



Virginia Department of
Transportation



Hampton Roads
Freeway Incident
Response Team
(FIRT)

Impact Study

Table of Contents

1	General	3
1.1	Revision Data Sheet	3
1.2	Objective.....	4
1.3	History.....	4
2	Data Used in the Analysis	6
3	The Analysis	7
3.1	Safety.....	7
3.1.1	The Problem	7
3.1.2	FIRT Impact on the Issue of Safety	8
3.2	Congestion / Incident Duration.....	9
3.3	Customer Service	10
4	Summary.....	12

1 General

1.1 *Revision Data Sheet*

4/12/2004	Initial Issue.

1.2 Objective

The primary objective of this study is to evaluate the effectiveness of the Freeway Incident Response Team (FIRT) in the Hampton Roads Virginia area (Norfolk-Newport News-Virginia Beach). As will be explained later, the FIRT program did not have the luxury of a before and after study to evaluate effectiveness. Recent changes to the program, however, have provided such an opportunity. Hopefully, a secondary benefit of this study would be that other agencies considering freeway incident response teams or interstate safety service patrol programs might find some of the information contained herein beneficial as well.

One final note: this study is not presented as a formal research paper. It is intentionally brief and conversational in tone; the intent is instead to provide timely information. Opportunities for formal research papers will be explored as follow-up, but generally take much longer to produce. This having been said, rest assured that all numerical data, formulas used for evaluation and quoted materials have been confirmed, to the best of our ability, and are accurate.

1.3 History

The FIRT program in Hampton Roads evolved from a need recognized by Hampton Roads Traffic Management System (HRTMS) drivers that were verifying conditions relating to the I-64 Bus / HOV Lane or Reversible Roadway System (RRS), which, at the time, was not verifiable with cameras or other Intelligent Transportation System (ITS) equipment.

The Virginia Department of Transportation (VDOT) opened the I-64 RRS in September 1992. The system utilized railroad style gate arms to cordon off entrances to the RRS when the system was not active in the respective direction. As there were no cameras or other devices through which operators could verify that the gate arms were in the correct position, HRTMS drivers were used to ensure that the system was safe and operating correctly 24 hours a day.

Those drivers, while patrolling the adjacent interstate system noticed a number of vehicles that were stranded on the shoulder(s) of the interstate system for a variety of reasons. The VDOT was approached with an idea that those same patrollers might stop to assist stranded motorists. VDOT agreed that this would be a good idea and hence the start of our FIRT program in the winter of 1992. The title 'Freeway Incident Response Team' was chosen for it's broader purpose than that of just a safety service patrol.

As the birthing of the FIRT program was not necessarily a 'planned' idea, no prior data existed for which to compare its effectiveness. It was believed all along that the program was making a difference and studies in other regions of the country also seem to report this. However, collecting data in areas where we didn't patrol was, for all intents and purposes, not possible. In February 2003 all of this changed.

The Commonwealth of Virginia Department of Transportation, in its efforts to overcome a growing deficit in spending was forced to make cutbacks in every area of service provided. Beginning March 1, 2003, the cutbacks to the Hampton

Roads FIRT program reduced the number of patrollers from 36 (it's peak number) to 16, of which only 12 would be routinely used as patrollers. The other 4, on rotating shifts, 24 hours a day, 7 days a week would be responsible for the safe operation of the RRS. Also reduced were the hours of operation for the FIRT patrol function, from 24 hours a day, 7 days a week, to 15 hours a day, Monday through Friday only. Additionally, the area(s) of coverage had to be scaled back. At the program's peak the FIRT program routinely patrolled nearly 100 centerline miles of interstate. As a result of the reduction(s) only 41 centerline miles are currently patrolled.

The Hampton Roads FIRT program wasn't the only thing growing in the HRTMS. During the same period, Sept. 1992 to Feb. 2003, the Hampton Roads Smart Traffic Center (HRSTC) was also built, staffed and equipped with ITS devices. The HRSTC now had the ability to monitor, via closed circuit television (CCTV) cameras, almost the full 41 miles of interstate that the FIRT would be patrolling. In addition to that, the HRSTC had been collecting highway related incident information for a number of years.

Rather than lament over the loss / reduction in the program, staff at the HRSTC viewed this as an opportunity. Using the data collected so far, data that would continue to be collected over the course of the next year, and the cameras installed along the interstate system, staff would now be able to do that 'before and after' study that would help evaluate the effectiveness of the program.

Up to this point, the incident information that controllers at the HRSTC had been collecting was centered on those highway incidents where FIRT personnel were present. Changes were made to the incident database that would now allow controllers to also collect information on those crash scenes that were viewed with the cameras, but outside of FIRT patrol times or where the reduction in personnel meant that FIRT could not get to the crash scene.

A full year has now passed since the cutbacks in the program and the change to the information being collected.

2 Data Used in the Analysis

There are two 'localized' sources of information that this study draws from. They are the basis for most of what is analyzed. Secondary components though include: the "Texas Transportation Institute: 2003 Urban Mobility Study", and other resources, mostly obtained from FHWA, ITS America and other transportation related web sites. Those will be credited appropriately as they are used in the study.

The first of the localized sources is the HRSTC Incident Database. The HRSTC Incident Database includes a number of data elements. Those most pertinent to this study are: HRSTC unique identifier; start date/time of the incident; type of incident; duration of the incident (this begins when the HRSTC is first made aware of the incident, not necessarily the same as when the incident 'actually' began); and, location of the incident. While the HRSTC Incident Database goes back a number of years, information used in this study is limited to calendar years 2000, 2001, 2002, and 2003, along with the first two months of calendar year 2004.

The second is information received from the Virginia State Police (VSP) Computer Aided Dispatch (CAD) database. Information queried from the VSP CAD database includes crash and disabled vehicle incidents during the Jan. 2000 – Feb 2004 timeframe. The information we studied includes: VSP unique identifier; type (categorized to further identify action taken in response to, or otherwise further identify); incident start date/time; VSP area; and a brief text description of the location of the incident.

3 The Analysis

3.1 Safety

3.1.1 The Problem

Motorist safety, FIRT personnel safety, and the safety of emergency responders is a major problem for high-speed roadways like the I-64 interstate system in Hampton Roads.

Disabled vehicles and the passengers of those vehicles often are not experienced with the huge risk that they place themselves in when stranded alongside or in travel lanes. Crash victims often are overwhelmed with circumstances and forget to consider subsequent dangers that they may be in when blocking travel lanes.

A primary goal of the FIRT is to safely secure tense and dangerous highway situations such as the two described above. FIRT personnel place their advanced warning equipment prior to dangerous or potentially dangerous scenes such as these. This creates not only a buffer for the motorists and emergency responders, but also provides warning to oncoming traffic resulting in a much safer environment for everyone.

Table 1 - Total FIRT Incident Responses

Month	2000	2001	2002	2003	2004
Jan	2,207	2,729	3,208	2,871	1,769
Feb	2,007	2,619	2,762	2,547	1,464
Mar	2,685	3,120	3,421	1,771	
Apr	2,712	3,547	3,528	1,790	
May	3,437	3,652	3,730	1,834	
Jun	3,662	4,078	3,885	1,929	
Jul	3,768	3,978	4,161	2,086	
Aug	3,628	3,994	4,021	1,942	
Sep	3,321	3,590	3,319	1,725	
Oct	3,359	3,680	3,521	1,958	
Nov	2,997	3,157	3,218	1,767	
Dec	2,932	3,119	3,181	1,803	
Total	36,715	41,263	41,955	24,023	

Table 1 - Total FIRT Incident Responses above shows the overall responses that FIRT personnel made to highway-related incidents by year for the study period. Those responses include: crashes, disabled vehicles, abandoned vehicles, debris calls, and other non-classified types.

Figure 1 - Overall Incidents by Year of the Appendix shows that even though the number of incidents that the FIRT responded to fell, the pattern by which they occur remained pretty constant.

Table 2 - VSP Responses to Incidents in the Region

Year	# of Crash(es)	# of Disabled Veh.
Jan – Dec 2000	8,742	17,905
Jan – Dec 2001	8,610	17,903
Jan – Dec 2002	10,672	21,251
Jan – Dec 2003	11,853	28,266
Jan – Feb 2004	1,733	4,009
Total	41,610	89,334

Table 3 - FIRT Responses to Incidents in the Region

Year	# of Crash(es)	# of Disabled Veh.
Jan – Dec 2000	2,593	26,264
Jan – Dec 2001	2,908	29,385
Jan – Dec 2002	3,424	30,717
Jan – Dec 2003	2,500	16,324
Jan – Feb 2004	401	2,098
Total	11,826	104,788

Table 2 - VSP Responses to Incidents in the Region, and Table 3 - FIRT Responses to Incidents in the Region, break down more specifically the responses that are the primary focus of this study.

These 3 tables and the aforementioned figure from the Appendix show that this is indeed no small problem in Hampton Roads. Each and every highway-related incident increases the likelihood of secondary and even tertiary accidents, puts the lives of emergency responders at risk, and reduces the safety of the interstate system.

3.1.2 FIRT Impact on the Issue of Safety

What impact does the FIRT program have on all this?

One of the most obvious is seen in the rise in the number of calendar year 2003 disabled vehicle responses by the VSP. In the first three years of the analysis data, the FIRT actually responded to more disabled vehicle incidents than did the VSP, by a ratio of 1.5:1. Yet the VSP coverage area greatly exceeds that of the FIRT coverage area.

Virginia State Police Sgt. D. S. Carr in a television interview aired February 23, 2004 by WAVY-TV, an NBC affiliate, was asked to respond to what impact the State Police felt as a result of responding to 7,000 additional disabled vehicles in 2003. He said, “Troopers are going to just have to be doing more motorist assistance than they are law enforcement and patrolling.”

Relative to FIRT presence at crash scenes, **Figure 2 - % of VSP Accidents Worked by FIRT** of the Appendix, reveals that prior to the reductions FIRT personnel provided assistance at 1 in 3 (1:3) crash scenes responded to by the VSP. After the reductions that number fell to only 1 in 5 (1:5) scenes. This not only lessened the safety buffer / zone previously provided to the State Police, but other emergency responders as well (fire, ambulance/rescue, wrecker, etc.).

Figure 3 - VSP Crash Scenes with FIRT Present of the Appendix was charted using a constant ratio of 1:3.5 incidents in an attempt to ‘picture’ the dip

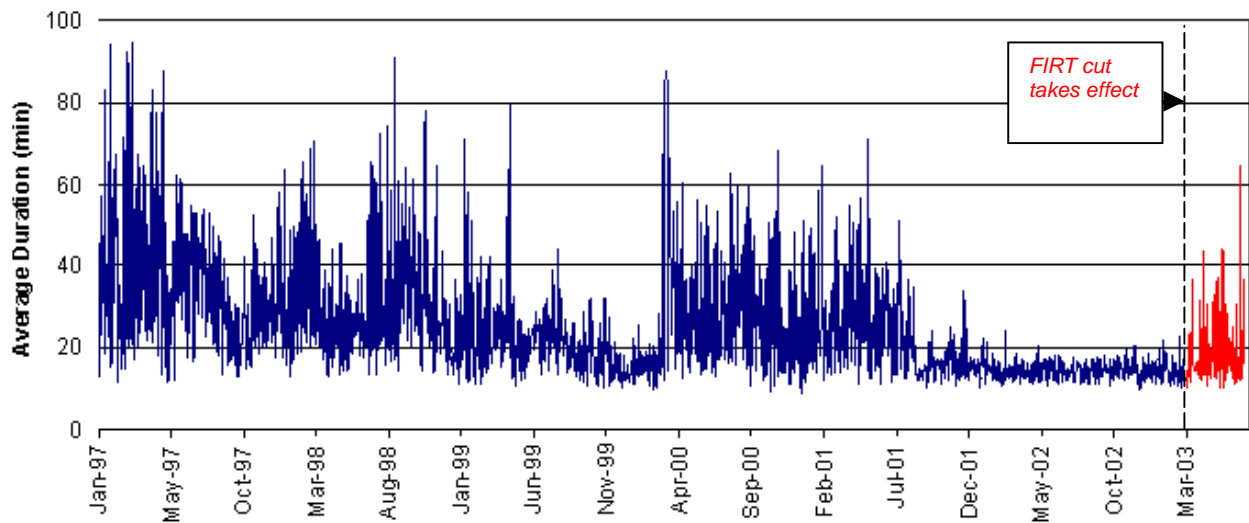
in the participation that the program experienced after the reductions went in to effect.

Finally, as will be explored in more detail in Section 3.2, Congestion / Incident Duration, there is a quantifiable difference in the duration of a crash scene when FIRT personnel are present.

Applying the 1:3 ratio of FIRT presence at crash scenes to the number of crash scenes worked by the VSP in 2003 (11,853) means that FIRT personnel would likely have responded to approximately 3,911 crash scenes. In fact, FIRT personnel were only able to respond to 2,500 crashes, leaving approximately 1,411 non-responded to scenes. Multiplying the average non-FIRT present duration for a crash scene of 49.97 minutes (see **Table 4 - Crash Durations with and without FIRT Presence**), means that VSP, other emergency responder agencies, and the motoring public saw 1,175 hours of crash scene time without the safety buffer and advanced warning that would have otherwise been provided by FIRT presence.

3.2 Congestion / Incident Duration

The most recent study of mobility and congestion for the 75 largest urban areas in the United States, titled “2003: Urban Mobility Report”, by the Texas Transportation Institute, states that congestion in the Hampton Roads area for calendar year 2001 cost consumers \$396 million dollars. As population and travel have continued to rise in the area, this number is bound to have only gotten larger.



The figure above, from a study titled, “Freeway Mobility Report: Hampton Roads, VA”¹, shows the average incident duration for those incidents responded to by FIRT personnel on a daily basis for the period of Jan 1997 through June 2003. As pointed out in the same report, incident duration times started evening

¹ “Freeway Mobility Report: Hampton Roads., VA.” Center for Transportation Studies, Smart Travel Laboratory, University of Virginia, Virginia Transportation Research Council. 2003

out in mid-year 2001 and remained fairly stable until the time FIRT force reductions went in to effect.

Table 4 - Crash Durations with and without FIRT Presence

Month	Average Duration FIRT Present in minutes (# of occurrences)	Average Duration NO FIRT Present in minutes (# of occurrences)
Mar 03	40.3372 (172)	49.7447 (47)
Apr 03	38.6983 (232)	42.3636 (44)
May 03	44.0941 (202)	55.0000 (33)
Jun 03	39.6028 (214)	51.7419 (31)
Jul 03	37.8378 (222)	53.6111 (36)
Aug 03	37.9590 (195)	52.8293 (41)
Sep 03	39.4366 (142)	48.7500 (20)
Oct 03	44.6835 (237)	58.3571 (28)
Nov 03	47.6835 (218)	45.7692 (39)
Dec 03	37.3174 (230)	41.2941 (34)
Jan 04	36.6667 (228)	51.7000 (30)
Feb 04	40.0347 (173)	48.4828 (29)
Overall Average	40.3626 (2465)	49.9703 (412)

Table 4 - Crash Durations with and without FIRT Presence, shows average durations of crash scenes by month for the 12-month period after the FIRT reductions went in to effect. According to Anne P. Canby, Cambridge Systematics, in a paper she wrote for ITS Public Safety², for every minute a lane is closed, 4-5 minutes of traffic backup results. Multiply that number by the 1,411 missed crash scenes detailed in Section 3.1.2 and there were over 1,017 additional hours of traffic backup as a result of no FIRT presence.

3.3 Customer Service

The HRSTC also collects consumer feedback in the form of business reply mail postcards that are handed out to motorists that they assist. While this program only started in January 2004, the response has been encouraging and definitely appreciative. Questions in the survey include things like: For what reason did you need assistance; how did the FIRT driver know that you needed assistance; were they (FIRT) courteous; how would you rate the service, etc.

For this study though the most telling question is: What value would you place on the service you received from the FIRT program? The responses are in the form of check boxes and are: 1) No value; 2) \$0 - \$20; 3) \$20 - \$50; 4) \$50 - \$100; and, 5) over \$100. As of 3/31/04 the HRSTC has received 202 responses for calendar year 2004, see **Table 5 - FIRT Assistance Reply Cards** below.

² <http://www.itspublicsafety.net/canbyarticle.htm>

Table 5 - FIRT Assistance Reply Cards

Response	# of Responses	Low \$	Mid \$	High \$
No Value	16	\$0	\$0	\$0
\$0 - \$20	23	\$0	\$230	\$460
\$20 - \$50	85	\$1,700	\$2,975	\$4,250
\$50 - \$100	45	\$2,250	\$3,375	\$4,500
Over \$100	33	\$3,300	\$4,125	\$4,950
Total(s)	202	\$7,250	\$10,705	\$14,160
Average		\$35.89	\$53.00	\$70.01

There are a couple of theories that float around relative to the 'No Value' response. Certainly one is that those persons served do not think anything of the program. However, a closer look at those particular responses shows that 100% (all 16) of the responses checked that the program should be expanded to include all of the interstate system in Hampton Roads. Further, 15 of the 16 replied 'Excellent' to the question, "Overall, how would you rate the FIRT service?" Number 16 of 16 responded fair.

Taking this added information into consideration, one could assume that they either mean: that the service is priceless; or, that the service is one that they have come to expect the State to provide and therefore a price should not be considered or that it should come from taxes that they already pay.

Therefore, if we discount the 'No Value' responses and re-look at the remaining the table would look more like that shown in **Table 6 - FIRT Assistance Replies (adjusted)** below.

Table 6 - FIRT Assistance Replies (adjusted)

Response	# of Responses	Low \$	Mid \$	High \$
\$0 - \$20	23	\$0	\$230	\$460
\$20 - \$50	85	\$1,700	\$2,975	\$4,250
\$50 - \$100	45	\$2,250	\$3,375	\$4,500
Over \$100	33	\$3,300	\$4,125	\$4,950
Total(s)	186	\$7,250	\$10,705	\$14,160
Average		\$38.98	\$57.55	\$76.13

However one chooses to view the information, it is clear that the motoring public puts a high value on the assistance provided by the FIRT program.

4 Summary

Though not an exhaustive analysis of the effectiveness of the FIRT program in Hampton Roads, it is very easy to come to the conclusion that the program does provide a quantifiable benefit to both the government and private sectors.

A reduction of almost 10 full minutes in crash clearance time when FIRT personnel are on scene reduces stress on motorists, law enforcement personnel, emergency response personnel, the environment, the economy, and lowers the chance(s) for secondary and beyond accidents.

Consumer response surveys that reveal a perceived value of as much as \$76 per FIRT assist says that the public realizes value in a program such as this one.

Traffic congestion is not going away. Building more and more lanes as land or rights-of-way becomes more costly is becoming less and less of an option. When it comes to gaining throughput in an already clogged roadway there simply aren't many options. Is the FIRT program the only one? Of course not, but as this study shows, it sure seems to be one of the more viable ones, for now anyway.

Total Incidents

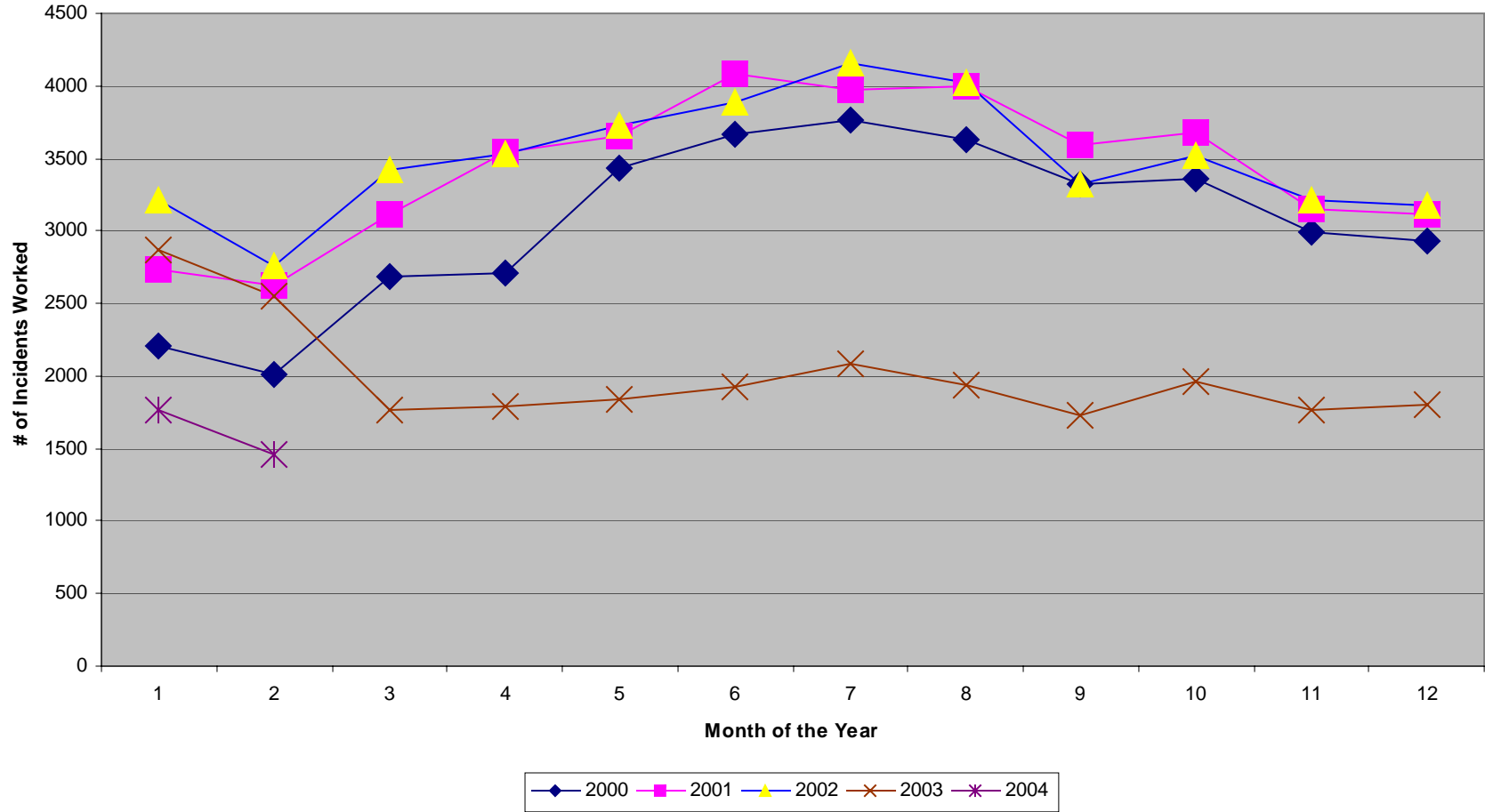


Figure 1 - Overall Incidents by Year

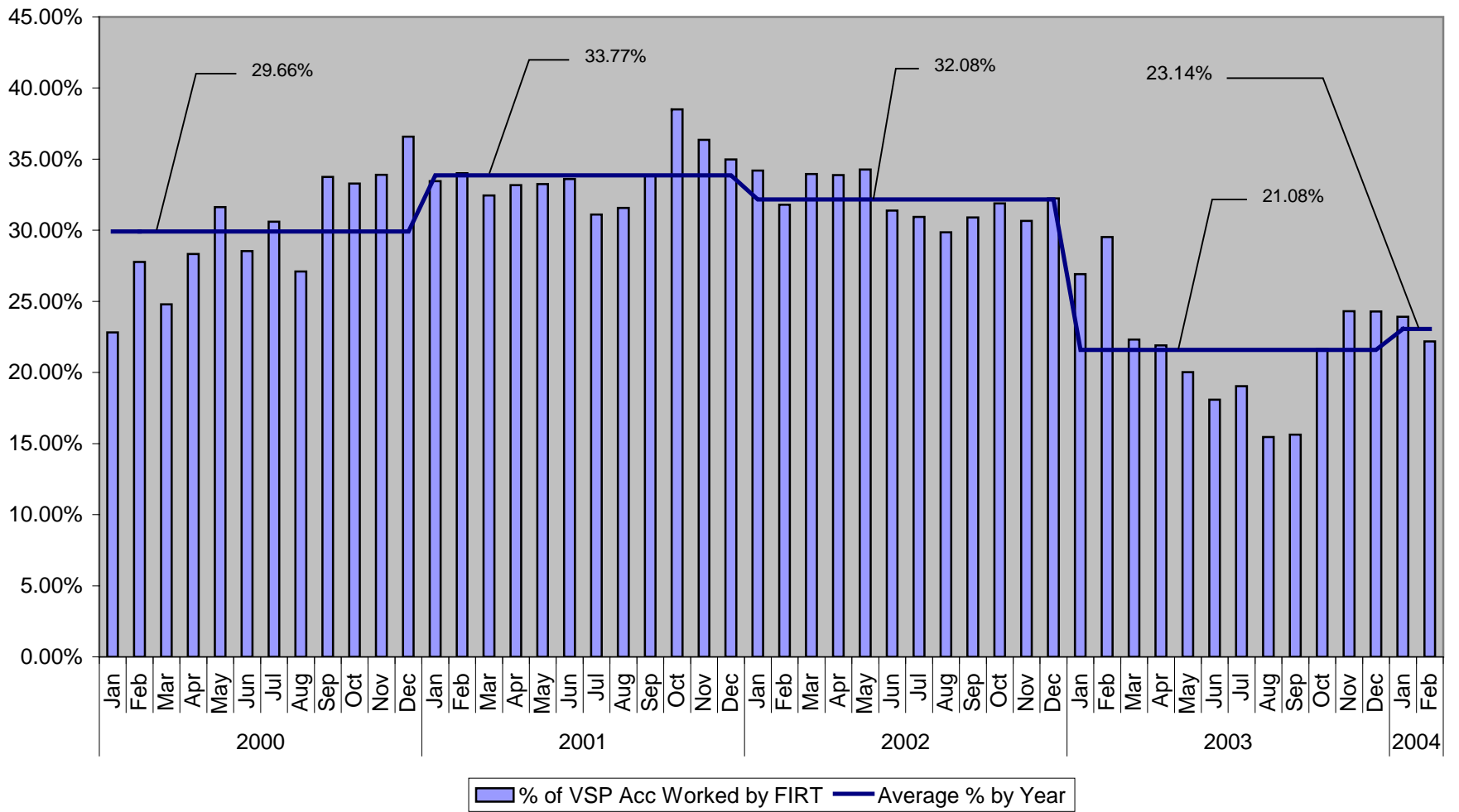


Figure 2 - % of VSP Accidents Worked by FIRT

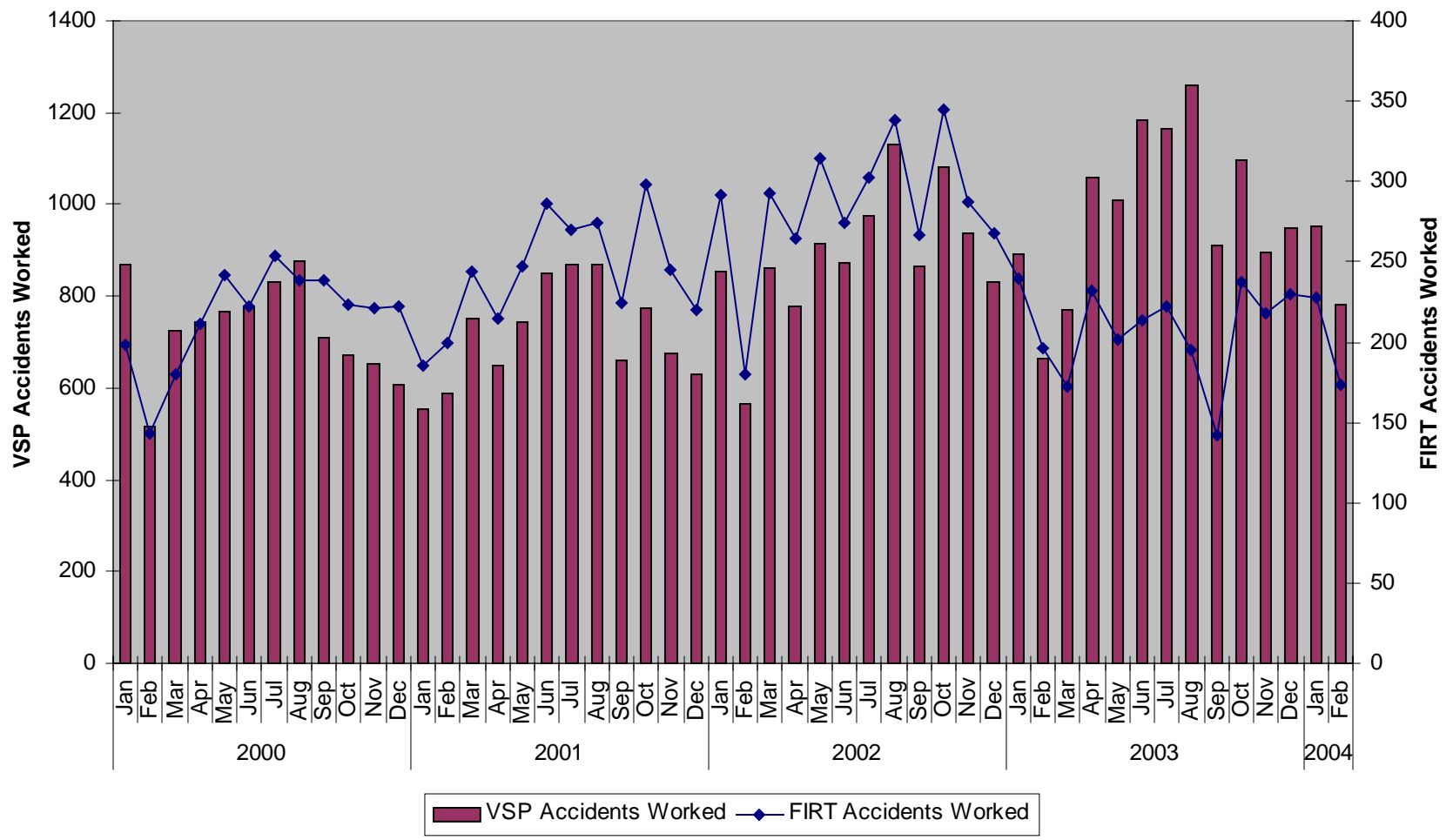


Figure 3 - VSP Crash Scenes with FIRT Present