The Intelligent Transportation Systems Public Safety Program:

Opportunities for Technological Advancement in Detecting, Responding, and Recovering from Community Emergencies

Public safety is a basic ingredient in community quality of life. We recognize the ever-present risks that face us, our families and communities and have confidence that our law enforcement, fire protection, emergency medical, and traffic management services will appear when and where needed to keep us out of harm's way or carry us to safety. Our public safety agencies strive to meet these expectations but are under increasing pressure as the growth in community needs exceeds that of public safety resources.

The community transportation infra-structure is particularly affected by emergency incidents. Most emergency incidents involve transportation resources either as part of the incident itself, as in the case of a highway, rail or air mishap, or as part of the response and recovery, as in the delivery of emergency responders to the scene and the transport of injured victims to medical facilities.

During the summer and fall of 2000, a group of high level public safety and transportation officials was brought together by the US Department of Transportation's (USDOT) Intelligent Transportation Systems (ITS) Program to consider the interaction between transportation and public safety and discuss opportunities for using new technologies to enhance community safety.

This report presents some important ideas that came out of this discussion and describes a new Federal initiative, the ITS Public Safety Program, which is taking shape to put these concepts into action.

Opportunities for Improvement

Public safety and transportation officials recognize that despite great advances in emergency services over the past decades, significant improvements in efficiency and effectiveness can be realized by applying information technologies to incident detection, response, and management. Detection technologies could engage public safety resources sooner, providing rapid medical care to save lives and minimize injury consequences, and reducing transportation infrastructure disruption. Response technologies could speed the delivery of emergency resources to the scene. And developments in on-scene incident management and coordination could improve the safety of emergency responders, reduce delays in stabilizing, investigating and clearing the scene.

The potential is clear and the opportunities are compelling. Information technologies offer a rapidly expanding range of possibilities for coordinating community public safety and transportation systems. The challenge is to bring these groups together and lay out a plan, identifying priorities for generating and sharing safety information, and engaging public safety and transportation professionals in developing, testing, and implementing

system enhancements.

The ITS Public Safety Program

The ITS program is a Federal initiative to apply information technologies to improve the safety, efficiency and effectiveness of the nation's surface transportation network. The program includes direction and guidance in the form of a national architecture, a master plan that will ensure that information generated in one part of the transportation network can be communicated and utilized in other parts of the system. To facilitate system growth, the Federal ITS program provides funds to support state and local infrastructure development which is consistent with the national architecture.

While safety has been a central ITS concern since the program's inception in 1992, an increased focus was initiated in 2000 with the formation of the ITS Public Safety Program. This new effort links the operations of a number of agencies with concerns in transportation and public safety. Within the USDOT the program is coordinated among the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the Federal Railroad Administration (FRA), the National Highway Traffic Safety Administration (NHTSA), and the Maritime Administration (MARAD). Beyond the USDOT, the program is linked closely with the Department of Justice (DOJ), and the Federal Emergency Management Administration (FEMA).

Public Safety Steering Committee

Community public safety is fundamentally a State and local responsibility. To make a contribution to public safety, the ITS Public Safety Program needs to be guided by public safety representatives, those with the best understanding and influence on local law enforcement, EMS, fire and traffic systems. The Public Safety Steering Group was established to serve this role.

The Steering Group formulated an overall vision for the ITS Public Safety Program and will provide ongoing guidance concerning program objectives and progress. This guidance will shape the overall philosophy and goals of the Public Safety Program and set the direction for program funding.

To ensure a balanced perspective, Steering Group members were selected to represent a cross-section of the professions involved in public safety and transportation operations. Participants include representatives from the law enforcement, fire, EMS, and emergency commun-ications professions, as well as traffic management, traffic safety, vehicle recovery, and local government officials. Since Federal advisory groups require special authority, this Steering Group operates under the auspices of ITS America. ITS America is established as a formal Federal Advisory Committee to the US DOT, includes public safety among its primary missions, and is therefore well suited to house the Public Safety Steering Group.

The Vision for Public Safety

With their background and expertise in public safety and transportation, together with an understanding of the potential role of the Federal ITS program, the Steering Group shaped the basic parameters of the ITS

Public Safety Program. The Group determined that while the Public Safety Program may eventually grow to address the comprehensive range of transportation emergencies, the immediate focus of the program will be on highway incidents, since this is the most frequent type of incident which brings these constituencies together.

The Steering Group outlined a vision using a motor vehicle crash scenario to address opportunities for technological intervention which would enhance incident prevention, detection, response, scene management, patient transport, and traffic recovery.

Prevention

The Steering Group started their deliberation with a look at opportunities to use information technology to prevent incidents from occurring. It was pointed out that this has been a strategy of the ITS Intelligent Vehicle Initiative, where vehicle-based equipment is being developed to prevent incidents such as run-off-the-road crashes and rear-end collisions. The Group felt that this principle should also be applied to solutions related to public safety operations, such as motorist alert systems to prevent collisions with emergency vehicles and traffic alert devices to advise motorists of the presence of emergency personnel on the roadway at incident scenes.

Detection and Notification

Once a serious motor vehicle crash occurs, the public safety system needs to be engaged as quickly as possible. In many emergencies this occurs when someone places a 9-1-1 call. The Steering Group discussed the potential benefits offered by the growth of wireless telecommunications and considered the challenges of incorporating this system in the 9-1-1 network.

About one of every three 9-1-1 calls now come from wireless phones and the proportion is rapidly increasing. The benefit is instant on-scene emergency communication, enabling quicker response and opening the opportunity for dispatchers to deliver pre-arrival instructions to facilitate bystander care of the injured while responders are en route. However, the current wireless system cannot automatically locate callers - an essential

- *Motorist alert systems to prevent crashes with emergency vehicles*

- *Incident advisory systems to protect emergency personnel from traffic*

- *Nationwide upgrade of the wireless system to allow automatic caller location*

- *New technology to sort out duplicate emergency calls*

- *ACN or Mayday system for automatically detecting crashes, fully integrated with the public safety dispatch system*

- *Hazardous materials alert system to identify harmful substances, and immediately dispatch appropriate rescue*

piece of information for dispatchers. The national wireless telecommunication system needs to be upgraded to provide location information while at the same time preserving the privacy of wireless users.

Another concern regards the number of duplicate calls for the same incident. With the proliferation of mobile phones, emergency communications officials report that as many as 25 percent of 9-1-1 calls are duplicates coming from passers-by reporting the same incident. Technology is needed to collate these calls and reduce the burden on 9-1-1 centers.

In many incidents, such as single vehicle rural crashes, there may not be a caller on scene. The Steering Group recognized that as many as one third of all fatal crashes are single vehicle rural events and that a system of incident detection is a high priority. An automatic collision notification (ACN) system needs to be implemented nationwide and fully integrated with the wireless E9-1-1 system.

Automatic collision notification systems have the potential to immediately inform emergency dispatchers of a range of data concerning the crash and crash victims. Studies need to be completed to identify the types of information needed to improve response and patient care.

> - *Information systems for advising responding agencies of the exact location and nature of the incident*
>
> - *Vehicle and infrastructure-based technology to reduce collisions involving emergency vehicles*
>
> - *Protocols and techniques for dispatching the right number and types of emergency vehicles, in the minimum time, with the least community risk cost*

Current crash notification systems utilize third-party calling centers which triage calls, directing them to the appropriate local dispatch center. These third party calling centers, known as Mayday Providers, must have adequately trained call takers and need to be coordinated with the public safety dispatch system.

False alarms from ACN systems and the consequent overload of emergency dispatch centers must be avoided. Automatic detection systems need to be carefully developed to minimize the possibility of erroneous calls.

Detection technology, procedures, and protocols need to be developed to alert rescue and recovery officials of the amount, type, and condition of hazardous materials involved in the incident.

Response

Emergency response is time critical. The overall community impact of a transportation incident is highly dependent on the time required to get emergency personnel and equipment to the scene, take control of the incident, alleviate hazards, transport victims, and control traffic at the site.

The Steering Group acknowledges that while quick response is critical, there is a community cost to sending high speed emergency vehicles through local traffic. The cost is in both crash risk and traffic delay.

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Crashes involving responding emergency vehicles are not uncommon. And traffic management methods such as signal preemption can cause substantial traffic delays.

Research and technology development is needed to minimize response time without sacrificing community safety or mobility. Vehicle and infrastructure techniques should be explored to reduce emergency vehicle crashes. Precise information regarding the location of the incident, the number of vehicles and victims involved, appropriate patient destinations, nearest water supply for fire suppression, other emergency equipment on scene or in route, optimal routing to the scene, and surrounding traffic conditions would facilitate the delivery of the appropriate amount and type of equipment.

- *Affordable, interoperable emergency communications systems*

- *Adequate radio frequency*

On-Scene Operations

Serious transportation incidents often require a response by several agencies. Emergency medical, fire, and law enforcement personnel from several jurisdictions may be on-scene providing care, managing hazards, and controlling traffic flow. Emergency scenes are highly dynamic situations in which operations require constant assessment and redirection to manage unpredictable dangers. Communication and information sharing among responding agencies are critical for successful rescue and recovery efforts.

A serious shortcoming noted by the Steering Group is that communication among agencies is often difficult due to differences in radio format and protocols. Responders from neighboring jurisdictions frequently cannot reach one another by radio, or need separate radios to share information with other agencies. Interoperability is critically needed among emergency communication systems, not only among police, fire and EMS, but with transportation and public works personnel as well.

Affordable solutions are needed to allow safety agencies to share voice and data communications. A number of challenges are preventing progress in this area, including restrictions in available radio bandwidth, aging communications equipment, and limited public safety budgets. Innovative technologies and techniques are sorely needed to address these issues.

Transport

Transportation emergencies frequently involve serious injuries which require rapid treatment at trauma care facilities. In recent years, great advances have been achieved both in the quality and availability of definitive care. Trauma care systems have been developed in many states to move injured victims to facilities with the appropriate level of care, ensuring that even remote locations have access to the highest levels of care when needed.

The Steering Group felt that further improvements in trauma care are possible by communicating patient care data between the ambulance and the trauma center. Information concerning the specific nature of injuries and patient condition can allow trauma professionals to prescribe early treatment by emergency medical technicians while either on-scene or in transport. Patient information can also save critical time by alerting the trauma facility concerning the need for assembling and preparing a special surgical team, as in the case of a serious head injury requiring immediate intervention by a neurosurgical team.

> - *Video and data link between the ambulance and trauma center to allow remote patient assessment*
>
> - *Electronic access to patient*

> - *Incident information systems to reduce time for recovery services*
>
> - *Prepared traffic routing options to efficiently redirect traffic flow*

A number of opportunities for improving patient care during transport were identified by the Steering Group. Video communication between the ambulance and trauma center could allow physicians at the trauma center to begin patient assessment while en route and triage the patient to the appropriate trauma facility. Electronic access to patient medical records, either carried by the patient or from a central location, could allow physicians to make more accurate diagnoses or prepare for patients needing specialized care.

Recovery

In dense urban areas or locations with high traffic flow, emergency incidents can have a devastating effect on mobility and commerce. Rapid recovery of safe, routine traffic flow is critical to community well-being and to reduce the probability of secondary incidents created by the traffic interruption.

Several opportunities were cited by the Steering Group for reducing incident recovery time. These involve rapid exchange of information among public safety, public works, and transportation officials to ensure that traffic routing is handled efficiently and that roadway repair and clean up personnel are on site and ready for immediate action once the incident is stabilized.

Systems are needed to quickly detect and alert appropriate recovery organizations, providing detailed scene information so that the nearest appropriate resources can be dispatched. Traffic routing options need to be prepared for critical arterials.

Next Steps

With this vision, the Public Safety Steering Group has created a goal, a model public safety system for the future that utilizes information technologies to integrate transportation and safety resources and reduce the community burden of

transportation emergencies.

The vision described above is intentionally nonspecific, leaving room to accommodate new technologies and opportunities. However, it presents a basic philosophy and approach which will steer development of the ITS Public Safety Program. Having laid out this broad plan, the Steering Group is turning to the next priorities, building support and participation from the public safety and transportation constituencies and defining further technical detail to guide technology development, demonstration and implementation.

Over the next year, the Group will be seeking input on the vision through national meetings and technical forums. As consensus builds around specific technical aspects, these concepts will be incorporated in the Federal ITS Public Safety Program. Federal support will be directed to operational tests and evaluation and to funding implementation through the state and local ITS infrastructure.

To facilitate outreach and feedback, the ITS Program will also support the establishment of Public Safety Liaison Groups for the fire, EMS, law enforcement, traffic management, and emergency communications professions. These liaison groups will bring together representatives of the range of constituents in each of these fields, serving as a focal point for disseminating information about the ITS Public Safety Program and gathering feedback on program direction.

Facilitated through ITS America, these Public Safety Liaison Groups offer an opportunity for widespread involvement in the ITS Public Safety Program. For further information about becoming involved with the Public Safety program, contact ITS America at (202) 484-4847.

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A Vision for Public Safety

Transportation, fire, law enforcement, and emergency medical services agencies and staff will share accurate, correct, relevant, and timely information with each other for fast, efficient, and safe incident resolution.

Transportation and public safety – law enforcement, fire, emergency medical services, and related activities – are closely intertwined. Public safety and transportation services involve complex, multi-jurisdictional operations, and require a great deal of operational and systems integration to succeed. Moreover, while transportation systems support the emergency movement of public safety resources to incident sites, they can also generate incidents of their own.

New information technologies and other advances in electronics continue to revolutionize all aspects of modern-day transportation. Similar technologies, when applied to the air transportation network, enabled the Federal Aviation Administration to greatly improve the safety and efficiency of air travel. Now applied to the surface transportation network, these Intelligent Transportation Systems (ITS) will yield significant benefits both to the traveling public and to public safety agencies. Computer-aided dispatch, digital wireless communications, and records management systems are related technologies currently being deployed by public safety agencies.

To perform at their best, transportation and public safety professionals need accurate, correct, relevant, and timely information. And, more often today, that information must be shared across system, organizational and jurisdictional boundaries. The architecture and standards developed for ITS by the U.S. Department of Transportation can provide the backbone for such interoperability. Similarly, public safety agencies are deploying advanced data systems that can use ITS resources. As a result, ITS can build on these foundations for integrating public safety information.

Interoperable procedures and technologies for public safety and transportation operations will enable this vision of integrated information for safer communities. The public benefits that can be achieved include:
•   Improved emergency injury and illness treatment due to faster response times and better communications links to medical centers;
•   More efficient deployment of public safety personnel and equipment; and
•   Reduced traffic congestion and hazards stemming from incidents and emergencies.

Lives will be saved and injuries and their consequences reduced – for the public *and* for