EFFECTS OF TRAFFIC ACCIDENTS ON FREEWAY OPERATION

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TEXAS TRANSPORTATION INSTITUTE
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SYNOPSIS

This report was developed from a research project conducted by the Texas Transportation Institute in cooperation with the Automotive Safety Foundation. The over-all objectives of the research project were (1) to study the effects of traffic accidents on freeway operation in the interest of improving the level of service, (2) to analyze and improve traffic control methods presently employed during the investigation of accidents, and (3) to promote better freeway accident reporting and greater interest on the part of police officials and investigating personnel in its attainment, so that more precise and complete information concerning accidents for engineering analyses could be provided.

The project was divided into two parts—a questionnaire survey of one hundred and twenty-five cities involved in freeway accident investigation, and field studies on Texas freeways where actual accidents were observed. The questionnaire survey was used to determine techniques employed and personnel and equipment used in the investigation of freeway accidents.

The field studies made on freeways in five major Texas cities consisted of actual observation of freeway accidents and the recording on motion picture film of the freeway's operation at the accident scene. A study technique using two cameras was employed which allowed a determination to be made of the actual travel time of vehicles in the congestion caused by an accident. The method also gave a measure of the delay experienced by these motorists.

EFFECTS OF TRAFFIC ACCIDENTS ON FREEWAY OPERATION

INTRODUCTION

Nearly every major city in the United States has one or more sections of freeway in operation. The mileage of these within the cities increases as the Interstate Highway network comes nearer to completion. The expanding population and increased motor vehicle usage often result in the freeway being loaded to capacity within its design life. This is especially true of the older freeways located within the larger cities. These are often hampered by sections which are now considered to be obsolete by present design standards. During the periods of peak flow, such as the afternoon rush hour, many of them become saturated with traffic and operate in a generally congested manner.

As the freeways become more congested, the problems created by an accident on the freeway become more serious. Upon the occurrence of an accident in the traffic stream of a freeway, its effect is immediately reflected in serious congestion and costly delay to the motorists in traffic behind it. During peak periods of flow, congestion such as this could affect the freeway users and the flow on nearby arterial streets. For a freeway which usually provides the motorist with a level of service that enables him to make a certain trip in a relatively short time, the level of service is decreased to the point where he could have had a shorter travel time on the nearby surface street system.

Especially during the morning peak period, this delay caused by an accident on the freeway could have many serious consequences. For instance, it might result in many employees with critical jobs being late to work. It might cause emergency vehicles to detour to a more time consuming route. But most important of all, it can and does cause drivers who are caught in the congestion behind an accident scene to become irritated and impatient and to take unnecessary chances in maneuvering to get past the accident, and in so doing, cause other accidents.

Just how extensive the effect of a freeway traffic accident may be depends to a great extent on the actions of the motorist involved in the accident and the investigating police personnel. To the motorist involved in an accident, reporting the accident to the police department may require considerable effort. There is usually no means of communication located on the freeway and to contact the police department, he has to walk a considerable distance to a phone or rely on a passing motorist to contact the police for him somewhere ahead. After receiving the report of an accident, the investigating officers are often hampered in reaching the scene of the accident by the resulting congestion. In some cases where long elevated sections are involved, they have to rely on motorcycles and sometimes walking to get to the scene.

The motorist involved in a freeway accident is immediately faced with the uncertainty of what he should do. Usually there are signs posted along the freeway which warn—"No Stopping on Pavement, Use Shoulders for Emergency Stops." Yet his damaged car remains stopped on the through lanes or at the ramp entrance, because most motorists have become thoroughly indoctrinated to not move a vehicle involved in an accident until told to do so by the police. Perhaps this is a result of the motorist feeling that he may jeopardize his insurance claim if he moves the vehicle. Certainly in the case of a major accident, there is no alternative except to leave the vehicle on the roadway. Quite often, however, the damage to the vehicles is very minor and would not prevent them from being moved at least to the shoulder.

Originally there was some question as to whether or not it was unlawful for a driver to move his damaged car from the traveled portion of the roadway before the police arrived at the accident scene. In the questionnaire survey made of investigating agencies in numerous cities throughout the nation, eighty-two percent (82%) answered **no** to the question "Are motorists prohibited by law to move their damaged vehicles from the traveled portion of the roadway until an officer instructs them to?" Six cities reported that it was unlawful to move the vehicles, and most of them, when questioned, gave as the reason a city ordinance which was rather outdated. The Texas Motor Vehicle Laws, issued by the Texas Highway Department, do not make a definite statement concerning this matter, although they do encourage moving the vehicle from the traffic stream with the instruction for the motorist involved in an accident that his stop ". . . shall be made without obstructing traffic more than is necessary."[1*]

The extent of the delay caused by a freeway accident in general depends on three things:[2] (1) the severity of the accident, (2) the traffic volume in relation to the capacity of the facility at the time, and (3) the period of time required to move the disabled vehicles from the sight of passing motorists. It is impossible for the person or agency responsible for the enforcement and operation of the facility to exercise any substantial control over the first two items. These are factors primarily due to chance or factors that the freeway designer must consider when designing a freeway. This leaves only the third factor available for immediate improvement to substantially

*Superior numbers refer to references listed at end of text.

reduce the delays to freeway users approaching an accident.

A research project was established to determine the effects of traffic accidents on freeway operation. Its objectives were:

1. To analyze the effects of accidents on freeway operation in order to improve the level of service.

2. To analyze and improve traffic control methods presently employed during the investigation of an accident.

3. To secure better freeway accident reporting and to stimulate greater interest and concern on the part of police officials and investigating personnel in the improvement of investigation and reporting procedures, so that more precise and complete information concerning accidents could be provided for engineering analyses.

Work on this project was divided into two phases. One phase consisted of a questionnaire survey of numerous cities throughout the nation and the other involved actual field studies conducted on several freeways in Texas.

FIELD STUDIES

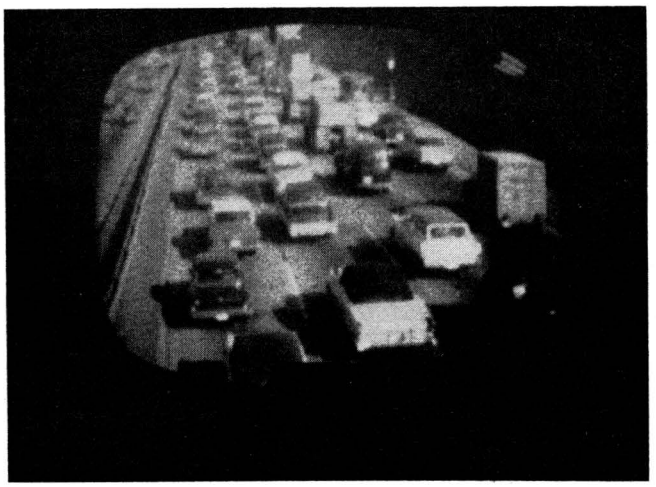
Study Procedure

Through the cooperation of the Michigan State Highway Department, the City of Detroit, Wayne County, and the Bureau of Public Roads, a period of one week was spent observing the closed circuit TV monitor system on the John C. Lodge Expressway in Detroit. During this period, any accident or unusual occurrence was recorded on 16 mm movie film by an Auricon camera equipped with a TV shutter for filming from a monitor. It might be noted that acceptable pictures were also made with a standard 16 mm Bell & Howell camera filming at a speed of ten frames per second. These films served to indicate what effects a traffic accident has on freeway operation and also what data should be taken during the actual field studies. Figure 1 shows samples taken from these movies made from the TV monitors.

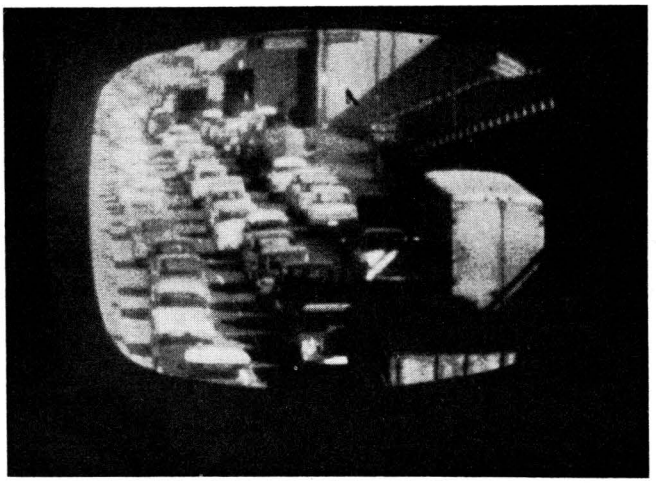
From an observation of the films made from the monitors in Detroit and also from the films of actual collisions previously recorded by chance during other studies by the Texas Transportation Institute, it was apparent that one of the most serious effects of an accident on freeway operation is the delay experienced by the other motorists in the vicinity of the accident. Because of this, one of the prime objectives of the field studies was to measure this delay.

The field data were gathered for this project by the use of two movie cameras. One camera was mounted on an aerial bucket truck as shown in Figure 2. This unit was used to photograph the acci-

(a) Accident in off-peak direction, 8:36 a.m. (Monitor No. 10)



(b) 8:40 a.m.—705 feet behind accident scene (Monitor No. 11)



(c) 8:42 a.m.—1945 feet behind accident scene (Monitor No. 12)

Figure 1. Scenes of accident taken from TV monitor system—John Lodge Freeway.

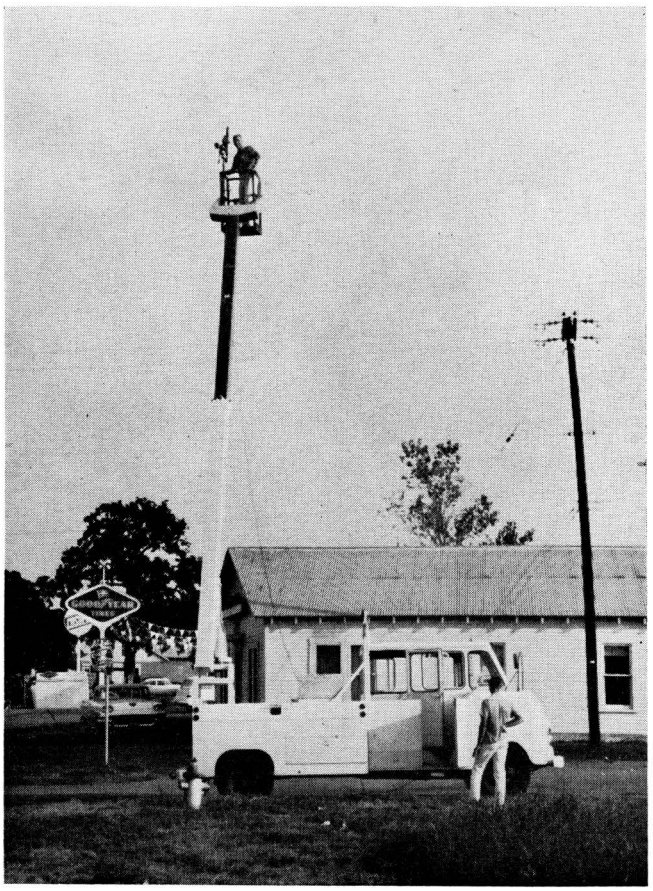


Figure 2. Aerial bucket truck used to elevate cameraman.

dent scene to show the action taken at the scene and to identify each car as it passed the scene. The other camera was positioned at a convenient location some distance behind the accident scene, such as shown in Figure 3. This camera was carried in a station wagon which allowed it to operate separately from the other unit. To coordinate the time with each camera, a device was arranged for each camera which placed a small watch with focusing lens about 18 inches in front of the camera. A record of the time was recorded by each camera on each frame of the film (see Figure 4). The two watches used were coordinated at the beginning of the study and checked frequently for discrepancies.

In each city studied, with one exception, a police radio receiver was installed in the aerial bucket truck with which the study personnel monitored all calls from the police dispatchers. One city did not have equipment available, so a direct telephone connection between the police dispatcher and the study personnel, located on the frontage road beside the freeway, was arranged.

A typical accident report and study would go as follows. Both units were parked along the frontage road of a freeway, near a section where a number of accidents were known to have occurred, in order to facilitate more coverage of an accident in the vicinity. The person monitoring the police radio noted the location of any accident reported on the freeway. Unit Number One, the aerial bucket truck, then proceeded to the accident scene as quickly as possible. After parking in a position that would not interfere with the freeway operation, the bucket, along with camera and cameraman, was elevated, as shown in Figure 2. The cameraman made a continuous movie of the activities and traffic operation at the accident scene from a vantage point about 35 feet high. Meanwhile, the second unit proceeded to a location behind the accident scene and the camera was positioned at some convenient location overlooking the freeway. Because the purpose of this camera was only to identify the cars, filming was done at the rate of one frame per second, and was continued until the freeway regained normal operation.

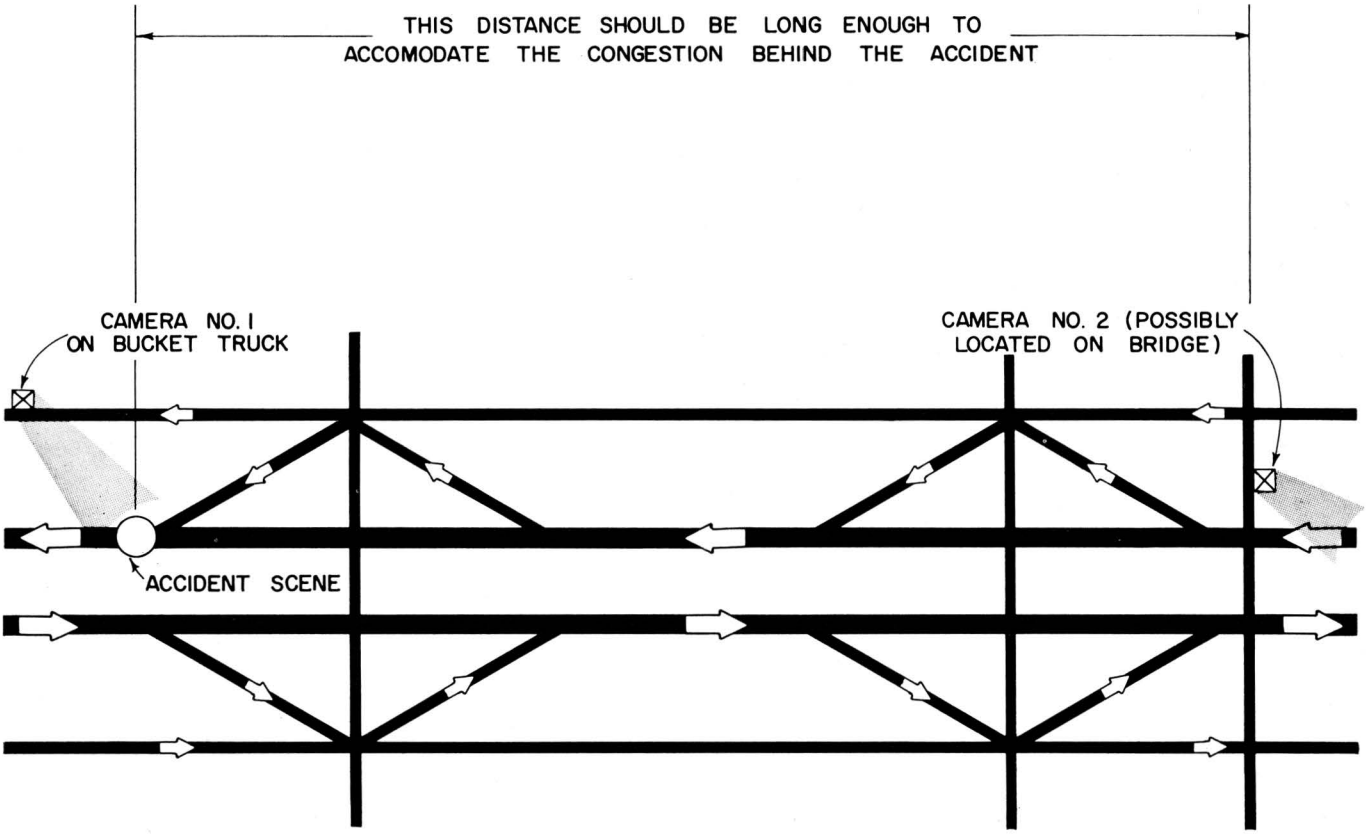
From these films, the actual travel time over a section of freeway between the two cameras could be determined. In order to have a comparison for this observed travel time, the normal travel time over the section was established from several test runs over the section, using the average car technique.

Results and Analysis

The films made in Detroit on the TV monitors allowed a relatively long section of freeway to be viewed and several of the effects of accidents were clearly visible. Some of the effects were the shockwave of cars that back-up behind the accident scene, and the delay caused to the motorists. It was also noted that people in this back-up of stopped or stopping cars were not aware of the cause of the congestion and therefore tended to take unnecessary chances to maneuver into a traffic lane which appeared to be moving faster than the one they were in. These maneuvers had an equally bad effect on the smoothness of operation as well as increasing accident potential. Figures 5 and 6 are examples of freeway accident scenes and the resulting congestion.

The vehicles behind an accident scene usually suffered substantial delay, and even the vehicles traveling in the opposite direction suffer some delay. During one of the accidents recorded from the monitors, which occurred in the outbound lanes during the morning rush period, the vehicles in the opposing lanes were slowed to almost a standstill as they passed the accident scene. Each driver apparently wanted to get a good view of the accident and this caused the inbound peak flow to operate in a stop-and-go manner as far as could be seen on the monitor system. These vehicles quickly regained their speed once they passed the accident scene.

Perhaps one of the most serious effects of a traffic accident is that one accident can easily be a contributing factor in the cause of another. The frequent occurrence of multiple rear-end collisions



CAMERA LOCATIONS DURING ACCIDENT OBSERVATIONS

Figure 3.

is evidence of this. It was also observed that some cars, especially older cars, become stalled in the line of stopped or stopping vehicles. Even when the stoppage ahead is cleared, these stalled vehicles in the traffic stream create as much congestion as did the accident.

During the months of July and August, a period of about one week was spent on the freeways in each of several Texas cities. Freeways were studied in Dallas, Fort Worth, San Antonio, and Houston. A shorter period of time in September was spent in Austin.

The best study was obtained of an accident which occurred in San Antonio on the Northwest Freeway only a short distance from downtown, on Friday, August 17, 1962, at 5:21 p.m. At this time of the day traffic had reached the peak flow condition. The accident was a rear-end collision in the median lane of the two lane roadway. Because the study unit was parked directly across the freeway from the accident scene, only a minor relocation of the unit was necessary and filming was begun six minutes later. Locating the second unit at a point behind the accident scene was considerably hampered by the congestion and about twenty minutes were required to place the second camera in operation.

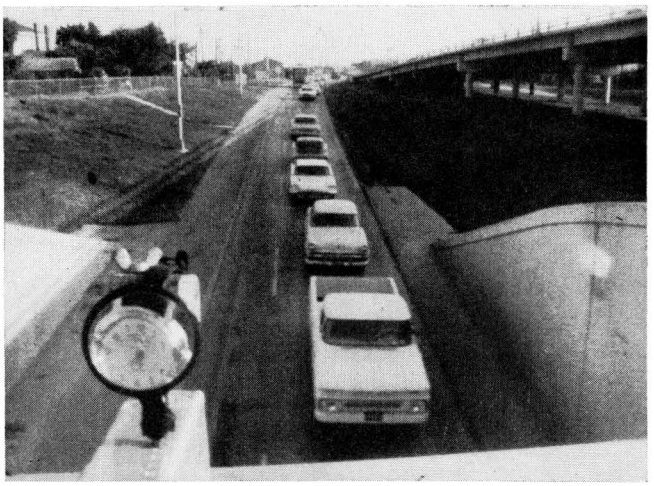


Figure 4. Watch used to record time.

Figure 7 shows the location of the accident, the study units, and the extent of the congestion.

Two wreckers were cruising in the area of the accident and arrived at the scene a short time after the collision. They did not attempt to clear the freeway but parked at the edge of the frontage road. The police apparently were caught in the congestion behind the accident and did not reach the scene until 32 minutes later, at 5:53. They immediately marked the location of the cars and, because there were no injuries, allowed the private wreckers to move the damaged vehicles to the shoulder. This was accomplished by 5:56.

The volume of vehicles past the accident scene was influenced by the presence of the wrecked vehicles on the shoulders. Figure 8 shows the variation in volumes, for each one minute period, as recorded by the camera at the scene of the accident. The effect of prompt action by the police officers is noticeable. During the time that the damaged vehicles remained in the through lane, the traffic flow was about 40 vehicles per minute. Immediately after the vehicles were removed to the shoulder the flow increased to about 55 vehicles per minute.

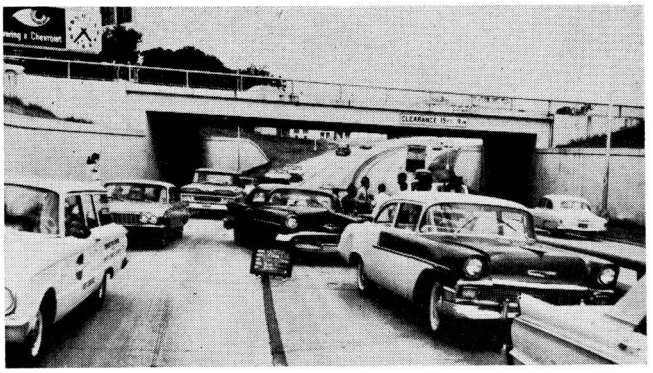
All of the vehicles passing the point of the accident scene during the remainder of the afternoon peak period experienced some delay. Although the accident occurred at 5:21, the procedure for measuring the actual travel times was not begun until 5:42, due to the difficulty encountered in locating the second camera (Unit Number 2) at an acceptable filming location. Beginning at that time, the actual times were determined for the cars passing within the range of both cameras. The time at which a vehicle passed under the first camera was subtracted from the time the same vehicle passed the accident scene in order to determine the actual travel time. Figure 9 shows how the average travel times varied during the period of study. Naturally, the travel times increased during the time when the police were interrupting the flow to direct the removal of the damaged vehicles to the shoulder. As soon as this was accomplished, the average observed travel times began to decrease and approach the normal travel time for that freeway section.

(a) Accident scene.

(b) Congestion behind accident.

Figure 5. Views of a freeway accident.

(a)



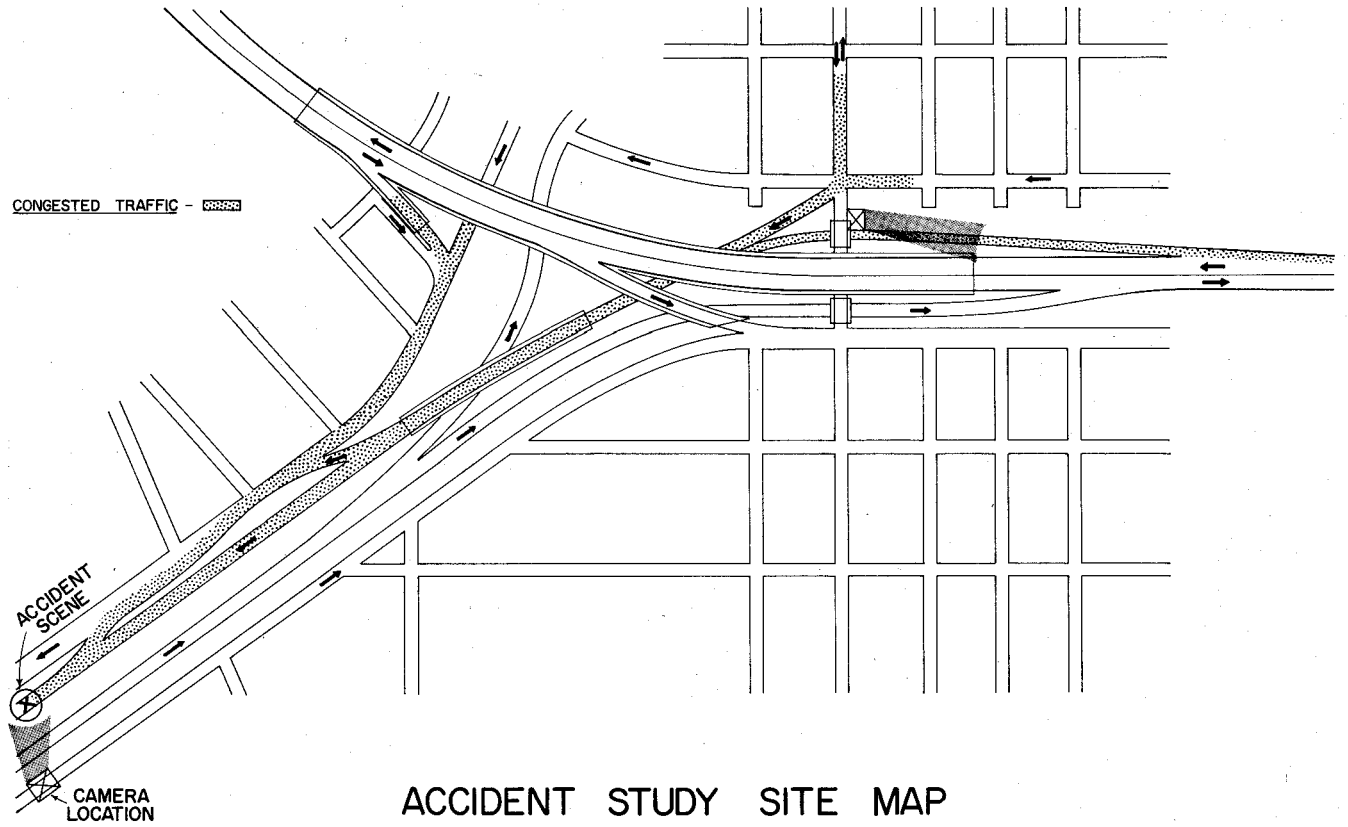
(b)

Figure 6. Views of freeway accidents.

The normal travel time of 47 seconds was regained at 6:12. The delay, which is the difference between the average observed travel time and the normal travel time, was a maximum of 7.5 minutes during the removal of the damaged vehicles. Figure 9 also shows that from the moment of collision, the freeway's operation was impeded for 51 minutes.

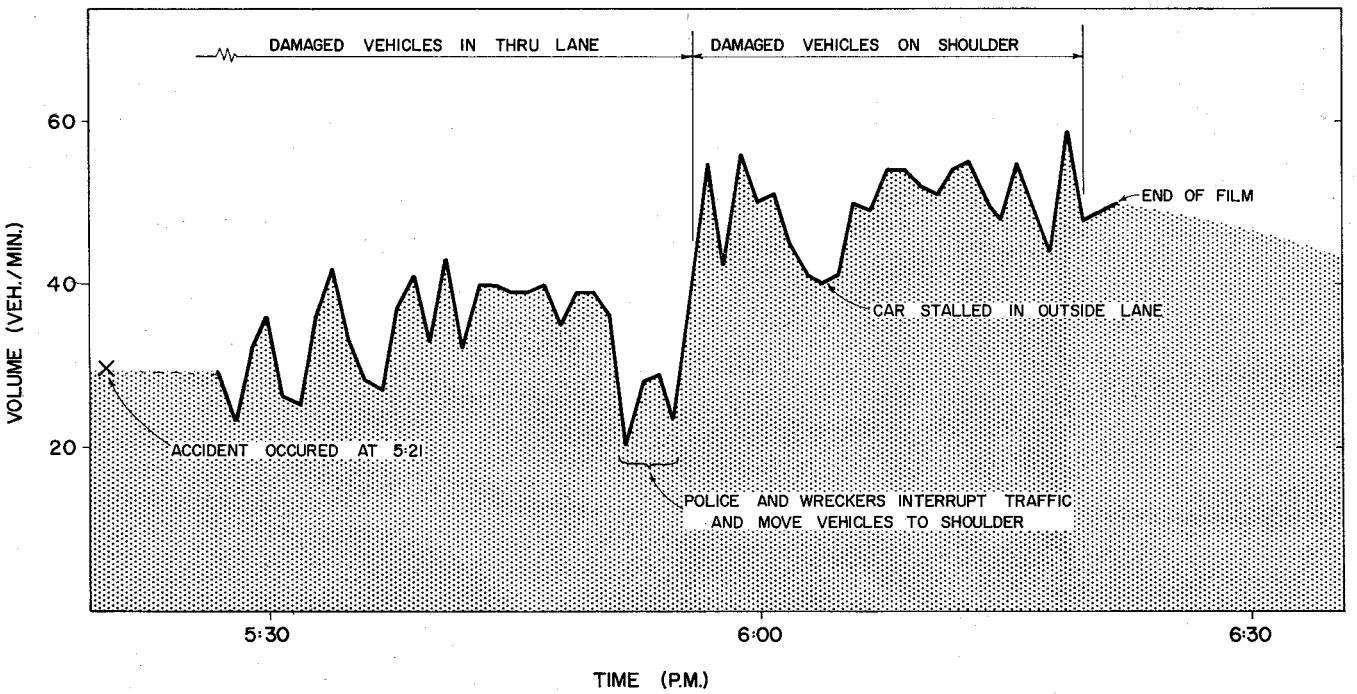
QUESTIONNAIRE SURVEY

One of the objectives of this research was to determine what methods of freeway accident investiga-



ACCIDENT STUDY SITE MAP
SHOWING LOCATION OF ACCIDENT
AND EXTENT OF CONGESTION

Figure 7.



VARIATIONS IN VOLUME PAST
AN ACCIDENT SCENE

Figure 8.

tion are currently being used in some of the major urban locations throughout the nation. The results of this survey seem to indicate that in most cities freeway accident investigation and traffic control at the accident scene is not thought of as being different from what is required on a local city street. In most cases, the problem has been approached using the same methods and techniques which have been applied on other facilities.

Study Procedure

One hundred and twenty-five cities, each with a population in excess of 100,000, were selected to receive the questionnaires. A copy of the questionnaire is included in the Appendix. The questionnaire was designed to gather information on the effectiveness of the methods of freeway patrol and accident investigation and to obtain information concerning ordinances and restrictions applying to freeways. Among these were questions concerning the use of emergency vehicles and wreckers, and whether or not sirens were used on freeways to get to an accident scene.

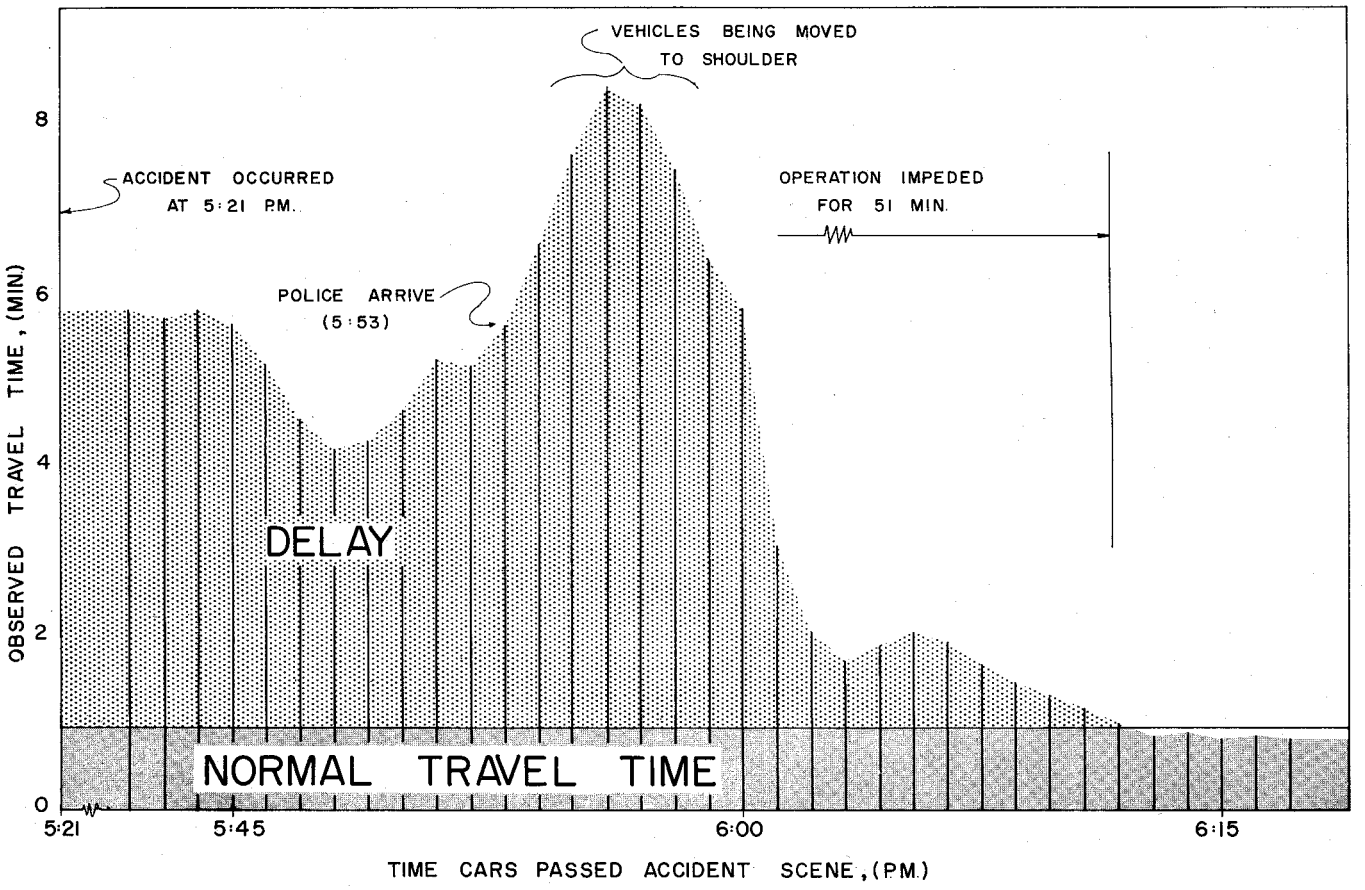
Results

Eighty-eight of the one hundred twenty-five questionnaires were returned. However, only 33 of them were answered sufficiently to be used in the analysis. Table 1 gives a summary of questionnaires returned and Figure 10 shows the location of the cities returning completed questionnaires. A list of all cities surveyed is included in the Appendix.

A. Accident Investigation Techniques

The fifty-five unanswered questionnaires can be accounted for by the following reasons:

	Number of Cities
Either no freeway or the city was not responsible for accident investigation on them	46
State Highway Patrol responsible	5
Recently opened short section of freeway	4



AVERAGE TRAVEL TIMES FOR VEHICLES PASSING ACCIDENT SCENE DURING PERIOD INDICATED

Figure 9.

Table 1

	Number	Percent
Questionnaires Sent Out	125	100
Questionnaires Returned	88	70.5
A. Answered	33	26.4
B. Unanswered	55	44.1

The 33 cities returning answered questionnaires had a total of 697.8 miles of freeways. These ranged from 1.7 miles to 84 miles with an average of 21.15 miles per city.

Regarding fatalities which occurred on freeways during 1961, the following was reported:

	Number of Cities	Number of Fatalities
Unknown	6	—
None	9	0
Freeway fatalities	18	179

In making assignments for patrolling and investigating accidents on freeways, the questionnaires gave these results:

Were specially trained officers used to:

(1) Patrol freeways?

Yes 11

No 21

(2) Investigate freeway accidents?

Yes 24

No 8

It was noted that, although is some cases no special training was given, the same personnel were assigned these duties day after day and the actual experience gained in observing the freeway's operation could be considered invaluable training.

Under average circumstances, the following number of officers were used to investigate a freeway accident:

	Number of Cities
One officer	8
Two officers	14
Three officers	9
Four officers	1

Freeway patrolling was done:

	Number of Cities
(1) Periodically during the peak periods only	2
(2) Periodically for the entire day	20
(3) Continually during peak periods only	0
(4) Continuously for the entire day	10

Table 2.—Variations in Volume

Time (pm)	Volume (vpm)	Time (pm)	Volume (vpm)	Time (pm)	Volume (vpm)	Time (pm)	Volume (vpm)
5:26		5:41		5:56		6:11	
	29		32		55		54
27		42		57		12	
	23		40		42		55
28		43		58		13	
	32		40		56		50
29		44		59		14	
	36		39		50		48
5:30		5:45		6:00		6:15	
	26		39		51		55
31		46		01		16	
	25		40		45		49
32		47		02		17	
	36		35		41		44
33		48		03		18	
	42		39		40		59
34		49		04		19	
	33		39		41		48
35		50		05		20	
	28		36		50		49
36		51		06		21	
	27		20		49		50
37		52		07		22	
	37		28		54		
38		53		08			
	41		29		54		
39		54		09			
	33		24		52		
40		55		10			
	43		38		51		

Table 3.—Average Observed Travel Times

Time	Average Observed Travel Times (min.)	Time	Average Observed Travel Times (min.)
5:42	5.88	6:00	5.92
43	5.73	01	3.05
44	5.92	02	2.12
45	5.75	03	1.72
46	5.25	04	1.93
47	4.60	05	2.12
48	4.25	06	1.98
49	4.35	07	1.70
50	4.67	08	1.50
51	5.25	09	1.37
52	5.20	10	1.18
53	5.68	11	0.98
54	6.65	12	0.85
55	7.68	13	0.65
56	8.45	14	0.68
57	8.32	15	0.62
58	7.55	16	0.67
59	6.47	17	0.63

Although only ten cities patrolled their freeways continuously, 28 cities expressed a preference for this type of patrol while only four cities preferred to patrol during peak periods only.

When asked if the city ever experienced a backlog of freeway accidents waiting to be investigated, the cities replied according to the following scale:

	Number of Cities
Frequently	0
Occasionally	1
Rarely	21
Never	11

With regard to clearing the accident scene, the following procedures were reported:

	Number of Cities
Damaged vehicles moved to shoulder	22
Damaged vehicles moved to some location not visible to traffic	9
Both	2

Where alternate routes existed, 26 cities also reported that traffic was diverted around the scene of an accident in order to minimize congestion.

Eighty-two percent, or 27 cities, stated that it was not unlawful for a motorist involved in a freeway accident to move his damaged vehicle from the

Figure 10. Location of cities returning completed questionnaires.

traveled portion of the roadway before a police officer instructed him to do so.

When an accident occurs on a freeway, it is essential that the scene be cleared as rapidly as possible. The following significant times were reported:

	Average Time	Maximum Reported Time
(1) Maximum time for a police officer to reach the scene	11.8 min.	48 min.
(2) Time to clear the scene if a wrecker was **not** required	5.8 min.	20 min.
(3) Time to clear the scene if a wrecker **was** required	23.1 min.	45 min.

B. Equipment Required

The officers assigned to patrol and investigate accidents on freeways have need for much equipment. The following items of equipment were reported:

	Number of Cities
Motorcycles	24
Automobiles	33
Two-way Radios	33
Cameras	23
Special Report Forms	19
Other Special Equipment	24

Some of the items reported as "Other Special Equipment" included first-aid kits, flares, reflector vests and gloves, traffic cones, fire extinguishers, measuring devices (roll-a-tapes), chalk, power jacks and wrecking bars, tow chains, radar, blankets, brooms, drunkometers, typewriters, brake testing devices, and stretchers. Although all 33 cities reported that automobiles were used, 13 cities expressed a preference for motorcycles for patrolling freeways.

C. Emergency Vehicle Operation

A factor which often creates confusion at an accident scene and adds to the congestion is the emergency vehicles which try to get near the scene. All of the cities reported that wreckers were dispatched by the police department to accident scenes, and in all but two cities, ambulances were also dispatched. However, in eight cities, private citizens engaged in operating a wrecker or ambulance service monitored police radios and went to a reported accident scene without being dispatched. It was also found that only eight cities provided wrecker service and 13 cities provided ambulance service.

Although twenty-six cities reported a city ordinance limiting the use of sirens on both public and private vehicles, certain vehicles could use sirens under any circumstances. These vehicles were:

	Number of Cities
Police vehicles	33
Fire-fighting vehicles	32
Wreckers	4
Ambulances	31
Others	3

The other vehicles allowed to use sirens in some cases were emergency public utilities' vehicles, city physician's vehicle, and private policeman's vehicle (by permit only).

D. Summary of Results

It is evident from the questionnaires that only a very few cities actually treated the freeway system as a separate phase of their patrol and accident investigation duties. Only ten of the cities surveyed made assignments of enforcement personnel to freeways only. The most common method of patrol considered the freeway as simply an extension of the surface street system. It was reported that a freeway usually passed through several patrol districts. Each of these districts was patrolled frequently, two or three times per hour, by a policeman in an automobile. This patrolman did not actually enter the freeway but observed its operation as he crossed it on a major arterial street. If he observed congestion or some hazardous operation, he was then in a position to act. By using this method of patrolling, the freeway's operation was checked only at regular intervals. This method of patrolling was sometimes supplemented by patrolmen stationed at critical points along the freeway during the peak periods.

When an accident occurred, an accident investigator located in that section of the city was assigned to the accident. The speed at which he cleared the roadway and conducted his investigation could have a serious effect on the freeway's operation. Usually, before the damaged vehicles were removed from the traveled portion of the roadway, some mark or other means of recording the exact position and location of any person killed or injured, the vehicle, and the skid marks was used. These markings were then safeguarded until the investigation was completed. When the accidents were serious and there were fatalities or injuries, such a procedure was necessary. Under these circumstances, traffic should have been diverted to an alternate route.

Accidents involving only minor property damage should not be allowed to cause other traffic to be delayed. Several systems for dealing with this type of accident were reported. In one city, police officers, a city-operated wrecker and ambulance were dispatched immediately to a freeway accident. Upon arrival at the scene, the city physician in the ambulance cared for the injured, the police officer

photographed the entire accident scene which recorded the positions of the vehicles and their "come-to-rest" locations. The wrecker then moved the vehicles to an exit and then to a nearby street where the investigation was completed after the freeway traffic congestion was relieved. Other cities used a similar procedure with the exception that they moved the damaged vehicles only to the through lane shoulder where the investigation was completed.

Because a large portion of the freeway accidents were minor rear-end collisions, which frequently involved several cars, one city devised a plan where the investigating officer took up the driver's license of all the drivers involved and instructed them to move to some specific off-street location where he conducted his investigation.

Freeway accidents definitely have the effect of causing other accidents. In order to prevent motorists from approaching a line of stopped cars from the rear at a speed which would not allow them to stop, one city established the policy of dispatching a unit to the "end of the line" of stopped or stopping vehicles. The function of this unit was to move with the "end of the line" to prevent other accidents by warning and slowing the on-coming traffic.

As one city summarized, a good accident investigator, from a freeway operation standpoint, should:

1. Get to the scene as quickly as possible with safety.
2. Care for the injured.
3. Safeguard the scene from further accidents by:
   A. Calling for assistance.
   B. Diverting traffic.
   C. Clearing the scene quickly of all visible signs of the accident.
4. Complete his investigation at some location where he will not influence the freeway traffic.

CONCLUSIONS

Based on the results of the questionnaire survey and the freeway accident field studies, the following conclusions are presented:

1. While there is a need for all accidents to be properly located and the information properly recorded by the accident investigation personnel, there is also a definite need to clear the freeway of all visible signs of the accident as quickly as possible in order to minimize the operational restrictions imposed by congestion at the accident scene.

2. Freeways in congested urban areas should be patrolled adequately so that there is no need for a motorist involved in a traffic accident to report the accident to the police department in order to have the accident investigated.

3. Most cities do not assign special enforcement and accident investigation personnel specifically to freeway duty only. The freeways are generally considered an extension of the surface street system and are integrated into the various patrol districts.

4. In many cities, accident information concerning freeways is not maintained in such a manner as to make the information readily available. For example, volume data and accident reports may be maintained by separate agencies. This makes it difficult to know what the freeway problem really is. It also makes it difficult to know such things as the location of high accident frequency locations.

5. No two freeway accidents are identical and each requires prompt action based on the sound judgment of the patrol and investigating personnel to minimize congestion and delay.

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APPENDIX

ACCIDENT INVESTIGATION QUESTIONNAIRE

City_____ State_____

Name of official completing questionnaire_____

Title of official completing questionnaire_____

Population of city_____

Are there freeways within the city's limits on which the city has the responsibility of investigating accidents? (Yes or no)_____ (If no, please return the questionnaire unanswered.)

If so, approximately how many miles?_____miles.

What was the accident rate (accidents per 100 million vehicle miles) and the number of fatalities for these freeways during 1961?

Freeway	Accident Rate	No. of Fatalities

Total size (number) of police force_____ How many officers are assigned to patrol and investigate accidents on freeways?_____

Are specially trained officers assigned to patrol freeways?_____

To investigate accidents on them?_____

These officers are equipped with which of the following items (check items used):

_____Motorcycles
_____Automobiles
_____Radios
_____Cameras
_____Special report forms
_____Other special equipment (please list)

_____

_____

Are motorcycles preferred over automobiles for patrolling freeways? (yes or no)_____

How many officers are used to investigate a freeway accident? (check the number used under average circumstances)

_____One
_____Two
_____Three
_____More (how many)_____

Freeway patrolling is done (check one):

_____Periodically (say when there seems to be an unusually large number of freeway accidents) during the peak periods only.
_____Periodically for the entire day.
_____Continuously (every day of the year) during peak periods only.
_____Continuously for the entire day.

How many officers do you think would be necessary to adequately patrol all of the freeways in your city (1) during peak rush hours only?_____ (2) continuously?_____

Do you prefer to patrol freeways? (check one):

_____During peak hours only.
_____Continuously.

What would you estimate as the average time it takes for an officer to reach the scene of a freeway accident after its occurrence?_____

Do you experience a backlog of freeway accidents waiting to be investigated? (check one):

_____Frequently
_____Occasionally
_____Rarely
_____Never

What is the maximum time that a motorist involved in a freeway accident has had to wait for an officer to arrive?_____

On the average, how long after the officer arrives at the accident scene does it take to clear the roadway if the accident is minor and all cars can move under their own power?_____

On the average, how long after the officer arrives at the accident scene does it take to clear the roadway if the accident is major and the vehicles require a wrecker to move them?_____

Are motorists prohibited by law to move their damaged vehicles from the traveled portion of the roadway until an officer instructs them to?_____

In clearing the freeway of an accident, which of the following procedures is used most often (check one):

_____The damaged vehicles are moved to the emergency shoulder (or other similar area near the thru lanes).

_____The damaged vehicles are removed to a nearby street, frontage road or other location not visible to the thru lane traffic.

Are motorists diverted to alternate routes, where they exist, by the police officers in order to minimize the congestion behind the accident scene? (yes or no)_____

How often is one freeway accident a contributing factor in the cause of another freeway accident? (check one):

_____Invariably
_____Frequently
_____Occasionally
_____Rarely
_____Never

Are there any design features of the freeways which hinder the work of the investigating officers? (Such things as the absence of median openings and frontage roads might make it difficult for the officer to get to the accident scene.) Please list them:_____

_____

_____

_____

Does the city operate its own wrecker service?_____ Ambulance service?_____

Does the city police dispatcher (or someone equivalent) dispatch wreckers to a freeway accident?_____

Ambulances?_____

Do private citizens engaged in these businesses monitor police radios and go to an accident scene without being dispatched?_____

Are disabled vehicles (breakdown, flat tire, etc.) allowed to remain on the shoulders near the freeway thru lanes?_____ How long?_____

Is there a city ordinance limiting the use of sirens on both private and public emergency vehicles?_____.

If so, which of the following are allowed to use sirens on freeways under any circumstances:

_____Police officers
_____Fire-fighting equipment
_____Wreckers
_____Ambulances
_____Others

Please describe in detail any accident investigation procedure or method used which is beneficial to the problem of relieving the congestion behind a freeway accident and getting normal operation restored on the freeway as rapidly as possible. (Answer on back if necessary.)

SUMMARY OF CITIES SURVEYED BY QUESTIONNAIRE

City	Questionnaire Returned	Questionnaire Completed
1,000,000 and over		
Chicago, Ill.	x	x
Detroit, Mich.		
Los Angeles, Calif.	x	x
Philadelphia, Pa.		
New York, N. Y.	x	x
750,000 - 1,000,000		
Washington, D. C.	x	
Cleveland, Ohio	x	x
Baltimore, Md.	x	
Houston, Tex.	x	x
500,000 - 750,000		
Buffalo, N. Y.	x	
Dallas, Tex.	x	x
Milwaukee, Wis.	x	
Pittsburgh, Pa.		
Seattle, Wash.	x	
New Orleans, La.	x	x
San Diego, Calif.	x	x
San Francisco, Calif.	x	
San Antonio, Tex.		
350,000 - 500,000		
Denver, Colorado		
Fort Worth, Tex.	x	x
Indianapolis, Ind.		
Louisville, Ky.	x	x
Memphis, Tenn.		
Columbus, Ohio	x	x
Portland, Ore.		
Phoenix, Ariz.	x	x
Kansas City, Mo.	x	x
Oakland, Calif.	x	
Atlanta, Ga.		
200,000 - 350,000		
Nashville, Tenn	x	
Dayton, Ohio		
Grand Rapids, Mich.	x	x
Rochester, N. Y.	x	x
Wichita, Kansas	x	
San Jose, Calif.	x	
Norfolk, Va.	x	
Des Moines, Iowa		
Tampa, Fla.	x	
Providence, R. I.		
Omaha, Neb.	x	
Syracuse, N. Y.		
Charlotte, N. C.		
Oklahoma City, Okla.	x	x
Miami, Fla.	x	
Jacksonville, Fla.	x	x
Tulsa, Okla.		
Albuquerque, N. M.	x	x
Toledo, Ohio	x	x
Richmond, Va.	x	
Akron, Ohio	x	
Tucson, Ariz.	x	
Mobile, Ala.	x	
Birmingham, Ala.	x	
El Paso, Texas	x	
Long Beach, Calif.	x	x
100,000 - 200,000		
Spokane, Wash.	x	
Torrance, Calif.	x	
Knoxville, Tenn.		
Topeka, Kansas	x	
Berkeley, Calif.	x	
Waterbury, Conn.		
Fresno, Calif.		
Fort Wayne, Ind.	x	
South Bend, Ind.	x	
Amarillo, Tex		
Trenton, N. J.	x	x
Lansing, Mich.	x	
Madison, Wis.	x	
Beaumont, Tex.	x	x
Salt Lake City, Utah		
Austin, Tex.	x	x
Utica, N. Y.	x	
Flint, Mich.	x	
Portsmouth, Va.		
Rockford, Ill.	x	
Newport News, Va.	x	
Hartford, Conn.		
Tacoma, Wash.	x	
Springfield, Mass.		
Yonkers, N. Y.	x	
Montgomery, Ala.	x	
Little Rock, Ark.	x	
Cambridge, Mass.		
Lincoln, Neb.	x	
Columbus, Ga.		
Allentown, Pa.		
Corpus Christi, Tex.	x	x
Canton, Ohio	x	x
Evansville, Ind.		
Lubbock, Tex.		
Chattanooga, Tenn.	x	x
Peoria, Ill.	x	
Baton Rouge, La.	x	
Bridgeport, Conn.	x	
Niagara Falls, N. Y.		
New Haven, Conn.	x	
Pasadena, Calif.	x	x
Kansas City, Kansas	x	x
Macon, Ga.		
Shreveport, La.	x	
Glendale, Calif.	x	
Greensboro, N. C.	x	x
Arlington, Va.		
Anaheim, Calif.	x	
Youngstown, Ohio	x	
Worcester, Mass.	x	
Winston Salem, N. C.	x	x
Jackson, Miss.	x	
Duluth, Minn.	x	
Elizabeth, N. J.	x	
Dearborn, Mich.		
Wichita Falls, Tex.	x	x
Erie, Pa.	x	
Hammond, Ind.	x	x
Santa Ana, Calif.	x	
Minneapolis, Minn.	x	
St. Paul, Minn.	x	
St. Louis, Mo.	x	x
Savannah, Ga.	x	
Gary, Ind.	x	
Cincinnati, Ohio		
Scranton, Pa.		
Newark, N. J.		
Albany, N. Y.		
Boston, Mass.		