EVALUATION OF TRAFFIC CRASH FATALITY CAUSES AND EFFECTS

PROBLEM STATEMENT

The number of highway fatalities in Florida is comparatively high, with 40% more fatalities per vehicle mile than the national average in 1999. Heavy trucks are overrepresented in fatal crashes in the state, with more than twice the percentage of fatalities than in passenger car crashes. FDOT's Crash Analysis Reporting (CAR) system is a tool that can be used for crash analysis and countermeasure planning. However, the data currently available from the CAR database is limited and often lacks detail, especially with regard to driver attitudes and actions, which makes differentiating causative factors and assigning fault difficult.

OBJECTIVES

The principal objective of this research was to provide an in-depth analysis of the causes of fatal traffic crashes and traffic fatalities so that appropriate actions can be initiated to improve safety on Florida's highways. To determine the actual causes of a crash, it is necessary to obtain detailed data, including data from Traffic Homicide Investigation (THI) reports, video log and crash scenes photographs, and site visits, as necessary. All fatal crashes on state roads in 2000 were investigated, in addition to crashes involving heavy trucks in 1999 and 1998. Crash data related to both behavioral and roadway-related causes of fatal traffic crashes was collected in an Oracle database and studied through case study, dynamic behavior, and statistical analyses. Various countermeasures, both behavioral and roadway-related, were recommended.

FINDINGS AND CONCLUSIONS

A total of 2,080 cases were reviewed in this project. Run off the road (32%) and intersection crashes (28%) were the common crash types, followed by pedestrian (16%) and rear-end/sideswipe (14%) crashes. Almost a quarter of the at-fault drivers were younger than 25, and over 13% were over age 64. About three-fourths of involved drivers, at-fault drivers, and pedestrians in the fatal crashes were male. Human factors were the primary causative factor in 94% of the fatal crashes; the most common human factors were alcohol and/or drug use and driver errors, including inattention and decision errors. Around 30% of the crash contributing factors (including secondary and tertiary factors) were roadway, environmental, and vehicle factors. Tire tread separation/blowout was the most common vehicle factor by far.

Not wearing a seat belt is the most common cause of fatality found in this study, contributing to fatality among 63% of vehicle occupants, especially in conjunction with ejection. Among drivers wearing seat belts, the most common contributing factors to the fatality were age, nearside impacts and vehicle-vehicle impact (as opposed to fixed object and overturning crashes, which were less frequently harmful to belted occupants). In heavy trucks, 50% of fatalities occurred in vehicles that rolled over, and 26% occurred in vehicles that caught fire. Trailer rear and side underrides accounted for almost 28% of the fatal impacts among occupants in vehicles impacting trucks.

Heavy trucks were overrepresented in multi-vehicle and multi-fatality crashes. Vehicle defects (other than tire defects) were highly overrepresented in heavy trucks. Trucks were at-fault in only about 30% of the crashes in which they were involved. Overall, the most common factor in crashes where a truck was at fault was inattention, which was the primary contributing factor in almost 40% of the crashes. In crashes where the

truck driver was at fault, a tendency was seen toward "taking" of right-of-way by the commercial motor vehicle.

Substantial numbers of run off the road (ROR) crashes occurred on rural limited access facilities, involving younger drivers (aged 15-24) and those under the influence of alcohol. Alcohol, speed, and abrupt steering input (including overcorrection and evasive maneuvers) are the most common driver-contributing factors in all ROR crashes. Approximately 25% of the ROR crashes in the study set involved subsequent overcorrection. ROR crashes were highly overrepresented on all limited access facilities. Rumble strips were present in only about 15% of the fatal ROR crashes, being most common on rural toll roads and interstates. However, overcorrection was about 50% more likely to occur in ROR crashes on road segments with rumble strips. The most common harmful outcomes of ROR crashes were overturning (40%) and fixed object impacts (30%). SUV's were found to have the highest rollover rates. Large vans and compact pickup trucks also had higher than average rollover rates, with high rates of tire tread separation and tire blowouts in the SUV rollovers. Overall, approximately 45% of the rollovers were tripped by grass or soft soil.

Left turning vehicle movements were the most likely to cause a fatal intersection crash. Almost one half of the fatal intersection crashes involved a left turn by one of the drivers involved in the crash. Seventy percent of left turn-oncoming crashes at signalized movements were classified as permissive left type crashes. Inattention was the most common primary contributing factor to fatal intersection crashes, followed by driving under the influence, and decision errors. In almost 20% of the fatal intersection crashes, there were roadway issues that had a direct bearing on the occurrence of the crash, mostly as secondary and tertiary issues. Sight distance was the most common roadway issue, followed by location of stop bars, wide or confusing design/geometry, lack of turn lanes/storage, and signal timing issues.

The most common types of pedestrian crashes were pedestrians crossing a roadway not in a crosswalk (53%) and pedestrians that had exited a vehicle prior to the fatal event (13%), followed by pedestrians who were crossing at intersections (10%). Pedestrian behavior is the first contributing cause of over 80% of the pedestrian crashes in this study. Where alcohol use was determinable, 69% of pedestrians crossing at non-intersection locations were under the influence. Among drivers, the most common contributing factor was speeding followed by driver alcohol/drug impairment. Lighting condition plays a major role in pedestrian cases. In nearly half of the roadway crossing cases, pedestrians were attempting to cross the road within 600 ft of a crossing location with a traffic signal. A total of 15% of the pedestrian crashes occurred on limited access facilities (interstate, toll road, other limited access facility, or ramp); half resulted from a disabled vehicle.

Researchers developed educational, enforcement, engineering, and other countermeasures specifically as relevant to the primary contributing factors and with regard to particular vulnerabilities (e.g., countermeasures calling for various transit-oriented solutions targeted at the elderly driver population in consideration of their increased susceptibility. It should be noted that the study studied only causes of fatal traffic crashes. Consequently, solutions developed in this study do not address traffic volumes and other exposure measures that should be considered before implementing state-wide programs. In addition, proposed strategies vary according to critical issues identified at particular crash sites, so care needs to be taken that while addressing the subject critical issues, other issues are not compromised.

BENEFITS

The results of this research can be used to develop educational, enforcement, and engineering countermeasures to address broad categories of crashes and contributing factors identified as occurring frequently on state roadways in Florida. The results can also be used to direct additional research projects into specific areas of need identified by this research. The primary benefit to the state of Florida should be a reduction in the number of fatalities on state roadways in Florida. A table highlighting key findings is appended to this summary.

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Notable Contributing Factors in Fatal Crashes on State Roads in Florida

Crash Factor			Crashes	Fatalities		
			Num.	Num.	% of Total	% of Category
Fatal crashes in study	All fatal crashes		2080	2350	100	100
		At-fault driver age < 25	419	505	21	21
		At-fault driver age 25 – 64	1056	1195	51	51
		At-fault driver age ≥ 65	301	337	14	14
		At-fault driver under influence of alcohol	463	536	23	23
		At-fault driver under influence of drugs	121	149	6	6
		At-fault driver inattentive or distracted	454	513	22	22
	Motor vehicle fatalities (vehicle types 01 through 09)		1540	1790	76	76
		Unbelted occupants	986	1126	48	63
		Ejections	419	460	20	41
		Occupant age ≥ 65	338	370	16	21
	Motorcyclist fatalities		133	140	6	6
		Motorcyclist at fault	75	78	3	56
	Bicyclist fatalities		62	62	3	3
		Bicyclist at fault	47	47	2	76
	Pedestrian fatalities		345	350	15	15
		Pedestrian at fault	284	286	12	82
Truck crashes	All truck crashes		575	680	29	29
		Truck at fault	178	225	10	33
		Inattentive truck driver	63	88	4	39
		Truck driver “taking” ROW	38	45	2	20
	1998		199	238	10	35
	1999		198	241	10	35
	2000		178	201	9	30
Non truck	All non-truck crashes		1505	1670	71	71
ROR Crashes	All ROR crashes		682	780	33	33
		Driver age < 25	203	241	10	31
		Driver under influence of alcohol	221	253	11	32
		Driver under influence of drugs	62	74	3	9
		Abrupt steering input	221	253	11	32
		Interstate	272	319	14	41
		With no rumble strips	193	230	10	72
		Median crossover	64	88	4	28
		Rural 2-3 lane	87	95	4	12
		Tight curve (≤ 1500’)	67	72	3	76
	Overcorrect		177	194	8	25
		Interstate	73	84	4	43
		With no rumble strips	44	53	2	63
	Fixed object impact		380	421	18	54
		Tree	118	134	6	32
		Interstate	45	53	2	40
		Guardrail	79	91	4	22
	Overturn		365	412	18	53
		Tripped on grass shoulder or soft soil	164	189	8	46
		Tripped on fixed object	92	100	4	24
Intersection Crashes	All intersection crashes		699	775	33	33
	Signalized movement		252	279	12	36
		Left turn w/ gap judgment	97	110	5	39
		Red light running	91	104	4	37
	Stop sign		228	259	11	33
		Left turn w/ gap judgment	98	108	5	42
		Stop sign running	42	50	2	19
	Unsignalized movement		217	235	10	30
		Left turn w/ gap judgment	105	118	5	50
Pedestrian	All pedestrian crashes		353	350	15	15
	Daytime		81	78	3	22
		Intersection crossings	10	10	0	13
		Crossings within 600’ from intersection	16	16	1	21
		Crossings greater than 600’ from intersection	15	16	1	21
	Nighttime w/street light		135	134	6	38
		Intersection crossings	15	15	1	11
		Crossings within 600’ from intersection	44	44	2	33
		Crossings greater than 600’ from intersection	41	42	2	31
	Nighttime w/out street light		123	124	5	35
		Intersection crossings	6	6	0	5
		Crossings within 600’ from intersection	24	24	1	19
		Crossings greater than 600’ from intersection	45	46	2	37
Rear-end/ sideswipe	All rear-end/sideswipe crashes		359	410	17	17
		Truck involved	197	238	10	58
Head-on/ oncoming	All head-on/oncoming		248	310	13	13
		Truck involved	110	131	6	42