

Promotional Issues Related to Accident Investigation Sites in Urban Freeway Corridors

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In this paper, a study of administrative, legal, and insurance issues concerning Accident Investigation Sites (AISs) in urban freeway corridors is described. The issues were identified through (a) a literature review; (b) contact with a limited number of individuals, organizations, and agencies involved in the coordination or administration of legal and insurance matters as related to traffic accidents; (c) interviews with urban freeway corridor traffic management teams; (d) contact with highway operations personnel from selected urban freeway surveillance and control systems; and (e) experiences of the authors. AISs are low-cost, specially designated and signed areas off the freeway where damaged vehicles can be moved, motorists can exchange information, and police and motorists can complete the necessary accident forms. These areas are located so that the motorists involved in the accident, the investigating police, and the tow truck operators are out of view of freeway drivers. "Rubbernecking" (and, consequently, freeway congestion) is thus reduced. Freeway congestion is also reduced because the motorists involved in property-damage-only accidents have a place where they can move their vehicles while waiting for the police investigators to arrive. Experiences with AISs in Houston, Texas, resulted in a benefit-cost ratio of 28:1 during the first year of operation. Data indicated that the potential benefit-cost ratio could be as high as 35:1, that is, \$35 return for every \$1 invested. The AIS concept is applicable for a variety of metropolitan area traffic management strategies. The administrative, legal, and insurance issues that must be addressed by highway and police agencies to implement and operate AISs successfully are identified and discussed.

Accident Investigation Sites (AISs) are specially designated and signed areas off the freeway where damaged vehicles can be moved, motorists can exchange information, and police and motorists can complete the necessary accident forms. These areas are located so that the motorists involved in the accident, the investigating police, and tow truck operators are out of view of freeway drivers. This reduces "rubbernecking," which is a major cause of congestion at freeway accident scenes. The AISs are may be located under a freeway overpass, on a side street or parallel frontage road, or in a shopping center parking lot out of view of freeway traffic.

The research reported in this paper was sponsored by FHWA (1) and involved a review of legal and insurance issues related to AISs through library searches and contact with a limited

number of individuals, organizations, and agencies involved in the coordination or administration of legal and insurance matters related to traffic accidents. In addition, the literature on the use of AISs was reviewed. Guidelines for locating, designing, and operating AISs are presented elsewhere (see companion paper by Dudek et al. in this Record).

BACKGROUND

Characteristics and Effects of Freeway Incidents

The frequency of incidents on urban freeways and their subsequent adverse effects in terms of congestion, delays, and secondary accidents have been well documented by several authors and summarized by Dudek (2). The consequences of accidents and other incidents are congestion, delay, shock waves in the traffic stream, secondary accidents, and other adverse effects.

Accidents that require police or wrecker assistance, as well as minor accidents in which the drivers refuse to move their vehicles off the freeway lanes until the police arrive, often block traffic for a considerable time. Studies conducted by the Texas Transportation Institute (TTI), for example, indicated that an average accident requiring (or waiting for) police assistance blocks one or more freeway lanes for an average of 19 min (2). An additional 25 min is required to complete the accident investigation.

Solution Approach

From a traffic management viewpoint, when an accident or other incident occurs on an urban freeway, the vehicles, debris, or both must be removed as quickly as possible. Approaching freeway traffic (demand) should be intercepted before it reaches the reduced capacity area caused by the incident and then redirected to routes with excess capacity. In addition, drivers must be warned of the slowed traffic ahead.

Freeway incident management (FIM) systems are frequently employed by highway and police agencies to combat congestion and safety problems resulting from accidents. These systems involve a coordinated and preplanned approach that uses human and mechanical resources to restore freeway traffic to normal operation after an incident has occurred. The approach involves a systematic process for

- Detecting any incident,

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- Identifying the scope (i.e., number of vehicles involved, number of lanes affected, severity of the accident, anticipated time of the lane closures, etc.) and needs (e.g., police, fire department, wrecker and maintenance equipment and personnel) of the incident, and
- Providing appropriate responses to aid the motorists involved and to minimize the adverse effects of the incident by clearing the incident as quickly as possible.

Minimizing the Effects of Freeway Accidents

There are two ways to minimize the adverse effects of freeway accidents. First, the severity and duration of the reduction in freeway capacity should be reduced by clearing the vehicles involved in the accident from the traveled lanes as soon as possible, and second, the distractions (accident, police and wrecker vehicles) should be removed from the roadside.

One major low-cost approach to minimizing the adverse effects of freeway accidents is the use of AISs. The first AIS system was installed along the Gulf Freeway in Houston, Texas, in 1971 (3). The benefit/cost ratio for the first year of AIS operation in Houston was 28:1. Data indicated that the potential benefit/cost ratio could be as high as 35:1, that is, \$35 return for every \$1 invested in AISs.

STUDY METHODOLOGY

Interviews were conducted with the following individuals or representatives from organizations and agencies:

- City attorney from a large city;
- Chief justice, district supreme court of appeals;
- Assistant attorney general and former judge, municipal court;
- Automobile club representative;
- Insurance association representative;
- Insurance company representative;
- Representative of a private company with a large fleet of vehicles;
- Representatives of urban freeway traffic management centers in two states (New York and Virginia); and
- Representatives of traffic (corridor) management teams from five cities in Texas.

The traffic management centers and teams normally included members of the traffic engineering and planning divisions of the city or state transportation departments, local transit authority, and city or state police.

IMPLEMENTATION OF ACCIDENT INVESTIGATION SITES

Experiences with AISs in Texas

Houston

Initial Program As mentioned previously, the first AIS system was installed in Houston, Texas, in 1971 (3). The Texas State Department of Highways and Public Transportation (SDHPT) and TTI developed and implemented an AIS system adjacent to the I-45 Gulf Freeway in Houston in conjunction with a corridor traffic management system. The purpose of the

AIS system was to provide a place out of view of the freeway motorists where police officers could investigate accidents and where motorists could exchange information. Texas law requires police investigation only for injury and fatality accidents, although drivers must complete and submit accident report forms for other accidents.

SDHPT and TTI installed 16 AISs within a 6-mi section of the freeway. Eight of the sites were located on city streets adjacent to the freeway, two were located on city streets under the freeway, one was located off a city street on freeway right-of-way, and five were on previously unused space under freeway structures. Two or more guide signs were erected on the frontage road and city street approaches to the sites to direct the motorists and to identify the AIS locations by number. No signs were placed adjacent to the traveled lanes of the freeway.

The Houston AIS system was designed so that the Houston Police Department could direct the motorists involved in a minor accident to drive to the nearest site at which the investigation would be completed. The police were provided with booklets containing maps detailing all of the site locations and with directions on how to exit the freeway to reach the closest site.

During the initial media releases, members of the public were advised to drive to the closest AIS if their vehicles were operational. Motorists, however, were reluctant to move their vehicles from the accident scene without being directed to do so by the police. No telephones were installed with the AIS system.

Records kept as part of the Gulf Freeway Surveillance Project revealed that the AIS system was used extensively by the police during the first 2 years. During the first year of operation, the AIS system was used for accident reporting for 40 percent of the 851 accidents reported in the study area. In addition, another 176 investigations (21 percent) were conducted at other off-freeway locations.

Benefits of the AIS system during the first year included \$203,000 savings due to delay reductions because freeway congestion cleared faster when accidents were out of sight and \$25,000 savings attributed to a reduction in secondary accidents. The annual cost for installation and maintenance of the sites was estimated to be \$8,000, resulting in a benefit/cost ratio of 28:1 (3).

Even though the AIS system was very successful during the first year, accident records indicate that an additional 25 percent of all accidents could have been moved to the AIS system or to other off-freeway locations. These data suggest that the potential benefit/cost ratio may be as high as 35:1.

The success of the AIS system during the early months of operation was due to a number of factors. The system was well designed by the staff of the Gulf Freeway Surveillance Project, which included representatives of the Houston Police Department in addition to staffers from SDHPT and TTI. The Gulf Freeway was monitored electronically by vehicle detectors and a closed circuit television system. When an incident occurred on the freeway, a police officer in the control center could call a police patrol unit by telephone or radio, provide information on the location and nature of the incident, and suggest an AIS for the accident investigation. Even without the central control

officer's reports, the surveillance project was well known to the police department.

The surveillance staff had requested and received cooperation and assistance from the police in the collection of data on many projects for several years. Thus the procedure for collecting data from the police accident investigators to assess the effectiveness of the AIS system was also instrumental in maintaining a high level of usage by the police.

The forms used to record the use and nonuse of the AIS system (2) were collected and analyzed weekly by the surveillance project staff, and the results were forwarded to the Chief of the Traffic Bureau of the Houston Police Department. The monitoring process continued for 2 years, until 1973, when the first phase of a major freeway rehabilitation project began on the Gulf Freeway. The Surveillance and Control Project was then shut down, and the record keeping on AIS usage was discontinued.

During Construction and in the Future During the next 7 years, the redesign and reconstruction of the Gulf Freeway changed the access patterns to and from the frontage roads. The original AIS design was keyed to the exit ramps for quick and direct movement from the freeway shoulders. Some of the sites, located under the freeway, served both directions of freeway traffic flow, whereas the others, on the adjacent streets, served only one direction.

Even though the construction activities severely restricted movement in the area, the AIS system was never officially taken out of service. However, as the reconstruction work progressed, most of the sites became inoperative. The few that were unaffected by the construction were not maintained, and the signs and pavement markings were not replaced when they deteriorated or were destroyed. The map booklets that were provided to the police were not updated or replaced. In general, the original AIS system was allowed to phase out by attrition (Table 1).

Some of the AIS system has been included in current plans for the reconstruction of the Gulf Freeway. One site under the

freeway was redesigned and reconstructed when an interchange was improved. An innovative design combined the AIS parking area with the roadway for a U-turn. Another special site under the freeway has been preserved during the reconstruction and will be put back into service as soon as the freeway construction is completed. The other special sites under the freeway have been taken out of service and are not scheduled to be replaced because of a lack of access.

The SDHPT Houston District Office will not reinstate the full AIS system described by Pitten and Loutzenheiser (3) because some of the locations are no longer functional. Plans are underway, however, to replace the signs for all existing AIS locations, to upgrade one of the existing parking areas, and to construct new sites.

SDHPT is committed to the AIS concept. It is a low-cost, high-benefit strategy. However, AIS must be supported by the local policing agency to receive the type of maintenance by SDHPT that the system requires. To get the active support of the police, formal requests for AIS use and periodic reviews of the usage rates are required. The supervisors of the accident investigation section of the police department must also be supportive of the AIS concept. In Houston, this type of support is expected, and the system should be back in full operation as soon as the construction on the Gulf Freeway is completed in 1988. Other Houston freeways that are now being reconstructed will also have AIS systems installed.

San Antonio

In 1980, the SDHPT San Antonio District, working closely with the San Antonio Police Department, identified 13 candidate locations on the freeway system that had high accident experience. Four AISs were installed at the more accessible locations. Each AIS site had telephones with direct lines to the police dispatchers.

The objective of the AIS System in San Antonio was to get the motorists involved in minor accidents to drive to the AIS, place a call to the police department for assistance, and then

TABLE 1 STATUS OF THE ORIGINAL HOUSTON ACCIDENT INVESTIGATION SITE SYSTEM

Site Number	Site Type ^a	Direction Served	Status of Location	Status of Signs ^b
1	1	North	Removed from service	Removed
2	1	North and south	Closed temporarily	Removed (TBR)
3	1	North and south	Closed temporarily	Removed (TBR)
4	2	North	Closed temporarily	Removed (TBR)
5	2	South	Removed from service	Removed
6	2	North	Closed temporarily	Removed (TBR)
7	2	South	Closed temporarily	Removed (TBR)
8	2	North	In service	Needs repair (TBR)
9	2	South	Closed temporarily	Removed (TBR)
10	2	North	Removed from service	Removed
11	1	South	Removed from service	Removed
12	1	North and south	Closed temporarily	Removed (TBR)
13	1	North and south	In service (new)	Removed (TBR)
14	2	South	Closed temporarily	Removed (TBR)
15	2	North	In service	Needs repair (TBR)
16	2	South	In service	Needs repair (TBR)

^aType 1: specially constructed site. Type 2: existing parking areas.

^bTBR: Signs to be replaced after the AIS is placed back in service.

wait at the site for the investigator to arrive. A media campaign, newspaper articles, and television and radio announcements were used to inform the public about the new AISs. SDHPT representatives appeared on talk shows to explain the operation and to answer questions. In addition, directional guide signs were erected on the freeway.

In spite of these efforts, the system was not used by the public because

- motorists did not become familiar with the system even though a media campaign had been conducted;
- motorists were unwilling to move their vehicles before the police arrived; and
- motorists were concerned that by moving their vehicles, they would lose their insurance coverage.

Also, the system was not always used by the police after they arrived at the scene of an accident. Some accident investigators preferred to use the shoulder and outer separation near the accident scene instead of removing the vehicles to an AIS.

Currently, two of the four AIS sites in San Antonio have already been removed, and a third site is scheduled to be removed from service because of freeway reconstruction. All of the telephones were removed because of vandalism. SDHPT considers the remaining locations to be operational. The signs, pavement, and lighting are being maintained. However, the San Antonio Police Department does not consider the system to be operational.

The concept of voluntary removal of vehicles from the freeway by the drivers before the police arrive has not worked well at any of the cities in Texas. The lack of support by the San Antonio Police can be traced to three factors:

- When the AIS system was installed, the police captain in charge of accident investigation was in favor of the program. When he was promoted, his successor did not encourage the staff to use the sites.
- Personnel changes at the SDHPT San Antonio District Office further reduced the level of support. The cause was a lack of communication rather than a lack of interest among the new personnel.
- There was no formal reporting or feedback mechanism on AIS system use, so the usage rate continued to fall.

There are current plans to install a few AISs at other locations that have good access and visibility (to discourage vandalism and to enhance motorist safety). These sites will be located with the assistance of the police department, and SDHPT anticipates increased participation by the police accident investigators.

Dallas

In May 1981, the city of Dallas installed an AIS system on the North Central Expressway (US 75). The system consisted of 10 sites located on the streets adjacent to the freeway. Signs were erected on the freeway, frontage road, and side streets to direct the motorists to the sites and to identify the locations by number.

The AIS system was designed to be used by the Dallas Police Department to direct the motorists off the freeway to the

sites to exchange information and to complete the investigations. Guide signs were placed on the shoulders of the main lanes of the freeway to remind the police of the AIS system. Guide signs were also placed at the exit ramps, intersections, and curb sites.

To date, use of the system has been less than expected. Usage has not been strongly emphasized within the Dallas Police Department. There are no monitoring or evaluation processes to determine the benefits of the system. Police and city transportation officials place the usage rate at 10 to 15 percent of the accidents that could be moved.

The North Central Expressway is scheduled for reconstruction during the next 5 years. Traffic control plans call for most of the emergency shoulders to be removed for travel lanes during reconstruction. The AIS system, or some form of quick incident removal procedures, will be implemented while the freeway is being upgraded. SDHPT will include some form of AIS use in the traffic control plan.

El Paso

In June 1986 the SDHPT El Paso District installed an AIS system on I-10 east of the central business district. The system consists of 10 sites, located on the eastbound frontage road, between the frontage road and the right-of-way line. These locations, although not completely out of sight of the freeway motorists, are far enough removed to lessen the impact of incident scenes on freeway traffic capacity.

The sites are well designed to provide a safe area for the vehicles and the occupants. Signs were not erected on the freeway but were placed on the frontage roads and at the sites. Guide signs were placed at the frontage road intersections to direct traffic from the westbound lanes to the AISs by way of U-turn lanes. The sites are in well lighted areas, downstream of freeway exit ramps, and near public telephones. Signs at the AISs provide telephone numbers for contacting the police department and the AIS identification number.

An intensive media campaign was conducted by the El Paso Police Department when the sites were opened. There is no formal procedure underway at this time to monitor the use of the system, but SDHPT officials plan to make a survey of their usage and the benefits to justify the expansion of the system.

Summary of Knowledge Gained from Texas Experiences

Experiences in Texas have indicated that AISs are low-cost highway improvements that result in significant benefits to motorists. The benefit/cost ratio for an AIS system in Houston, for example, was 28:1. Data suggest that the potential benefit/cost ratio may be as high as 35:1.

The Texas experiences have also highlighted the need for effective management techniques. Recommendations based on the Texas experiences are incorporated into AIS administrative, location, design, and operation issues discussed in the next section.

CURRENT AIS ADMINISTRATIVE ISSUES

Lead Agency

The traffic and transportation agencies of cities, counties, and states have the authority to design, construct, and maintain AISs on their property and to acquire the rights (through agreements) to use private commercial parking areas for these purposes. To develop an effective AIS system in an urban area, the involved agencies should include, as a minimum, the department of transportation and the policing agencies that will use the AIS system. Also, a lead agency (usually the state department of transportation) should be designated to be responsible for the design and implementation of the AIS system for the entire freeway network. One approach to the successful development and operation of an AIS system is through a local traffic management team.

Traffic Management Teams

A traffic management team brings together professionals from the various traffic-related agencies in the area and helps them to work together to solve the area's traffic problems (4). The team improves the overall traffic operation and safety in the freeway corridors by coordinating the activities of the principal operational agencies in the urban area. The communication, coordination, and cooperation that can be realized through working side by side on the team are essential to its successful operation. Because of these relationships and activities, the traffic management team is a logical focal group for the administration, design, implementation, and operation of an AIS system.

The state of Texas provides an example of the success of traffic management teams. The first traffic management team in Texas was officially formed in 1975. Currently, 12 teams are operating in the state. These teams cover the seven largest metropolitan areas and the nine largest cities, as well as other, smaller areas. The rapid spread of the team concept and its wide acceptance among the large cities in Texas indicates that it is very beneficial. The need for the team approach was recently reemphasized by several governmental agencies during a national conference, "Corridor Traffic Management for Major Highway Reconstruction," which was held in Chicago, Ill., September 28–October 1, 1986.

The identification of specific agencies that should be represented on a local traffic management team is difficult because different cities have different situations. However, some agencies are almost always included on the team. These include the city and state traffic engineering offices, city and state law enforcement agencies, and the local transit authority. Other agencies and divisions should be included if they are significantly involved in the operation of the freeway corridor or corridors.

Distribution of Responsibilities

The responsibilities that each agency assumes in the day-to-day operation of AISs will be based on the organizational structures of each agency and the interagency operational structure within the city. In addition, specific interests of individuals and agencies will be influential in determining responsibilities.

Expected Benefits and Advantages of AISs

The monetary value of AISs fall into five categories:

- Reduced delay to freeway motorists,
- Reduced vehicle operating costs (e.g., gasoline consumption),
- Reduced secondary accidents,
- Reduced pedestrian accidents, and
- More efficient use of public agency personnel.

Delay and Operating Costs

AISs reduce delay time of freeway motorists and vehicle operating costs through the early removal of incidents from the traffic lanes and the removal of the vehicles from the sight of freeway motorists, particularly during the peak traffic periods. Examples of the reduced delay benefits of removing incidents occurring during the peak period to AISs were presented previously.

Monetary benefits of AISs resulting from reduced delay and vehicle operating costs are determined by computing the estimated delay and operating costs that would be expected if AISs did not exist and comparing them with the delay and operating costs calculated by assuming that AISs do exist. Analytical procedures and simplified computer programs are available to assist highway agencies in evaluating the delay and vehicle operating cost reductions and the monetary values of the reductions on the basis of the time of day that the incidents occur and length of time that they affected freeway traffic. For example, an analytical procedure for estimating freeway traffic congestion and calculating delay was published by Morales (5). A microcomputer program using an interactive Lotus 1-2-3 spreadsheet was also developed and is available for general use. Memmott and Dudek (6) developed a computer program called QUEWZ for determining delay and road user costs associated with delay and vehicle speed changes caused by stop-and-go driving in congested traffic. The program was developed for evaluating the effects of lane closures at freeway construction and maintenance work zones, but it can also be used for evaluating the effects of freeway incidents. Two major advantages of this computer program are that the information necessary to run the program can be easily obtained by highway agencies and that road user costs are automatically calculated.

Another approach to estimating the delay associated with freeway lane blockages is to use simple arithmetic. Subtracting the estimated traffic volume moving through the lane blockage section of the freeway from the estimated demand volume each hour gives an estimate of the number of vehicles trapped in the stop-and-go traffic during the hour. Multiplying the number of vehicles in the congestion by a time factor produces an estimate of vehicle-hours of delay.

Acceptable monetary values of time that can be applied to the computations of delay already exist. For example, in Texas as of August 1985, the average value of time for passenger vehicles was \$10.55 per vehicle-hour; that for trucks was \$19.25 per vehicle-hour (7). The value of time is affected by the composition of traffic and by changes in the monetary value of the dollar. These values must therefore be adjusted regularly.

An example of detailed analyses of the value of vehicle travel time can be found elsewhere (7).

Secondary Accidents

Each freeway incident has the possibility of causing a secondary accident, that is, an accident involving a stopped, parked, or disabled vehicle. Information about the number of secondary accidents that occur on a given section of freeway is difficult to obtain. It may therefore be necessary to make an estimate on the basis of experiences elsewhere. Because the monetary benefits of reducing secondary accidents will probably be relatively small in comparison to reduced delay and vehicle operating costs, the error associated with this estimating procedure may not be too critical. Fambro et al. (8) estimated that in 1973, 144 secondary accidents occurred in a 64-mi freeway network in Houston.

Monetary values can be placed on the cost of accidents. Accident cost statistics can be found in reports produced by the National Highway Traffic Safety Administration (9) and National Safety Council (10). In addition, highway agencies and research organizations periodically publish reports summarizing accident costs (11). Rollins and McFarland estimated that the costs for rural accidents as of July 1985 were \$1,151,100 per fatal accident, \$13,900 per injury accident, and \$1,700 per PDO accident. For urban areas the estimated costs per accident were \$1,077,700 for fatal accidents, \$11,400 for injury accidents, and \$2,000 for PDO accidents (11).

Pedestrian Accidents

AISs may also reduce pedestrian accidents. A California study (12) concluded that 43 percent of all the pedestrians struck on freeways were on the facility because their vehicles were either disabled or involved in a prior accident. In the absence of similar data in the local area, the California percentage can be used to estimate the potential reduction in the number of pedestrian accidents that occurred by using the number of total pedestrian accidents on the freeways to be serviced by AISs.

Efficient Use of Personnel

AISs can benefit local and state agencies by allowing a more efficient use of personnel. For example, by providing a refuge for motorists involved in accidents, encouraging them to move their vehicles to AISs before the police arrive, and providing telephone communications at the AISs, police will have additional time to attend to other responsibilities. Therefore savings might be realized by reducing human resources requirements.

CURRENT AIS LEGAL AND INSURANCE ISSUES

Ideally, for effective freeway incident management, vehicles involved in PDO accidents should be moved off the freeway lanes as soon as possible, even before the police arrive, to minimize the adverse effects of the lane blockages. However, interviews with highway and police agencies, insurance companies and an insurance association, an automobile club, lawyers, and judges revealed an obstacle that must be overcome. These agencies, organizations, and individuals reported that a

majority of the motorists believe that it is illegal to move their vehicles before the police arrive, even if the distance traveled is a few feet to the shoulder of the roadway. In addition, it was reported that most motorists believe that it is necessary to wait for the police to arrive before moving the vehicles so that the insurance requirements would be satisfied.

Moving a vehicle before a police officer arrives is not normally a violation of the law in most states. In fact, the opposite may be true. Laws in some states explicitly require that vehicles involved in noninjury (PDO) accidents be moved so that the stopped vehicles will not interfere with traffic on the traveled way. In contrast, traffic laws in other states are not explicit on the issue. An assistant attorney general in Texas stated that because PDO accidents seldom go to trial, there is no reason for not moving minor accidents from the roadway before the police arrive. However, misperceptions about legal and insurance requirements and the specific requirements of several private and public fleet operators cause motorists involved in PDO accidents to take actions that are in conflict with freeway incident management objectives.

This section summarizes the legal and insurance issues that affect (a) motorists' moving their vehicles off the travelway before the police arrive, and (b) motorists' moving the vehicles to an AIS to conduct the accident investigation and to complete the necessary accident forms. The conflicts that result from the policies of private and public fleet operators and from insurance company instructions are also discussed.

Traffic Laws and Ordinances

Most states and municipalities use the *Uniform Vehicle Code* and the *Model Traffic Ordinance* as guides to setting up traffic laws and ordinances (13, 14). These publications were prepared and are periodically updated by the National Committee on Uniform Traffic Laws and Ordinances. The *Uniform Vehicle Code* is a set of motor vehicle laws that is supposed to reflect the best local, state, and federal laws and regulations, as judged by the National Committee, and is a guide for states in preparing and updating motor vehicle laws. The *Model Traffic Ordinance* is a companion document that contains a set of motor vehicle ordinances for municipalities. It provides a comprehensive guide or standard for cities and counties to follow in reviewing and revising their traffic ordinances. Section 10-103, "Accidents Involving Damage to Vehicle or Property," of the *Uniform Vehicle Code* addresses the issue of minimizing the adverse effect of accident vehicles to traffic. The section states that

The driver of any vehicle involved in an accident resulting only in damage to a vehicle or other property which is driven or attended by any person shall immediately stop such vehicle at the scene of such accident or as close as possible, but shall forthwith return to and in every event shall remain at the scene of such accident until he has fulfilled the requirements of [Section] 10-104. *Every such stop shall be made without obstructing traffic more than is necessary* [emphasis added]. Any person failing to stop or comply with said requirements under such circumstances shall be guilty of a misdemeanor and, upon conviction, shall be punished as provided in [Section] 17-101.

The provision that "Every such stop shall be made without obstructing traffic more than is necessary" has been part of the

national code since 1934. However, as of 1983, the following 19 jurisdictions did not have the requirement in their codes: Alaska, California, Connecticut, Delaware, Kentucky, Louisiana, Maine, Massachusetts, Missouri, Nebraska, New Hampshire, New York, North Carolina, Ohio, South Dakota, Vermont, Washington, Wisconsin, and the District of Columbia (13, 14). At least two states, Texas and Georgia, expand on the requirement to minimize the adverse effects of accidents on traffic flow.

Texas is the only state that specifically addresses the use of AISs (13). The *Texas Motor Vehicle Laws* specifies the following provision for PDO accidents (15):

...when an accident occurs on a mainlane, ramp, shoulder, median, or adjacent area of a freeway in a metropolitan area and each vehicle involved can be normally and safely driven, each driver shall move his vehicle as soon as possible off the freeway main lanes, ramps, shoulders, medians, and adjacent areas to designated accident investigation site, if available, a location on the frontage road, the nearest suitable cross street, or other suitable location to complete the requirements of Section 40, so as to minimize interference with the freeway traffic. Any person failing to stop or comply with said requirements under such circumstances shall be guilty of a misdemeanor.

"Metropolitan area" is defined as "an area that contains at least one city with a population of one hundred thousand (100,000) or more, according to latest federal census, and includes the adjacent incorporated cities and unincorporated urban districts."

Georgia adopted a law stating that when accidents occur on expressways in metropolitan areas, drivers or occupants with licenses must remove the vehicles from the roadway into a safe refuge on the shoulder, emergency lane, or median when the vehicle can be normally and safely driven without further damage or hazard. A person who moves a vehicle in compliance with this law is not regarded as being at fault merely because he moved it (15).

Large cities have also taken measures to reduce the impact of accident vehicles on freeways. For example, Houston enacted an ordinance in 1978 because (16) "vehicles left standing or parked on main-travelled portions of freeways constitute a grave and undue hazard to the travelling public and impede the flow of traffic." The ordinance, in part, reads (16):

... Any commissioned police officer of the City is hereby authorized to remove, or cause to be removed any vehicle: (1) parked or standing in or on any portion of a main-travelled lane or ramp of any freeway within the city limits...

Such ordinances give the police added, written authority to take actions necessary to minimize the adverse impacts of disabled vehicles on the main lanes.

Removing Vehicles: An Old Problem

In spite of the laws on removing vehicles from freeway lanes, observations indicate that many drivers wait until police officers arrive at the scene before moving their vehicles. This problem is not new to freeway operators.

In the early 1960s, Lynch and Keese (17), concerned that most drivers did not remove their vehicles from the freeway lanes after an accident, contacted various police departments. In the survey of 33 cities throughout the nation, 27 reported

having no ordinance prohibiting a driver from removing a damaged vehicle from the freeway traffic lane before the police arrived.

Lynch and Keese then asked accident investigating officers of four Texas city police departments to furnish information on all freeway accidents for the following questions:

- Did the operator drive the vehicle to the freeway shoulder after the accident but before the police arrived?
- Could the operator have driven to the freeway shoulder after the accident but did not?

The results revealed that in the cities that did not require the vehicles to remain in place before investigators arrived, 50 percent of those vehicles able to move remained in place. Reasons given by the drivers were usually either fear of violation of law or possible loss of insurance claims.

From all indications, the drivers were not fully educated about what action they could or should take. In view of the results of the more recent interviews for the study reported in this paper, the problem has not changed in more than 25 years. Therefore encouraging motorists to move their vehicles off the travelway before the police arrive is a formidable challenge.

Fleet Operators

Government Agency and Private Company Policies and Procedures

Government agency and private company policies and procedures for operating their own fleet vehicles are often counterproductive to both the AIS concept and efficient traffic management. Therefore government and private policies and procedures should be evaluated at the local level, and measures should be taken to change them if conflicts exist.

For example, the policies of several cities and states specify that government fleet vehicles involved in accidents should not be moved before an on-site investigation and report conducted and prepared by the police. Some states require that the investigation be conducted by the state police and not by the local police. The policies do not actually discourage employees from using AISs, but they require that employees leave the vehicles on the roadway for extended periods of time until the police arrive. Another example of government conflict with FIM objectives can be found in local or state police fleet vehicle policies. Many police departments require a department representative to photograph or videotape the police vehicles involved in accidents before the vehicles are removed from the travelway.

Reporting procedures required by private companies with fleet vehicles are usually more stringent than the local and state motor vehicle laws. The reasons for these extensive procedures are to protect the organization in case of legal action, to be accountable to the taxpayers or owners of the organization in the use of the equipment, and to provide a measure of employee or departmental performance.

The public welfare would be better served if government agencies and private companies were encouraged to amend their accident reporting procedures by requesting their employees to remove vehicles involved in PDO accidents from the travelway as quickly as possible. In particular, governmental

agencies that are responsible for the safe operation of streets and highways should have fleet vehicle accident procedures that are consistent with efficient traffic management objectives.

Government Agency Accident Reporting Information Guides

Most state and city agencies place brochures or checklists in fleet vehicles to remind their employees of the procedures to follow after an accident. Procedures can also be found in departmental or employee office handbooks. However, information from selected states and cities reviewed by the research team indicates that state and city agencies are not explicit enough about moving fleet vehicles involved in PDO accidents from the freeway lanes before the police arrive. Information guides do little to encourage employees to move their vehicles. In fact, the brochures and checklists from some states and cities—even those with state or city codes that require removal—appear to suggest that the vehicles should be left on the freeway until the police arrive. Consequently, many state and city employees—like the average driver—are not aware that they might need to move the vehicles off the lanes. The government representatives interviewed by the research team thought that most government employees would leave their vehicles on the main lanes until the police arrived.

City and state agency brochures, checklists, and handbooks should be examined and revised, if necessary, to ensure that employees have explicit instructions about the removal of vehicles from the travelway. In addition, information concerning the use of AISs should also be incorporated into the procedures.

Insurance Agencies

Insurance Agency Policies

Representatives from three insurance agencies interviewed by the research team agreed that most motorists believe that they should not remove their vehicles from the travelway until the police arrive, regardless of the type of accident. They also said that no insurance company policies would be violated if a policy holder's vehicle that had been involved in a PDO accident were removed from the freeway to an AIS before the police arrived.

Insurance Company Advice and Printed Information

Although each insurance agency interviewed stated that no insurance company policies would be violated by the removal of a policy holder's vehicle to an AIS, the insurance companies do little to encourage their policy holders to move their driveable vehicles from the freeway travelway after PDO accidents. Verbal advice is generally contrary to company policy. In addition, the examples of brochures and written instructions furnished to policy holders do not include explicit instructions to remove vehicles from freeway lanes after PDO-type accidents.

The primary obstacles appear to be the high priority placed in the written instructions on contacting the appropriate police agency and the high priority that drivers give to avoidance of

accepting fault for the accident, which is thought to be a consequence of removing the vehicle without authorization from the investigating police officer. In response to questions about how insurance adjusters view the use of an AIS (removal of a vehicle) before an investigation and report by a police officer, the general opinion was that the best procedure is not to move the vehicle because moving the vehicle can have an adverse effect on the outcome of adjustments.

Insurance agencies appear to be most protective concerning the welfare and optimum protection against possible fault (responsibility) of their insured. This is only natural because of the potential problems of payment of damages and resulting insurance rate increases for policy holders. One concern expressed by insurance agency representatives that may be an underlying cause for caution in use of an AIS is the indefinite description of criteria or clear definition of what type of accident involves property damage only, which is the type of accident to which the AIS concept applies. It may be difficult for a motorist to rationally define or assess a PDO accident without assuming great risk (fault or possible lawsuit) if there is an injury that is not apparent to those involved in making the decision to remove a vehicle from a freeway lane.

Police Response to Accidents

Because of other pressing priorities, police agencies are changing their modus operandi for accident response and investigation. These changes can have both positive and negative effects on the implementation and use of AISs. Police in many large cities, for example, do not issue tickets for PDO accidents, but they do issue citations for no driver's license or no insurance card. Also, many state and city police agencies no longer respond to most PDO accidents, particularly during emergency conditions (e.g., severe inclement weather). For example, of six large cities in Texas, only one police department (San Antonio) responds to all PDO accidents.

In March 1986, the city of Austin joined Beaumont, Dallas, and Fort Worth in establishing policies to limit their response to accidents involving injuries or vehicles requiring special assistance. The intent was to allow police to concentrate on crimes against people and serious collisions. In 1985, Austin had more than 33,000 collisions. Police who responded to accidents involving minor damage and no injuries spent a minimum of 30 min taking information and writing a report (18). Austin police officers are dispatched to collisions to check for proper licenses, injuries, or criminal violations. If an officer finds no injuries or criminal violations, the drivers are given the "blue form" to fill out. The drivers must mail their reports to the Department of Public Safety.

The trend toward eliminating police response to PDO accidents and non-issuance of traffic violations after an accident reinforces the need to encourage motorists to move their vehicles off the freeway lanes and in particular, off the freeway to AISs when these facilities exist.

Initial Accident Information Collection Before Vehicle Removal

Some of the law enforcement officers interviewed expressed concern that encouraging motorists to move their vehicles to an

AIS before the police arrive may give some motorists greater opportunities to leave the area completely instead of moving to an AIS. Some law enforcement officers fear that AISs may increase the already high frequency of hit-and-run accidents. For example, of the 22,095 accidents that occurred in Fort Worth during 1985, 4,203 (25 percent) were hit-and-run.

To minimize the potential for hit-and-run situations, motorists could be instructed to exchange some basic information before moving the vehicles off the freeway lanes. Basic information (e.g., names, addresses, telephone numbers, license plate numbers, insurance companies, etc.) could be exchanged within a few minutes before moving the vehicles to an AIS. Instructions advising this initial information exchange could be made available through the media and through the materials distributed to motorists by state motor vehicle agencies and insurance companies.

Additional Accident Information Collection After Removal to AIS

More complete information can be exchanged and collected at the AIS, when the drivers and vehicles are not exposed to traffic. This includes information necessary for accident forms and insurance purposes.

Opinions of Judge, Attorney, and Police

In the opinions of a chief justice of a district supreme court of appeals, an assistant state attorney general, and police in New York, Texas, and Virginia (all interviewed by the research team), there are no legal or insurance requirements that prevent the movement of vehicles involved in PDO accidents from the travelway to a shoulder or to an AIS location, even if the vehicles must be pushed off the lanes. All the information for purposes of establishing traffic violations can be obtained after the vehicles are moved from the freeway. Police from one city stated that most freeway accidents during the peak hours are rear-end type, and violations are not that difficult to determine in most cases.

Insurance Agency Opinions

The three insurance agencies interviewed said that for PDO accidents, all the necessary information for insurance purposes can be obtained *after* the accident vehicles are moved from the freeway and that no insurance company policies are violated by removing the vehicles before police arrive at the scene. They added, however, that it would be a good practice for motorists to exchange basic information before the vehicles are moved off the freeway.

Effect of PDO Accident Severity on Removal

After PDO accidents, if the involved vehicles can be driven, the vehicles should be moved to the shoulder or an AIS as soon as possible to minimize the adverse safety and congestion impacts of the other motorists on the freeway. A major PDO accident may prevent one or more vehicles from moving under its own power, and therefore the motorists must wait for a push or for towing assistance.

Vehicle Pushing by Police or Highway Agency

A city's operations, according to the state assistant attorney general interviewed, can be classified into two basic functions: governmental and proprietary. These functions can be further classified into the following:

Governmental

- Police
- Fire
- Traffic control

Proprietary

- Street construction
- Maintenance
- Water treatment and so on

A city would not be held liable for damages caused by functions that are classified as governmental. According to the state assistant attorney general, if the city performed the act of pushing a vehicle from the roadway, even with a police vehicle with special bumpers, this could be judged to be a proprietary function, and the city could be liable for damages caused by the removal of the vehicle (legal reference: *Shilling vs. the City of Houston*). Also, for PDO accidents, there are no legal or insurance requirements that prevent the motorists from being pushed from the travelway to a shoulder or to an AIS location. If further damage or injury results from the action of being pushed, there is a question of liability. This could be construed as a proprietary function, and the person or agency involved in the clearance procedure may be liable.

Police interviewed from six jurisdictions in New York, Texas, and Virginia said that there have been no specific legal problems as a result of pushing disabled vehicles off the freeway travelway with special push bumpers. The gain in reduced motorist delay and increased safety by removing the disabled vehicles off the travelway, according to the police, far outweighs any potential damage that may be caused to a vehicle while it is being pushed. However, the city attorney interviewed in a large Midwest city said that the city has no vehicles equipped to push disabled vehicles and has no intention of pushing disabled vehicles because of liability elements.

Removal Methodology and Towing Fees

Perhaps the most critical issue about private enterprise that concerned the insurance agencies, judges, attorneys, transportation officials, and private fleet operators interviewed was related to towing. The primary concern was towing fees. If a vehicle is to be towed from the freeway to an AIS, the intermediate stop by a wrecker at an AIS may be perceived as the end of one tow, and moving the vehicle from the AIS to an automobile service center may be thought of as a second tow with an additional charge. The questions that must be resolved deal with the amount and payment of what is potentially two tows and with the waiting time involved at the AIS.

Procedures and pay schedules may also need to be evaluated to account for the additional time required by wrecker operators to wait for the drivers, police, or both to complete their

discussions, investigations, and reports at the AISs before towing vehicles to a service center.

Fleet operators, both public and private, and automobile club members may have their own agreements with tow truck operators for on-call service. These agreements may complicate the procedures for towing and would need to be evaluated when local towing ordinances are being developed.

The importance of good wrecker service in metropolitan areas is well recognized. One major city, for example, indicated that 38 percent of all reported accidents require a wrecker. Most people interviewed agreed that private enterprise should handle the towing service. However, city codes to regulate towing services must be developed and enforced.

AIS IMPLEMENTATION

The AIS concept is applicable to a variety of traffic management system strategies in metropolitan areas. Traffic management strategies can range from very basic low-cost systems to sophisticated electronic traffic surveillance and control systems. The important thing to consider is that use of AISs in all cases will reduce both the time that incidents are blocking lanes on the freeway and the time that vehicles and motorists involved in accidents are in the view of freeway motorists. Thus the normal adverse effects of freeway accidents on congestion, delay, energy consumption, air pollution, and so on can be minimized.

Three broad categories of situations in which AISs might be implemented are as follows:

- No electronic freeway surveillance and control traffic management system exists, but AISs can be implemented. Examples in Texas include Houston, San Antonio, Beaumont, and El Paso.
- An agency is planning to implement an electronic freeway surveillance and control traffic management system, and AISs can be included as part of the overall system. An example is Fort Worth, Texas.
- There are already urban freeway networks that have operating electronic surveillance and control traffic management systems. In these cases, AISs could be added to the existing systems. Examples include Chicago, Illinois; Dallas, Texas; Denver, Colorado; Detroit, Michigan; Long Island (the Integrated Motorists' Information System) in New York; Los Angeles, California; Minneapolis, Minnesota; the New Jersey Turnpike; Tampa, Florida; San Diego, California; Seattle, Washington; and Northern Virginia.

It would be desirable for the AIS system to be installed and operated as part of a citywide freeway incident management program involving traffic engineers and law enforcement personnel. Without an incident management program, the AIS emphasis could become a "one-shot" effort that is forgotten as personnel change and everyone gets involved in other activities.

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