# Benefits of Traffic Incident Management

ntimc
National Traffic Incident Management Coalition

**NATIONAL UNIFIED GOAL (NUG) FOR TRAFFIC INCIDENT MANAGEMENT**

*Traffic Incident Management (TIM) programs address issues that are of vital concern to the American public: congestion and travel delay, public health and safety, the nation's economic health, energy savings, public safety resources, responder safety, and citizen satisfaction with government services. Yet decision-makers at all levels of government generally do not have TIM on their "radar screen," in part because the benefits of TIM programs have not been articulated succinctly and strongly.*

*Before they vote for, or budget for, TIM program elements, public officials want to know the cost-benefits of TIM investments. While we can safely assume that no one wants "unsystematic, unplanned, uncoordinated" traffic incident management, the reality is that investment in the elements of TIM programs must compete with other worthy public investment opportunities.*

*This paper summarizes currently available information about TIM benefits. A major challenge in documentation of the "Benefits of TIM" is the broad scope of the traffic incident management discipline. Formally defined as "The systematic, planned and coordinated use of human, institutional, mechanical, and technical resources to reduce the duration and impact of incidents, and improve the safety of motorists, crash victims, and incident responders,"[1] TIM is a catch-all phrase. Programs and program elements that may fall under the general rubric of "TIM" include development of unified policies, procedures, operations and / or communication systems among TIM responders; the application of Intelligent Transportation System (ITS) technologies to traffic incidents; motorist assistance patrols; interdisciplinary training in traffic control, unified command and the National Incident Management System (NIMS); improved towing industry procedures and practices; and traveler information. Among these, motorist assistance patrols have the best documented cost and benefit data.*

*Most of the TIM benefits information available is based on studies of elements of state or metropolitan TIM programs. Lack of uniformity in measurement and analysis methods prevents comparison and generalization. Although TIM benefits are difficult to quantify precisely, enough is known to make the case that TIM should be strongly supported at the federal, state and local levels.*

## Congestion Relief

Traffic incidents account for about one-quarter of all congestion on U.S. roadways. For every minute that a freeway travel lane is blocked during a peak travel period, four minutes of travel delay results after the incident is cleared. Reduced incident-related travel delay is a key benefit of TIM programs.

- Maryland's DOT's Coordinated Highways Action Response Team (CHART), a robust incident management program that includes motorist assistance patrols, reduced average incident duration by 23 percent in 2005. CHART assisted in 20,515 lane blockage incidents where average incident duration in 2005 was approximately 22 minutes, compared to 29 minutes for similar incidents responded to by other agencies. Using a traffic simulation program, analysts determined that MDOT TIM program reduced travel delay on major Maryland corridors by 37 million vehicle-hours in 2005.[2]
- The Hudson Valley's Highway Emergency Local Patrol (H.E.L.P), a motorist assistance patrol,

| REDUCTION DUE TO CHART | AMOUNT | | UNIT RATE | DOLLARS (MILLIONS) |
|---|---|---|---|---|
| Delay (million vehicle hours) | Trucks | 2,383 | $19.59 / hr driver cost<br>$45.40 / hr cargo cost | $ 46.72<br>$108.33 |
| | Cars | 26,276 | $14.34 / hr driver cost | $376.80 |
| Fuel Consumption (million gallons) | | 4.84 | $1/gal | $ 4.84 |
| Emissions (tons) | HC | 487 | $6,700/ton | $ 41.11 |
| | CO | 5,476 | $6,460/ton | |
| | NO | 233 | $12,875/ton | |
| **TOTAL** | | | | **$577.79** |

*Figure 1. 2005 Direct Benefits to Highway Users from Maryland's CHART Program1*

| PATROL LOCATION | PATROL NAME | YEAR PERFORMED | RESULTS |
|---|---|---|---|
| Charlotte, NC | Incident Management Assistance Patrol | 1993 | 3:1 - 7:1 |
| Chicago, IL | Emergency Traffic Patrol | 1990 | 17:1 |
| Dallas, TX | Courtesy Patrol | 1995 | 3:1 - 36:1 |
| Denver, CO | Mile High Courtesy Patrol | 1996 | 20:1 to 23:1 |
| Detroit, MI | Freeway Courtesy Patrol | 1995 | 14:1 |
| Fresno, CA | Freeway Courtesy Patrol | 1995 | 13:1 |
| Houston, TX | Motorist Assistance Program | 1994 | 7:1 - 23:1 |
| Los Angeles, CA | Metro Freeway Service Patrol | 1993 | 11:1 |
| Minneapolis, MN | Highway Helper | 1995 | 5:1 |
| New York, NY | Highway Emergency Local Patrol | 1995 | 24:1 |
| Norfolk, VA | Safety Service Patrol | 1995 | 2:1 |
| Oakland, CA | Freeway Service Patrol | 1991 | 4:1 |
| Orange County, CA | Freeway Service Patrol | 1995 | 3:1 |
| Riverside County, CA | Freeway Service Patrol | 1995 | 3:1 |
| Sacramento, CA | Freeway Service Patrol | 1995 | 6:1 |

*Figure 2. Summary of Motorist Assistance Patrol Benefit-Cost Studies.[10] The underlying methodologies and assumptions used in the studies varied widely, producing a broad range of results. Results are not comparable, but do support the assertion that Motorist Assistance Patrols are cost-effective.*

responded to 129 incidents in June 2005, where average clearance time was approximately 36 minutes. This compared to average clearance time of 42 minutes for 86 incidents that occurred after the HELP program's operating hours on weekdays, and a 50 minute average for 39 incidents on the weekends.[3]

## Economic Savings

By reducing travel delay, fuel consumption, emissions, and secondary incidents, TIM programs boost the national and regional economy. According to Texas Transportation Institute's (TTI's) *Urban Mobility Report 2005*, travel time value for each person-hour of travel was $13.45 in 2004; for trucks the value was $71.05. In 2004, trucks idled due to traffic delay (incident-related and other) cost the U.S. trucking industry 243 million hours, and cost $7.8 billion. The costs of travel delay drive up freight costs, which are passed on to consumers through product and commodity price increases.[4]

***TIM saves highway users money:*** Total direct benefits to highway users from Maryland's CHART program in 2005 due to travel delay reductions alone were estimated at $578 million. Figure 1 above shows the benefit breakdown.[5] Delay savings from Florida's Road Ranger motorist assistance patrol program were reported at $25.8 million a month in 2005.[6]

*Motorist Service Patrols are Cost-Effective:* In 2005, the overall benefit/cost ratio for the Florida Road Ranger program was 26:1.[7] Highway Helper, a $600,000 / yr. motorist assistance patrol program in Minnesota,

reduced the average duration of stall incidents by 8 minutes, saving $1.4 million/year in delay costs.[8] Figure 3 shows benefit/cost ratios for similar programs in other locations. In a 1998 analysis [9] based on data obtained from a telephone survey of 53 patrol managers in 22 states, benefit-to-cost ratios of Motorist Assistance Patrols were reported to range from 2:1 to 36:1.

## *Energy Conservation and Environmental Benefits*

Shorter incident durations reduce fuel consumption, fuel costs, and emissions. Florida's Road Ranger program saves 1.7 million gallons of fuel valued at $3.4 million monthly.[11] CHART saved Maryland highway users 6.4 million gallons of fuel in 2005, including 4.8

## BENEFITS BY STAKEHOLDER SECTORS

*A key to effective incident management is strong interdisciplinary partnerships to develop joint TIM operating policies, procedures, communications networks and training. Because TIM programs are usually initiated by transportation agencies, it can be difficult to motivate other responders to dedicate their scarce time and resources to TIM programs unless the benefits to the emergency responders can be articulated persuasively. Figure 3 below summarizes how TIM benefits major stakeholder sectors.*

| | Firefighters | Law Enforcement | Emergency Medical Services | Private Sector Towing & Recovery: and Traffic Control Services | Transportation Agencies | Highway Users |
|---|---|---|---|---|---|---|
| Congestion Relief | ● | ● | ● | ● | ● | ● |
| Economic Savings | ● | ● | ● | ● | ● | ● |
| Fuel Savings | ● | ● | ● | ● | ● | ● |
| Personnel Savings | ● | ● | ● | | | |
| Emissions Reductions | | | | | | ● |
| Crash / Secondary Crash Reductions | ● | ● | ● | ● | ● | ● |
| Faster Incident Detection, Verification, Dispatch & Response Time | ● | ● | ● | ● | ● | ● |
| Reduced Mortality | ● | ● | ● | | ● | ● |
| Reduced Morbidity | ● | ● | ● | | ● | ● |
| Increased Responder Safety | ● | ● | ● | ● | ● | |
| Increased Customer Satisfaction | ● | ● | ● | ● | ● | ● |

*Figure 3. How Traffic Incident Management (TIM) benefits major TIM stakeholder sectors.*

million gallons saved from delay reductions (see Figure 1), and additional fuel savings from reduced running time in the Baltimore and Washington regions.

## Public Health and Safety Benefits

About 43,000 Americans die in highway crashes every year. Good traffic incident management reduces traffic congestion, which improves roadway safety and reduces crashes. When crashes do occur, TIM mitigates impacts by speeding detection, response, and clearance.

***TIM reduces crashes:*** A before-and-after analysis of the San Antonio TransGuide System in 1996 showed a 35 percent decrease in crashes.[12]

***TIM reduces secondary crashes:*** The likelihood of a secondary crash increases by 2.8 percent for each minute the primary incident continues to be a hazard.[13] Causes include the dramatic change in traffic conditions, including the rapid spreading of queue length, and the substantial drop in traffic speed, as well as rubbernecking. Secondary crashes due to congestion resulting from a previous crash are estimated to represent 20 percent of all crashes. Incident management programs prevent secondary incidents by reducing the duration of traffic incidents, and by publicizing the incident using changeable message signs and traveler information systems.[14] Maryland's CHART incident management program resulted in an estimated 290 fewer secondary incidents in 2005.[15]

***TIM reduces incident detection, verification, dispatch and response time:*** Closed Circuit Television (CCTV) cameras, motorist assistance patrols, and integrated public safety/transportation dispatch and communications networks are among the many tools that TIM programs use to speed incident detection and verification, and dispatch. San Antonio's TransGuide ITS system combines a communications network and CCTV to improve incident detection. In the first year of deployment, TransGuide reduced incident response times by 20 percent.[16] A 2006 analysis comparing the Hudson Valley's H.E.L.P. motorist assistance patrol's average response time to weekend response times showed an average 12 minute difference, with H.E.L.P. responding in approximately 8 minutes, compared to 20 minutes on the weekends, and 12 minutes on weekday evenings, both times when the service patrol is not on duty. Maryland's CHART motorist assistance patrol program reported an average response time in 2005 of 5.8 minutes, compared to 6.7 minutes in 2004, despite the worsening congestion and the increasing number of incidents in the Washington-Baltimore region.

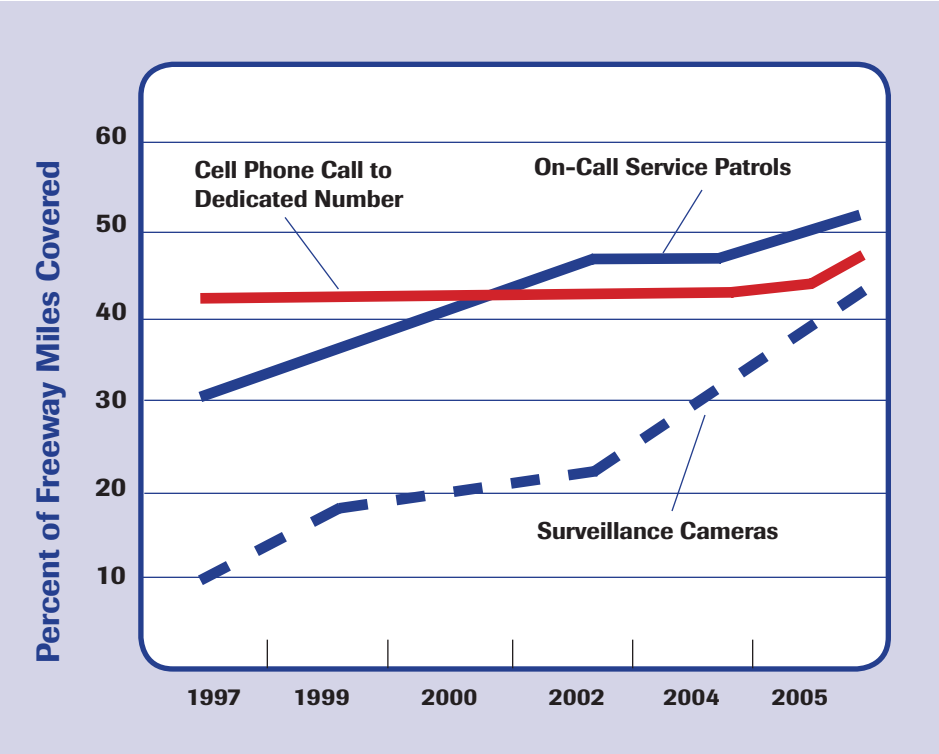


*Figure 4. Closed Circuit Television (CCTV) surveillance cameras, on-call service patrols, and cell phone reportage are rapidly emerging technologies for reducing incident detection times on freeways.[17]*

## Reduced Mortality

Faster highway incident detection and response saves lives. Response time has a well-documented relationship to likelihood of crash survival. For seriously injured patients, arrival at the hospital within the "golden hour" after the crash is considered a strong predictor of patient outcome. The average notification time [e.g., the time elapsed from the crash or the onset of an emergency until emergency medical service (EMS) is notified] is 9.6 minutes for rural crashes, compared to a national average of 5.2 minutes. The average time between notification and arrival at a fatal crash scene is 11 minutes in rural areas, versus 3.4 minutes in urban areas. By reducing

both notification and response times, TIM saves lives.

## Reduced Patient Morbidity

Faster incident detection and response prevents injuries and reduces health care costs. Particularly in cases of head trauma or internal injury, faster EMS response can dramatically improve a crash survivor's prognosis and reduce the collateral costs to society. Traffic crashes injured 2.7 million Americans in 2005. Crash survivors often sustain multiple injuries and require long hospitalizations. Crashes cost society more than $150 billion a year and consume a greater share of the nation's health care costs than any other cause of illness or injury.

## Reduced Public Safety Personnel Requirements

Reducing the number of crashes and clearing them more quickly and efficiently frees public safety personnel resources needed for other duties.

## Increased Responder Safety

The emergency response community is increasingly concerned with "struck-by" incidents where fire, law enforcement, EMS, transportation and other responders are killed or injured at incident scenes by passing vehicles.

***Improved on-scene procedures reduce struck-by deaths and injuries:*** TIM programs promote responder safety by improving incident traffic control practices, procedures, and resources, as well as encouraging responders to follow safety procedures and use safety apparel and equipment.

***Improved emergency communications networks increase responder safety:*** What responders don't know can hurt them. Recent advances in networking technology and public safety spectrum availability allow a broad range of transportation, public safety, public health, and emergency management agencies to share voice, video, graphic and text data in real time. Sharing information through Regional Emergency Communications Networks makes it easier to monitor the incident and manage resources safely and appropriately.

## Increased Customer Satisfaction

TIM increases public satisfaction with government services. Clearing the road after an incident ranked as the top priority among SHA functions in a 2006 statewide citizen survey by MDOT, with 98 percent of respondents ranking road clearance as "very important." [18]

Motorist assistance patrols are very popular with travelers. Tennessee has reported that of 1,572 comment cards regarding their HELP service patrol in FY 1995, 99.9 percent rated the service "excellent." [19] Washington State DOT reports hundreds of positive comments and letters every year, including checks from some pleased motorists who offer to pay for the service. "...like a guardian

angel. He replaced the tire, checked the air, and...within 15 minutes of the 'disaster' we were on our way home...." read one of hundreds of letters received each year by Virginia DOT.

## MEASURING BENEFITS

### *Status of Performance Measurement*

"Things that get measured get performed" is an often-quoted truism of organizational management. Performance metrics and performance goals are important tools for developing and maintaining strong traffic incident management programs.

Currently, the most frequently used performance metric for TIM programs is incident clearance time—either average, or maximum. California, Washington State, and Florida have set statewide goals of 90-minute incident clearance times. Utah's state performance goals are based on incident severity: 20 minutes for fender-benders; 60 minutes for injury crashes; 90 minutes for fatalities. Idaho takes a similar approach, with a statewide program for 30, 60, or 120-minute maximum clearance times, based on incident severity.

States have found that tracking and reporting improvements in average incident clearance times is a powerful tool for communicating with their state legislatures and with their customers. The Maryland and Washington State transportation departments have made progress in securing steadier funding from their state legislatures for their traffic incident management activities as a result of clearance data reporting. Washington State DOT (WSDOT) also has had some notable success in improving public perception of the agency.

Effective performance measurement requires additional supporting resources that are not currently available in many states and localities, including capability for continuous collection and analysis of supporting data. If performance data are to be shared, agreement must be reached on the definitions of performance metrics, and on a uniform and structured reporting method.

In 2005, the FHWA launched the Focus States Initiative for Traffic Incident Management Performance Measures to initiate development of a set of nationally recognized, consensus-based performance measures for TIM. Through a series of workshops, participants from 11 states (with representatives from transportation and law enforcement) identified two initial program-level performance measures:

- **Roadway Clearance Time:** the time between the first recordable awareness (detection/notification/verification) of an incident by a responsible agency and first confirmation that all lanes are available for traffic flow.
- **Incident Clearance Time:** the time between the first recordable awareness and the time at which the last responder has left the scene.

The 11 Focus States currently are working through their State Action Plans to implement and test the two measures for eventual adoption by other states. This initiative will likely impact other TIM program areas as well. The multi-agency coordination and technical integration necessary for performance measure data collection will be brought about by advances in strategic planning and communications.

At the same time, the National Transportation Operations Coalition (NTOC)

| MEASURE | DEFINITION | SAMPLE UNITS OF MEASUREMENTS |
|---|---|---|
| Incident Duration | The time elapsed from the notification of an incident until all evidence of the incident has been removed from the incident scene. | Median minutes per incident |
| Non-Recurring Delay | Vehicle delays in excess of the recurring delay for the current time-of-day, day-of-the-week, and day-type. [21] | Vehicle-hours |
| Travel Time-Reliability (Buffer Time) | The Buffer Time is the additional time that must be added to a trip[22] to ensure that travelers making the trip will arrive at their destination at, or before, the intended time 95percent of the time. | Minutes. This measure also may be expressed as a percent of total trip time or as an index. |

*Figure 5. NTOC-Proposed Performance Measures for Incident-Related Travel Delay*

is developing a common set of about 10 performance measures for evaluating the management and operations activities of participating NTOC members. The performance measures that NTOC has proposed[20] that relate directly to incident-related travel delay are summarized in Figure 5.

## Barriers to Performance Measurement

Where officials fear public controversy over failure to meet the goals, or unfair comparisons to results from other jurisdictions, there can be resistance to performance goals and performance measurement. While performance measurement is relatively new to transportation operations professionals, other TIM responders (fire, EMS, law enforcement) long have been publicly accountable for their response times.

## Recommendations for Sharing and Comparing Performance Measurement Data

NTOC's 2006 report on *Measuring Performance Among State DOTs*[23] suggests "basic principles" to help advance successful adoption of comparative performance measurement within the DOT community. Based on input from workshop participants and others, the principles are:

- **Participation in comparative performance measurement should be voluntary.** Strong marketing and leadership must be included in implementation planning to encourage sufficient participation by DOTs.
- **Focus on knowledge-sharing, not number crunching.** Results should be used to enable transfer of successful management practices rather than to rank DOTs. Systems for sharing qualitative information about best practices, innovations, and lessons learned should be just as important as the collection and reporting of data.
- **Ensure comparisons are between peers.** State DOTs are far from homogeneous and each agency's performance is aided and constrained by its unique operating environment, including factors that may not be apparent in the comparative performance measurement data. These factors include physical geography/climate, land use/demographic/ socio-economic patterns; labor and materials costs; state legislative requirements; agency management structures and responsibilities; and system size.
- **Consider creating peer groupings by topic.** The factors that determine appropriate peer states may vary from issue to issue. For example, in TIM performance measurement, land use and demographic patterns are particularly important—managing incidents in highly urbanized areas with high levels of congestion differs significantly from TIM in smaller cities or in rural areas. However, it is important to note that road users in rural and remote areas have the same expectations as road users in urban areas: that roadway incidents be well managed through coordinated, efficient response.
- **Ensure methodologies for measurement are rigorous.** The success of comparative performance

measurement rests heavily on the credibility of results. Methodologies for collecting data among states must be carefully formulated to ensure accurate comparisons.

- **Build on DOT's current efforts.** The state-of-the-art for performance measurement in state DOTs is rapidly evolving. Comparative performance measurement should focus on those areas where consensus is emerging on the value of measurement and where reasonable techniques for measurement are available.

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# Safe, Quick Clearance

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*Faster incident clearance is a fundamental goal and a strong priority for Traffic Incident Management (TIM) programs. Traffic incidents account for about one-quarter of all congestion on U.S. roadways. For every minute that a freeway travel lane is blocked during a peak travel period, four minutes of travel delay results after the incident is cleared. Roadway users calculate trip times by taking recurring congestion intro account. It's the unexpected travel delays that inconvenience motorists the most.*

*Particularly in congested areas, public perception of transportation and response agencies hinges on the efficiency of traffic incident clearance operations. When the Maryland Department of Transportation (MDOT) asked customers to rate the importance of State Highway Administration (SHA) functions in 2006, "clearing the road after an accident" rated higher than any other function statewide, with 98 percent of respondents ranking it "very important."*

*Incident-related delays also impact the economy by increasing shipping costs for freight. The issue is exacerbated on truck routes in rural areas where prompt incident response and clearance are challenging due to scarcer and more geographically dispersed responder resources.*

*In order to gain unqualified support from all the TIM stakeholders, quick clearance goals must be balanced with other important incident management tasks, which are performed routinely by law enforcement, fire and rescue, emergency medical care, and towing and recovery. Additional responders on major incidents may include hazardous materials (hazmat) teams, public health, and countless other response functions depending on the nature and severity of the incident.*

*While emergency responders support the concept of "Quick Clearance," they are reluctant to agree it is the top priority for traffic incident management, fearing that their responsibilities and concerns will become secondary to road clearance. While it doesn't have the same ring as "Quick Clearance," a goal more likely to unify the entire spectrum of TIM stakeholders is "Coordinated, Efficient Clearance." Because faster incident clearance reduces the exposure of responders to hazardous roadside conditions, it is a good strategy for increasing responder safety. The opportunity to improve responder safety can be a powerful motivator for emergency responders to support more coordinated and efficient incident clearance.*

## KEY CLEARANCE STRATEGIES

Key strategies for "Coordinated, Efficient Clearance" that seem to be supported by most stakeholders include:

- Unified incident command
- Standardized operations, response, and scene safety practices
- More timely and coordinated use of technology
- 24/7 availability of transportation TIM responders
- Joint, accredited incident management training, and
- Clearance performance goals

### *Unified Incident Command*

Conflicts among responder disciplines at traffic incident scenes often stem from disagreements regarding decisions related to road closures or partial closures. When decisions are made unilaterally without consulting all of the responding disciplines, quick clearance and other goals can be compromised. Each case must be considered individually. In some cases, a total roadway shutdown enables emergency responders to clear the

road more quickly. At other times, road closures hamper the ability of responders to bring equipment to the scene. Sometimes, placement of equipment across a lane protects responders; in other cases, such equipment may block several lanes unnecessarily, increasing the likelihood of another collision.

Unified Incident Command (UC) is a method for coordinating efficient incident response at larger, more complex traffic incident scenes, where the incident involves several responding agencies with contrasting functional responsibilities and missions, and/or affects multiple political or legal jurisdictions. UC assures that the missions and concerns of all of the responders are taken into account in the incident command function, which is essential to achieving "quick clearance" goals.

UC procedures for sharing command decision-making fall under the overall Incident Command System (ICS) concept, defined as "a systematic tool used for the command, control, and coordination of an emergency response." ICS and UC concepts and procedures were developed by the fire service, and they are routinely applied with success in managing more complex fire and other emergency incidents. More recently, the federal National Incident Management System (NIMS) was built on an ICS framework to provide a unified nationwide management structure for emergency response operations. As a result of the requirement for training in and use of ICS as part of the Department of Homeland Security's NIMS requirements, more and more agencies are institutionalizing ICS in their approach to all hazards and emergencies.

The Federal Highway Administration (FHWA) is fostering greater understanding and awareness of ICS among transportation professionals, having sponsored publication of *A Simplified Guide to the Incident Command System for Transportation Professionals* in 2006, and *Model Procedures Guide for Highway Incidents* in 2003. Currently under development by the FHWA is an ICS training course (to include NIMS concepts) targeted specifically for transportation professionals.

While many jurisdictions incorporate ICS into everyday traffic incident response and removal activities, and use UC as appropriate, this is not always the case. In 2006, the FHWA asked the nation's largest urban areas to conduct a Traffic Incident Management (TIM) Self-Assessment. Twenty-four percent of the 70 responding urban areas reported that ICS was not a generally accepted practice in their area. The respondents ranked their progress in 34 TIM program components, on a scale of 1-4: (1) "no progress;" (2) "very little being done;" (3) "strong efforts and progress, with room for improvement;" and (4) "outstanding progress." Seventy-six percent scored themselves 3 or higher in ICS, a 12.6 percent increase from the results of the initial assessments in 2003.

Even when the ICS is used within a jurisdiction, however, its effectiveness may vary with the size and complexity of the incident. At larger, more complex incidents, UC and NIMS compliance often is carried out by ranking members of the respective responder agencies, who are well versed in UC principles and procedures. At more routine incidents, which account for a significant proportion of non-recurring congestion, scene operations may be managed by entry-level personnel and their first line supervisors, who are generally less familiar with and less comfortable with the UC process. The challenge is to push ICS tactics down, across disciplines, through standardized, controlled, readily accessible, credential-oriented training.

## Standardized Operations and Response Practices

The various TIM stakeholders recognize the need to "sing from the same sheet of music" in order to facilitate quicker, safer, and more efficient response operations. TIM stakeholders are calling for the development of national guidelines for traffic incident response that define responder roles, responsibilities and requirements, and provide recommended on-scene practices and procedures. TIM stakeholders are also calling for cross-disciplinary TIM training. These elements can provide the basis for unified policies and procedures to be adopted by state, regional, and/or local TIM partners. Adopting guidelines rather than promoting standard procedures would make it much easier for jurisdictions to tailor their procedures to the specific authorities granted to each agency under state and local law. Some specific suggestions for topical guidance that emerged as a result of the stakeholder "listening sessions" sponsored by NTIMC in 2006 include:

***Best practice guidelines and recommended procedures for quick clearance of commercial vehicles.*** These guidelines would be developed with input from motor carriers, truck drivers, commercial vehicle law enforcement, and insurers. As a roadway user, the trucking industry is extremely supportive of eliminating unnecessary travel delay. However, roadway clearance goals must be balanced with the carriers' interests in preserving the value of overturned cargo. Where cargo cannot be salvaged, or where safety or time considerations prevent salvaging, proper incident investigation and data collection are vital to ensure that the carrier will be able to substantiate insurance claims. Proper incident investigation and evidence collection by law enforcement is also imperative for motor carriers and their insurers to satisfy accident reporting requirements and their subsequent impact on carrier safety ratings.

***Best practices and recommended procedures for towing and recovery operations.*** These guidelines would be developed with input from the towing and recovery industry. Towers play a vital but often under-recognized role as traffic incident responders, and also can be a tremendous asset in disaster response. Like other emergency responders, towers need prompt incident notification, and timely and accurate incident information. By working with towers to establishing clear procedures and policies for towing and recovery operations, TIM partners can make the most of the many resources that towers have to offer. Guidance would be included on how to pre-qualify towers who have the equipment, education, certifications, and level of competency to serve as TIM responders. Guidance on pricing structures and incentives to facilitate quick clearance ("Incentive Clearance") also would be included. For example, the Florida Toll Road Authority has had success with an Incentive Clearance program that offers pre-qualified recovery companies a monetary incentive for clearing commercial vehicle incidents within a pre-determined time frame. Such performance incentive pricing structures encourage towers to invest in recovery equipment and in personnel training to facilitate quick clearance of commercial vehicle inci-

dents. Authorities also have the option to impose financial penalties for performance failures. Because dispatch of the wrong type of towing and recovery vehicle is a frequent cause of unnecessary clearance delay, education of responders regarding how to properly identify the classes of vehicles involved in an incident, and how to relay this information to the tower, should be encouraged. The Towing and Recovery Association of America (TRAA) has developed educational materials for responders to assist them in identifying vehicle classes.

***Best practice guidelines and recommended procedures for traffic control at incident scenes.*** Good traffic control practices contribute strongly to quick clearance, traffic safety, and responder safety objectives (preventing secondary crashes). Improving the availability of training in TIM traffic control procedures, personnel and equipment is a key strategy for quick clearance. Guidelines should cover best practices for use of private sector traffic control firms, as well as recommendations for training transportation and public safety personnel in TIM traffic control. The 2003 *Manual on Uniform Traffic Control Devices (MUTCD)* defines traffic incidents as temporary work zones requiring traffic control. The quality of traffic control at traffic incident scenes varies dramatically. Proper traffic control procedures, including providing upstream warnings to motorists well before they reach the traffic queue or enter the incident scene, are key to preventing secondary incidents and protecting responders.

***Best practice guidelines and recommended procedures for incident investigations.*** These guidelines would be developed with input from the law enforcement and medical examiner communities. These would include:

- *Best practice guidelines, recommended procedures, and recommended technologies for efficient incident investigations.* This could include guidance for managing fatal incident scenes, including recommended practices for medical examiners. Because investigations of fatal incidents can require lengthy road closures, managing fatal scenes more efficiently presents a prime opportunity for reducing travel delay. Strategies for more efficient investigations would be included. For example, law enforcement could be encouraged to record initial incident data (by photographing and marking the scene), and then to return when traffic volumes are lower to make detailed measurements. Recommendations for cost-effective technologies to reduce investigation time also would be included. For non-criminal, non-responder-related crash investigations, specific incident investigation performance goals could be considered.

- *Recommendations for traffic incident investigations training.* Training more state and local officials in traffic incident investigations could improve clearance times. For example, in incidents involving commercial vehicles, the motor carrier division of the state highway patrol usually responds. Because these divisions tend to be understaffed, this can create an obstacle to quick clearance. Increasing the pool of qualified investigators can advance quick clearance goals, but it may be difficult to achieve (especially because not all those involved in commercial vehicle regulation are sworn officers). Maintaining the expertise of crash investigators who transfer out of specialized investigations units and assigning them to assist with major crashes may be feasible in some jurisdictions. Another possibility might be to define, by policy or agreement, what other responders might do prior to the specialists' arrival to speed the investigations process.

- *Best practice guidelines and recommended procedures for clearing HAZMAT incidents involving spilled fluids (antifreeze, etc.) and saddle tank spills.* More efficient handling of certain types of

HAZMAT incidents provides another opportunity to reduce unnecessary travel delays caused by common incident types. Small spills (such as antifreeze) are not hazmat spills, but sometimes cause unnecessary clearance delay because responders perceive them as hazmat issues. Providing more information to responders about hazmat issues, and including this information in TIM training, would help.

## More Coordinated and Timely Use of Technology

Technology is available that can improve many aspects of traffic incident management, including traveler information, responder communications, and incident investigations. At present, these technologies are vastly underutilized.

*Responder Communication:* The NUG technical paper on "Improved Incident Communications" discusses the many opportunities to improve the safety and efficiency of incident response operations by upgrading the information and communications technologies used by emergency responders. The paper puts interoperability challenges (such as CAD-ITS integration) into the context of a future vision for regional wireless interagency emergency information exchange networks, and relates these topics to current issues in the 9-1-1 (E 9-1-1 and next generation 9-1-1). Existing, but underutilized technologies for incident notification, public notification, coordinated incident command, prompt emergency dispatch, improved real-time emergency vehicle routing, signal prioritization for emergency vehicles, remote scene monitoring, and information sharing also are discussed.

*Traveler Information:* Traffic signal timing, changeable message signs, and traveler information technologies are powerful tools for rerouting traffic around incident scenes, but more planning, coordination, and development are needed to facilitate the most effective use of these technologies for TIM applications. Ideally, for example, traveler information systems and changeable message signs would instantly warn motorists when incidents occur on their route, and provide timely information on re-routing, to divert traffic from the scene. While such systems are in place in some areas of the country, the personnel who control the changeable message signs and traveler information systems may not operate 24/7; may not be aware of the incident until some time after the traffic back-up queue is forming; and may post information that the incident has occurred—but fail to advise the motorist on alternative routes. Determination of alternative routes and traffic signal timing can benefit from pre-planning, but also requires consideration of real-time traffic conditions, so that traffic is not diverted from one incident scene onto what might be an even more congested roadway.

*Incident Investigations:* Use of developing incident investigation technologies that promise to reduce investigation time should be encouraged.

## 24/7 Availability of Transportation TIM Responders

While fire, law enforcement, EMS and towing responders must be available 24/7, transportation agencies often do not have response capability during non-business hours. Consequently, incident responders must manage the traffic incident without the transportation agency's resources and capabilities.

A strong case has been made for 24/7 availability of transportation responders on Interstates and other high-volume transportation facilities. Traffic control during nighttime operations is particularly important. A serious commitment to responder safety implies 24/7 avail-

ability of the on-scene traffic control and motorist assistance provided by freeway service patrols (sometimes called traffic incident response teams). By providing this service, transportation agencies have an opportunity to gain credibility and acceptance within the emergency responder community. 24/7 support for traffic management and traveler information via changeable message signs and traffic signal management also is critical.

While recognizing that transportation agencies face many competing demands for budgetary resources, and will vary in their methods and abilities to respond to the need for 24/7 TIM response, there is widespread agreement among TIM stakeholders that as the transportation community seeks to be more included in the emergency responder community, it must accept the 24/7 nature of emergency response work. In some states, 24/7 operation of a statewide traffic management center to oversee major freeways, expressways and tollways has been supported, whereas 24/7 operation of regional or metropolitan TMCs has not yet been implemented.

## Joint, Accredited Incident Management Training

Interagency training programs for all TIM responders are needed to spread the best practices for incident scene response, management, and clearance, while fostering better understanding of the various responders' roles, responsibilities, and requirements. These trainings would not replace existing training programs for each discipline (for example, the training requirements formulated by state Peace Officer Standards and Training (POST) commissions). Rather, they would be an advanced, or specialized training program for traffic incident responders.

Interdisciplinary cross-training should include towers as well as law-enforcement, fire, EMS, and transportation, at a minimum. The trucking industry has called for training to include special concerns related to incidents involving large commercial vehicles, including safe procedures for victim extractions, recommended procedures for moving vehicles, priority notifications, etc.

Multi-disciplinary training programs will ensure that transportation and towing professionals are better trained in ICS (including NIMS), and other responders are better trained in traffic-related operations, while providing additional responder safety training for all.

Existing resources that form a foundation for development of more comprehensive TIM training and certification programs include:

- Managing Traffic Incident and Roadway Emergencies, a workshop on traffic incident management, is currently available from the FHWA's National Highway Institute. The workshop is recommended for mid-level management and on-scene supervisory-level personnel from law enforcement, fire and rescue, emergency communications, transportation, towing and recovery, traffic reporting media, and other agencies or companies involved in resolving traffic incidents.

- Emergency Traffic Control for Emergency Responders, a new course offered by the American Traffic Safety Services Association (ATSSA), is aimed at police, fire and rescue, and towing personnel who are involved in traffic control, either responding to an incident or enforcing traffic control in work zones. This 4-hour course covers the concepts of temporary traffic control presented in the *Manual on Uniform Traffic Control Devices (MUTCD)* Section 6.I, a Federal standard.

- TRAA developed a *Vehicle Identification Guide* to aid incident responders in identifying vehicles by classes, so they can request the dispatch of appropriate towing and recovery vehicles. The FHWA and TRAA also developed a National Driver Certification Program for towers, and have partnered with the International Association of Chiefs of Police (IACP) to promote these and other efforts.

Additional relevant resources currently under development include:

- The transportation ICS training course currently being developed by the FHWA (see p. 2);
- Quick Clearance / "Move-It" Tool Kit and Workshop currently being developed by the I-95 Corridor Coalition based on its 2005 report, *Quick Clearance and "Move It" Best Practices.* The I-95 Corridor Coalition plans regional workshops to introduce incident management personnel as well as legislators and policymakers to these concepts. Tools will include a 4-D visualization to illustrate scene management issues.

A formal multidisciplinary TIM certification process would strengthen training programs.

## Clearance Performance Goals

Performance goals create accountability. Currently, the most frequently used performance metric for TIM programs is incident clearance time—either average, or maximum. California, Washington State, and Florida have statewide 90-minute incident clearance targets. Utah's state performance goals are based on incident severity: 20 minutes for fender-benders; 60 minutes for injury crashes; 90 minutes for fatalities. Idaho takes a similar approach, with a statewide program for 30, 60, or 120-minute maximum clearance times, based on incident severity.

Where officials fear public controversy over failure to meet the goals, or unfair comparisons to results from other jurisdictions, there can be resistance to performance goals and performance measurement. While performance measurement is relatively new to transportation operations professionals, other TIM responders (fire, EMS, law enforcement) long have been publicly accountable for their response times. As previously noted, emergency responders are sensitive to clearance goals that may compromise their ability to fulfill their basic missions. For example, law enforcement is likely to support clearance goals only to the extent that investigative quality is not jeopardized.

Effective performance measurement will require additional supporting resources that are not currently available in many states and localities, including capability for continuous collection and analysis of supporting data. If performance data are to be shared, agreement must be reached on the definitions of performance metrics, and on a uniform and structured reporting method. Clearance goals based on facility and roadway classification, and incident type, are more likely to be supported.

The National Transportation Operations Coalition (NTOC) is developing a common set of about 10 performance measures for evaluating the management and operations activities of participating NTOC members. Three of the performance measures that NTOC has proposed that relate directly to incident-related travel delay are summarized in Figure 2.[2]

| MEASURE | DEFINITION | SAMPLE UNITS OF MEASUREMENTS |
|---|---|---|
| Incident Duration | The time elapsed from the notification of an incident until all evidence of the incident has been removed from the incident scene. | Median minutes per incident |
| Non-Recurring Delay | Vehicle delays in excess of the recurring delay for the current time-of-day, day-of-the-week, and day-type. | Vehicle-hours |
| Travel Time-Reliability (Buffer Time) | The Buffer Time is the additional time that must be added to a trip to ensure that travelers making the trip will arrive at their destination at, or before, the intended time 95 percent of the time. | Minutes. This measure also may be expressed as a percent of total trip time or as an index. |

**Figure 2.** National Transportation Operations Coalition—Proposed Performance Measures for Incident-Related Travel Delay

## KEY CLEARANCE ISSUES

As noted in the introduction, quick clearance programs, while generally supported, must be carefully balanced with other incident management concerns to attain unqualified support from all of the TIM stakeholders. Discussed below are stakeholder viewpoints and concerns related to some key clearance issues.

### *"Move-It" Laws and Policies*

Move-it" laws are considered key strategies for speeding clearance of non-injury crashes, which accounted for about two-thirds of all U.S. crashes in 2002. These laws encourage or require drivers that are involved in a non-injury crash to move crashed vehicles and debris out of the roadway, if they can do so safely. "Move-it" laws also empower responders to move vehicles and debris. Speedy debris removal is a major issue in commercial vehicle crashes, where long traffic back-ups result from delays in clearing overturned loads. Ironically, the cost of delay of delivery of cargo on trucks in the back-up queue often exceeds the value of the cargo being salvaged while traffic waits. Nearly half of the states have enacted "move-it" laws, intended to reduce fatalities, injuries, and property damage from an incident, prevent secondary incidents, and reduce the duration or extent of traffic congestion caused by the crash.

In a 2005 report, *Quick Clearance and "Move It" Best Practices: Executive Summary*, the I-95 Corridor Coalition recommends a model "Move-It" law with the following provisions:

- "Any driver able to do so safely and who is physically able to do so shall move a vehicle (and debris) off the traveled way (and if possible to the shoulder or median) on any class of highway as quickly as possible so long as further risk of injury is not imposed.
- If the driver cannot move the vehicle, he or she shall seek assistance in doing so.
- Any traffic or public safety responder shall be empowered to move any disabled vehicle and debris from the traveled way in as safe and efficient manner possible.
- In all such cases, if frontage road, cross street, accident investigation site, or other save haven is available, there are preferable to the median, shoulder, sidewalk or clear zone.

- In all such cases, both drivers and responders shall be immune from liability for the lawful and conscientious execution of these actions.

- Similarly, when such actions are not prudent, drivers and responders shall be immune from liability for deliberately not undertaking such action when the risk of further damage or injury dictates."

Concerns related to "Move-It" laws include property rights, insurance issues, liability issues, investigations concerns, and public education.

- Motor carriers generally oppose legislation that may deny their rights to control recovery of their cargo and/or vehicle. Carriers generally prefer to use their own towing companies and to wait for on-scene response from their insurance investigators. The American Trucking Associations (ATA) has a policy against non-consensual tows—that is, towing without the owners' consent using towers that the owner hasn't chosen.

- Even if the cargo is unsalvageable, anything that may impede proper incident investigation and data collection may threaten the carriers' ability to recover losses through insurance claims. Some insurance companies will not honor claims for vehicles or cargo that has been moved prior to arrival of investigators.

- Responders (particularly law enforcement and towers) are often hesitant to move vehicles off the road because they don't want to be charged with liability for causing additional damages.

- The public needs to be educated about "Move-It'" laws. While these laws are on the books in half the states, most drivers don't know it. In fact, many drivers were taught in driver education classes not to move vehicles after an incident. Some states have been successful in using signage to inform drivers approaching emergency scenes that they are expected to move over.

## Law Enforcement and Quick Clearance Performance Goals

Law enforcement agencies often are reluctant to sign off on quick clearance performance goals because their primary missions at a traffic incident scene are crime investigation and public safety.

Building strong interdisciplinary working relationships and effective TIM programs seems to be the key to overcoming this barrier. Florida and Washington State are the only states where the State Patrol has fully endorsed a 90-minute clearance performance goal (meaning that clearance time is a performance measure for both agencies), and in each case the working relationship between the State Police and the DOT is very strong.

In California, the state's 90-minute maximum clearance time is not a performance measure for California Highway Patrol (CHP) field commanders, but CHP has otherwise agreed to embrace the incident clearance time target.

One DOT official reported that the DOT is reluctant to seek signed agreements or joint performance goals with the State Patrol for fear of jeopardizing the good relationship already in place. However, the same official noted that law enforcement clearance practices, and clearance times, vary widely statewide.

## Medical Examiner Procedures and Policies

Fatal incidents generally take much longer to clear because of legal concerns, including the need for thorough incident investigation and documentation, and the need for medical examiner investigation. Many jurisdictions

have passed medical examiner legislation or developed informal agreements to improve the efficiency of fatal incident investigations.

The California Department of Transportation (CalTrans) proposed state legislation that would allow fatalities to be removed from the traveled way before the medical examiner arrives, but the legislation did not pass. Some localities, including Los Angeles County, have developed protocols to speed clearance of fatal injuries, and there is an attempt to spread these practices. For example, a vehicle with a fatally injured passenger may be removed to an off-road location, where the body may be extracted following medical examiner investigation.

## *Towing Industry Issues*

Unnecessary delays in towing and recovery operations lead to unnecessary traffic delays. In some cases state DOTs have developed relocation capability, where a service patrol (public or private) quickly relocates crashed vehicles away from the roadway, or well off the roadway, to speed clearance.

A common solution is rotation lists, where the law enforcement or transportation department maintains a list of qualified towers and rotates call-outs. Poor or unresponsive service may result in a tower being removed from the list. Use of rotation lists alone does not encourage improvement of the level of competency and the operating standards in the towing industry. The towing industry encourages use of standards, training and equipment requirements, and other measures to assure the quality and competency of towing service providers.

An incentive pricing approach has been used with success in Florida. A combination of financial incentives for quick clearance, and pricing disincentives for slow performance, have successfully improved tower performance and reduced clearance times. On a 320-mile-long turnpike in Florida where this approach is in place, average clearance time to achieve all lanes open is 56 minutes (for all crashes). Towers point out that contract towing with price incentives enables towers to invest in the equipment and the personnel training that are needed to assure quick clearance of larger and more complex incidents. In the Orlando area, where traffic management is key to the Disney-fueled tourist industry, clearance times average less than 90 minutes due to these and other TIM practices.

In order to participate as a Florida Turnpike contract tow service provider, towers must meet equipment, training, and performance requirements. Many states are grappling with the need to update regulations for heavy-duty towing in order to address the more complex recovery issues associated with today's heavier commercial vehicles.

Another example of successful use of contract towing is the City of Houston's SAFEclear program, implemented in 2005. Qualified towing companies contract with the city to be responsible for responding within an average of 6 minutes to incidents on a designated section of the state-owned freeways in the Houston metro area. In order to meet the required response times, the tow companies continually patrol the freeways. The towing companies are charged with rapidly removing disabled or crashed vehicles from the highway lanes or the shoulders to a location off of the freeway. The private sector arrangement dramatically enhances the previous Motorists Assistance Program (MAP) coordinated by the Transtar Transportation Management Center. Where MAP used nine trucks to provide services, there

are about 60 tow trucks patrolling the freeway in Houston.

Tows from the shoulder to a safe, off-highway location are free to motorists. Long-distance tows or tows of vehicles in travel lanes are paid for by the motorist, but the fees for those services are the same as they were prior to the SAFEClear program. Over the first year of the program, the tow trucks responded to more than 60,000 stalls and collisions. Tow trucks responded to more than 87 percent of incidents in less than the 6-minute target. The events were cleared in less than 20 minutes 72 percent of the time. Less than 3 percent of the incidents took longer than 90 minutes to clear. Over the first year of the program there was a 10 percent reduction in the number of collisions on the freeways compared to 2003 and 2004. Comparisons of travel time data from Transtar indicate that travel delay will be 1.8 million hours lower in 2005 than expected given the traffic growth rate. Travel time reliability, as measured by the amount of extra travel time to accomplish a trip during the worst day of the month, also stabilized in 2005 after being 16 percent worse in 2004 than in 2003. Not all of these improvements can be traced to SAFEclear, but the improvements in congestion and collisions represent more than $70 million in savings to Houstonians. The net cost of the program in 2005 was approximately $2.1 million. Responder safety also is enhanced because vehicle repair and collision paperwork activities are being conducted in locations well away from flowing traffic.

The management of towers during incident recovery operations is an issue of concern to state DOTs. After incident response and investigation, many transportation agencies feel that they should have jurisdiction over roadway clearance and recovery operations. However, staffing these functions can be an issue for DOTs, as it is for law enforcement and other responding agencies.

## *Emergency Responder Designations*

Transportation agencies and private sector responders, including towing and recovery companies and traffic control companies, generally are not recognized as emergency responders. This has many adverse consequences:

- Incident notification may be delayed and haphazard, which slows response times. Towers, for example, complain that there are no standard procedures for notifying towers of an incident to which they are expected to respond. "Last called and first blamed" is a frequent refrain in the towing industry.

- Scene access may be impeded. Emergency vehicles en route to

an incident generally are permitted to use shoulders, HOV lanes, and emergency turn-around lanes to gain access to the scene. But in many states, including California, highway department vehicles may not have access to these emergency facilities. CalTrans currently is seeking recognition as an emergency response agency to enable its response vehicles to use the emergency lanes.

Some states have recognized transportation as emergency responders, with beneficial results. In Oregon, for example, ODOT maintenance personnel are frequently the first responders on the scene at rural incidents, where the public safety agencies have difficulty in providing adequate and speedy coverage. In urban areas, ODOT incident response teams are assigned to specific corridors, with a goal of arriving on scene as soon as possible to negotiate roadway issues with other responders. Statewide, 20 percent of the time, the transportation responders arrive first. Use of UC principles ensures that roles are understood by all involved. ODOT is notified of incidents using the same CAD system that the state patrol uses, and two of three ODOT TMCs, including the statewide traffic management operations center in Portland, are co-located with Oregon State Patrol dispatch.

[1, 2] National Transportation Operations Coalition: *National Transportation Operations Coalition Performance Measurement Initiative—Final Report,* June 27, 2005

[3] This measures the effects of incidents, special events, and weather events on travel delay.

[4] Base-level trip time is measured as "Travel Time-Trip," defined as "the average time required to travel from an origin to a destination on a trip."

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# Prompt, Reliable Traffic Incident Communications

ntimc
National Traffic Incident Management Coalition

**NATIONAL UNIFIED GOAL (NUG) FOR TRAFFIC INCIDENT MANAGEMENT**

*"Improved Incident Communications" is a "motherhood" issue—everyone agrees there is an urgent need to "improve incident communications." But, like "world peace," it's hard to know where to start, because "incident communications" is a broad topic, and so many aspects of traffic incident communications need improvement.*

*Improved and more coordinated multidisciplinary planning is needed to lay the foundation for improved incident communications. Coordinated response plans create mutual understanding of public safety and transportation responder roles, and mutual expectations about on-scene actions and interactions. When multidisciplinary groups plan together, train together, and exercise together, they develop the strong working relationships that under-gird effective communication.*

*Incident notification is a hot topic. The issue of who is notified of a traffic incident, and when they are notified, is of broad concern. Prompt dispatch of the appropriate type and level of emergency medical services (EMS) response is a life-or-death issue. "Secondary responders," such as transportation agencies and towers, may not be notified until after the first responders arrive on scene and determine that help is needed. This can have*

*Continued on next page*

*Utah Department of Public Safety Officer accessing the advanced traffic management system, which is integrated with law enforcement's CAD system.*

## *Traffic Incident Response Planning*

Public safety and transportation agency response to traffic incidents has been mediated more by intradisciplinary tradition and training, and by experience gleaned from multidisciplinary responses, than by organized, well-communicated preplanning. In the United States today, as law enforcement, fire, EMS and transportation responders arrive on an incident scene, regardless of order, they tend to focus single-mindedly on their roles, respectively:

- Traffic flow, crash investigation and scene clearance;
- Hazard suppression and patient extrication;
- Patient triage and care; and
- Roadway management, traffic flow, and scene clearance.

The evolution of the incident command system (ICS) and the National Incident Management System (NIMS) have improved coordinated response to large-scale events. However, response to more common events, such as car crashes involving few patients, rarely benefits from preplanning, or from proactive ad hoc interdisciplinary discussion and planning by commanders on the scene. There have been isolated efforts, such as training programs and standards for safety wear, to better prepare responders for safe operation at traffic incidents.

*major ramifications on clearance time. The 9-1-1 system itself, taken for granted by most of the public (although many rural and remote areas of the nation still do not have basic 9-1-1 coverage), is facing unprecedented challenges in responding to calls originating from wireless and next-generation technologies such as voice-over-Internet Protocol (VoIP).*

*Public notification is an extremely important element of traffic incident management. Notifying motorists in time to divert them from the incident-caused traffic queue reduces incident-related travel delay and congestion, and decreases the likelihood of secondary crashes. While some progress has been made in recent years in real-time traveler information, nearly everyone agrees we have a long way to go.*

*Emergency routing is a major issue. Responders want and need real-time information advising the best route to and from incident scenes, and motorists need to know how to re-route. Future visions call for widespread use of mobile wireless technology linked to transportation management centers (TMCs). In the meantime, much could be gained by improving the voice communications links among TMCs, emergency response command centers, and the public news media, as well as more widespread use of existing "Smart Response" technologies.*

*Finally, there's the often-discussed interoperability issue, itself a term with many meanings. After September 11, the need for compatible, interoperable voice communication equipment to connect first responders at incident scenes received needed attention. To law enforcement, fire, and EMS, achieving "interoperability" through access to common radio channels has been a major goal, and some progress has been made with post-9/11 Homeland Security funding to improve public safety radio interoperability. Lack of adequate public safety radio spectrum has been a major issue for many years, and as a result recent FCC action has opened up new broadband spectrums for public safety use. This opens up the vision of a broader "interoperability" beyond voice communications, and beyond the first responders.*

*With broadband spectrum available for public safety use, it is technically feasible to design interoperable, mobile, wireless voice and data networks to connect all responders (law enforcement, fire, EMS, transportation, 9-1-1 centers, towing and recovery, and others) in real time. At the national level, advisory groups discuss the possibilities of a "network of networks" to connect all emergency responders through mobile wireless networks, but much work remains to create the will to develop such communications networks and to overcome the technical, institutional and funding barriers to greater information- and data-sharing. Strong partnerships among state and local traffic incident responders can foster the close working relationships necessary to development of cross-agency emergency information exchange networks.*

The 2005 FHWA / AASHTO "scan" of traffic incident response practices in Europe revealed significantly different practices in some European countries. England, Germany, and The Netherlands have made a commitment to nationwide preplanning, and developed well-communicated standards for response. The Dutch have established a "national directive" for traffic incident management to foster a multidisciplinary responder culture that combines safety, effective scene management, and quick clearance.

The Dutch responders covered by the directive include EMS, law enforcement, fire, transportation, and towing and recovery. The directive establishes the following priorities for on-scene operations: (1) Responder (workers') safety; (2) traffic safety; (3) assistance to victims; (4) maintaining traffic flow; and (5) salvaging cargo and vehicles.

The Dutch directive defines initial safety measures to be followed by all traffic incident responders, regardless of the order of their arrival on scene. First priority is establishing a 100-meter buffer between the scene and on-coming traffic, with the responder's vehicle in a "fend-off" position, and traffic cones set in particular patterns. The directive continues with standards for safety wear, vehicle livery, patient care, and the like. It mandates a multidisciplinary command conference on scene, so that mutual expectations established by the preplanning are enhanced by communication of specifics relevant to the event at hand.

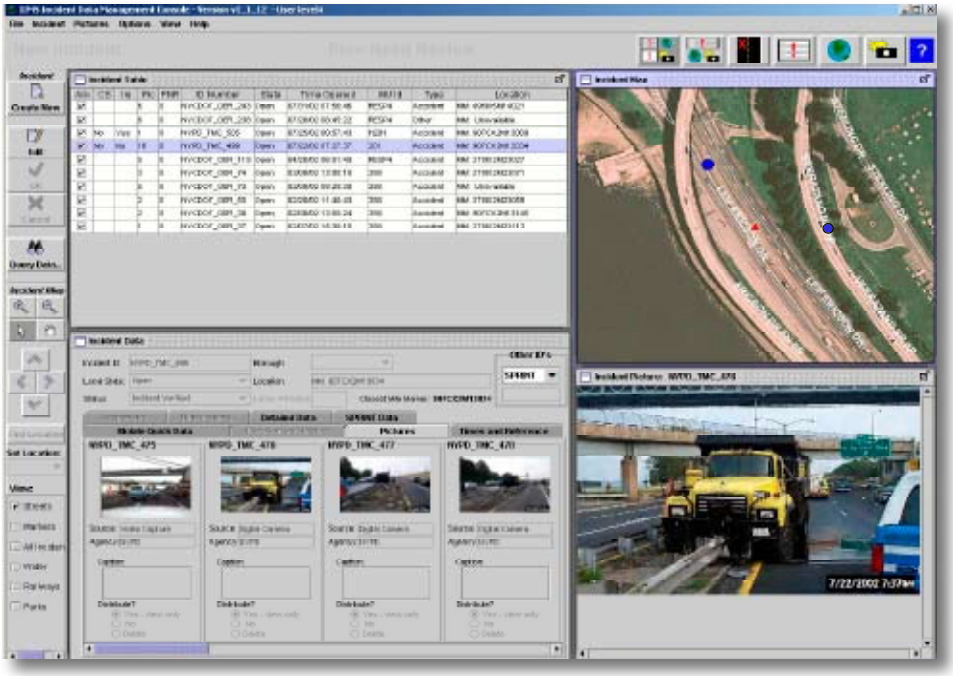
The National Cooperative Highway Research Program (NCHRP) has funded a study to analyze what the United States might learn from incident responder training programs both at home and abroad. While such detailed

standards may not be appropriate for the National Unified Goal (NUG) for traffic incident management, state and regional traffic incident management planners should be encouraged to detail their response plans. The more effective the pre-event communication of expectations, the less likely that radio and other communications will impede response operations. Since no two events will ever be exactly alike, a complete communications plan must be an effective mix of pre-planned communications and on-scene ad hoc communications.

## *Incident Notification*

All traffic incident responders need prompt incident notification with timely and accurate incident information. While incident notification procedures vary from jurisdiction to jurisdiction, in major metropolitan 9-1-1 facilities, notification of traffic incidents occurs through a call to a 9-1-1 center, which then notifies emergency first response agencies—generally defined as law enforcement, fire and rescue, and emergency medical services (EMS). In many rural areas, often the call-taking and dispatch functions are combined.

Transportation agencies and private sector responders, including towing and recovery companies and traffic control companies, generally are not recognized as emergency responders. Consequently, incident notification may not occur at the dispatch center, and may be delayed and haphazard, which slows response times. Towers, for example, complain that there are no standard procedures for notifying towers of an incident to which they are expected to respond. "Last called and first blamed" is a frequent refrain in the towing industry. In cases where transportation officials must be on-scene to manage decisions regarding road or lane closures or openings, or call-outs of towers, notification delays lead to clearance delays. Delay in notification of transportation agencies also causes delays in application of traffic management tools, such as changeable message signs (CMS), traffic signal timing, and traffic surveillance technology.



*Screenshot from New York City's Integrated Incident Management System (IIMS), which enables NYPD officers to transmit incident scene photos to NYCDOT's Traffic Management Center, speeding prompt dispatch of appropriate responder resources.*

Co-location of Transportation Management Centers (TMCs) with public safety call-taking and dispatch has solved the notification issue for transportation agencies in some areas, but at a national level this remains a significant issue.

Some states have recognized transportation as emergency responders, with beneficial results. In Oregon, for example, ODOT maintenance personnel are frequently the first responders on the scene at rural incidents, where the public safety agencies have difficulty in providing adequate and speedy coverage. In urban areas, ODOT incident response teams are assigned to specific corridors, with a goal of arriving on scene as soon as possible to negotiate roadway issues with other responders. Statewide, twenty percent of the time, the transportation responders arrive first. ODOT is notified of incidents using the same CAD system that the state patrol uses. Two of three ODOT TMCs, including the statewide traffic management operations center in Portland, are co-located with Oregon State Patrol dispatch. Use of Unified Command principles ensures that roles are understood by all involved.

Still more incident notification policy issues swirl around Automated Crash Notification (ACN) systems (which open a voice link to call centers when a vehicle crashes or when occupants press a call button), and the emerging Advanced Automated Crash Notification (AACN) technologies (which also transmit crash data). At issue is

whether the calls and/or data should go directly to 9-1-1 centers (as the 9-1-1 community advocates), or be routed through private sector call centers where the operators are not trained in 9-1-1 call-taking. Additional legal and privacy concerns surround the routing of crash data, which has the potential to speed the dispatch of appropriate emergency medical resources to the crash scene, and to help hospitals and trauma centers prepare for the arrival of crash victims.

## Public Notification

The National Traffic Incident Management Coalition (NTIMC) held "listening sessions" with member organizations in 2006 to learn about stakeholder priorities for improvement of traffic incident management. The issue of public notification of traffic incidents emerged as a major concern. Here are some typical comments:

- "Faster, more reliable incident notification and public information is a major priority for the trucking industry. We need to get incident information to the truck driver at a point where there's still another option—that is, alternative routing to avoid incident-related traffic back-up." (American Trucking Associations)
- "NUG themes should include public notification. Communications with the general media should be considered...." (I-95 Corridor Coalition Southern HOGS)
- "The NUG should promote partnering with the news media as a best practice. For example, the United Kingdom has a national media person who broadcasts incident information." (American Trucking Associations)
- "Why can't we have more timely information out to drivers to tell them not only what has happened, but what we want them to do? For example, 'Accident ahead. Move Left and Slow Down.' (Cumberland Valley Volunteer Fire Association/Emergency Responder Safety Institute)

Several stakeholders expressed concern about the delivery of traveler information to drivers via cell phone as a dangerous driver distraction. For this reason, stakeholders voiced reservations about the 511 Traveler Information system, through which many state DOTs provide real-time traffic and road condition information from TMCs to the public. The 511 Deployment Coalition, which coordinates deployment of 511 by state DOTs, is aware of the safety concerns and encourages public information messages to ask drivers not to use cell phones when they are driving; rather to call 511 before they leave home, or to pull over to the side of the road. Many states' 511 deployments also deliver real-time information on the web, and future plans in many states call for delivery by many other mechanisms.

A participant from the trucking industry articulated a strong vision for the traveler information system of the future. While he described a system tailored for truckers' needs, the basic vision would serve all motorists well:

*"We need an incident information system that will deliver real-time information without distracting truck drivers. We need timely and critical information to be pushed out to drivers. An ideal system would be where the driver could plug their route in electronically, and get notification when something happens along the route. Notification could go to the dispatcher, or directly to the trucker. It would be easy to obtain information*

*regarding how to re-route according to weight, route, etc. This would require national coordination so the driver can avoid diverting into yet another incident in the region."*

## Emergency Routing Information, Coordination, and Communication

Embedded in the traveler information vision for the future quoted above are three resource-intensive capabilities that currently are generally lacking in most jurisdictions: rerouting information, rerouting coordination, and rerouting communications.

***Rerouting Information:*** Pre-planning emergency detour routes, including commercial vehicle routes, is an important element of preparedness for major traffic incidents. The trucking industry would like to see states work together more closely to coordinate alternative routing, and to provide information about restrictions on alternative routes (e.g. tunnels, hazmat, or weight restrictions). Experience gained from previous emergencies or special events can be used to plan the most effective diversion strategies.

***Rerouting Coordination:*** What if there's another major incident on the pre-planned diversion route? Adjusting detour routes to accommodate real-time traffic and road conditions will require integration and fusion of real-time traffic information regionally, interstate, and nationally. While it will take many years to fully fuse and integrate the nation's traffic information system, regional fusion already has taken place in many areas of the country. For example, the I-95 Corridor Coalition was able to effectively coordinate traffic management throughout the corridor from the I-95 Interim Operations (Traffic Management) Center at TRANSCOM (in New Jersey) during the events of September 11. While coordination at that time depended on phone, fax and e-mail, the future promises more automated capabilities.

A glimpse of that future may be seen in the Washington, DC metropolitan region, where a Regional Integrated Transportation Information System (RITIS) is being planned that will compile real-time transportation data from each of the region's transportation agencies. RITIS will feed this information to a soon-to-be developed region-wide entity responsible for improving interagency coordination of incident management among the three state DOT agency partners—Maryland, Virginia, and the District of Columbia. The National Capital Region's Regional Transportation Coordination Program (RTCP) is under development, with initial funding of $1.6 million under the 2005 SAFETEA-LU federal transportation reauthorization legislation. The RTCP program will have three major focus areas: improved technology systems for data sharing; multi-agency coordination of standard operating procedures and notification practices; and improving the quality and timeliness of information provided to the news media.

***Rerouting Communications:*** A final element in the realization of the "traveler information vision of the future" would be a "surface traffic control" communications system, analogous to the aviation industry's air traffic control system, to push critical information out to drivers when they need it.

***Media Relations:*** While it will be many years before "surface traffic control" is fully evolved, much more could be accomplished using existing technology. Strong partnerships with the news media can go a long way toward improving the dissemination of the information that transportation officials already have. For major incidents, it makes sense to designate a spokesperson with responsibility for providing the news media with timely and accurate information. Media relations has been a somewhat overlooked area in the emerging discipline of traffic incident management. Workshops, policy papers, and recommended practices for public communications about traffic incidents should be considered.

## CAD-ITS Integration

While DOT TMCs sometimes share information with state highway patrol dispatch centers, it is relatively rare for communications and data to be shared in real time among responders (transportation, law enforcement, fire, EMS, 9-1-1, towers). Yet the technical feasibility of real-time information sharing networks has been demonstrated, and in a few areas of the country, such systems already have been built. With the current emphasis and interest in "interoperability," the public safety interoperability vision needs to be expanded to include integration of Intelligent Transportation Systems (ITS) with public safety computer-aided dispatch (CAD).

Major metropolitan areas in the United States have advanced traffic management systems (ATMS) at the core of their ITS deployments. But ATMS systems generally are not integrated with public safety CAD systems. Most existing CAD systems are proprietary and are not designed to exchange information with CAD systems offered by other vendors, let alone with ATMS. CAD vendors have been generally hesitant to design their systems for easier interoperability. Additional challenges are posed by variations in formats and protocols for data and for messaging, and different system standards in the transportation and public safety communities.

Funding of system integration is of course another major challenge. In 2003, the FHWA sponsored field operational tests of integrated CAD-ITS systems in Salt Lake City and Washington State. A more viable long-term funding model may be to use of a combination of transportation and homeland security funding. Recently, the Oregon Department of Transportation (ODOT) used a $400,000 homeland security grant and a $700,000 Urban Area Security Initiative (UASI) grant to integrate ODOT, the Oregon State Patrol (OSP), the City of Portland's 9-1-1 system, and public safety communications in surrounding counties.

The Cincinnati region also is a leader in the coordinated use of homeland security and justice funding for integrated public safety communications, going beyond voice integration to regional voice and data integration. In 2003, Hamilton County, Ohio implemented a new 800 MHz digital trunk radio system, providing a voice link among emergency medical technicians, firefighters, and law enforcement officers. They then built a mobile data computer network, which includes the County Coroners' Office, the Public Health Commissioners' Office, 44 fire and rescue departments, 44 Hamilton County law enforcement agencies, and tri-state area hospital emergency rooms, and the Emergency Management Operations Center. Thanks to strong regional coordination, all of the agencies agreed to spend about $2.7 million of the region's UASI funds to purchase mobile data computers. At the same time, Hamilton County was implementing a new CAD system, and wanted to integrate it with the region's Advanced Regional Traffic Interactive Management & Information System (ARTIMIS) to exchange real-time traffic data and to obtain video feeds from ARTIMIS' cameras. Again thanks to strong regional coordination, the county was able to secure a Congressional earmark of $700,000 from the Department of Justice's COPS-MORE program to support integration of the new CAD system with ARTIMIS.

On the east coast, the I-95 Corridor Coalition will soon have in place the first link of what could become a fully integrated corridor-wide network. The Hudson Valley Transportation Management Center (HVTMC) is building a comprehensive solution for CAD to CAD, ATMS to ATMS, and CAD to ATMS in the Hudson Valley, NY. The system effectively creates a "center to center" communication backbone, separating CAD and ATMS data and linking them to state and multi-state systems. The system will be located at the HVTMC facility in Hawthorne, NY. The HVTMC has already successfully completed a CAD-ATMS interface using the same principles as a proof of concept. This new project will create a model for the rest of the state, and the I-95 Corridor Coalition, to use in their interface projects.

CAD-ITS integration would not only provide for more coordinated and accurate traffic incident communications at control centers and on-scene; it would greatly facilitate data-gathering related to incident operations, which is in demand as the basis for more performance-based traffic incident management. Data on incident durations, locations, and types would be available in a single consolidated, transportation / public safety database.

*Wireless remote laptop*

## Regional Wireless Interagency Emergency Information Exchange Networks

Voice communications (radio, telephone) are the backbone of the local first responder emergency communications system in this country. But wireless networked technologies are revolutionizing the way Americans communicate in both their personal and business lives. Wireless transmission of text, data, images and video is already commonplace.

As noted in the introduction to this paper, now that broadband spectrum is increasingly available for public safety use, it is technically feasible to build interoperable, mobile, wireless voice and data networks to connect all responders (law enforcement, fire, EMS, transportation, 9-1-1 centers, towing and recovery, and others) in real time.

Sharing information through regional emergency communications networks increases situational awareness and event and resource control. Both at the control center and on-scene, better information makes it easier to monitor the event and manage resources appropriately. Unified Command also is much easier when emergency responders integrate their information and communications systems so that all the responders share up-to-the-minute incident information.

In many if not most cases it is not practical to gain commitment from multiple agencies or jurisdictions to build a new, consolidated, shared in-

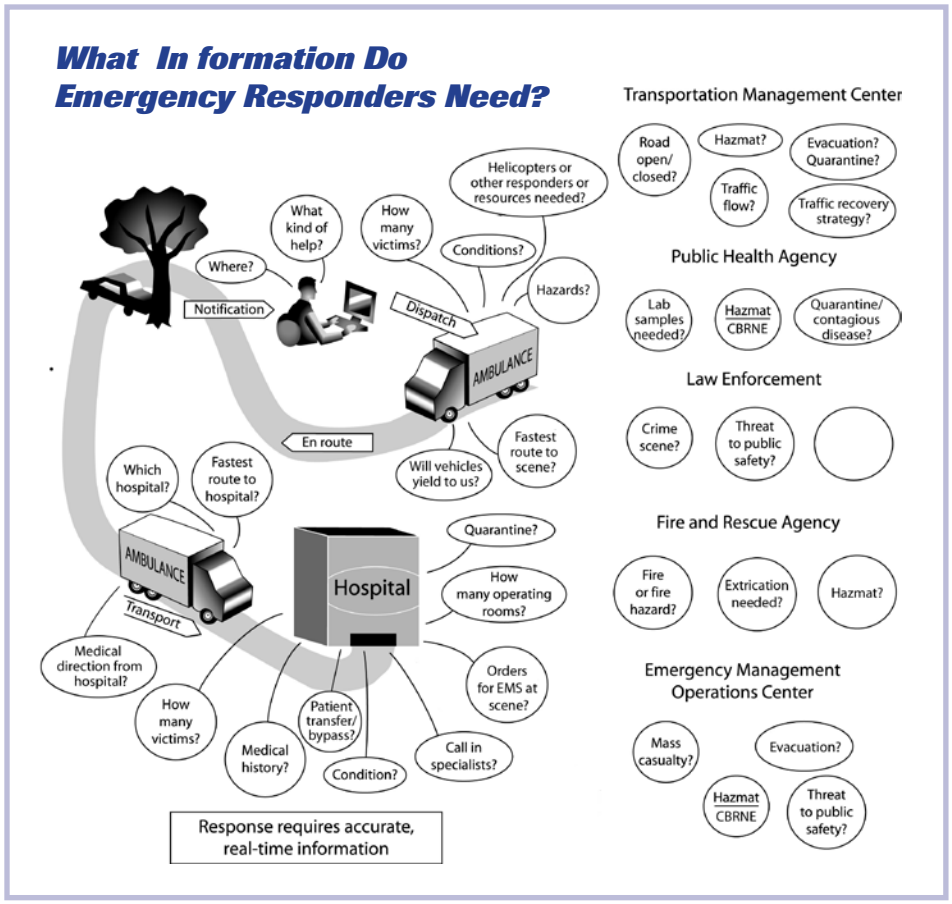



*Figure 1: ITS America's Public Safety Advisory Group (PSAG) produced this drawing in 2004 depicting the information needs of various incident responders, and how they might be linked in a real-time wireless cross-agency emergency information exchange network. Such networks would enable a broad range of public safety, transportation, public health, and emergency management agencies to share voice, video, graphic and text data in real time.*

formation or communications system or network (although that is exactly what has occurred in New Orleans, post-Katrina). But the idea of a common system architecture and compatible equipment that will permit users to more easily share information or communications capability, as needed, is broadly attractive. In a "network of networks," individual partners maintain their own information and communications networks, but can easily link them to others at the local, state, or national level. The ITS America Public Safety Advisory Group (PSAG), which includes representatives of leading transportation and public safety national associations, has discussed the desirability of a "network of networks" to connect all emergency responders in real time through mobile wireless networks. Many institutional barriers must be overcome to deploy broad-based networks. Leadership is needed to develop models for financing, technology development, data-sharing and privacy protocols.

Figure 1 depicts the user information that each emergency responder might need, which could be provided thorough such a shared "network of networks."

Much work remains to be accomplished if this vision for the future of emergency communications is to be realized. Development of a real-time wireless incident communications network requires the many stakeholders to work together to provide a coordinated suite of standards and open system architectures, in a reasonable time frame. New public policies are required to provide incentives (positive and negative) for standards compliance. Technology users need to be educated about the benefits of broad-scale voice and data interoperability, and encouraged to demand and specify interoperable standards and open architectures. Funding programs ideally would encourage the sharing of networks to save money. At the same time, information-sharing policies need to be developed to address privacy concerns related to sharing of medical and judicial information. Work on common data dictionaries must be coordinated and accelerated, and agreements on common emergency communications terms must be developed.

## Next Generation 9-1-1 and the "Network of Networks"

Nationwide, emergency response agencies lack the basic transmission infrastructure to support an emergency communications "network of networks." The National Highway Transportation Safety Administration's (NHTSA)'s Next Generation 9-1-1 Initiative is currently developing a national framework and deployment plan for the Next Generation 9-1-1 System. Part of this effort should be to consider how to upgrade infrastructure to support the entire emergency communications "network of networks." The transmission of text, data, images and video into 9-1-1 centers, and linking 9-1-1

call centers to other emergency responders through regional emergency communications networks, will require a major upgrade of transmission infrastructure. 9-1-1 centers are already struggling to handle calls from wireless phones, because many call centers still do not have the technology necessary to locate wireless callers (this capability is called wireless E9-1-1). In August 2003, 75 percent of Americans lived in areas without full wireless E9-1-1 call location capability. But before the wireless location challenge has been met, another, even more difficult challenge is facing 9-1-1: What happens when a citizen tries to send a text message to a 9-1-1 center? Or tries to call 9-1-1 using a computer (voice-over IP?), or a picture of an incident scene from a cell phone? Most 9-1-1 call centers cannot accept those types of calls. The current 9-1-1 system is based on telephone technology.

## *Funding for "Smart Response" Technologies*

While it may be many years before the vision of cross-agency emergency information exchange networks can be attained, in the meantime much can be gained through additional funding for purchase of state-of-the art information and communications tools for first responders. According to the ITS America' PSAG, here's how incident responders can benefit from ITS technologies:

***Monitor the scene remotely:*** Closed circuit video cameras placed along roadways observe real-time traffic and can assist law enforcement agencies in monitoring red-light runners, aggressive drivers, and criminal activity. When mounted on airplanes or helicopters, cameras can provide live transmission using downlinks to traffic management and public safety operations centers.

***Verify the Incident:*** Closed-circuit video cameras assist in incident verification, which speeds response and assures appropriate asset deployment.

***Dispatch the closest unit:*** Automatic Vehicle Location (AVL) systems track the location of law enforcement, fire, EMS, towing, and freeway service patrol vehicles, so dispatchers can determine which available units are closest to the scene.

***Access real-time traffic and travel information:*** ITS systems use traffic surveillance cameras and traffic and weather sensors to provide real-time traffic and travel condition information. Public safety agencies can "pull" this information into their information and communications systems, so both command center and field units have route guidance based on real-time traffic and travel condition information.

***Stop wasting time at red lights:*** Traffic Signal Priority or Preemption Systems give green-light priority to emergency vehicles passing through intersections.

***Signal other vehicles to clear the way:*** Emergency signaling technologies enable emergency vehicles to transmit a warning to devices in vehicles in their forward path.

***Prevent crashes and increase crash survivability:*** New in-vehicle safety technologies such as seat-belt alarms, driver condition alarms, and crashworthy construction reduce the changes that responders will be injured or killed on the highway.

***Control scene access:*** Smart Passes assist in controlling access to secure areas and in identifying responders.

***Manage incident-related traffic:*** The TMC can assist responders by adjusting traffic signal controls and changeable message signs to assist in scene access and control, or to manage evacuation and exclusion zone operations.

***Access real-time incident information, maps, and databases:*** Computer terminals in emergency vehicles, or handheld wireless devices provide on-scene responders with access to incident information, route guidance, maps and databases.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# Responder Safety

ntimc
National Traffic Incident Management Coalition

**NATIONAL UNIFIED GOAL (NUG) FOR TRAFFIC INCIDENT MANAGEMENT**

*The opportunity to enhance the safety of incident scenes is a key motivator for law enforcement, fire, emergency medical services (EMS), and towing and recovery to participate with transportation responders in traffic incident management programs.*

*While secondary incidents involving emergency responders can take many forms, they often occur when emergency responders are struck by passing vehicles while they are working at a traffic incident scene. For example, a law enforcement officer may be struck while assisting a stranded motorist or while directing traffic; a firefighter may be hit by a motorist while advancing a hose line across a roadway toward a vehicle fire; or a paramedic may be struck by a car while attending to an incident victim.*

*Public safety professions are high-risk, and have a safety culture with a low tolerance for any preventable deaths or injuries. As roadways grow more congested, and driver behavior deteriorates, concern mounts for responder safety at traffic incidents. Transportation agencies and private sector responders are equally concerned for the safety of their traffic incident responders.*

*The concerns are borne out by National Institute for Occupational Safety and Health (NIOSH) data showing an upward trend in numbers of workers of all types killed as a result of being struck by vehicles. In 2005, NIOSH reported 390 workers killed in struck-by incidents, up from 278 in 2004, and up from an annual average of 365 over the 2000-2004 time period. In 2005, struck-by incidents accounted for 7 percent of the total number of fatal occupational injuries. (Figure 1)*

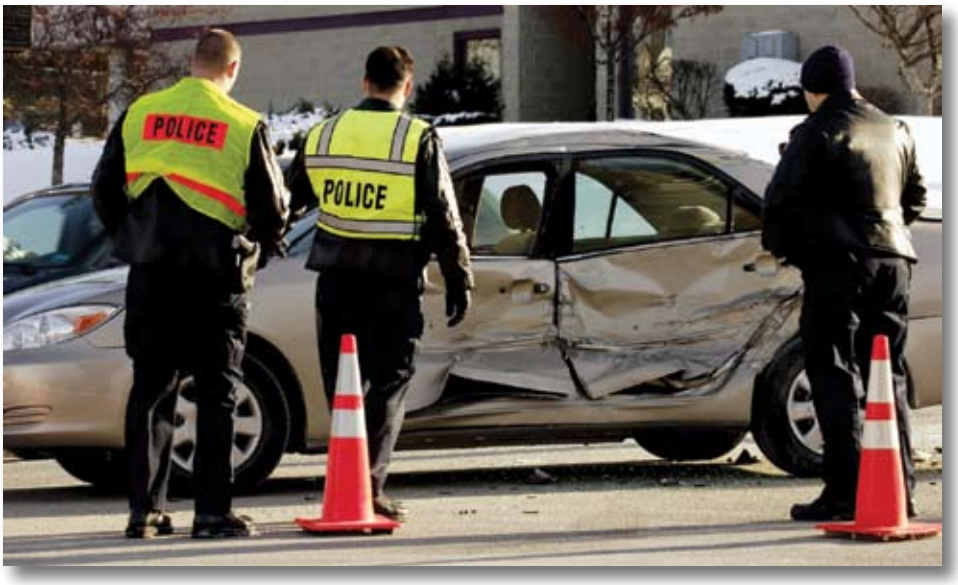
| | 2000-2004 AVERAGE | 2004 NUMBER | 2005 NUMBER |
|---|---|---|---|
| Worker Struck by Vehicle (All Occupations) | 365 | 378 | 390 (7 percent) |

*Figure 1. Struck-by incidents accounted for 7 percent of fatal occupational injuries in 2005.*[1]

## *Fire Services*

As dangerous as firefighting is, transportation-related incidents claim about 20 percent of the roughly 105 firefighter on-duty deaths each year, and struck-by deaths account for a growing proportion. In June 2001, NIOSH reported that the number of firefighters struck and killed by motor vehicles had increased by 89 percent in the previous five years. Seventeen firefighters had been struck and killed between 1995 and 1999, compared to 9 between 1990 and 1994. The report, *Traffic Hazards to Fire Fighters While Working Along Roadways*,[2] states:

*". . . Motorists accustomed to a clear, unobstructed roadway may not recognize and avoid closed lanes or emergency workers on or near the roadway. In some cases, conditions can reduce a motorist's ability to see and avoid firefighters and apparatus. Some examples include weather, time of day, scene lighting (i.e., area lighting and optical warning devices, traffic speed and volume), and road configuration (i.e., hills, curves and other obstructions that limit visibility). These hazards are not limited to the fire service alone. Other emergency service providers such as*




*law enforcement officers, paramedics, and vehicle recovery personnel are also exposed to these hazards."*

Of the six firefighters who died in struck-by incidents in 2002, three were killed as they assisted on the scene of motor vehicle crashes, one on the scene of a vehicle fire, one on the scene of a wildland fire, and one during training near a roadway.[3] The Emergency Responder Safety Institute (ERSI), founded by the Cumberland Valley Volunteer Firemen's Association (CVVFA), sponsors a website that tracks news reports of responder deaths and injuries at www.responder-safety.com. NIOSH's Firefighter Fatality Investigation and Prevention Program (www.dcd.gov/niosh/fire/) conducts independent investigations of firefighter line of duty deaths, and the program's web site includes reports of investigations of traffic-incident-related firefighter deaths.

## Law Enforcement

According to the Federal Bureau of Investigation (FBI), traffic crashes claim the lives of more law enforcement personnel than any other cause of death in the line of duty, including shootings. Being struck by vehicles is the number two cause of accidental law enforcement officer death (behind vehicle crashes).[4] The majority of officers killed in struck-by incidents are killed when assisting at traffic incident scenes, but a significant number also are struck during traffic stops. In 2004, 28 officers died in crashes, including 10 who were struck and killed by passing vehicles while they worked outside their patrol cars.[5]

| | Number of workers killed in struck by incidents (2004) |
|---|---|
| Firefighters | 4 |
| Police and sheriff's patrol officers | 11 |
| Highway maintenance workers | 11 |

*Figure 2. OSHA data on fatal occupational injuries from transportation incidents tracks the annual number of struck-by deaths for some responder occupations, but not all. The struck-by deaths are not necessarily at traffic incidents; they might occur anywhere, at any time.*[7]

Even more officers are injured each year, some very seriously. A check of the "Officer Down Memorial Page" (http://odmp.org) in September 2006 revealed that among the five officers that the web site reported killed by struck-by incidents in the first nine months of 2006 was Lt. Herman W. Brooks of the DeRidder Police Department in Louisiana, who died on February 17, 2006 of injuries he sustained 8 1/2 years earlier when he was struck by a vehicle while assisting at the scene of an automobile crash. Another officer had signaled the vehicle to change lanes, but the driver did not follow the instructions and Lt. Brooks was thrown head first into the path of another moving vehicle. He sustained massive head injuries and spent the last 8 1/2 years of his life on life support.

The International Association of Chiefs of Police (IACP) offers the "Your Vest Won't Stop This Bullet"[6] roll call training video; posters; the *Highway Safety Desk Book*; the *Manual of Police Traffic Services Policies and Procedures*; Staff Study 2004; and Staff Study 2006 to increase officer safety during all roadside contacts, including traffic stops, collision investigations, traffic direction, and assisting motorists with disabled vehicles. The IACP educational package emphasizes the importance of high-visibility apparel and headgear, location safety, safe vehicle and officer positioning, safe trunk packing, and safe placement of aftermarket equipment and replacement parts.

## Towing and Recovery Industry

According to the Towing and Recovery Association of America (TRAA), during the first three months of 2006, five TRAA towers were killed at traffic incident scenes. Data on towing indus-

try occupational fatalities is not well tracked, as incident reporting categories lump together incidents involving towing trailers (such as boat or pull-along trailers) with incidents involving towing professionals. Although data is anecdotal, the towing industry is increasingly concerned about incident scene safety, and the towing industry has made responder safety one of its key focus areas. In September 2006, the International Towing and Recovery Hall of Fame and Museum in Chattanooga, TN unveiled the "Wall of the Fallen," a memorial that displays the names of towers across the world who have died in the line of service. The museum also has started a Survivor Fund for the families of those killed in service. (www.internationaltowingmuseum.org/wallofthefallen.htm)

### *Highway Agency Responders*

Data on highway workers killed at traffic incidents currently is not separated from overall statistics. (Figure 2) However, the highway industry has a strong focus on reducing worker deaths and injuries at highway construction work zones, where NIOSH estimates struck-by deaths (including workers struck by a passing vehicle, or mobile equipment) accounted for half of the 844 worker deaths between 1996 and 2002. In 2001, NIOSH published *Building Safer Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment,* which covers safety

strategies ranging from contract award processes to high-visibility apparel at work sites.

## KEY STRATEGIES FOR RESPONDER SAFETY

Key Strategies for "Responder Safety" that seem to have broad support include:

- Standardized (but not mandated) Responder Safety Operational Procedures
- Accredited Traffic Safety and Traffic Control Training for Responders
- Responder Safety Policies and Legislation
- Driver Training and Awareness Programs

### *Standardized Responder Safety Operational Procedures*

TIM stakeholders seem to agree that widespread understanding and acceptance of standardized responder safety operational procedures for traffic incidents is a good strategy for reducing responder injuries and death. Mandated procedures may not be universally supported, however; there is concern among some stakeholders about retaining sufficient flexibility and control of their own response procedures to ensure safe, effective achievement of their mission. Recommended standard operating procedures (SOPs) for emergency operations at roadway incidents would cover issues such as:

- Traffic control at traffic incident scenes, including (but not limited to) 24/7 staffing for traffic control functions; vehicle positioning upon arrival (to protect responders); and safe procedures for reopening highways. Procedures should be scalable to incidents of varying size and location. (Current issues related to the *Manual on Uniform Traffic Control Devices* (MUTCD) are discussed below under "Key Responder Safety Issues.")
- High-visibility reflective apparel as standard safety equipment for all responders operating in or near moving traffic. (Current issues related to standards for high-visibility reflective apparel are discussed below under "Key Responder Safety Issues.")
- Incident Command System (ICS) operations as they relate to traffic control duties. Emergency responders performing traffic control duties must understand their scope of authority in relation to other responders (i.e., police vs. fire) and other agencies (i.e. departments of transportation). Laws differ as to the traffic control authorities of responders. For example, in some jurisdictions fire officials have the authority to control traffic at incident scenes; in others, law enforcement has this authority; in still other cases this authority is shared among fire, law enforcement, and/or transportation.

- On-scene traffic safety management, which is the responsibility of the Incident Commander unless otherwise delegated, but which often is overlooked. Incident Command principles call for deployment of designated safety officers at major incident scenes, but in some cases these officers may not focus on the traffic safety aspects of their duties.
- The use of adjunct warning lights or audible devices while responding to, or operating at, emergency scenes. (Current issues related to use of warning lights or audible devices are discussed below under "Key Responder Safety Issues.")

## Accredited Traffic Safety and Traffic Control Training for Responders

In its 1999 *White Paper*,[8] CVVA stated:

*"Emergency responders are frequently called upon to operate near moving traffic, performing functions ranging from traffic diversion around collision or accident scenes, to aiding stranded motorists, to attending to victims in vehicles directly adjacent to moving traffic. Responders must be familiar with how to safely conduct all these functions because of the constant uncertainty regarding the situations they may face. For example, a police officer arriving at an accident scene may be required to attend to victims, or a firefighter may be called upon to control traffic to enable other rescuers to reach a scene. Because of the multitude of factors to be considered, emergency responders must have appropriate training."*

The *White Paper* went on to recommend that, at a minimum, all emergency responders should receive basic awareness training in traffic safety and traffic control, and responders who are

more likely to routinely perform traffic direction should receive focused training in traffic control. The CVVFA *White Paper* also recommended that incident commanders "be better trained to appreciate the task of, hazards implicit in, and training needed to safely perform traffic direction and control."

Based on the results of listening sessions conducted by NTIMC in the summer of 2006, the idea of multidisciplinary training programs for traffic incident responders, to include training in traffic safety and traffic control, is gaining currency among stakeholders. The TIM training would be considered advanced, specialized training that would be in addition to the basic training currently required for each discipline. (See the NUG Technical Paper on "Safe, Quick Clearance" for further discussion of TIM training and certification.)

Existing resources that form a foundation for development of more comprehensive TIM training and certification programs in traffic safety and traffic control include:

- "Managing Traffic Incidents and Roadway Emergencies," a workshop on traffic incident management, is currently available from the FHWA's National Highway Institute. The workshop is recommended for mid-level management and on-scene supervisory-level personnel from law enforcement, fire and rescue, emergency communications, transportation, towing and recovery, traffic reporting media, and other agencies or organizations involved in resolving traffic incidents.
- "Emergency Traffic Control for Emergency Responders," a new course offered by the American Traffic Safety Services Association (ATSSA), is aimed a police and fire rescue personnel who are involved in traffic control, either responding to an incident or enforcing traffic control in work zones. This four-hour course covers the concepts of temporary traffic control presented in the *Manual on Uniform Traffic Control Devices* (MUTCD) Section 6.I, a Federal standard.
- Downloadable Responder Safety Training Presentations available at www.respondersafety.com/training.php, including Safety Benchmarks; Intermediate Incidents; Minor Incidents; and Definitions of Roadway Incident Terms.
- Emergency Responder Safety Institute (ERSI) roadway incident training for fire and EMS personnel.
- Fire Department Instructors Conference traffic safety courses.
- Volunteer Fire Insurance Services (VFIS) "Highway Safety" training program (workshop and supporting materials).
- "10 Cones of Highway Safety" DVD produced by VFIS and distributed free by Respondersafety.com.
- "Emergency Vehicle Safety Program" produced jointly by the

International Association of Fire Chiefs (IAFC) and the International Association of Fire Fighters (IAFF), which Includes a section on "Roadway Scene Safety" and can be accessed at www.iaff.org/evsp/.

### *Responder Safety Policies and Legislation*

State and local policies and legislation are an important element of any initiative to enhance responder safety. For example:

- Slow Down and Move Over laws require drivers to slow down and move over for emergency vehicles stopped on the side of the highway. At this writing, 33 states had Slow Down and Move Over laws, with fines that averaged $170 and ranged from $50 in Colorado to as high as $500 in Georgia and Washington. (Current issues related to the Slow Down and Move Over laws are discussed below under "Key Responder Safety Issues.")
- Policies requiring preplanning of traffic control and traffic diversion strategies for likely incident scenarios on the transportation network are important techniques for reducing the likelihood of secondary incidents, because preplanning enables responders to implement effective scene traffic management more quickly.
- Policies supporting multi-agency and multi-jurisdictional training exercises permit responders to develop appropriate mutual aid agreements, to evaluate the effectiveness of planning, and to make needed modifications.

### *Driver Training and Awareness Programs*

Emergency responders feel strongly that motorist education and awareness are key elements in responder safety programs. During the NTIMC-sponsored NUG listening sessions in the 2006, stakeholders called comments included:

- "We should educate the public to drive more safely at incident sites."
- "Driver education programs should include information on responder Safety. AARP's and AAA's courses also should include responder safety elements."
- "We should work with the national coalition of driver education teachers to encourage fire, EMS and law enforcement speakers to visit classes and discuss responder safety."
- "We should coordinate public education initiatives with the insurance industry, trucking industry, and the safety industry. We should reach out more to insurance industry, AAA, and AAA Foundation for Highway Safety."
- "Prevention topics include driver fatigue, motorist information, public and driver education, graduated driver licensing, aggressive driving, and driver education regarding sharing the road with commercial vehicles."

## KEY RESPONDER SAFETY ISSUES

Summarized below are current issues related to responder safety that will require additional dialogue among the TIM stakeholders for resolution.

### *MUTCD Section 6-I*

The *Manual on Uniform Traffic Control Devices* (MUTCD), published by the FHWA, defines the standards used by road managers nationwide to install and maintain traffic control devices on all streets and highways. Non-compliance with mandatory MUTCD provisions on Federal-aid projects may lead to Federal sanctions. Now that most states no longer have sovereign immunity, tort liability in lawsuits is another possible penalty for non-compliance, especially in situations where a crash has occurred that might be attributed to inadequate, inappropriate, or non-compliant traffic control devices.

MUTCD Part 6 covers "Temporary Traffic Control," and Chapter 6.I addresses "Control of Traffic through Traffic Incident Management Areas."[9] The current version of Chapter 6.I provides examples of signs used in Traffic Incident Management Areas, and guidance on managing traffic incidents of varying magnitude, and on use of emergency-vehicle lighting.

The MUTCD is revised every five years. NTIMC advocates the involvement of the public safety community in the development of the 2008 edition of the MUTCD, and especially in Chapter 6.1. The NTIMC has been actively engaged in providing comments and resolving the concerns of public safety organizations regarding proposed revisions to the MUTCD. The Coalition endorsed the definition of buffer zones when

placing vehicles at a highway incident scene, and has suggested that both lateral and longitudinal buffer zones be encouraged to protect the incident scene, responders, and victims.

NTIMC also strongly advocates MUTCD recognition of the pending ANSI/ISEA standard on high-visibility apparel for public safety personnel (see below).

## High-Visibility Apparel Standard

NTIMC promotes use of high-visibility apparel by traffic incident responders. NTIMC believes there should be a public safety vest capable of visually signaling public safety officers' presence by contrasting the color and brightness of the vest against the ambient background of their work environment and incorporating, as well, the requirements of its users. Firefighters need a vest that will fit over their turnout gear; emergency medical technicians and police officers need side access to reach equipment such as scissors, pistols, handcuffs, and walkie-talkies; and they all may need break-away shoulders, adjustable waists, pen/penlight openings, and badge and microphone tabs. IACP's

Richard Ashton explained the history of NTIMC's involvement in the high-visibility safety vest issue in an article recently published by Responder Safety.com[10] and quoted below:

*"Under the NTIMC umbrella, representatives of the Cumberland Valley Volunteer Firemen's Association's Emergency Responder Safety Institute, the I-95 Corridor Coalition, the American Traffic Safety Services Association, and the IACP Highway Safety Committee's Law Enforcement Stops and Safety Subcommittee (LESSS) met in October 2005, with the International Safety Equipment Association (ISEA) and outlined their vision for the conspicuity of public safety officers, as well as their needs. ISEA invited those representatives to present at its High Visibility Group meeting in November 2005, the issues facing the public safety community.*

*Once the ISEA's High Visibility Group heard NTIMC's presentation, it voted immediately and unanimously to develop a standard, which will be designated ANSI/ISEA 207-200x when it is released later this year, to ensure public safety officers' conspicuity, day and night, under all lighting conditions via fluorescent and retroreflective materials. ANSI/ISEA 207-200x will be a voluntary industry consensus standard specifying the requirements for public safety vests. The standard will include performance criteria for the properties of the background materials, color, retroreflectivity, minimum areas of coverage, suggested configuration, and specific features required. The requirements also will include standards against which an independent, accredited third-party laboratory will be able to test and certify a garment, so a manufacturer of a public safety vest ultimately can verify that an item sold to a public safety agency complies with all of the requirements established in the ANSI/ISEA 207-200x standard."*

On Oct. 4, 2006, ISEA submitted the standard to ANSI for final approval, but the version of the standard adopted by ISEA omits the break-away feature of the vest, which NTIMC believes is crucial to responder safety.

Ashton's web article also covers a related pending FHWA rule:

*"In a related development, the Federal Highway Administration (FHWA) sought public comment between April 24, 2006, and June 23, 2006, on a proposed Worker Visibility rule that the Secretary of Transportation is required to promulgate under current Federal highway legislation. FHWA acknowledged the multiple roles and responsibilities of law enforcement officers on the public right-of-way of Federal-aid highways and specifically noted its desire to fully assess the impact on safety and security of law enforcement officers should high-visibility garments be required for use in all situations.*

*The regulation, as proposed, would include a two-year compliance period from the effective date of the final rule and would read, 'All [law enforcement officers] within the right-of-way of a Federal-aid highway who are exposed either to traffic (vehicles using the highway for purposes of travel) or to construction equipment within the work area shall wear high-visibility safety apparel.'*

*The members of the IACP Highway Safety Committee (HSC) and LESS discussed FHWA's proposal at their Midyear Meetings in June 2006, recognizing its positive intent 'to improve the visibility of all workers on or in close proximity to Federal-aid highways in all*

*circumstances including, but not limited to, . . . traffic incident management,' but nevertheless emphasized to FHWA that police officers being required to wear high-visibility safety apparel at all times on Federal-aid highways realistically could jeopardize officers' safety in certain circumstances such as traffic stops or criminal activity. As of this writing the Final Rule is in review at FHWA and will likely be published in late 2006.*

*An officer who is not wearing high-visibility safety apparel, but who nevertheless makes a traffic stop and is struck by a passing vehicle could experience Workers' Compensation or Occupational Safety and Health Act (OSHA) issues, as could the supervisor who arrives at a crash scene only to be struck by a vehicle before s/he can even retrieve high-visibility safety apparel from his vehicle's trunk.*

*The HSC's response stressed that the diverse responsibilities of police officers separate them from all others who work on highways; that their safety is better assured in non-traffic-related situations occurring on highways, such as high-risk felony stops and checks of suspicious persons/vehicles, by furtiveness as opposed to conspicuousness; and that police officers should be required to wear high-visibility safety apparel on Federal-aid highways only when they are engaged in 'traffic incident management,' i.e., in such traditional duties as traffic direction, traffic incident resolution (crash investigations, roadway closures, and highway obstructions), and work-zone assignments."*

## Use of Warning Lights or Audible Devices

Emergency vehicle lighting and audible devices are often distracting and confusing to road users, especially at night. Road users approaching the traffic incident from the opposite direction on a divided facility are often distracted by emergency-vehicle lighting, and slow their vehicles to look at the traffic incident, posing a hazard to responders, themselves, and others traveling in their direction. If good traffic control is established through placement of advanced warning signs and traffic control devices to divert or detour traffic, then public safety agencies can perform their tasks on scene with minimal emergency-vehicle lighting. The MUTCD guidance[11] states:

*"Public safety agencies should examine their policies on use of emergency-vehicle lighting, especially after a traffic incident scene is secured, with the intent of reducing the use of this lighting as much as possible while not endangering those at the scene. Special consideration should be given to reducing or extinguishing forward-facing emergency vehicle lighting, especially on divided roadways, to reduce distractions to oncoming road users.*

CVVFA's responder safety *White Paper*[12] identifies other issues related to safe use of warning lights and audible devices, including:

*"…how to ensure: (1) operator competency, including familiarity with the scope of legal authority to use such devices; (2) adequate vehicle visibility when such devices are deployed; and (3) proper vehicle positioning when responding to, or operating at emergency scenes. Individuals who use warning devices on their private vehicles, and the fire, police, or other department with which the individual is affiliated, should be aware of any implications these devices may have on their insurance coverage."*

## Slow Down / Move Over Laws

Emergency responders are the key proponents of Slow Down/Move Over laws. Inclusion of all responders can be an issue. For example, the Towing and Recovery Association of America (TRAA) is advocating inclusion of towers in Slow Down/Move Over legislation, and reports that a summer 2006 survey revealed that only 14 of 33 Slow Down/Move Over laws then in place mentioned towers.

Increasing public awareness of move-over laws is a key issue. Because these laws are relatively new, many drivers are not aware that they are expected to slow down and move over when they come upon an emergency scene. The use of changeable message signs to advise motorists to slow down and move over when approaching an incident scene is one solution. Some proponents have called for increased nationwide uniformity of Slow Down/Move Over laws so that drivers will have a better understanding of the law they travel across state lines.

Enforcement of Slow Down/Move Over laws can be challenging. Most often fines are imposed for violations that occur in relation to a secondary incident.

## European Models for National Unified Goals and Uniform Traffic Incident Management Procedures

While there is general consensus that more uniform multidisciplinary traffic incident management procedures should be developed and implemented, reaching consensus on the procedures themselves is likely to be less easy.

A 2005 FHWA/AASHTO/NCHRP scan of traffic incident response practices in Europe revealed that The Netherlands, England, and Germany have a comprehensive and multi-disciplinary national commitment to responder safety. Public and private organizations, including road service/auto-clubs, public safety agencies, highway agencies, and towing organizations in these countries have agreed upon standardized procedures and practices to increase responder safety and promote efficient scene clearance. Two of the countries have developed specific programmatic approaches or materials that could be adapted for use in the United States.

In The Netherlands, for example, all responders carry traffic cones, and the first responder to arrive on scene places the cones before attending to victims or vehicles. In the United States, this would represent a major cultural shift. Proponents argue that if responder safety is to be a first priority, establishing a safe work zone for responders needs to be the first priority at incident scenes. On the other hand, requiring emergency responders to carry and use traffic cones is likely to be problematical. As one participant in the NTIMC listening sessions stated, "Putting out cones is not my job."

An NCHRP project has been funded, but is not yet under way, to develop consensus recommendations regarding how to adapt European policies and procedures as a tool in establishing such programs on a local, state, and regional (e.g. corridor-based) basis, which would remain consistent across the nation.

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# Example Strategies for Building Stronger State Traffic Incident Management Programs

ntimc
National Traffic Incident Management Coalition

**NATIONAL UNIFIED GOAL (NUG) FOR TRAFFIC INCIDENT MANAGEMENT**

*Traffic Incident Management (TIM) is a key strategy for improving the efficiency and reliability of highway operations. As concerns about traffic congestion have increased, a call for increased institutional support for highway operations functions, including TIM, has arisen.*

*One of the major objectives of the National Traffic Incident Management Coalition (NTIMC) is to encourage the formation of strong and stable TIM programs and partnerships. But what, exactly, is a TIM program? TIM is a catch-all phrase. Examples of the broad scope of programs and program elements that may fall under the general rubric of "TIM" include development of unified policies, procedures, operations and / or communication systems among TIM responders; the application of Intelligent Transportation System (ITS) technologies to traffic incidents; freeway service patrols; interdisciplinary training in traffic control, unified command and NIMS; improved towing industry procedures and practices, and traveler information.*

*NTIMC promotes effective and sustainable TIM programs, as distinct from TIM activities that, while beneficial, are vulnerable to administrative personnel changes and annual budgetary fluctuations. Stable and effective public programs require legislative or administrative authorization; strategic missions and goals; written operational policies; and formal organizational structure, including trained and dedicated staff, assigned responsibilities, defined reporting channels, and steady dedicated funding. Most highway operations and TIM programs at the State and regional levels have some of these institutional support elements in place, but none seem to have them all.*

*Continued on next page*

## *Incident Management Plans and Policies*

Many state DOTs are starting to recognize the need for strategic planning, as well as operational plans and policies, to improve management of traffic incidents. Formal strategic plans and written operational policies are the foundation of sustainable TIM programs. Some notable models are described below.

***Statewide Clearance Policies and Performance Goals:*** While performance measurement is relatively new to transportation operations professionals, other TIM responders (fire, EMS, law enforcement) long have been publicly accountable for their response times. Within DOTs, there is increased consciousness of performance measurement, and many DOTs are beginning to measure and classify incidents, focusing on quick clearance of major incidents. Currently, the most frequently used performance metric for TIM programs is incident clearance time—either average, or maximum. California, Washington State, and Florida have statewide 90-minute incident clearance goals. Utah's state performance goals are based on incident severity: 30 minutes for fender-benders; 60 minutes for injury crashes; 90 minutes for fatalities. Effective performance measurement will require additional supporting resources that are not currently available in many States and localities, including capability for continuous collection and analysis of supporting data. Few State Highway Patrols are currently involved in performance measurement related

*Typically, DOT efforts to improve highway operations and TIM are not organized as a distinct program or department, but instead consist of activities undertaken by a variety of DOT departments or programs—principally maintenance, traffic engineering, and ITS. Frequently, personnel assigned to TIM duties have other full-time responsibilities in maintenance, traffic engineering, Intelligent Transportation Systems (ITS) or emergency management.*

*TIM programs and activities nevertheless are rapidly emerging and evolving. Many observers predict that eventually traffic incident management will become a professional sub-specialty within the transportation profession, practiced by full-time personnel who have clear responsibilities and accountability through reporting and performance measurement for stable and funded TIM programs. It is relevant to recall that 75 years ago, the maintenance engineering and traffic engineering sub-specialties had not yet emerged.*

*As always, there will be no "one size fits all" solution to development of Traffic Incident Management programs and the TIM professional sub-specialty. Each multi-State Region, State, metropolitan or rural region, or locality will build their TIM program to address their unique needs. This paper is intended to provide some "building blocks" for strong TIM programs. While no State or region currently has all of the desired elements of a fully mature TIM program in place, several have developed program elements that can be useful elsewhere.*

to traffic incidents, and data definition issues are significant.

- Florida's Open Roads Policy commits Florida DOT (FDOT) and the Florida Highway Patrol to clearing all incidents within 90 minutes of arrival of the first responding officer.

- Washington DOT (WSDOT) and the Washington State Patrol (WSP) are jointly accountable to the Governor for a 90-minute maximum clearance time performance goal, which is reportable quarterly. Incidents with durations of greater than 90 minutes are examined carefully to identify opportunities for improvement.

- The California Department of Transportation (Caltrans) and the California Highway Patrol (CHP) have agreed to a goal of 90 a minute clearance time. (CHP endorses this policy but it is not a performance measure for CHP field commanders.)

***Statewide TIM Strategic Plans:*** Where they exist, statewide traffic incident management plans vary in approach and focus. Kentucky and Tennessee have strategic statewide TIM plans, where strategies and an action plan have been developed based on strategic goals and objectives.

- In 2005, the Kentucky Transportation Cabinet (Kentucky's DOT) developed a State Strategic Plan for Highway Incident Management that includes: mission, goals, objectives, and a timeline for implementation of 49 prioritized action strategies. The plan was developed with input from the FHWA, State Police, emergency management, and local agencies.

- In 2003, Tennessee developed a Strategic Plan for Highway Incident Management that represents a coordinated effort among TDOT, the Tennessee Dept. of Safety, Tennessee Dept. of Commerce and Insurance, the Tennessee Emergency Management Agency, and other public and private organizations with responsibilities for highway incident management. A four-department resolution adopted the plan, which looks beyond the major cities. The statewide effort includes four regions that each have an Incident Management Coordinator, statewide service patrol reports, and incident reports.

***Statewide Best Practices Guidelines:*** Best Practices Guidelines are a good approach to building more standardized practices across disciplines and jurisdictions, while still operating on a voluntary basis.

- Ohio's *Quick-Clear Best Practices Guide* provides guidance on reducing incident duration, reducing secondary crashes, increasing responder safety, and traffic control at incident sites. The Guide was developed in 2003 by a working group including AAA Ohio, Buckeye State Sheriff's Assoc., Ohio Association of Chiefs of Police, Ohio Dept. of Public Safety, ODOT, Ohio EPA, Ohio Fire Chief's Assoc., Ohio Fire Marshall's Office, Ohio Trucking Assoc., and the Towing & Recovery Assoc. of Ohio.

***Regional TIM Operational Plans and Guidelines:*** Several States have developed regional- or corridor-level TIM programs, where partners jointly developed recommended operational guidelines or response procedures. In some cases these regional plans later form the basis for statewide plans.

- Colorado's nine corridor-level TIM programs follow the TMC *Traffic Incident Response Procedures* operational manual. Each corridor-level program was developed by a working group that included local and State traffic engineers, maintenance, law enforcement, fire, EMS and towing.

- The Twin Cities Metro Incident Management Steering Committee's (IMSC's) *Incident Management Recommended Operations Guidelines* define the roles and responsibilities of different agencies at incident scenes, and provide guidelines for incident response and clearance. This regional plan is the model for a Minnesota statewide plan under development.

***Statewide Traffic Incident Management Planning and Preparedness within the All-Hazards Emergency Planning Context:*** The "All Hazards" emergency planning concept calls for scalable policies and procedures, based on Unified Command principles, which can be used for all types and sizes of emergency incidents, from routine to disaster-scale. The Department of Homeland Security's (DHS's) National Incident Management System (NIMS) calls for the "All-Hazards" planning approach. Some States have fully developed emergency transportation operations plans within the All Hazards context. NIMS requirements are only beginning to be reflected in State DOT plans because the requirements and related funding flow through State law enforcement and State and local emergency management agencies.

- Oregon DOT's Emergency Operations Plan is a multi-modal, all-hazards plan that is scalable from traffic incident management to disaster transportation management, and includes a business continuity plan. The transportation annex to the State's Emergency Operations Plan, it is based on FEMA's *Guide for All-Hazard Emergency Operations Planning: State and Local Guide (State and Local Guide 101).* The plan includes all statutes and authorities, copies of all emergency response agreements, and information on hazards in the transportation system.

- Idaho DOT officials literally have a briefcase of emergency plans, including an incident management plan, hazmat plan, national response plan, Idaho emergency operations plans, business resumption plans, internal policies and procedures, emergency response manual, and an employee phone list. The package also is on the Internet (with secure access).

## Interagency and Interdisciplinary Relationships

Strong working partnerships among all responding disciplines and agencies is a basic underlying principle of effective traffic incident management programs. NTIMC encourages partnerships that are formalized through written operational agreements, joint, written operational policies and procedures, and joint training exercises. Ideally, the partnerships include all TIM partners—which, at a minimum, would include transportation, law enforcement, fire, emergency medical services (EMS), and towing and recovery. Additional partners that ideally would be involved include the trucking industry, traffic control industry, insurance industry, and emergency management agencies.

Many State DOT's work closely with law enforcement, and often, but not always, there is a Memorandum of Understanding (MOU) in place between the DOT and SHP defining procedures and responsibilities for traffic incident management. Co-location is increasingly common. In a few cases, emergency dispatch has been integrated through integration of the DOT Intelligent Transportation System (ITS) with the law enforcement Computer Aided Dispatch (CAD). Even where MOUs are in place, there is wide variation in the level of formal interac-

tions, such as formal debriefings after major incidents.

Much less common are TIM partnerships that include fire, emergency medical services (EMS), or towing. The typical distant relationship between State DOTs and the fire/EMS communities is based on institutional factors, and tradition. First, fire and EMS are largely local functions, whereas law enforcement has a State-level agency that corresponds to the state DOT. Secondly, the first responder and emergency management communities traditionally have considered transportation to be a secondary responder, and a provider of logistical resources. Consequently transportation often is not included in emergency planning and preparedness activities. NIMS requirements are beginning to open doors for transportation agencies. For example, many State DOTs have been involved in NIMs-required Incident Command System (ICS) training for first responders, and some State DOTs also have been involved in hazard-specific training (earthquake, tsunami, bioterrorism). Those exercises have proven especially valuable for the face-to-face contacts made. The towing industry, as a private-sector TIM partner, wages an across-the-board struggle for recognition. For example, the towing industry has pointed out that the MOUs between DOTs and SHPs typically require DOTs to provide training to all responders who respond on Interstate highways, yet towers are not routinely trained.

Examples where State DOTs are building more inclusive interagency and interdisciplinary partnerships are:

- Arizona's Statewide Incident Management Plan was developed in 2000 with input obtained from legislative, transportation, law enforcement, fire, medical, towing industry, and other stakeholders in eight regional workshops. The plan includes statewide alternate route plans and Traffic Operations Center (TOC) Incident Management Operations guidelines. In implementing the plan, ADOT has developed traffic control agreements with the towing industry.

- Minnesota DOT's Responder Safety Committee assists with development of statewide TIM policy and TIM training classes that include all responders. Members include MnDOT, the State Patrol, the State Fire Marshall's Office, law enforcement, EMS, fire service and towing companies.

- Oregon DOT has a local outreach program, focusing on responder safety, that offers TIM training to local fire and law enforcement responders.

- The Ohio Lane Closure Protocol Committee is a working group comprised of AAA Ohio, Buckeye State Sheriff's Assoc., Ohio Association of Chiefs of Police, Ohio Dept. of Public Safety, ODOT, Ohio EPA, Ohio Fire Chief's Assoc., Ohio Fire Marshall's Office, Ohio Trucking Assoc., and the Towing & Recovery Assoc. of Ohio. They developed the *Quick-Clear Guide*.

- The Traffic Incident Management Enhancement (TIME) Program in Wisconsin developed and entered into a multi-agency, multi-discipline partnering agreement early in the implementation of the program. The Program Steering Committee is co-chaired by the Department of Transportation and Department of State Patrol.

## Organizational Structure

Organizational structures for TIM programs vary widely.

- Arizona's TIM program includes coordination between ADOT and the Department of Public Safety, but there is no formal traffic incident management committee.

- Colorado's nine TIM corridors were developed by working groups that include local and state engineers, maintenance, law enforcement, fire, EMS, and towing. Statewide or regional working groups are under consideration.

- Connecticut's Statewide Incident Management Task Force includes fire and regional planning representatives. A subcommittee of this Task Force, together with the Department of Emergency Management & Homeland Security, is developing a Unified Command System (UCS)-NIMS program manual.

- Florida's TIM Executive Panel is

comprised of DOT, FHP, and the Department of Environmental Protection. A formal process for this panel is being developed; it has operated informally for many years. The statewide TIM team is made up of members of local TIM teams. Local TIM teams implement programs.

- Maryland's Coordinated Highways Action Response Team (CHART) Board includes representatives from the Maryland State Highway Administration (SHA), the Maryland Transportation Authority, the Maryland State Police, the University of Maryland, and local government. The Chair is the chief engineer of the SHA.

- The Tennessee Department of Transportation (TDOT) Office of Incident Management coordinates traffic incident management, with direction from the Highway Incident Management Policy Committee, which includes representatives from the State's agencies for transportation, safety, commerce and insurance, and emergency management.

- The Wisconsin Department of Transportation leads the TIME Program in southeastern Wisconsin. The high-level organizational structure for the TIME Program includes a Steering Committee (policy and direction), Freeway Incident Management (technical) Team, and several sub-regional committees and task forces.

## *TIM Programs*

There are very few formal statewide or regional traffic incident management programs, and those that exist are generally limited to a few very specific tactical and operational applications. Freeway Service Patrols are by far the most common type of incident management activity or program conducted by State DOTs. The most common model is a State-operated service patrol, with the missions of helping motorists with minor vehicle problems, such as tire changes or gasoline, as well as providing traffic control at traffic incident scenes. Private sector freeway service patrol models also are emerging.

Ideally, DOT Traffic Management Center (TMC) assets are operationally coordinated with incident communications and management, so that changeable message signs, traffic signals, video cameras, and other technology can be used to assist with incident notification, scene traffic control and with motorist information and diversion.

- Maryland's CHART program is one of the more comprehensive statewide traffic incident management programs. Maryland's Statewide Operations Center (SOC) provides 24/7 statewide command & control. Satellite Traffic Operations Centers handle peak-period traffic. The CHART freeway service patrol reduced average incident duration by 23 percent in 2005. CHART assisted in 20,515 lane blockage incidents where average incident duration in 2005 was approximately 22 minutes, compared to 29 minutes for similar incidents responded to by other agencies. Using a traffic simulation program, analysts determined that MDOT TIM program reduced travel delay on major Maryland corridors by 38 million vehicle-hours in 2005.

- Florida DOT (FDOT) provides Road Rangers service patrol on all Interstates. In 2005, the overall benefit/cost ratio for the Florida Road Ranger program was 26:1. FDOT's photogrammetry program helps the Florida Highway Patrol automate crash investigation. The Florida Turnpike provides a combination of financial incentives for quick clearance, and pricing disincentives for slow performance, to improve tower performance and reduce clearance times. On a 320-mile-long turnpike in Florida where this approach is in place, average clearance time to achieve all lanes open is 56 minutes.

- The City of Houston's SAFEclear program, implemented in 2005, is a private sector freeway service patrol model. Qualified towing companies contract with the City to be responsible for responding within an average of 6 minutes to incidents on a designated section of the state-owned freeways in the Houston metro area. In order to meet the required response times, the tow companies continually patrol the freeways. The towing companies are charged with rapidly removing disabled or crashed vehicles from the highway lanes or the shoulders to a location off the freeway. The private sector arrangement dramatically enhances the previous Motorists Assistance Program (MAP) coordinated by the Transtar Transportation Management Center. Where MAP used 9 trucks to provide services, the private sector fields about 60 tow trucks to patrol the 190 miles of freeway in Houston.

- San Antonio's TransGuide ITS system combines a communications network, CCTV, and loop detectors to improve incident detection. In the first year of deployment, TransGuide reduced incident response times by 20 percent.

- In Wisconsin, efforts are currently underway to establish templates, standards, and consistency for statewide alternate route plans, freeway service patrols, crash reconstruction tools, on-scene traffic control guidelines, evacuation planning, education/training, and several other TIM-related tools and tactics. This is being accomplished in-part by leveraging the successes from the individual regions in the State.

## Chain of Command and Reporting Channels

Strong and stable public programs require accountability. Personnel must be responsible for reporting performance results up a chain of command. Except where reporting of performance measures is required, DOTs generally do not have established chains of command and reporting channels for traffic incident management functions. Whereas law enforcement and fire agencies have centralized command and control, DOTs typically are decentralized. As a result, chain of command and reporting requirements for traffic incident management functions vary widely. As previously noted, most States do not have separate traffic incident management programs. Instead, traffic incident management functions are conducted by DOT personnel who are housed in maintenance, traffic, and ITS sections. Typically, field operations are conducted by maintenance personnel as a secondary function, and the ITS and traffic control personnel handle communications functions at the TMCs. Further, most States treat transportation emergency and disaster management as a different activity from major traffic incident management in organizational and reporting terms, although within the DOT these activities are most often carried out by the same people at the field operational level.

The NIMS planning framework provides an opportunity to identify a formal DOT chain of incident command, and reporting requirements.

## Budget

In order to build stronger traffic incident management programs, TIM responder agencies need dedicated resources. Gaining resources within DOTs is especially difficult for traffic incident management, because incident management functions generally are secondary personnel duties, and spread across so many departments within a DOT. It can be very difficult to isolate how much money currently is being spent on traffic incident management personnel and equipment, agency-wide, which impedes the ability to make a solid argument for spending more.

Freeway service patrols are again the exception. Dedicated vehicles and staff may be line-item budget items, and States may track the number and duration of incidents that their personnel respond to.

While ITS is an important element of effective traffic incident management, the ITS budget typically is not integrated with traffic incident management budgets. Many States have developed Intelligent Transportation System (ITS) plans in order to qualify for federal ITS funds. These plans generally list equipment that the DOT hopes to acquire during various time frames should funds become available. However, these plans generally are not put within a strategic functional framework and are not consolidated as programs with separate line item budgets and business plans, so program status is difficult to track.

## Summary

This paper has introduced the building blocks of the institutional framework for traffic incident management programs—Plans and Policies; Interagency and Interdisciplinary Relationships; Organizational Structure, Formalized TIM Programs; Chain of Command and Reporting Channels; and Budget. We have highlighted some examples of strategies various States are using. The table on the following pages presents additional information on current state DOT practices. While these organizational elements are very important to building stronger, more stable TIM Programs, in the end a culture change is required. Only when all of the responder disciplines train their professionals, from the outset, to operate in a multidisciplinary context; to follow coordinated procedures; and to address common goals for safe, quick clearance of roadway incidents will TIM programs become completely embedded in the fabric of public safety and transportation operations.


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| | IM Plans & Policies | Interagency Relationships | Organizational Structure | TIM Programs | Staffing & Training | Performance Goals | Reporting Channels |
|---|---|---|---|---|---|---|---|
| **Arizona** | 2000 Statewide Incident Management Plan<br>– Statewide alternate route plans<br>– TOC Incident Management Operations Guidelines | Plan developed by ADOT in 8 regional workshops, w/ input from legislative, transportation, law enforcement, fire, medical, towing & others. Implementation includes traffic control agreements between the towing industry & ADOT. | Coordination w/ ADOT and Dept. of Public Safety but no formal traffic incident management committee. | | ICS and HAZMAT training for responders. | | |
| **California** | Mission: "Caltrans improves mobility across California." Mobility and reliability are key goals, w/ performance measures that are tracked and reported quarterly.<br>State Quick Clearance legislation.<br>Proposed legislation to ID Caltrans maintenance as first responders.<br>Move It law exempts Caltrans and CHP from liability.<br>Caltrans and CHP working on promoting the "clear the way – reduce delay" campaign.<br>L.A. County has protocols for quick clearance of fatal incidents; trying to take statewide. | Caltrans and CHP have regular meetings on improving incident management. | | Caltrans Traffic Management Teams (TMT) - responded to 2,415 incidents in 2004-05.<br>Freeway service patrol is contracted out by MPO or local agency using matching funds DOT provides. 13 regions, 425 vehicles.<br>Pay incentive to towing companies for quick clearance. | 30 TMT people statewide and 50-60 pieces of equipment.<br>All field supervisors are trained as first responders and in SEMS (converting to NIMS).<br>Statewide Caltrans has 91 CMS trucks, 70 CMS trailers, 17 HAR trailers, 169 part-time and full-time personnel for incident management. | 90 minute average clearance time. (CHP has endorsed, but it is not a priority for CHP field commanders.) | TMT equip and personnel from Caltrans maintenance and traffic operations divisions.<br>Maintenance coordinates incidents at district level. District managers report major incident status to HQ. |
| **Colorado** | CDOT developed statewide Guidelines for Developing Traffic Incident Management Plans for Work Zones.<br>TMC Traffic Incident Response Procedures is the operational manual for nine corridor-level TIM programs. | Intent of Guidelines document is to assist in developing management programs that meet the needs of the contractor, CDOT, emergency responders, and the motoring public. | Nine TIM corridors were developed by working groups that include local and state engineers, maintenance, law enforcement, fire, EMS, and towing.<br>Statewide or regional working groups under consideration. | TIM programs have been developed by corridor. CDOT TMC coordinates. | State offers TIM training. | | |

| | IM Plans & Policies | Interagency Relationships | Organizational Structure | TIM Programs | Staffing & Training | Performance Goals | Reporting Channels |
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| **Connecticut** | Statewide Incident Management Policy developed in 2004 is under review by state agencies. | | 2003 Statewide Incident Management Task Force includes fire and regional planning reps. Subcmtee of the Task Force & the Dept. of Emergency Management & Homeland Security are developing the UCS-NIMS program manual. | | | | |
| **Florida** | Open Roads Policy commits to clearing all incidents within 90 minutes of arrival of the first responding officer.<br><br>Statewide TIM team develops global policies and templates, including legislative recommendations.<br><br>FDOT Statewide TIM team writing strategic plan for TIM. | Open Roads Policy executed by the DOT and the Highway Patrol as a formal document. | Executive Panel comprised of DOT, FHP, Dept. of Environmental Protection. A formal process for this panel is being developed (has been informal for many years).<br><br>Statewide TIM team is made up of members of local TIM teams.<br><br>Local TIM teams implement programs, e.g. the Rapid Incident Scene Clearance (RISC) program on the Florida Turnpike. | FDOT provides Road Rangers service patrol on all Inter-states and on I-75 from St. Petersburg to Naples.<br><br>FDOT photo-grammetry program helps FHP automate crash investi-gation. (RISC) program on the Florida Turnpike pays towers incentive for quick clearance. | | | |
| **Idaho** | Idaho DOT officials liter-ally have a briefcase of emergency plans, including an incident management plan, hazmat plan, national response plan, Idaho emer-gency operations plans, business resumption plans, internal policies & pro-cedures, ER manual, and employee phone list. Also on Intranet.<br><br>State "Move It' law. | Emergency transporta-tion plan is annex to state emergency plan, and adopted through the Governors' execu-tive plan. Counties can reflect it in their pro-grams and plans.<br><br>Co-located dispatching w/ state police in some locations. | | Boise area freeway ser-vice patrol. | Maintenance Section staffs incident re-sponse, and are trained in incident response. | State legisla-ture mandates strategic planning & perf. measures. Currently working on development of new perf. measurements for hwy system operations. | Maintenance Section has authority to coordinate and man-age incident response throughout the depart-ment. |

| | IM Plans & Policies | Interagency Relationships | Organizational Structure | TIM Programs | Staffing & Training | Performance Goals | Reporting Channels |
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| **Illinois** | Gary-Chicago-Milwaukee Intelligent Transportation System (ITS) Priority Corridor | 3 state DOTs, 16 counties, numerous local agencies & FWHA | Work group focuses on traffic incident management. | Public info web site includes real-time info on travel times, congestion, road closures, and traffic video links. | | | |
| **Kentucky** | 2005 State Strategic Plan for Highway Incident Management: mission, goals, objectives & 49 action strategies (prioritized w/ implementation timeline). | Plan developed for Kentucky Transportation Cabinet w/ input from State Police, Kentucky Emergency Management, FHWA & Lexington-Fayette Urban County Gov't.. | | | | | |
| **Maryland** | | | CHART Board includes reps from Md SHA, Md. Transportation Auth., MD State Police, FHWA, Univ. of MD and local gov't. Chair is chief engineer of SHA. | Statewide Operations Center (SOC) provides 24 X 7 statewide command & control. Satellite TOCs handle peak-period traffic. | | | |
| **Michigan** | Regional TIM plans have been developed by local offices or local law enforcement.<br><br>"Steer It Clear" (Move Over) legislation is being promoted statewide. | Detroit's TIM working group is multi-disciplinary. Grand Rapids is more transportation-oriented. | Grand Rapids and Detroit metro areas have working groups on TIM. | Courtesy Van Freeway Service Patrol. (30 units) | | | |

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| **Minnesota** | Highway Incident Management and Emergency Traffic Control Equipment Guidelines outlines general traffic control requirements for highway incidents. (MnDOT document)<br><br>Developed by Twin Cities Metro IMCT: Incident Management Recommended Operations Guidelines defines the roles and responsibilities of different agencies at incident scenes, and provides guidelines for incident response and clearance.<br><br>Statewide policy on TIM under development, based on Twin Cities Metro Recommended Operations Guidelines.<br><br>Twin Cities IMSC has developed legislative proposals for Quick Clearance legislation and proposal to allow Freeway Service Patrol to tow abandoned vehicles. | MnDOT State Traffic Engineer, MN State Fire Marshall, & MN State Patrol have signed off on Emergency Traffic Control Equipment Guidelines.<br><br>Responder Safety Committee includes reps from Mn/DOT, State Patrol, State Fire Marshall's Office, law enforcement, EMS, fire service & towing companies serve on Responder Safety Committee.<br><br>Twin Cities IMSC policy body includes MnDOT Traffic Operations, MnDOT Metro Maintenance, and MSP. The working group (IMCT) includes MnDOT Maintenance, Freeway Service Patrol Drivers, State Patrol, Fire, EMS, and private towing companies. | Responder Safety Committee assists w/ development of statewide TIM policy and training class.<br><br>Two incident management committees in Twin Cities Metro Area: Incident Management Steering Committee (IMSC) and Incident Management Coordination Team, (IMCT) a working group. Primary purpose of IMCT is to debrief major incident and develop new ideas to improve incident management. IMCT developed guidelines document. | Current TIM program focuses on Twin Cities Metro Area.<br><br>Includes Freeway Service Patrol. | MnDOT incident management training course for all emergency responders. | | |
| **Ohio** | 2003 Ohio Quick-Clear Best Practices Guide provides guidance on reducing incident duration, reducing secondary crashes and increasing responder safety, and traffic control at incident scenes. | | Ohio Lane Closure Protocol Committee is a working group comprised of AAA Ohio, Buckeye State Sheriff's Assoc., Ohio Association of Chiefs of Police, Ohio Dept. of Public Safety, ODOT, Ohio EPA, Ohio Fire Chief's Assoc., Ohio Fire Marshall's Office, Ohio Trucking Assoc., and the Towing & Recovery Assoc. of Ohio. They developed the Quick-Clear guide. | | | | |

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| **Oregon** | Emergency Operations Plan is multi-modal, all hazards, and includes a business continuity plan. It is based on FEMA's Guide for All-Hazard Emergency Operations Planning: State and Local Guide ( State and Local Guide 101)<br><br>This is a controlled distribution document. Includes all statutes and authorities, copies of all Emergency Response agreements, and info on hazards on the transportation system. | Partnership with state patrol, including TMC co-location and integrated dispatch.<br><br>Outreach program for developing training for emergency response partners, focusing on responder safety. | ODOT committee wrote Emergency Operations Plan, which was promulgated by the Director. | Statewide TOC in Portland and 3 others integrate w/ State Patrol CAD system. | Shortage of state patrol. 1000 highway maintenance DOT employees all considered first responders.<br><br>Also have corridor management teams devoted to incident response. 24X7 in operations center since 1996. | None | Oregon Emergency Response Council keeps statistics on the number of emergency incidents and who was involved.<br><br>Law enforcement CAD system captures data on traffic incidents. DOT Maintenance team uses data to track level of service. |
| **Tennessee** | 2003 Strategic Plan for Highway Incident Management | Plan adopted by TDOT, Tenn. Dept. of Safety, Tenn. Emergency Management Agency, & other public & private sector orgs. | TDOT Office of Incident Management coordinates, w/ direction from Highway Incident Management Policy Committee. Includes State Depts. of Transportation, Safety, Commerce & Insurance, & the Emergency Management Agency. | | 4 regions ea. Have Incident Management Coordinator. | | Regions responsible for reporting incidents and on statewide service patrol activity. |
| **Utah** | Operations Manual update completed October 2005. | Partners with Utah Highway Patrol. TOC co-location with patrol dispatchers. | Day to day oversight by Region Traffic Engineer. Programmatic oversight by Traffic Management Division | 12 freeway service patrol vehicles, in Salt Lake metro area. Dispatched by State Highway Patrol dispatchers. | 12 fulltime incident responders. Daytime hours plus available on call overnight. | 30, 60, 90 clearance time based on severity: fender bender, injury, fatality. | Clearance times are reported as a performance measure for "Make the System Work Better," one of the "Final Four" UDOT Strategic Goals. |

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| **Washington** | Joint (WSDOT/WSP) Strategic Plan for Traffic Incident Management approved in 2006.<br><br>WSDOT/WSP Joint Operations Policy Statement (JOPS) developed in 2002, updated annually.<br><br>More aggressive policy to increase establishment of tow-away zones to reduce capacity loss and collisions resulting from abandoned vehicles. | 2006 JOPS agreement covers traffic incident management & other issues of mutual interest. TIM Training provides outreach to fire & EMS.<br><br>Working with Coroners/ Medical Examiners to develop agreements for expediting removal of deceased.<br><br>Worked with tow industry to pilot test "instant dispatch" to blocking incidents in Seattle.<br><br>Funding proposal developed to implement a Tow Incentive Program to expedite clearance of heavy truck incidents. | Headquarters IM program manager provides functional and administrative support and oversight.<br><br>Field operations are managed by Regional Offices in partnership with local responding agencies. | IM program concentrated in Puget Sound/ Interstate 5 Corridor with satellite programs on mountain passes, in Spokane and Vancouver.<br><br>55 IM vehicles.<br><br>Responded to 58,000 incidents in 2005, 930 serious. | Full- and part-time WSDOT IM staff perform roving service patrols and major incident response. Contract with State patrol for 3 service patrol cadets. Contract with tow vendor for roving tow service patrols. Contract with local radio station for "Freeway Hero" mobile assistance van. | 90-min. clearance goal for major incidents<br><br>–WSDOT and State Patrol jointly accountable to report clearance time to Governor, quarterly.<br><br>–Examine incidents > 90 min to determine cause. | Performance data provided by WSDOT Washington Incident Tracking System & State Patrol CAD data are used in quarterly report to Governor, Legislature, Commission, Media and Public. |
| **Wisconsin** | General TIM Plans typically on a regional basis (e.g. TIME Program Blueprint)<br><br>Alternate Route Plans<br><br>Move Over Laws<br><br>Quick Clearance/Hold Harmless Laws<br><br>Evacuation Plans<br><br>Outreach Plans and initiatives<br><br>Special event plans | TIME Program Partnering Agreement<br><br>Relationships fostered through regular meet-ings in regions and sub-regions.<br><br>Strong relationship with Wisconsin State Patrol as well as other law enforcement and public safety agencies. | TIM champion is typically WisDOT.<br><br>TIME Program (SE WI) includes Program Steering Committee, Freeway Incident Management Team and several committees and task forces.<br><br>Similar structures in other regions. | Formal regional programs (e.g. TIME)<br><br>Emerging Statewide Program | Regional Incident Manage-ment Coordina-tors (WisDOT RIMCs) | Under Development through Statewide TIM initiatives | Reported through Statewide TOC |