure dropped and the crew lost their effective water stream. The post incident inspection of the 1 ¾" handline revealed that both layers of the hose had been burned through approximately 10 feet from the nozzle. These holes reduced the available pressure at the nozzle.

The engine officer, engine firefighter, and ladder firefighter were able to escape the oncoming flames by retreating to a bedroom and closing the door. After entering the room they heard glass breaking. They searched for a window and found that outside crews had placed a 24-foot extension ladder to the bedroom window. All exited the structure by sliding down the ladder and were cared for by on-scene personnel.

The ladder officer attempted to retreat to a bathroom but was unable to break a window. He retreated attempting to find another escape route. Nearly three minutes after the mayday was called, the tower officer jumped from the master bedroom window with his protective clothing burning. Crews in the backyard immediately rendered care and extinguished the smoldering protective clothing.

The department reported that all four members were properly in their protective ensemble including self-contained breathing apparatus (SCBA). Due to excessive heat exposure, the reflective trim on all four victims' turnout coats and pants disintegrated. This damage indicated that all were exposed to temperatures in excess of 600 degrees F. There were no defects found in any protective clothing that contributed to any of the injuries. However, the tower officer's gear did show degradation of the moisture barrier and thermal liner in some areas. The department was concerned on why the tower officer's protective clothing was on fire after he jumped from the structure. The investigative report states that "some flammable agent on the fireground adhered to the clothing or absorbed into it."

The investigation revealed that the fire originated on the back deck of the house caused by a discarded cigarette. The fire spread up the rear of the structure into the soffits and into the attic. The fire also spread through broken windows in the first floor sunroom inside the structure. The tower officer is currently on restricted duty. The other three firefighters were treated for thermal burns and missed from two to 10 weeks of work before returning to full duty.

Fire Investigator Shot

A fire investigator was seriously wounded after being shot while investigating an attempted arson. After fire crews left the scene the investigator requested a police car to stand by and assist while he conducted his investigation. The investigator, an 18-year veteran of the department, remembered seeing a masked man who yelled at him and then shot him. He was able to call for assistance after being shot in the abdomen.

The 43-year-old victim spent five days in the hospital and is currently on restricted duty, unable to return to work as a fire investigator.

Training Incident

During ice dive training, a 42-year-old captain was pulled unconscious from the icy waters. The objective of the training dive was to simulate looking for a victim that fell through the ice. The drill consisted of several hours of cognitive lessons followed by several hours of diving sessions. In the early afternoon, the dive team went out to the lake and began the dive training.

One of the dive sessions provided training in being the primary diver. The objective of the dive was to vector under the ice to three predetermined holes as targets. After his briefing, the captain entered the water to check the seal of his mask. There were no leaks and the victim stated he was comfortable. His air cylinder pressure was documented as 2750 psi on his diver status sheet. The captain, a veteran diver, then began the training session with good communications from the tender. While subsurface the captain tried to inflate the dry suit to become more buoyant. However, he found that the inflator hose had not been connected. He connected the hose and continued to the first target.

After reaching through the hole, the captain was asked by the tender if he wanted to continue. The captain stated that he was proceeding to the second objective. While being directed toward the second hole, the tenders asked for a diver's status check. The captain reported that he had 2700 psi and that he was under the ice. The captain dismissed this number as a mistake with his vision due to his recent need for reading glasses.

After the status check, the captain continued his dive. Several minutes later he ran out of air and the mask began sucking to his face. He tried to switch to the backup air system but it was not working properly. He began to swim back towards the hole. Voice communications were out, so he began to pull his tether line to give the emergency signal, but because he was swimming back there was slack in the line. Before he could get the slack out, he went unconscious.

On shore members began noticing irregularities in the dive. No voice communication with the captain, no response from shore signals, and slack in the line were clues that something was wrong. The captain was then pulled from the water eight minutes after starting the dive.

Resuscitative efforts began and an advanced life support unit was requested. The victim responded to the efforts and regained consciousness approximately five minutes later. He was transported to the emergency room and released the same day.

All diving gear was confiscated and sent to a professional certified facility for further inspection. The victim's main air cylinder was still reading at 2689 psi. The department investigation revealed that the redundant supply valve was attached, locking the valve in the emergency bypass mode, meaning the diver was drawing air from the smaller reserve tank instead of the main cylinder. The near drowning was caused by loss of air during the dive. The 12-year veteran returned to full duty two months after the incident and restricted dive duty for one year.