A Guidebook to Smart Response through Coordinating Local Public Safety & Transportation, Communications & Technology

How Can We Work Together?

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U.S. Department of Transportation
Federal Highway Administration
FHWA-OP-01-003

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EDL Document Number: 11943

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Acknowledgments

How We Can Work Together: A Guidebook to Smart Response through Coordinating Local Public Safety and Transportation Information and Technology was produced by Public Technology, Inc. (PTI) with funding from the U.S. Department of Transportation (DOT) and the Federal Highway Administration (FHWA).

The decision to develop this guidebook was inspired by the vision and foresight of PTI's Urban Consortium Transportation Task Force. A few years ago, the Task Force staff and the FHWA commissioned a guide that would introduce technical developments related to the coordination of information technology across agency lines to improve service delivery to citizens. Members of the Task Force recognized that a dynamic trend had already begun to take place in their respective jurisdictions and metropolitan areas; they therefore indicated a necessity to share the benefits of this synergistic approach.

The development of the guidebook was challenging due to a lack of research and literature on this topic. In January 1999, members of the Urban Consortium Transportation and Public Safety Task Forces participated in a focus group to develop the scope of work for this guidebook. One of the goals derived from these discussions was to help initiate dialogue among different sectors to assess the potential to save lives, time, and money through the coordinated application of information technology.

Thanks go to Karen Haas Martin of Editor's Ink who conducted a great deal of the research and authored the guidebook; Myrna Dingle-Gold and Marsha E. Covington, who edited it; Carolyn Covington, who designed it; and the members of the PTI Urban Consortium and others for their contribution of success stories and valuable critique of this document.

At PTI, Robert Hicks, Managing Director of Research and Strategic Initiatives, oversaw the project from concept to completion. Janet Quist, Director of Public Safety Programs, ensured that concepts presented were consistent with emerging trends in public safety technology. Bryan Gold, Director of Communications, managed the editing and design of the guidebook.

PTI is the nonprofit technology R&D organization of the National League of Cities, the National Association of Counties, and the International City/County Management Association. Since 1971, PTI has tapped the collective research of its member jurisdictions and partnerships with private industry to create and advance technology-based products, services, and enterprises in cities and counties nationwide.

The Urban Consortium Transportation Task Force guides PTI's Local Government Intelligent Transportation Systems (ITS) Outreach and Technology Transfer Program, which ties advanced transportation technology research, planning, and implementation activities to the needs of local government.

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Dear Local Government Official,

When someone needs help in your community, survival may depend on how fast local public safety and transportation agencies can respond. This guidebook seeks to help your community coordinate its deployment of powerful new information and communications technologies for improving both emergency response time and the quality of day-to-day services.

To perform at their best, transportation and public safety professionals need the right information within the right time and at the right place. And that information often must be shared across system, organizational and jurisdictional boundaries. The transportation community is rapidly deploying Intelligent Transportation Systems (ITS), even as public safety agencies are deploying advanced data and communications systems. To improve both public safety and transportation operations for greater community safety, the U.S. Department of Transportation's Federal Highway Administration (FHWA) recently launched an ITS Public Safety Program to encourage interoperability of voice communications and integration of data systems. The FHWA provided funding support for this guidebook and will support field tests of interoperable systems in the coming years.

This guidebook was written for local government officials such as yourself who must provide the leadership to break down turf barriers and encourage local transportation and public safety agencies to engage in cooperative planning, investment, and operations.

Section I of this guidebook introduces local public officials to the range of new information and communications technologies, the benefits they offer, and some current technical challenges and opportunities. Section II presents case studies which illustrate how public safety and transportation agencies in large and small communities across the country are currently implementing new technologies together. Section III suggests leadership tactics that can facilitate the partnership-building and long-range planning needed to realize the full potential of new technology.

We hope this guidebook will inspire you to help unite your community as it seeks to employ state-of-the-art, coordinated public safety and transportation services through the information highway.

Sincerely,

Dr. Costis Toregas,

President

Public Technology Inc.

Lead Your Community to Higher-Quality Public Safety and Transportation Services

Whether the issue is traffic, crime, or emergency response, the people who live in your community deserve and demand service—not excuses. This guidebook is designed to help you, as a local public official, improve public safety and transportation services in your community through well-coordinated deployment of new technologies: "Smart Response" technologies.

The challenge: Today local governments face more complex challenges than ever before. In many urban areas, the capacity of the transportation infrastructure has not kept pace with rapid population growth, often resulting in severe traffic congestion. Police, fire and rescue, and medical emergency response agencies in communities large and small are being stretched to the limit. Public safety agencies must be everywhere at once responding to crime and crashes as well as special events and other incidents. But too often these very response teams find themselves stuck in traffic with the rest of us. Furthermore, local officials have become particularly concerned about their preparedness for potential terrorist attacks and natural disasters.

SECTION I Introduction

The opportunity: New technologies are being deployed that can enable local governments to meet both emergency and routine challenges much more efficiently. An overview of the Smart Response technologies discussed in this guidebook is presented on page 6. Transportation officials may be familiar with Intelligent Transportation Systems (ITS), a term that encompasses a broad range of information processing, communications, automated control, and electronics technologies that improve the efficiency and safety of transportation system operations. Public safety officials may be familiar with the use of computer-aided dispatch (CAD) systems, the nationwide effort to upgrade public safety voice communications and enhance interoperability and the move toward increased integration of automated data storage and retrieval systems. This guidebook addresses the issues involved with the coordination of information technology and communications infrastructure investments between the transportation and public safety sectors to enable local transportation, police, fire, and emergency medical services (EMS) agencies to leverage their resources and work together more effectively.

Your leadership is needed to help your community unlock the potential of its technology investments. Change will be required. A new level of interdepartmental and inter-jurisdictional cooperation will be necessary. An unprecedented amount of joint planning and operations must take place. New partnerships between local government and other private sector and government entities can help leverage resources for the maximum benefit of all involved.

OKLAHOMA CITY: WHEN YOU CAN'T COMMUNICATE, YOUR HANDS ARE TIED

On April 19, 1995, the sound from the explosion of the Alfred P. Murrah Federal Building rocked downtown Oklahoma City. First responders rushed to the scene from the police department headquarters and fire and ambulance stations located a few blocks of the blast. At the scene they witnessed the horror of more than 1,500 victims wandering in shock and panic, covered with blood and glass. Rescuers immediately began crawling through the burning rubble searching for trapped survivors.

Then the fire department learned that additional bombs might be in the building. For safety, everyone at the site needed to evacuate to at least one block clear of the building. But the fire department's radios could not reach the police, highway patrol, and ambulance crew rescuers inside the fallen building, which put rescuers in even greater jeopardy.

"We vacated the premises twice that morning. Fortunately, in both instances, the suspicious material turned out not to be bombs," said Ann Simank, an Oklahoma City Council member and past Chair of the Public Safety Task Force for Public Technology, Inc. "That morning we learned firsthand the extreme importance of interoperable voice communications. Under the best of circumstances, when terrorism or natural disaster strikes, you are working in chaos. But when you can't communicate, your hands are tied. We are now building a system that will allow us to communicate not only among ourselves, in the city agencies, but with agencies throughout the region."

Organization of this Guidebook

This introductory section provides a brief explanation of Smart Response technologies (pps 6-7) as well as an overview of some emerging system integration opportunities (p 9).

Section II of the guidebook provides case studies which illustrate how communities across the country have already begun to coordinate implementation of new transportation and public safety technologies.

Section III provides information along with suggested leadership techniques to assist local public officials as they develop innovative coordinated response capabilities in their communities.

The appendices contain useful resource material such as sample documents, recommended practices, related organizations, Web site links, and a glossary of terms.

HOW SMART RESPONSE TECHNOLOGY CAN BENEFIT YOUR COMMUNITY

Properly planned and implemented, new Smart Response technology can help you:

- *Improve public safety:* Achieve faster and more effective response to emergencies and incidents, which will save lives, and reduce and deter crime. Reduce red-light running and speeding. Protect your public servants by providing officers responding to an event with more advance information and better back up.
- *Reduce traffic congestion:* Clear the road more quickly when crashes and other emergency incidents occur. Manage traffic flow more efficiently during special events and disasters. Provide drivers and transit users with real-time travel and traffic information.
- *Operate more efficiently and cost effectively:* Avoid duplication of resources by sharing communications systems, databases, and monitoring equipment, and by coordinating the dispatch of vehicles, equipment, and personnel to incident scenes.
- *Provide valuable public information:* Give the public the real-time information it needs to be able to travel safely and pleasantly in your jurisdiction. Real-time information makes it easier to plan commutes, everyday errands, and highway trips, and reduces time spent waiting to catch buses or trains.
- *Stimulate economic development:* Encourage tourism and economic development by providing state-of-the-art traveler information systems, making your roads and streets safer, and reducing the time it takes for people and goods to travel within your region.
- *Improve the environment:* Qualify for emissions control credits for implementing new technology to improve traffic flow and use existing roads more efficiently, which saves fuel and reduces pollution.

Best of all, new Smart Response technology can help your community's various public service agencies work together to achieve common goals and better manage day-to-day problems. Public safety, transportation, and emergency response agencies can use new technology as a shared tool to expand capability in incident management, emergency planning and response, and special event planning, so that:

- quality of service improves with each incident, emergency and event
- teams from each agency can coordinate their work seamlessly
- routine operations are dramatically improved

Sooner or later, weather emergencies, highway, rail, or plane crashes, crime incidents, or crowd and traffic control at special events challenge every community. When crisis strikes, citizens want prompt and efficient responses—without excuses.

How Would Your Community Respond?

1. *A tanker truck accident occurs on a major highway during rush hour. Police cordon off the affected area until crews can clean up the hazardous chemical spill. Traffic backs up. In your community, would there be:*

- A lengthy delay before fire and cleanup equipment arrives due to the fact that officials have trouble determining the incident's exact location?
- Confusion among public safety, environmental, and transportation personnel responding to the incident because no one is sure which agency procedures to follow?
- A huge traffic delay which leaves commuters stuck for hours with no way to warn approaching drivers of the delay?
- Subsequent media coverage about lack of coordination and poor handling of the event?

or…

- Nearby fire and hazardous waste cleanup equipment dispatched to the scene instantly, with the exact location of the incident pinpointed through Automatic Vehicle Location (AVL) technology, and backed up by closed-circuit video traffic surveillance cameras?
- State-of-the-art communication and coordination among police, ambulance, environmental cleanup, and traffic control personnel that allows crews to minimize traffic congestion and to clear the site quickly?
- Highway signs, highway advisory radio, media announcements, and traveler-information Web sites that warn motorists about the problem and encourage the use of alternate routes?
- Traffic signals adjusting to encourage traffic flow along alternate routes and giving green-light priority to emergency vehicles responding to the incident?

2. *A three-car pileup on the interstate three miles south of your city occurs in the southbound lane at rush hour, resulting in significant injuries for several passengers. Under normal rush-hour conditions it takes an ambulance 10 minutes to get to the nearest hospital, and helicopters take just 10 minutes to reach the regional trauma center five miles away. Which of these scenarios might result?*

- A driver in one of the cars calls 911 from a cell phone but cannot tell the operator the exact location of the crash. Passersby who also call 911 on cell phones give conflicting reports regarding the crash; dispatch operators cannot tell whether the accident involves a single incident or multiple crashes. To be safe, operators dispatch patrol cars, ambulances, and fire trucks to both northbound and southbound lanes of the interstate south of the city.

  The medical technicians in the first ambulance to arrive on the scene report that two victims have serious injuries that require treatment at the regional trauma center. These technicians contact the trauma center, which dispatches two MediVac helicopters to the scene. Sadly, both victims die en route to the trauma center. The third victim receives treatment at the local hospital and

survives. Commuter traffic backs up for miles before officials can clear the scene.

or…

- Automatic Crash Notification (ACN) devices located in each of the affected vehicles activate upon impact. Mobile phones allow occupants to dial 911 directly. And ANC devices installed in the vehicles can transmit crash data—such as the speed the car was traveling, the principal direction of force, whether the cars rolled over, and the type of cars in the crash—to the 911 center, local hospital, or regional trauma center. Emergency dispatch center operators learn the exact location of the crash, which is instantly plotted on a computerized map in front of them. They know that Good Samaritans passing by the incident and dialing 911 on their wireless phones are describing the same emergency scene. Based on the data that indicates the severity of the crash, the trauma center dispatches two MediVac helicopters and the 911 center sends an ambulance. On the same map that pinpoints the victims' location, the emergency dispatchers can see the location of the nearest police cars and fire trucks, which are also quickly dispatched to the scene. The nearest traffic surveillance camera automatically switches on to provide emergency dispatchers and traffic managers with a better view of the scene.

  As the MediVac and ambulance crews arrive on the scene and transport victims to the trauma center and hospital, medical teams at both treatment facilities prepare to manage the specific kinds of internal and external injuries that were predicted based on the crash data. Inside the helicopters and ambulance, wireless devices attached to the victims dispatch vital signs in real time to the trauma center. Doctors who have the ability to see victims through closed-circuit video cameras can provide instructions to the emergency technicians. On the way to the hospital, the ambulance receives green-light priority through traffic signals, and is routed along highways with the least amount of congestion. All three victims survive.

  Traffic managers dispatch equipment immediately to clear the highway and program traffic signals and signs to divert traffic around the accident, getting commuters to their destinations more quickly.

3. *In the middle of a weekday, a blizzard expected to track to the east of your area suddenly changes course and strikes your community with little warning. Roads become treacherous and traffic slows as schools dismiss early. Ice disables phone and electric lines. Snow continues for three days, delighting school children but shutting down businesses and making travel difficult until roads are plowed. In your community, which would occur?*

- Parents are worried about children arriving home late , and school officials unable to provide parents with any information about either the location of their children's bus or whether an accident has occurred.
- Citizens place angry calls to their elected officials after days without some neighborhood streets being plowed.
- A woman on dialysis equipment finds herself in critical danger after she is unable to reach her dialysis clinic (due to blocked roads) or even to call for help (due to downed phone lines).

or…

- Use of state-of-the-art communications and weather monitoring equipment allows agencies to interact and cooperate with each other, resulting in minimal confusion, efficient snow removal, and proactive emergency medical response.
- Transportation operations centers using Automatic Vehicle Location (AVL) systems enable transportation officials to track—in real time—the exact location of school busses. School officials are able to tell parents exactly where their children are and when to expect them home.
- Transportation officials know exactly which streets have been plowed and the condition of all the roads on the system, and are able to dispatch equipment accordingly.
- Emergency personnel can pinpoint the exact location of patients on life-sustaining medical equipment, and are thus able to dispatch someone to check on those patients who are left without utility service.

An Overview of Smart Response Technologies

Here are some brief descriptions of new communications, information, and control technologies currently being implemented by transportation and public safety agencies. A glossary of technical terms used in this guidebook appears in the appendix.

Intelligent Transportation Systems (ITS) include a range of new technologies applied to a transportation network for improving the safety and efficiency of operations. ITS includes information processing, communications, control, and electronics technologies.

Traffic Management Centers (TMCs), also called Traffic Operations Centers (TOCs), monitor real-time information obtained from various components of ITS. Transportation and public safety agencies can share this real-time information to improve incident response time and coordination, adjust traffic controls, and keep motorists informed of traffic and weather conditions. Some common components of ITS systems include:

Closed circuit video surveillance cameras placed along roads or sidewalks that observe real-time traffic and assist law enforcement agencies to monitor red-light runners, aggressive drivers, and criminal activity. These cameras can remain stationary or be animated through remote control. Cameras mounted on airplanes and helicopters can also provide live transmission using downlinks to traffic management and public safety operations centers.

Sensors placed in or along the roadway that measure pavement temperature, air temperature, and precipitation. They can also monitor weather conditions, traffic volume, and the weight of commercial vehicles and relay the information to traffic management centers. Traffic engineers can use real-time information on traffic and road conditions to adjust traffic signals and variable message signs or to deploy snowplows, traffic control, or roadside assistance. Also, officials can provide information about traffic and road conditions to the public and the media through television, radio, the Internet, information kiosks, and personal communications devices such as hand-held computing systems or Web-enabled pagers and mobile phones.

Smart passes that enable vehicles to drive through tollbooths at normal speeds. Affixed to a car's windshield, a smart pass provides a unique identification code within a secure electronic code that a sensor in a tollbooth can read, then automatically record it on a prepaid or monthly account.

Traffic signal priority or preemption systems that give green-light priority to emergency vehicles passing through intersections.

Variable message signs that display current information on traffic and emergency conditions for travelers. The messages inform motorists about incidents or dangerous conditions and alternate routes, and encourage safe driving.

Web sites, traveler information kiosks, cable TV stations, and telephone hot lines that provide real-time information on traffic, road conditions, transit schedules, and emergency information.

Computer-Aided Dispatch (CAD) was one of the earliest uses of communications technology in

public safety. It remains at the core of Enhanced 911 (E911) systems. With E911, when a caller dials an emergency number (911) from a hardwired telephone, the address of the caller pops up on the call taker's screen; when Geographic Information Systems (GIS) are integrated with the CAD system, a location map also will appear. The CAD system will identify, prioritize, and notify available responders. When rescue vehicles are equipped with Global Positioning systems (GPS) and mobile communications, the system can track their actual location at the time of the call and provide direct in-vehicle dispatch, making the dispatch operation quicker and more efficient.

Information Technology (IT) refers to a vast array of electronic communications technology, including computers, television, radio, and telephone. All of these telecommunications technologies depend on the transmission, manipulation, and control signals of various frequencies within the electromagnetic spectrum.

> ***Wired Communication*** refers to hardwired telephone lines and cable used for voice or data transmission. ***Wireless communication*** includes transmission by broadcast signal including AM radio, shortwave radio, FM radio, and broadcast television; cellular (or mobile wireless) telephones; terrestrial microwave voice/video and data communication; and communications satellites.

Wireless Enhanced 911 (E911) phone calls now comprise from one-quarter to one-third of all telephone calls, with wireless market expanding greatly. Many people buy mobile phones primarily for safety, but are not aware of a major flaw in our emergency response system: without wireless E911 capability, emergency dispatchers lack the ability to identify the location of callers using wireless telephones. Many localities across the nation are currently upgrading their 911 centers for wireless E911 capability. In addition to adding equipment, because the U.S. uses about 25 different emergency numbers across the country, some of these localities must first designate 911 as the cellular emergency number. Local governments planning E911 upgrades should consider how E911 technology can be used for other municipal functions. (See Wireless Location Technologies: An Example of an Emerging System Integration Opportunity, p. 9.)

Geographic Information Systems (GIS) are electronic maps that can be combined with informational databases for graphically representing information such as the location of recent high crime activity, sites of frequent crashes, the location of police, fire, medical, or hazmat (hazardous material) equipment, and the homes of people on life-support equipment.

Global Positioning Systems (GPS) use satellites to determine—with a high degree of accuracy—the real-time location of objects on earth, including those in motion. GPS is useful for real-time tracking of fleet locations like snowplows and other highway maintenance equipment, police cars, school buses, transit buses and trains, fire trucks and ambulances and for pinpointing the exact location of crash or crime incidents.

Automatic Vehicle Location (AVL) systems relay information on vehicle location back to a base, where an operator can see the location of the vehicle on a computer screen displaying an electronic map. Current AVL systems use satellite GPS technology and may incorporate other location technologies in the future.

Mayday Systems, such as General Motors® OnStar™ system, automatically contact a privately-operated call center when a driver presses a button, or when an airbag deploys. Call center operators contact emergency responders. A nationwide effort, named the National Mayday Readiness Initiative (www.nmri.net), seeks to improve coordination among private sector call center operators and Public Safety Answering Points, or PSAPS. At present Mayday systems relay calls using mobile phones and provide location information through AVL or ACN systems. (See case study on Minnesota's Mayday Plus system, p. 36.) In the future, mobile phones may provide data on location, speed, and direction. (See Wireless Location Technologies: An Example of an Emerging System Integration Opportunity, p. 9.) Note that Mayday systems don't work in areas without mobile phone service.

Automated Crash Notification (ACN) systems are an enhancement of Mayday systems. They also transmit information on collision severity to assist responders in determining what type of help to send and where to transport the injured.

LIMITED SPECTRUM AND THE INTEROPERABILITY CHALLENGE

Public safety and transportation agencies must be able to communicate in real time from mobile positions to contend with criminal activity, weather emergencies, fires, medical emergencies, disasters, and highway incidents. Access to public airwaves is vital for every public safety responder.

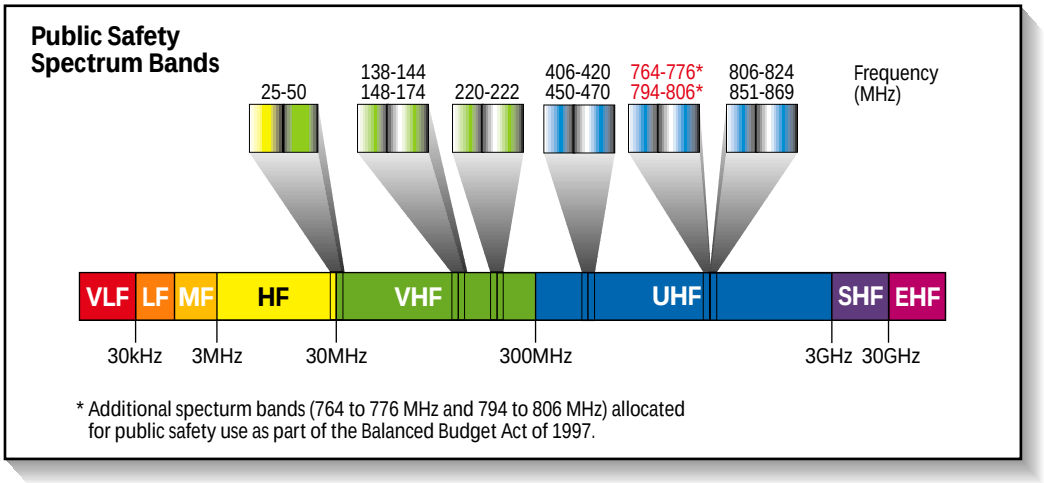
Radio spectrum refers to the array of channels, or frequency bands, available for communication transmissions. Commonly referred to as spectrum, these channels are a finite natural resource; they cannot be created or discovered.

The amount of spectrum or bandwidth currently assigned to public safety agencies is not sufficient to meet these needs, which results in congestion and interference in public safety radio communications. Many communities lack the needed bandwidth for police, fire, emergency medical services, transportation, and other public safety personnel to communicate within their own agencies, much less across agency lines.

Interagency communication, known as interoperability, is especially difficult to achieve because bands currently assigned to public agencies are spread out across the radio spectrum. Public agencies need to have additional bandwidth adjacent to those bands they currently use dedicated solely for interoperable communications. Without this additional bandwidth for interoperable communications, coordinated efforts among public safety agencies are often impossible.

New opportunities for interoperability are possible since the FCC recently allocated the list of 5-9 gHz for use in transportation agencies. Limited spectrum access also makes it difficult to take advantage of new technologies. In addition to voice communications, public safety agencies have increasingly significant data transmission requirements. Mug shots and fingerprints used by the police, maps and building blueprints needed by firefighters, and biomedical information used in emergency medical services all are sent by wireless. These new technologies require higher frequency transmissions in ranges that television broadcasters currently use.

Public safety agencies are working through the Public Safety Wireless Advisory Committee (PSWAC) to address these issues. As a result, Congress has directed the Federal Communications Commission (FCC) to set aside additional spectrum to meet public safety requirements. However, there are still concerns that additional spectrum band will be needed to meet interoperability requirements and to accommodate wireless data transfer.



WIRELESS LOCATION TECHNOLOGIES: AN EXAMPLE OF AN EMERGING SYSTEM INTEGRATION OPPORTUNITY

When a wireless phone is turned on, whether or not it's being used, it periodically transmits signals so the wireless network knows where to deliver calls. By installing computer equipment on current cellular towers, cellular providers can use the signals from cell phones that enable 911 dispatchers to determine the location of wireless callers. This would provide wireless E911.

In the so-called terrestrial wireless E911 technologies, the cell phone signal data collected at each tower can transmit to a central control center, where triangulation (the difference in time between the arrival of the signal at two different receiving stations, or by the signal's angle of arrival at each tower) can pinpoint the location of a telephone emitting a signal. Another option for providing wireless E911 capability might be to equip cell phones with tiny transmitters that would signal to satellites, much like Global Positioning Systems (GPS).

The terrestrial technologies can provide local governments with other services besides E911. They not only provide the vehicle's location, they also provide speed and direction.

If data on the location, speed, and direction of all cars carrying active cell phones throughout the transportation network is available, localities can use this data to measure the velocity and direction of travel on all roadways within a service area. Transportation managers can use aggregates of this information to view traffic patterns and manage traffic congestion more efficiently. This might present a more effective way to monitor system-wide traffic than the road sensors currently in use.

Most highway agencies can only afford to deploy traffic sensors on major highways, and these measure traffic only at their immediate location. Consequently few of our highway systems are covered by sensor technology. Experts say that if only one or two percent of motorists in urban areas use their cell phones at a given moment, this would still represent thousands of points of information—more than enough to measure traffic.

As this guidebook went to press in the fall of 2000, the Maryland and Virginia Departments of Transportation were planning to test the use of cell phones for traffic monitoring and other purposes on an especially congested section of the Capital Beltway that rings Washington, DC. Officials said one of their biggest challenges would be to convince the public that their privacy is protected. The technology will not be able to monitor phone calls or identify callers and will not track travel patterns of individual vehicles. Instead, the system will follow the pattern generated by thousands of cell phones. In a separate project, the Virginia Department of Transportation is also planning to use cellular location data to provide real-time traffic reports in the Internet.

Wireless technology may also provide a more cost-effective alternative for Automatic Vehicle Location (AVL). Law enforcement and fire/EMS agencies may potentially use the same technology for dramatically improving the quality and speed of police and fire/EMS response.

For local officials the challenge will be to work with local cellular providers, private sector systems integrators, and other public and private partners to maximize the potential of wireless location technologies and provide multiple services in their communities (beyond wireless E911). By working together, agencies can lower costs while improving their operations. The issue is quite timely because many local governments are currently working to provide wireless E911 in their communities.

Emerging System Integration Opportunities

Current State-of-the-Practice

Three separate worlds: The case studies presented in the next section of this guidebook document the state of the practice of integrated communications and technology among public safety- and transportation-related government agencies in the United States. Careful readers will discern that while advanced communications technologies offer abundant opportunities for coordination of operations and emergency response, few communities have begun to exploit the full potential. This is largely because the separate sectors and communities—(transportation and public safety sectors including separate law enforcement, fire, and emergency medical systems (EMS) communities—generally function quite independent of one another due to separate agencies and funding streams.

Transportation sector: The transportation sector has been leading the application of Intelligent Transportation Systems (ITS), and the U.S. Department of Transportation (DOT) has encouraged integrated operations between transportation and law enforcement agencies for incident management as well as integration with fire/EMS services. While many ITS deployments have included technology to facilitate better coordination of transportation and law enforcement agency response to traffic-related incidents, the fire/EMS functions included in ITS applications have generally been more limited in scope.

Public safety sector: Although the public safety sector has seen increasing interest in more coordinated use of automated data storage and retrieval systems as well as integrated mobile data and communications, the focus to date has primarily been on sharing information within the law enforcement sector or between law enforcement and fire/EMS. Where public safety organizations coordinate with transportation agencies, the primary focus has been on incident management. Within the fire/EMS community exists a growing sense of urgency regarding wireless E911 and Mayday response capabilities.

However, funding for fire/EMS remains scarce; as a consequence, this community generally has been the slowest to implement new technologies to date.

In many localities, the transportation, law enforcement, and fire/EMS public agencies continue to develop separate infrastructures, though they may have data links to one another. Further, these public agencies generally do not coordinate with private sector interests, such as insurance companies, medical service providers, and utility and telecommunications companies, which may share similar interests and may also be investing in infrastructure.

Focusing on synergies: By focusing on the true synergies among operations and equipment, and by considering some emerging next-generation technologies, localities will save public money and improve efficiency while creating a "chain of survival" to dramatically improve emergency preparedness and response capabilities.

Broader Partnerships Are Key

Forming broader partnerships is the key to harnessing system integration opportunities. For example, in the Portland, Oregon region, public agencies are partnering to more fully integrate voice and data communications region-wide using a wide area network (WAN) fiber optic cable infrastructure. In the process, they are leveraging individual resources to reap more return on investment for each agency.

Section III of this guidebook provides recommendations for specific actions to reach new partners in different sectors, including the private sector.

"Today in the United States there are 68 million wireless subscribers, over 5,500 public safety answering points (PSAPs) responding for calls for help, 98,000 emergency wireless calls per day, increasingly from 'smart cars' with more computer chips than a personal computer, the most advanced emergency medical system in the world, and intelligent transportation systems being installed to manage our roadways. These components can be linked in a 'chain of survival' that integrates their strengths into a 21st century 911 response system that will help prevent vehicle crashes and life-threatening emergencies. And when crashes and other emergencies do occur, this system can reduce the impact of injuries, more efficiently employ emergency response resources, and most importantly save lives. The common link among these components is wireless communications."

—David K. Aylward, Executive Director
ComCARE Alliance

SECTION II

Case Studies

Introduction to Case Studies

How can we learn from one another?

One of the major purposes of this guidebook is to facilitate the exchange of information among local governments interested in improving their public safety, emergency response, transportation, communications, and information infrastructure while integrating operations among a variety of agencies. Why reinvent the wheel? Benefit from the experiences of others!

To this end, the following case studies describe projects underway across the country. At the end of each case study you will find contact information for local officials in charge of each project.

The projects described in these case studies vary widely. Some are relatively small in scope, involving, for example, the sharing of a single set of equipment between transportation and public safety agencies in a single local government. Others are enormously complex, involving the development of regional data and communications networks to handle the full range of law enforcement, fire/EMS, and transportation services at the local, county, regional, and state levels. In each case, project leaders have stepped across traditional jurisdictional and operational boundaries to bring innovative new services to their constituents.

Though all the projects documented in these case studies involve some degree of joint operations and cooperation among transportation, law enforcement, and/or fire/EMS agencies, rarely have all these functions and operations been fully integrated.

To assist the reader, case studies are categorized by the major functions they address:

- Integrated Transportation, Law Enforcement, and Fire/EMS Services

  (Case studies demonstrating various approaches to three-way integration)
- Integrated Incident Management

  (Case studies demonstrating integration of transportation and public safety agency response to traffic incidents)
- Improved Law Enforcement Communications

  (Case studies demonstrating information technology for law enforcement agencies)
- Improved Communications Between Ambulances and Medical Institutions

  (Case studies demonstrating information technology that connects ambulance crews with hospital doctors)
- Quicker Emergency Response

  (Case studies demonstrating information technology to improve fire and EMS dispatch services)

Because the various communities (transportation, law enforcement, fire/EMS) have traditionally operated separately, full-scale technical integration is just beginning to take place. The introduction to this guidebook discusses some emerging opportunities for integrating next-generation technology for the coordination of operations. The next section–Section III: Leadership Tactics–provides general guidance for local public officials interested in forging broader partnerships in their communities.

INTEGRATED TRANSPORTATION, LAW ENFORCEMENT, AND FIRE/EMS SERVICES

(Case studies demonstrating various approaches to three-way integration)

Austin, Texas

A regional public safety center integrates transportation and emergency management services

As this guidebook went to press, facility planning was well under way, with groundbreaking expected in late 2000 or early 2001 for a Regional Emergency Communications and Transportation Management Center that will serve the Travis County area surrounding Austin, Texas. The new center will provide an unprecedented degree of coordination among the region's fire and emergency medical services (EMS), law enforcement, and transportation services at the city, county, and state levels.

The project has evolved over five years of joint planning that began in 1995 when a committee with representatives from the various agencies started discussing radio communications improvements. At that time, fire and EMS personnel shared radio communication, but agencies recognized the need to extend the radio network to link to public safety, public works, and transportation agencies dealing with freeway incident management. Soon the committee identified the shared need not only for voice communications, but for high-frequency data communications systems as well. The idea of a new shared facility to accommodate new communications technologies was born.

In many areas, integrated operations between transportation and fire/EMS means that a police officer stationed at the Transportation Management Center (TMC) telephones the 911 dispatch center when a highway incident occurs. But the Austin system will include real-time software integration of the traffic management and Computer-Aided Dispatch (CAD) functions. When officials introduced the idea of sharing facilities, the Texas Department of Transportation (TxDOT) was already planning a new TMC for the Austin area, and the city's fire/EMS services were writing specifications for a new CAD system. They agreed to work together to integrate both the software and the facilities.

The integrated communications system will include wireless radio, telephone, video, fax, and microwave technology combined with countywide GIS mapping. Both EMS dispatchers and transportation managers will view real-time maps showing traffic and crime incident locations and the location of emergency responders. This will result in quicker, safer emergency response and traffic incident management.

Partnering agencies include:

- City of Austin police, fire, EMS, and transportation agencies
- Travis County
- Texas Department of Transportation
- The regional transit authority

The project budget is in the $40 million range. The City of Austin will raise $22 million through bonds. Although funding agreements are not final, TxDOT and Travis County may split the remaining project cost (contributing $8 million to $9 million each).

For more information, contact David Stone, City of Austin Project Manager, (512) 469-5041.

Houston, Texas

A state-of-the-art control center truly integrates transportation management and emergency response

Houston, world-famous as the home of the NASA flight control center that managed the moon landing, has another mission control center that distinguishes it as one of the most interoperable cities in the nation. Houston is home to TranStar, a state-of-the-art transportation and emergency response center operated jointly by four agencies: the Texas Department of Transportation (TxDOT), the Metropolitan Transit Authority of Harris County (METRO), the City of Houston, and Harris County. Staff at the center includes professionals from all four member agencies, as well as the Harris County Sheriff's Department, the Houston Police Department, local emergency management groups, and Metro Traffic, a private traffic reporting service. TranStar is housed in a new $13.5 million, 52,000 square-foot facility, and the four agencies share its operating costs. A unified management structure allows TranStar to minimize administrative boundaries and to effectively carry out multiple missions.

TranStar provides intermodal traffic management, communications, police and bus dispatch, telephone switching, and emergency management. The traffic management system's state-of-the-art Intelligent Transportation System (ITS) technology uses:

- traffic volume sensors
- transit and emergency response vehicles with Automatic Vehicle Location (AVL)
- computerized traffic signals for changing signal timing in response to traffic jams or accidents, and to give emergency vehicles and buses green-light priority
- advanced radio technology—including fiber-optic cable, video traffic surveillance, and mobile voice and data communication—to gather traffic information and direct commuters to the best route for reaching their destinations

Houston-area travelers benefit from continually updated information about route travel times, incident/accident reports, construction activities, weather and pavement conditions, traffic volumes, HOV lane use, alternate routes, bus fares and payment methods, schedules, and public transportation on-time performance.

The AVL technology assists in efficient dispatch of emergency vehicles, including the 14 motorist assistance vans that patrol regional freeways. A private sector partner, Houston Cellular, provides free airtime to motorists who use cellular telephones to request assistance or notify TranStar of problems on regional freeways.

Houston TranStar is unique among the nation's traffic control centers in that both the Harris County and City of Houston Offices of Emergency Management are located at the center. In a major emergency, service agencies in the Houston region converge in TranStar's emergency management center where they have immediate and simultaneous access to vital information such as weather reports, flood conditions, road closures and evacuation plans. The emergency management team includes representatives from law enforcement, fire, ambulance, utility, flood control, and social service agencies. Tax dollars are saved through the use of common equipment, and life and property are better protected through faster response to rapidly changing emergency situations.

For more information, contact Thomas C. Lambert, Assistant General Manager/Chief of Police, Department of Police & Traffic Management, Metropolitan Transit Authority, (713) 615-6409.

San Diego Region, California

Integrating incident management and emergency response through a regional communications network

The San Diego, California Intercad communications network, scheduled to deploy in late 2000, will be one of the first communications networks in the nation to integrate emergency and incident response communications on a region-wide basis. The system will facilitate more efficient mutual response operations across agency and jurisdictional lines, while reducing information and communications costs for many of the participating agencies.

Public officials in Southern California are very sensitive to the need for government agencies to work together when disaster strikes. Mutual response to fire, earthquake, flood, highway emergency or terrorist threat is important in a region that has been so hard hit by natural disasters in recent decades. The region already has an unusual degree of integration among its disaster response providers. The California Department of Transportation (CalTrans) regional traffic operations, the California Highway Patrol (CHP) regional operations, and the county disaster preparedness and response agency will be co-located within the county's Transportation Management Center scheduled to begin operations in the summer of 2000.

The new Intercad communications network will reach beyond facility walls to link all city and county transportation, law enforcement, and EMS agencies. Intercad will integrate the CAD systems of the fire/EMS and law enforcement agencies and traffic incident management systems regionwide. Any incidents reported through the regional transportation management system will immediately post to the entire public safety/EMS CAD system. On the other hand, calls coming into the law enforcement agencies and EMS will first be coded to indicate whether the information should stay within the secure public safety communications network, or bridge the firewall for broadcast to EMS and transportation agencies as well. This ability to provide security for law enforcement operations while integrating response has attracted interest from the FBI and other law enforcement agencies outside Southern California.

The Intercad system began as a functional module for incident management and emergency response of the Southern California corridor's intermodal ITS network software, which links the region's six local transportation agencies and the State DOT (which includes the CHP) to facilitate highway incident management. The Southern California corridor, which extends from Ventura County south to Mexico, was one of four priority corridors selected in early 1991 by the U.S. Department of Transportation (DOT) for early deployment of ITS systems.

The Intercad project builds on the ITS network capabilities to more fully integrate computer-aided dispatch among transportation, EMS, and public safety agencies throughout the region, and to provide for the public safety firewalls discussed above. The regional integration and interconnection of Intercad is funded through the San Diego Association of Governments, the regional metropolitan planning organization. A committee that includes representatives of the law enforcement and transportation agencies oversees the project.

The concept is to create a core network, analogous to a communications network, with switch boxes that enable new customers (users) to connect to the core system for a relatively small fee. Eventually, 300 smaller cities in Southern California expect to connect to the regional communications network, which costs hundreds of millions of dollars, for a plug-in cost of just $25,000 to $50,000 to each new jurisdiction.

For more information, contact John Duve at the San Diego Association of Governments, (619) 595-5368.

Portland, Oregon Region

Partnerships for lower-cost development of disaster-proof government communications infrastructure

The City of Portland, the State of Oregon, and Tri-Met, the regional light rail and bus authority, are partnering in a strategic alliance to develop a reliable regional government communications infrastructure for a much lower capital investment than otherwise would have been required. The network will provide integrated wired and wireless communications for transportation, fire/EMS, public safety, health care institutions, and public utilities (water, sewer, power) agencies. The system is designed for optimum reliability to survive natural or man-made disasters.

The systems integrator is the City of Portland's Bureau of General Services' (BGS') Communications and Networking Division (ComNet). ComNet, already a regional communications provider, had wanted to build a high-speed bandwidth voice and data network for telecommunications (wide-area network or WAN) to service public-safety-related government agencies in the Portland region. But ComNet lacked the budget to cover the estimated $7 million cost.

Partnerships and clever asset management made the project possible. The Portland Department of Transportation (PDOT) and the Oregon Department of Transportation (ODOT) were deploying the Portland region's ITS. Leveraging the already-programmed ITS infrastructure investment with about $5 million of cable conduit assets (owned as a result of cable franchise agreements) and partnering with the State of Oregon and Tri-Met (which had also previously planned to deploy their own fiber optic infrastructures) enabled ComNet to place fiber assets worth more than $13 million to date.

In addition to seeking a more disaster-proof communications system, project managers say they knew the time was right to invest in communications infrastructure. The public agencies were facing a growing demand for bandwidth to accommodate GIS-based applications showing police and fire stations, EMS 911, and water hydrant locations. Agencies estimated that costs for bandwidth rise ten percent a year, with demand rising 300 percent a year. Simultaneously, the citizen demand for Internet-based services (e-gov) is growing. From a real estate investment point of view, making government property e-commerce ready assures that it will remain competitive. A final and important benefit is that the partners will manage and control the communications network and are positioned to offer services to other government and public safety agencies and to educational institutions as a private carrier. (Though the FCC often licenses government radio networks as private carriers, this status is unusual for wired carriers because most wired networks are run by commercial carriers.)

Tri-Met, ODOT, and the City of Portland all currently use the City of Portland's 800 MHz public safety radio and mobile data systems. The current goal of the communications infrastructure expansion is to converge voice, video, and data telecommunications infrastructure into a reliable system for all users.

To formalize and expand opportunities for joint regional fiber infrastructure development, PDOT, ODOT and Tri-Met entered into a formal "Cooperative Improvement Agreement: Telecommunications Infrastructure."

The agreement establishes a working committee for coordinating communications infrastructure of public safety and transportation, with equal representation from each of the partnering agencies and an Executive Committee (Cooperative Telecommunications Infrastructure Committee consisting of one voting member from each agency. The Executive Committee must establish collaborative network architectures, designs, implementation plans, expansion plans and maintenance plans to create a regional

communications network infrastructure to serve all partner organizations. The purpose of the working group is to coordinate use of network assets, such as funding, physical assets, rights-of-way, equipment, and labor, in such a way as to benefit all partners whenever practical and avoid the development of duplicative network investment.

Each partner agrees to share infrastructure with the other organizations, provided that such sharing does not compromise the integrity of that organization's telecommunications system. The partners also agree to leverage financial assets where possible to create shared infrastructure, and to provide the other partners with access to the public rights-of-way that each agency may control.

For more information, contact Nancy Jesuale, Division Manager, Bureau of General Services Communications Services Division, City of Portland., (503) 823-4331.

Monroe County, New York

INTEGRATED INCIDENT MANAGEMENT

(Case studies demonstrating integration of transportation and public safety agency response to traffic incidents)

Team-building is key to development of joint transportation/ public safety operations center

When severe blizzards strike, state, county, and local transportation and public safety agencies in upstate New York routinely work together across jurisdictional boundaries. After an enormous amount of diplomacy, team-building, and three years of joint planning, a new joint Transportation Operations Center (TOC) in Monroe County, New York is scheduled for completion in early 2001.

The 49,000 square-foot facility will consolidate and integrate delivery of services on county and state highways. Together, the Monroe County and New York State transportation agencies will jointly operate the state-of-the-art TOC, which will implement ITS technology to handle critical highway incident management. The county's Highway Lighting Division, Monroe County DOT's signal maintenance operations, New York State DOT's signal maintenance/ITS operations, and a New York State Police Zone Substation will share the joint facility. The Zone station is a major facility that will house more than 80 State Police employees. The TOC will have on-line links to the county's cutting-edge 911 emergency response center currently under construction across the street. The facility is located adjacent to the Greater Rochester International Airport and across the street from the county's EMT and fire training center. The airport's field operation facility will be located on the TOC site as well.

The TOC will use a wide variety of new ITS technologies—including a road weather information system to improve traffic safety, traffic surveillance cameras to improve management and detection of incidents, variable message signs to improve traffic flow, weather monitoring for enabling managers to better deploy snow removal equipment, and integrated traffic signals on county and state highways. The TOC will integrate an upgraded radio communication system with the county's fiber optic and telecom systems.

Monroe County is the lead agency, owner, and operator of the Joint Transportation Operations Center. In developing the partnership, Monroe County transportation officials first sought support for the project from top executives at potential partnering agencies. This strong backing from the top was crucial in overcoming institutional resistance, which inevitably arose.

A next step was to develop a working team that included good liaisons at each partnering agency. The state ITS coordinator, airport engineer, a senior manager at

the county TOC, and a state police captain were involved in the working team. When members changed due to job turnover, strong support from senior management in each agency helped assure continued progress.

Diplomacy was a key skill needed by project managers as they addressed each partnering agency's needs and concerns. In some cases, partnering agencies needed assurances of safety in sharing information and space with personnel from other agencies. In other cases, the team addressed valid security concerns regarding facility design. For example, the state police portion of the facility provides security and limited access for certain functions, including use of the New York State Police Information Network, and processing of persons entering custody.

The $10 million project uses a variety of funding sources that include FHWA ITS deployment grants and surface transportation program (STP) flex funds, FAA airport funding, and $2.2 million in county funds.

For more information contact Paul H. Bush, Assistant to the Director for Special Projects, (716) 428-4812.

For more recommendations on how to develop partnerships for resource sharing, joint operations, or integration, see Appendix B.

Montgomery County, Maryland

Transportation and public safety departments coordinate incident management

Maryland's Interstate 270 provides a vital lifeline connecting commuters and businesses in booming edge cities in the northern area, the close-in suburbs at the south end of the county, and the region's urban core in downtown Washington, D.C. When a hazardous materials incident shut down I-270 for 18 hours in December 1990, an interdepartmental group—the Transportation Incident Management Task Force—undertook the mission of improving incident response time through better interdepartmental coordination and cooperation.

As a result of the task force's work, public safety and transportation agencies in Montgomery County now work together under the provisions of a jointly signed Memorandum of Understanding (MOU) (see Appendix A). Signatories to the MOU include the county's Department of Transportation, Department of Police, Department of Fire and Rescue Services, and Department of Environmental Protection.

The MOU contained provisions for creating a permanent interdepartmental Transportation Operations and Incident Management Committee. With each participating department or agency maintaining one vote on the full committee, they agreed to pool their resources to support the committee, and to:

> *Make every effort in good faith to abide by the policies and procedures established by the Committee, and adjust operating procedures accordingly, for the mutual benefit of all participating departments and transportation system patrons.*

Two standing subcommittees carry out the committee's day-to-day business. A policy committee, consisting of senior staff representatives from the participating departments, sets interdepartmental transportation policy and determines priorities among competing demands. A work group with representatives from each of the participating departments must identify and develop mechanisms for best implementation of policy and for recommending new policy initiatives or direction.

The Transportation Operations and Incident Management Committee has a goal of combining the county's Transportation Management Center and its police and fire/rescue 911 call-taking and dispatch centers into a combined facility. This physical co-location may soon become a reality as the county completes construction of a new Emergency Communications Center as part of an upgrade to a countywide 800 MHz radio system in 2003.

The new 800 MHz radio system will enable the police, emergency responders, and transportation departments to communicate with each other. At present, agency radios operate on separate frequencies. However, agencies have exchanged radios so that primary incident responders can communicate. For example, the Chief of Transportation Systems Management has a police radio and clearance to talk on it. The new radio system will provide the additional bandwidth needed for mobile data equipment. To date $50 million has been approved for development of the voice communications system specifically, but planners envision that the system will eventually include mobile data capabilities with computers in the county's transportation, fire and rescue, and police vehicles at an estimated additional cost of $50 million.

In the meantime, Montgomery County already has a technically advanced and interdepartmentally integrated local government transportation and incident management system. In addition to roadside video traffic surveillance cameras, red light enforcement cameras and pavement sensors feed data into the county's Traffic Management Center (TMC).

The county also has an aerial surveillance program. An airplane staffed with a pilot and technician provides the county's TMC with live video footage of bottlenecks during morning and evening rush hour. Aerial surveillance helps the county better respond to citizen complaints, traffic crashes, construction-related traffic problems, disabled vehicles, and other incidents, and to adjust traffic signal timing more effectively. The

county's police and fire dispatch system uses the real-time information to speed incident response time. As a result, the TMC can optimize traffic flow by adjusting signals and changing highway message boards, which advise motorists of delays and alternate routes.

With traffic monitoring as its primary mission, the aircraft has also become a valuable shared resource. The police department has used the airplane to respond to armed robberies, high-speed chases, suspicious situations, searches, and narcotics surveillance operations. While a helicopter would be more useful for some types of police operations—particularly those requiring very close visual contact with the ground, or landings at a crime scene—the airplane meets most of the police department's needs with lower overall operating costs.

The county's Automated Traffic Management System (ATMS) is funded at $3 million a year. Half the funding is state aid with the remainder coming from county funds. Communications infrastructure is funded separately.

For more information, contact Emil J. Wolanin, Chief, Transportation Systems Management Section, Department of Public Works and Transportation, (240) 777-2190; fax (240) 777-8750.

Phoenix, Arizona

Police use traffic surveillance cameras for downtown event management

Many cities struggle to revitalize downtown streets at night and on the weekends when office workers retreat to the suburbs. But in Phoenix, Arizona, downtown is where it all happens. A basketball arena, baseball stadium, civic plaza, and symphony hall are located within a few blocks of one another. Parking facilities are shared, and events at the various venues often coincide, requiring efficient management of traffic and crowds.

At the new City of Phoenix Event Operations Center, located in the midst of the downtown area, new technology shared by the police and transportation departments improves event management operations. City police can view the real-time situation on downtown area streets via the transportation department's remotely located cameras, and dispatch services accordingly.

Fiber optic cable links the Event Operations Center with the City of Phoenix Traffic Management Center (TOC) located seven blocks away. The police department can manipulate the TOC traffic surveillance cameras (zoom, tilt, rotate, etc.) to better view real-time events. Because the Events Operations Center functions at night and on weekends, the ability of the police to control camera position does not interfere with TOC operations, which take place primarily during daytime commutes. The traffic department's special events coordinator works with the police at the Events Operations Center to provide signal coordinating, variable messaging, and other automated traffic operations support.

The video cameras provide real-time surveillance only (not for videotaping) with a primary purpose of assisting with officer dispatch rather than to document crime for evidence. As a result, privacy issues are not at issue in relation to the use of the cameras by police.

The police department funded the fiber optic cable and the construction of the new Events Operations Center through funds from a city-owned parking garage.

For more information, contact Tom Callow, Interim Street Transportation Director, City of Phoenix, (602) 262-4690.

Puget Sound Region, Washington

Technology enables agencies to clear the road 50 percent faster after accidents

During peak traffic periods, highway speeds drop to 40 mph in the Puget Sound region that surrounds Seattle, Washington. Highway crashes can further delay traffic well beyond the clearing of the accident. Worse still, every accident greatly increases the risk of a related secondary accident.

Twenty-five agencies and organizations have cooperated in building state-of-the-art Intelligent Transportation System (ITS) infrastructure in the Puget Sound region that enables roads to be cleared 50 percent faster when crashes and other traffic-stopping incidents occur. The region's Advanced Traffic Management System (ATMS) enables traffic management staff from 19 jurisdictions to share real-time traffic information and make consistent decisions about traffic management, assuring that travelers encounter minimal delays as they pass between jurisdictions.

Incident response trucks equipped with video cameras are one of the more unusual elements of the Puget Sound Region's comprehensive ITS system, which is known as Smart Trek. The cameras allow traffic managers in control centers to assess the severity and impact of crashes. Smart Trek also is field testing a mobile Web camera in a fire department ambulance, which allows emergency response medical technicians to send real-time images of accident victims to a secure Web site, which emergency room doctors can access. As a result, physicians can better assess treatment options for the patient before transport. The total cost of the video camera systems for two incident response trucks and one ambulance was $125,000.

In the event a major disaster disrupts the telecommunications system, a backup wireless radio system enables all the county emergency operations centers in the Puget Sound region to maintain communication with the Washington State Department of Transportation (WSDOT). WSDOT provides 800 Mhz radios to each county, enabling them to maintain communications with the DOT and the State Patrol in an emergency. The total cost for the backup wireless radio system was $100,000 for 16 radios and two repeater stations. King County and WSDOT also have shared the costs of developing the county's first countywide disaster preparedness plan as part of the Smart Trek project.

WSDOT had wanted to include an emergency operations management element as part of the Smart Trek project to comply with FHWA criteria for projects using ITS model deployment funds. They consulted the region's local emergency management officials who identified the radios and preparedness plan as first priorities.

More than 200 closed circuit television cameras monitor Puget Sound's major corridors, providing a quick view of traffic conditions for local news and traffic broadcasts and Internet users. More than 45 variable message signs and seven highway advisory radio stations inform travelers of traffic incidents ahead so they can select alternate routes.

Private companies access the information available through Smart Trek and repackage it in formats such as customized traffic reports available on pagers and other hand-held personal computing devices. In the future, the same information will probably become available through in-car navigation devices.

The total cost of the Smart Trek system was $18 million. The FHWA provided nearly $14 million in ITS Model Deployment funding; the state contributed almost $2 million. Public and private partners contributed the remaining $2 million.

For more information, contact Pete Briglia, ITS Program Manager, WSDOT, (206) 543-3331.

PUBLIC/PUBLIC PARTNERSHIPS: MOVING FROM LOCAL TO REGIONAL COORDINATION

Miami-Dade County's Metropolitan Planning Organization (MPO) acts as lead agency in the Sunguide partnership. Because the Miami metropolitan area already was experiencing severe traffic congestion problems, the City of Miami was the first in the region to express interest in deploying new technologies. Soon the entire county recognized the value of coordinating new technologies. Thereafter, the Miami-Dade County MPO formed an ITS Committee, which conceptualized migration toward a regional system that would include the neighboring Broward and Palm Beach Counties.

Working through MPOs in neighboring counties, the ITS staff of the Miami-Dade County MPO met with transportation staff from neighboring jurisdictions. While these less populated counties had not yet experienced severe congestion problems, they recognized that future population growth in the region would require more efficient traffic operations for accommodating growth in traffic. Cost savings was a key selling point for a regionally coordinated ITS system as each county considered the price of duplicate facilities and equipment.

In approaching potential partnering counties, the Miami-Dade County MPO promised to be the guinea pig for the new technologies. Only after the technologies had been successfully deployed in Miami-Dade would partnering counties be asked to install them. By offering to reduce initial risk, the Miami-Dade County MPO effectively reduced the barriers to cooperation with its neighboring counties.

It also was important to neighboring counties that the Miami-Dade MPO had shown its commitment to the Sunguide project by giving it highest priority for MPO funding (using STP and CMAQ funds) rather than relying exclusively on federal funds from the State DOT. The Sunguide program was reflected as a strong element of the Miami-Dade MPO's long-range plan and transportation improvement program.

The three-party partnership was implemented through a memorandum of understanding (MOU) (see Appendix A).

Southeast Florida

Regional ITS system reduces traffic congestion and improves safety

As a major international tourist destination, South Florida has an economic stake in providing a smoothly functioning transportation system and reliable, understandable real-time traveler information. Transportation and public safety agencies in three counties—Broward, Miami-Dade and Palm Beach—share the benefits of Sunguide, South Florida's ITS. The current infrastructure provides:

- Closed-circuit television cameras for traffic monitoring
- Advanced traffic signal control for better timing and incident response
- Emergency dispatch management centers with dispatch assisted by Geographic Information Systems (GIS)
- Freeway service patrols with fleet tracking and dispatch assisted by Automated Vehicle Location (AVL) systems
- Real-time transit system information, with AVL-assisted fleet tracking and dispatch
- Changeable message signs to advise drivers of traffic and weather events
- Fiber optic and wireless communication systems to assist interoperability
- Highway advisory radio.

In 1999, construction began on a 30,000 square foot control center where the Florida Highway Patrol will share space with regional highway and transit agencies. The center includes a wall for 12 integrated video screens to monitor real-time traffic, as well as management software that eventually will coordinate automated incident detection and traffic system management in the entire tri-county area.

Beginning in 2000, a private provider, SmartRoute Systems, will provide a range of real-time information services to travelers in the three counties through a variety of media, including radio, television, Internet, toll-free telephone lines, message signs, and kiosks. The private providers will partner with public sector agencies in offering the services for three years, after which the revenues from commercial traveler information services are expected to make the private providers self-sufficient. Thereafter, public agencies will have the equipment in place to assume some of the nonprofit travel information services. Via a variety of media, travelers will receive information on issues such as: highway travel times, incident locations, construction locations and schedules, transit conditions and schedules, special events, HOVs, parking, tourist travel, and transportation agency contacts.

Sunguide was financed primarily through FHWA ITS model deployment funds that flowed through the Florida Department of Transportation as well as FHWA Surface Transportation Program (STP) and Congestion Mitigation and Air Quality (CMAQ) funds programmed by the Miami-Dade MPO.

For more information, contact Carlos Roa, Miami-Dade County Metropolitan Planning Organization, (305) 375-1886; fax (305) 375-4950.

Hampton Roads Region, Virginia

Nation's first wireless traffic information system will provide real-time traffic reports on the Internet

The nation's first wireless, geographically-based Advanced Traveler Information System (ATIS) will soon be implemented in the Hampton Roads region of Virginia. The wireless traffic information system will improve the timeliness and breadth of traffic information currently available on the Internet at www.gohamptonroads.com. This Cox Interactive Media Web site uses traffic information from the Virginia Department of Transportation (VDOT) and local agencies in the Hampton Roads region. The system will use the signals emitted from in-vehicle cell phones to track traffic volumes and speeds throughout the region. To enable the system, Iteris, Inc. developed proprietary data fusion software and U.S. Wireless developed proprietary technology that can determine vehicle travel times. The Iteris application will merge and aggregate the data emitted from cell phones and data from VDOT local agencies as well as other sources into regional traffic information. (Officials emphasize that the system will not track individual telephones or vehicles.) Cox Interactive Media will then use the data to improve real-time traffic and congestion information provided through the Internet. Another project partner, Metro Traffic, will use the information to improve traffic reports on local radio stations. As the system matures, new media distribution outlets such as television and kiosks, and new services such as personalized Internet-enabled communications devices, will become available.

Officials estimate the project cost will be in excess of $7 million. The public sector's share is $1.2 million. Local governments will use funds from the Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds to provide one-quarter of public funds.

For more information, contact Todd Kell at VDOT's ITS Division, (804) 786-2451.

Alexandria, Virginia

IMPROVED LAW ENFORCEMENT COMMUNICATIONS

(Case studies demonstrating information technology for law enforcement agencies)

Wireless computers give police flexible, fast data access

Alexandria, Virginia lies along the Potomac River near downtown Washington, DC. Although steeped in colonial history, Alexandria has its share of modern-day urban traffic and crime—and some of the world's most up-to-date public safety equipment.

While about 30 percent of police agencies nationwide now have at least some mobile computers, officers using dashboard-mounted mobile data terminals (MDTs) must be in their patrol cars to transmit or receive information. Officers in Alexandria, can send and receive data from virtually anywhere.

Cellular digital packet data (CDPD) wireless modems and laptop computers are the technologies that enable this high level of portability, with the laptops linked to the department's computer-assisted dispatch (CAD) system. Today, whether at a community meeting, at a stakeout, or at their desks in headquarters, officers have fast access to computers that enable them to diagram crash reports for witnesses review and transmittal from the scene. After interviewing crime witnesses from virtually any location, the officer can immediately transmit the witness report to headquarters and to other officers.

Officers routinely use the system to run license, warrant, stolen property and gun checks, and to automate accident and citation reporting. The department's roll call information (up-to-date information on local crime and events) and dispatch assignments are relayed via modem to the mobile officers. Additionally, the system makes it possible to transmit digital photographs of missing and wanted persons as well as fingerprints between police cars, to and from other jurisdictions, and/or to national databases. (The CDPD network provides end-to-end encryption, or scrambling, to protect message security.) It can be combined with global positioning devices to enable Automatic Vehicle Location (AVL). AVL also enables dispatchers to monitor the location of patrol cars and dispatch units more efficiently.

After deciding in 1991 to implement mobile computing technology, the Alexandria police had the vision to plan for future compatibility. System requirements focused on the ability to transmit images as well as data, add new technologies as needed, and establish interoperability with emerging nationwide systems. Functional specifications included:

- portable PC with large storage capacity
- enough memory for a graphical user interface
- ability to link with the FBI's new National Crime Information Center 2000 computer system linking all law enforcement agencies nationwide
- compatibility with National Institute of Standards data requirements for new technologies such as automated fingerprint identification

The city pays less than $50 per modem each month for unlimited transmission on the CDPD network. By using the network, the city avoids the costs of upgrading the private radio network it uses for voice communications to handle data transmission.

Total cost for system development, integration, and purchase was about $7,500 for each patrol vehicle. The city paid for the systems with a combination of city funds (including money from seized assets) and grants from the Department of Justice.

For more information, contact the Commander of Automated Systems, Alexandria Police Department, (703) 838-3833.

San Jose, California

Digital cameras stop speeders

If you don't know the way through San Jose, it can be tough to navigate its busy streets. Now, thanks to San Jose's NASCOP-Neighborhood Automated Speed Compliance Program, motorists can travel within the city more safely and efficiently.

Operated by San Jose's Department of Streets and Traffic, NASCOP is one of the nation's first programs to employ all digital photo-radar enforcement equipment for surveying areas according to requests from neighborhood associations. After receiving a surveillance request from one of the participating neighborhoods, NASCOP dispatches a marked van equipped with two digital cameras for capturing images of both front and rear plates of passing vehicles. One camera faces the rear window of the van to capture the image of an oncoming driver's face—an important data collection function that supports California law requiring drivers to be identifiable for ticketing purposes. Additionally, the dual-camera system records images of the rear plates of speeding vehicles, which is important because about 5 percent of vehicles have missing or defaced front plates.

When violations occur, the city mails notifications to a vehicle's registered owner. The owners may respond by mail or in person. If a vehicle's owner contends that he or she was not driving the car at the time of the violation, that person may sign a certificate of innocence. If responding to the violation by mail, the vehicle owner may submit a copy of a valid driver license and photo. The owner has the option of identifying the driver and notifying the city in these cases. To answer any questions regarding a violation or other concerns, the city provides a toll-free information line.

Before NASCOP deployment, the city of San Jose conducted an extensive 20-month trial during which time NASCOP proved its effectiveness to reduce speeding on neighborhood streets. To kick off the program in December 1998, the city mailed more than 300 NASCOP program applications to official neighborhood associations and interested individuals. It also sponsored an extensive media campaign prior to initial enforcement.

Initially, San Jose used a film-based camera system, but moved to a digital camera system to eliminate potential framing problems and film development delays and costs. The digital camera system allows operators to zoom in and out of violation images. Thanks to advanced digital imaging technology, the driver's face or license plate displays clearly on a monitor and enables system users to adjust images for reduction of problems from exposure or glare. Additionally, images captured with the digital system print as well or better than those captured with conventional film.

During the trial period, registered vehicle owners received 3,500 violation notices. About one-third of owners didn't respond and another 18 percent provided proof they were not driving. Over the 20-month course, the program yielded a 44 percent reduction in speed-related crashes and reduced speeding on 12 of 20 streets tested. Based on this and other information, the San Jose City Council approved deployment of today's NASCOP system. Currently, NASCOP incorporates procedures to deal effectively with non-respondent owners by obtaining drivers' license photos from the Department of Motor Vehicles (DMV). About half of the photographs taken have resulted in Superior Court traffic citations being mailed to the registered vehicle owners.

Because of NASCOP's initial success, the city of San Jose plans to expand the program to serve more neighborhoods. During the program's trial period, about 2 percent of those who received notices in the mail questioned the validity of the program and expressed dissatisfaction with having their pictures taken. Surveys showed that most residents and motorists were supportive of the program, although a majority noted that speeding continues to be a problem during non-enforcement periods. The program remains popular with participating neighborhood associations.

NASCOP exemplifies the cooperation of multiple city agencies working together to better serve the transportation needs of citizens. All of NASCOP's program procedures were developed by a task force involving coordination between

San Jose's police, fire, streets and traffic, parks, recreation, and neighborhood services departments, city attorney, and county Superior Courts with the California Department of Motor Vehicles (DMV), the San Jose Traffic Appeals Commission, and the California State Automobile Association.

The city's general fund wholly supports all of NASCOP's financial needs, spending $70,000 for the van and photographic equipment. Operating costs are $185,000 a year, which covers technicians, supplies, clerical and administrative assistance, and vendor costs. Leveraging the California law that enables local governments to designate who will enforce speed ordinances, NASCOP effectively keeps the costs of operations low by employing technicians instead of police offers for speed enforcement.

Additionally, a third-party vendor manages administrative program tasks at a cost of approximately $5,000 per month. The vendor receives the photos, looks up owner information in DMV records, prepares notification letters, staffs the toll-free telephone line, schedules appointments for those who want to respond in person, issues final notices to non-responders, and prepares court packages for those who do not respond within 15 days of the final notice.

For more information, contact Larry Moore, Senior Civil Engineer, City of San Jose Department of Streets and Traffic, NASCOP Unit at (408) 277-4304.

IMPROVED COMMUNICATIONS BETWEEN AMBULANCES AND MEDICAL INSTITUTIONS

(Case studies demonstrating information technology to connect ambulance crews with hospital doctors)

San Antonio, Texas

Two-way video links ambulance crews with hospital doctors

In the case of medical emergencies, San Antonio, Texas is one of the best places to receive care. Thanks to the city's LifeLink® program, emergency-room doctors and ambulance paramedics can maintain constant communication through two-way videoconferencing at the incident site and en route to the hospital. The technology helps to save time, which can make the difference between life and death.

The video camera inside the ambulance allows emergency room and trauma center physicians to see the patient and read vital signs, allowing for the rapid ability to determine the extent of injury and possible treatment options. The two-way visualization of the video enables doctors and paramedics to send and receive treatment instructions. The physician can instruct the paramedic to move the video camera over an area of the patient's body that the physician wants to examine. Newer technology will allow the doctor to use a remote control device to move the camera and zoom in and out of an area.

San Antonio launched LifeLink in 1998 as part of its ambitious TransGuide, a transportation management system involving the city, the state, metropolitan transit authorities, and systems integrator Southwest Research Institute. About half of the San Antonio fire department's ambulances have video capability that links portable computers, video cameras, and microphones via wireless radio. Patient data transmits by radio frequency to receiving antennas placed at hubs of the fiber optic cable lines installed along roadways for reception at the TransGuide operations center. From the operations center, high-capacity lines carry the data to the hospital. The reverse path handles hospital-to-ambulance communications. The equipment costs about $20,000 each for the initial 10 ambulances.

Since TransGuide became operational on 26 miles of San Antonio highways, it has helped to reduce accidents by 15 percent and cut emergency response time by 20 percent. Eventually, the city will expand the system to cover 289 miles of highways and city streets all around San Antonio.

In addition to LifeLink, TransGuide provides:

- a bus incident monitoring system (using surveillance cameras) and automatic vehicle locator
- in-vehicle navigation units in city, county, state and federal vehicles
- advance warning to motorists to avoid railway delays
- traveler information kiosks
- real-time traffic condition maps on the Internet
- live traffic video, maps, congestion and accident data sent to area newspapers and broadcast stations
- monitoring of actual travel times and speeds through a voluntary program where motorists place a "Travel Tag" on their windshields that codify the vehicles' identities and the time when the vehicles pass highway sensors

For more information, contact E. Sterling Kinkler, Jr. at Southwest Research Institute. (210) 522-3478.

Erie County, New York

QUICKER EMERGENCY RESPONSE

(Case studies demonstrating information technology to improve fire and EMS dispatch services)

Automatic crash notification system sends crash data to EMS services and hospitals

To reduce the time for notifying authorities of a crash, to dispatch help, and to improve the quality of the response, safety officials in western New York state have field tested an automatic crash notification (ACN) system. With sponsorship from the National Highway Traffic Safety Administration (NHTSA), the team responsible for the field test included the Erie County Sheriff Department, the Erie County Medical Center, Cellular One Buffalo, Rural Metro Ambulance, manufacturers of automatic crash notification (ACN) equipment, and Veridian, an engineering research and development firm.

In this field test, more than 800 privately-owned vehicles in Erie County were equipped with an ACN system that uses in-vehicle sensors combined with cellular telephone and Global Positioning System (GPS) technology. Sensors provide information on the time of the crash, the amount of time it took the car to come to a stop, the direction of force, measurements of crash severity, and the vehicle's final resting position. GPS technology provides the exact location of the incident.

When a crash occurs, location and crash data transmit directly to 911 operators. All the information is displayed simultaneously on monitors at the Erie County Sheriff Department's Cellular 911 Message Center and the Emergency Radio Dispatch System Center. Thanks to the highly-automated nature of this process, each crash message takes less than a minute to arrive at its destination. After the appropriate 911 operator receives the data message, a voice line opens between the dispatcher and vehicle.

Using crash data, dispatchers and trauma centers can determine the probability of injury to passengers and the appropriate type of EMS equipment to dispatch. As responders receive more crash data, the system's algorithms for predicting the probability and nature of injuries will improve. Eventually, the injury prediction function will greatly enhance the quality of emergency medical response.

For more information, contact Noah Rifkin, Strategic Business Planning Director, Veridian, (716) 631-6876.

Dallas, Texas

Ambulances and fire trucks respond quicker thanks to AVL technology

When a human heart stops beating, four to six minutes will lapse before the brain dies. With such a small window of opportunity for saving a life, emergency responders have no time to waste in getting to the rescue scene.

In Dallas, Texas, all 150 fire and medical rescue vehicles—ambulances, fire engines, fire trucks and chiefs' cars—are equipped with automatic vehicle location (AVL) units. When any of these public safety agencies receives a request for rescue assistance, computers at a dispatch center can automatically track and dispatch the closest emergency vehicle and provide the dispatcher with a printout documenting which unit was chosen and its approximate response time. Within the emergency vehicle, an alarm on the mobile data terminal (MDT) sounds to notify the driver of the assignment. The MDT displays the type and location of the incident, the companies dispatched, and the locations and working conditions of fire hydrants.

AVL technology pays off significantly during medical emergencies involving life-threatening conditions. Dispatchers using conventional systems generally contact the crew assigned to dispatch stations by radio in order of the station's proximity to the incident. But occasionally emergency vehicles and their crews are not at their dispatch stations; they may be at an incident scene, at the hospital, or at the repair shop. En route, a mobile unit may pass closer to an unfolding incident than any of the more local dispatch stations.

Dallas first implemented AVL in 1993, starting with ambulances, and expanded to AVL-equipped fire vehicles in 1996. During the first three years, the new technology enabled the fire department to reduce average response time slightly (from 5.24 minutes to 5.11) despite a 10 percent increase in call volume.

While the system has automated many of the dispatchers' tasks, dispatchers remain important members of the emergency response team. They maintain voice contact with crews, check addresses and other information to assure that the system works properly, and remain prepared to resume conventional dispatch operations if the computer system crashes.

Fire and police departments achieve interoperability via the use of the City of Dallas' mainframe computer in operating the dispatching system. The MDTs in fire and police department vehicles transmit data in the 800 MHz range. A separate radio system carries voice communication.

AVL systems use a two-part global positioning system (GPS) unit that includes a roof-mounted antenna that receives satellite signals and an in-vehicle GPS receiver that calculates position, then feeds the information through the MDT to the mainframe. Dallas chose a GPS receiver that allows reprogramming of position-reporting frequency. This feature has enabled the department to avoid jamming the airwaves with unnecessary data. In addition, the AVL system provides the ability to determine the distance traveled for reporting. For example, the units may be programmed to report when they have moved 400 meters, or after five minutes, whichever comes first.

The AVL system was funded through a capital equipment budget request. Cost of antennas and receivers for 150 vehicles was $185,000. System maintenance requires about 100 person-hours a year. The city estimates that its current computer hardware—including the mainframe and MDTs—is worth about $4 million. In early 2000, the city was in the process of replacing all the MDTs with PC-based computers equipped with more intuitive touch screen technology for graphical user interfaces.

For more information, contact Barbie Block, Public Information Officer, Dallas Fire Department, (214) 670-7949.

Minnesota

Mayday Plus automatically calls for help.

Automobile crashes kill more than 40,000 Americans each year. But with faster medical response, many can survive. Too often, life slips away in the time it takes for passersby to discover unconscious victims and call emergency services.

Partnering agencies in Minnesota are now pioneering the new frontier of emergency response with in-vehicle commercial Mayday systems that deploy automatically to provide information about crash location and severity, even when the vehicle occupants are unconscious.

Vendors such as General Motors and Ford already offer commercial Mayday systems like On Star® and Rescue®. These relay data from a troubled vehicle to a central location staffed by private sector call-takers who in turn notify local emergency service providers. Aftermarket products such as CERES® and AutoGuard® also are commercially available and being installed in consumer vehicles across the nation.

As the use of Mayday equipment becomes more prevalent, local law enforcement, emergency medical providers, and transportation agencies must be equipped to handle the available data more efficiently. Unfortunately, some commercial Mayday products do not provide a direct data link to emergency dispatch centers. National message centers and commercial product providers currently use databases that provide non-priority numbers into local emergency response centers (Public Safety Answering Points or PSAPs). In the case of a life-threatening vehicular emergency, key emergency providers must receive notification immediately to provide optimal care.

Minnesota agencies are partnering in development and testing of an integrated emergency response infrastructure capable of accepting data and voice messages directly from commercial Mayday systems. The system, named Mayday Plus, integrates global positioning systems (GPS), in-vehicle sensors, satellite and cellular phone technology, and computer-aided dispatch (CAD) systems. The new system can handle both voice and data communications. Minnesota agencies hope the information obtained from the test program will help identify and resolve institutional issues and ultimately lead to national standards and protocols for Mayday systems. Commercial market providers are currently developing proposed standards.

The Minnesota State Patrol and Mayo Medical Center cooperated with the equipment manufacturer, Veridian Engineering, the Minnesota Department of Transportation, and industry groups in an operational test of the Mayday Plus system in rural southeastern Minnesota from August 1999 to January 2000. One-hundred twenty vehicles were equipped with the Mayday system. Dispatcher interfaces were installed at Mayo Clinic, the Minnesota State Patrol, and Rural Metro (a nationwide, private, third-party response center). During the operational field test period, more than 400 simulated events tested and evaluated procedures for response to service needs ranging from roadside service to medical emergencies.

The field tests yielded some promising preliminary results. The emergency services, police, and DOT dispatchers found the Mayday Plus system to be easy to learn and use. The state transportation agency (MnDOT) and the Minnesota State Patrol (MSP) found that the Mayday Plus system enhanced their ability to promptly alleviate traffic flow problems associated with highway incidents. All those who participated in the field tests (both public participants and dispatchers) said they would purchase a system like Mayday Plus if it were affordable.

Overlapping law enforcement, medical, and fire boundaries among both public and private providers were some of the institutional issues that the project

partners had to overcome in planning the operational field test. Responders had to establish call-answering and routing protocols. The team also had to overcome technical challenges such as gaps in wireless communication capability and gaps in rural addressing.

Participating agencies plan to implement the Mayday system permanently, which will require multi-jurisdictional integration of computer-aided dispatch and operations as well as ongoing integration with commercial providers. Eventually Minnesota plans statewide implementation of Mayday Plus.

MnDOT and MSP experience a significant amount of interagency cooperation beyond their partnering in the Mayday Plus project. The two state agencies are typically located in the same building. MSP provides dispatching of state highway maintenance vehicles, and MSP dispatchers input pavement conditions reports into a MnDOT system for use by patrol and DOT personnel.

For more information on the Mayday Plus project, contact Farideh Amiri, Project Manager, MnDOT-Office of Advanced Transportation Systems, at (651) 296-8602. For more information about Mayday readiness issues, see the National Mayday Readiness Initiative Web site at www.nmri.net.

MAYDAY PLUS COMPONENTS

The three primary components of the Mayday Plus system include the In-Vehicle Module (IVM), dispatcher interface stations, and Gateway.

In-Vehicle Module (IVM): The IVM includes a cellular handset and antennae, GPS receiver and antennae, and a "black box" that collects and transmits valuable crash severity data such as:

- Indication of rollover
- Change in velocity upon impact
- Principle direction of force
- Heading direction of the vehicle
- Telephone callback number
- Driver and vehicle information

GPS equipment provides exact vehicle location information.

In addition to the data above, which transmits automatically when there is a crash, the user can manually send three types of distress signals: (1) emergency assistance, (2) roadside assistance, or (3) Good Samaritan assistance (when a passerby reports a roadside incident in another vehicle).

Dispatcher Interface: The interface provides the dispatcher with a map of the vehicle location, together with the data shown above, and allows forwarding of calls and faxing of data.

Gateway: The Mayday Plus Gateway serves as the brains behind the automatic routing of Mayday calls according to the location and type of incident. The calls are automatically routed to the proper authority depending on the type of call (emergency, automatic collision, roadside assistance, or Good Samaritan).

SECTION 3

Leadership Tactics

CHANGING AN OBSTACLE INTO AN OPPORTUNITY THROUGH LEADERSHIP.

Making the changes necessary to share new technology and develop more cooperative operating procedures requires top-down leadership—plus a lot more. Here are some tactics for overcoming common institutional, political, and technical barriers.

Tackle Turf.

Typically law enforcement, transportation, and emergency response communities are composed of separate stakeholder groups and different local, state, and federal agencies. Within each level of government, the law enforcement, transportation, and emergency response agencies tend to work alone. Each has a separate budget process, and they often compete with the other agencies for resources. Joint operations can challenge an agency's autonomy. The sharing of information or resources may be perceived as giving up power.

In many communities, law enforcement, transportation, and emergency response communities work together to manage crises or special events. But when such events pass, each retreats again into isolated operation. This is partially because continuing liaison or joint operations is not part of anyone's job description. Where good ongoing cooperation exists, it often results from the efforts of individuals within the departments who have formed well functioning and mutually beneficial working relationships. Unfortunately, when those individuals leave, mutual cooperation may cease.

Sometimes the reasons for resisting cooperation are more technical or practical than political and institutional. A police, fire/EMS, or transportation agency that has already invested heavily in technology systems and equipment may be reluctant to work with other agencies because of fears that equipment compatibility issues will be insurmountable. Within the law enforcement community, agencies traditionally resist sharing data because of security concerns.

To tackle turf barriers:

Focus initial discussions around joint concerns. It's easier to team build by dealing with common issues. Start by discussing issues or problems related to the functions you have in common and identify shared common goals in relation to those issues. For example, a common function might be incident response. A common goal might be improving the timeliness and quality of incident responses.

Encourage multi-agency strategic planning toward common goals. Having identified the issues you want to address and the desired benefits or outcomes, work together to prepare a multi-agency strategic plan. Include specific objectives, strategies for achieving them, and the specific actions and resources necessary to get the job done, including an action timetable. A good strategic plan can facilitate ongoing integrated planning and fundraising, and pave the way toward permanent improvement in ongoing operations. The publication *And Justice for All: Designing Your Business Case for Integrating Justice Information*, published by the Center for Technology in Government, University at Albany, SUNY, provides excellent guidance on how to develop a strategic plan. This publication is available for download from http://www.ctg.albany.edu/resources. As we went to press in the fall of 2000, the International Association of Chiefs of Police was developing a publication entitled *An Information Integration Planning Model* that

also will provide guidance for planning. See www.theiacp.org. (While these publications address planning of integrated justice information systems, the techniques can be readily expanded to address integration of both public safety and transportation information with communications technology.)

Provide incentives for agencies to work together. Use a multi-agency strategic plan as the basis for a joint funding proposal to obtain the resources you need to work together more effectively. That will provide agencies with an incentive to work together, because they will be able to gain resources that they cannot access if they continue to work in isolation.

Start small and build.

Initially, it's best to keep any project simple with reasonable expectations and an achievable timetable for implementation. The initial success can build team cohesion and project support, and lay the groundwork to expand what works well for a larger vision.

Some tactics:

Select a relatively low-tech application for your first attempt at joint interagency operations—for example, traffic signal preemption for emergency vehicles. Then add new and more complex applications a few at a time.

Introduce a pilot project in a limited geographic area, and include sufficient time for troubleshooting before expanding the project to include all the jurisdiction or region.

Include a formal advance training program to orient agency personnel to new equipment and procedures.

Identify a leader.

Like all organizations, local government agencies tend to suffer from institutional inertia. Things will tend to stay the same unless a strong force creates a movement toward change. Identify a leader who will become a powerful project advocate. The leader can be anyone who:

- **is knowledgeable** about the project
- **can translate** its benefits to the general public
- **understands political and institutional dynamics**
- has the **respect** of the project team
- has the **passion** and time to devote to making things happen

Such a leader may be a powerful stakeholder or someone further down the chain of command that has the strong support of superiors.

COMPATIBILITY ISSUES

Many relationships fail because of incompatibility. The relationships among government agencies are no exception. At the local and regional levels, working toward interagency and interjurisdictional equipment compatibility can be facilitated by asking the following questions before equipment procurement:

What information or communications functions would we like to share, and with which partners? **For example, do you want your state police, local police, local emergency medical responders, fire agencies, and state, county, and local transportation management officials to have mutual voice contact from vehicles to facilitate mutual response? Do you want all the partners to receive real-time traffic incident information? Do you want all of them to be able to view real-time data at their operations centers? At their emergency dispatch centers? On laptops in their vehicles? Will some data be collected that only some of the partners should see?**

Which types of equipment must be compatible to perform those joint functions? **Which agencies already have the relevant equipment? Is existing equipment compatible? Must new equipment be purchased?**

Are there any national standards (draft or final) that address the compatibility of the types of equipment needed? **(For more information about ITS standards, consult the ITS America Standards Home Page at www.itsa.org/standards, or the DOT ITS Joint Program Office Web site at www.its.dot.gov. Also see "How Does Your Information Flow," on p. 43 of this Guidebook.)**

Can the partners agree on a common procurement standard? **Will the standard be agreeable to potential future partners? For example, will other counties or cities in a region agree to use this equipment if future region-wide implementation of a city or county program is contemplated?**

Involve everyone.

Take a "big tent" approach. As early as possible, involve everyone in the planning process who will be affected by the program in order to smooth implementation, achieve greater benefits, and build support.

Catalyze discussion among all concerned parties. Bring together everyone who will be affected by the program, provide information about project goals and preliminary plans, and ask for their input. Stakeholder groups often include such groups as:

- the business community
- neighborhood civic associations
- elected and appointed government officials
- special interest groups (e.g. transit users, bicyclists, environmentalists, AAA)
- the emergency medical response community
- the legal community
- the media
- private sector contractors and suppliers
- government agency personnel such as federal, state, and local public safety and transportation agencies, including the finance, planning, public information, and personnel departments as well as operations staff.

If you glance over the "Case Studies" section of this Guidebook (Section II), you will see that many joint projects have been started simply because the partners:

- had overlapping needs
- were already working on similar projects that could be combined to benefit both parties
- had previously worked together successfully and wanted to go a step further

This illustrates the basic fact that partnerships start with communication. If you are not talking to an organization, chances are slim that you will ever partner with them. Start your partnership by contacting the stakeholders with whom you may have a common interest, and opening a dialogue.

Dialogue between potential partners should explore the following questions:

- What are each potential partners' needs?
- Where do the needs overlap?
- What benefits and risks are involved in working together?
- Can the benefits and risks be quantified?
- How can the risks be limited and the benefits be maximized to serve each potential partner?

Try to include representatives of three major communities:

- Fire/EMS
- Law Enforcement
- Transportation

Try to attract private sector partners to leverage the public investment. If you need help in identifying local organizations that represent each type of stakeholder group, the national organizations listed in the Resources section of this guidebook may be of assistance (see Appendix D).

Consider nonprofit organization partners: You may be surprised at the level of resources some of the nontraditional partners, including nonprofit organizations, may bring to the table. For example, the American Heart Association is extremely interested in issues related to emergency medical response time.

Start at the top: Try to gain the initial support of top-level policymakers. Initial invitation letters to top executives can help assure that staff members take their responsibilities to the project seriously, and help pave the way for the organization to provide other resources.

Listen and respond to concerns. Keep a record of every concern voiced by stakeholders and track responses. This assures that key concerns will not be ignored in final project implementation plans. Consider designating a staff person as a project liaison to stakeholder groups responsible for making sure that concerns are addressed.

Make sure elected and appointed officials and stakeholder leaders are on board with plans and provide them with the information they need. Make sure that no public officials or stakeholder leaders are blindsided by your project without the information they need to respond to their constituents' inquiries and concerns. Give key leaders the information they will need to build support for the project. Elected and appointed officials need current, reliable information on project benefits stated in terms that are understandable to average citizens (for example, reduced crime and traffic congestion). When privacy issues are involved, legislators, sheriffs, and judges must be briefed about enabling legislation or relevant agency procedures.

HOW DOES YOUR INFORMATION FLOW?

After you have identified which types of joint functions to address with new technology, and what types of information you want to share, and with whom, a key issue is how the information will flow. Information technology professionals refer to the map of information flow as "system architecture."

The U.S. Department of Transportation (DOT) has developed a National ITS Architecture to provide a commons structure for the design of ITSs. The architecture defines the functions that could be performed to satisfy user requirements and how the various elements of the system might be connected for information sharing. It is not a system design, nor is it a design concept. However, it does define the framework around which multiple design approaches can be developed, each one specifically tailored to meet the needs of the user, while maintaining the benefits of a common approach. The National ITS Architecture, Version 3.0 is available from the ITS Joint Program Office of the DOT in CD-ROM format and on the ITS Web site http://ww.its.dot.gov. DOT requires that projects using DOT funds be consistent with the National ITS Architecture. The ITS America Web site at www.itsa.org also provides information about architecture and standards issues, including a library of regional ITS architectures.

Within the criminal justice community, the National Association of State Information Resource Executives (NASIRE), an organization for state Chief Information Officers, is working with the U.S. Department of Justice (DOJ) to identify information needs and flows and to address system architecture issues. *The NASIRE Justice Report: Toward National Sharing of Governmental Information*, published in February 2000, is available for download from at https://www.nasire.org/publications. The DOJ's research arm, the National Institute of Justice (a component of the Office of Justice Programs) has launched a program named "Advanced Generation of Interoperability for Law Enforcement" (AGILE), funded through the Crime Identification Technology Act (CITA) appropriation. The AGILE program is charged with developing open architecture standards for interoperability; research and development of interoperable communications and information-sharing technologies; and interoperability education and outreach. For more information, see www.ojp.usdoj.gov/nij.

Communities that are creating integrated public safety/emergency services/transportation systems will want to consider compatibility with one or both of these emerging national architectures, as well as compatibility with other local, regional, or statewide architectures in their area.

Build public/public and public/private partnerships.

Look for opportunities to partner among government agencies (public/public partnerships) as well as with private sector organizations (public/private partnerships). Partnering builds ownership and greatly assists in project planning and implementation.

Partners don't necessarily have to contribute funding. Knowledge, services, equipment, and public relations support are examples of contributions that other partners can make. Chambers of commerce, for example, may become formal project partners because they want to use project benefits—improved public safety and reduced traffic congestion—to promote tourism and economic development.

Formalize the partnership agreement in writing so that all parties are clear about their responsibilities to the project as well as the benefits they can expect from participation. Sometimes when partners are not contributing financially to a project they can take their project responsibilities too casually. Drafting a partnership agreement in the form of a Memorandum of Understanding can help create the team discipline necessary to get things done. (See Appendix A for a sample MOU).

Think regionally.

Promote regional collaboration among local and state governments to improve service, save money and provide joint benefits. Crime, traffic, natural and man-made disasters, and hazardous waste incidents often cross jurisdictional and functional lines. When jurisdictions and agencies can share information and coordinate response efficiently, everyone benefits.

Make regional integration of information and communication systems a long-term goal, and pool funding from various sources to support the regional integration effort. Some Federal funding is available to support regional integration. The U.S. Department of Transportation will support, through a process called mainstreaming, regional integration activities such as:

- Support for state and regional working groups, comprising representatives of public and private sector stakeholders
- Development of state and regional business plans that identify specific projects, milestones, funding sources, and responsibilities. (See "Encourage multi-agency strategic planning," p. 58)
- Benefit/cost analyses and other technical studies that provide supporting information for integrated deployment planning activities
- Appointment of a "champion" (leader) in each region to work with regional and state working groups and encourage integrated deployments
- Outreach to and education of state and industry stakeholders that will increase the awareness of and support for integrated deployment activities

Transportation agencies can use National Highway System (NHS), Surface Transportation Program (STP), and/or Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds to support regional integration activities through mainstreaming. The 1998 Transportation Equity Act for the 21st Century (TEA-21) also provides $100 million annually (for five years) to support state and local integration of intelligent infrastructure programs, although these funds already have been "earmarked" for specific recipients. (See "Seek Creative Funding Arrangements.")

Build on existing regional organizations and initiatives rather than "starting from scratch." Metropolitan planning agencies often provide an initial nucleus for a regional planning group.

Plan and budget for the long run.

Develop and implement a long-term strategic operations plan that will create permanent institutional change to promote ongoing integration of public safety, transportation, and emergency response operations.

Make sure that ongoing maintenance operations costs are included in the initial strategic plan and budget. (To qualify for federal highway funding, operations costs must be included in the initial planning process.)

Create permanent positions to support the interagency and interjurisdictional functions.

Develop consensus on joint operating procedures and avoid situations where some of the partners are forced to go along with procedures they do not support.

Modify the standard operating procedures of all the cooperating agencies as needed to accommodate the joint functions.

Seek creative funding arrangements.

Try to pool funds from a variety of potential funding sources that are available to the partnering agencies.

Transportation Funding Sources: The U.S. Department of Transportation's FHWA's National Highway System (NHS) Surface Transportation Program (STP) and Congestion Mitigation and Air Quality Improvement (CMAQ) program funds may be used for technology integration planning and deployment. Use of STP and CMAQ funds is usually coordinated through Metropolitan Planning Organizations (MPOs). The most recent (1998) FHWA five-year funding authorization bill, the Transportation Equity Act for the 21st Century (TEA-21), provides additional flexibility in the use of federal-aid highway funds through the NHS program. Up to 50 percent of NHS apportionments to states may be transferred to STP or CMAQ. As noted above, TEA-21 also provided $100 million annually to support state and local integration of intelligent infrastructure programs, although these funds are earmarked for specific areas.

Justice Community Funding Sources: The Department of Justice's Office of Justice Programs provides $4 billion in annual grants to support the justice programs of local, county, state, and tribal nations justice programs, which in recent years has included about $1 billion a year in grants to support development of information technology.

- The Local Law Enforcement Block Grants Program (LLEBG) directly funds units of local government to support projects that reduce crime and improve public safety. Some funds may also be available to state police agencies. Additionally, the LLEBG
  Program funds training and technical assistance in support of the program. Innovative ideas are encouraged. For more information, see http://www.iir.com/grants.
- $20 million in LLEBG funding for FY 2000 has been allocated to the National Institute of Justice to identify, select, develop, modernize, and purchase new technologies for use by law enforcement, including communication and information technologies. Additional information is available on the NIJ Web site at http://www.ojp.usdoj.gov/nij.
- The DOJ's Office of Justice Program's (OJP's) Office for State and Local Domestic Preparedness Support provides state and local jurisdictions funding for purchase of specialized equipment needed to respond to terrorist incidents. The same program provides training, technical assistance, and preparedness assessment. See http://www.ojp.usdoj.gov/osldps.
- DOJ provides training and technical assistance for justice agencies to improve criminal justice information management, as needed, through SEARCH Group, Inc. To address the growing demand for integrated justice information systems assistance, OJP has created the Information Technology Executive Council to develop a more strategic approach to program funding. SEARCH Group, Inc. is assisting OJP, BJA, and the Executive Council in developing a comprehensive and coordinated strategy for funding integrated justice information systems planning and development efforts nationwide. See www.search.org.
- A Memorandum of Understanding between the Bureau of Justice Assistance (BJA) and the Office of Community Oriented Policing (COPS) has made funds available for BJA to upgrade the communications infrastructure of the DOJ's Regional Information Sharing Systems (RISS). RISS is composed of six regional centers that share intelligence and coordinate efforts against criminal networks that operate in many locations across jurisdictional lines. Each of the centers selects its own target crimes and the range of services provided to member agencies. RISS serves more than 4,700 member law enforcement agencies. The vast majority of member agencies are at the municipal and county levels.

The Department of Commerce's Technology Opportunities Program (TOP) promotes the widespread availability and use of advanced telecommunications technologies in the public and non-

profit sectors. TOP gives grants for model projects demonstrating innovative uses of network technology. TOP has made matching grants to state, local and tribal governments, health care providers, schools, libraries, police departments, and community-based nonprofit organizations. TOP projects demonstrate how networks support delivery of health care and public health services, foster communications, and help public safety officials protect the public. The program is administered by the Commerce Department's National Telecommunications and Information Administration (NTIA) http://www.ntia.doc.gov.

The Federal Emergency Management Agency (FEMA) is another potential funding source, particularly in flood, earthquake, and/or hurricane-prone communities.

The fire and rescue community has relied mostly on law enforcement sources for funding to date, although proposed federal legislation would establish more funding sources for fire and emergency medical systems.

Alternative funding sources: In addition to the federal funding sources described above, state and local funds from a variety of agencies may be tapped, as well as alternative sources such as:

- Entering into partnerships, interagency agreements, franchising agreements, and coalitions, and accepting pro bono services.
- Assessing fees, surcharges, and subscription fees when providing government information or services with the establishment of a special fund for specific expenditures.
- Selling space for advertising on kiosks or other government property.
- Selling used or obsolete computer and telecommunications rather than donating or excising it.
- Entering into contingency fee contracts with vendors based on the revenue they generate or the cost savings or cost avoidance incurred.
- Ensuring state participation in the Federal government's Asset Forfeiture Program.

For more information on alternative funding, see *Innovative Funding Approaches for Information Technology Initiatives: Federal, State and Local Government Experiences*, published by the Office of Intergovernmental Solutions, Office Of Government-wide Policy, U.S. General Services Administration, January 1998. The document is available for download from http://policyworks.gov/org/main/mg/intergov. Click on "Reports and Publications."

Be responsive to privacy concerns.

As electronic information sharing capabilities grow, concerns about information privacy rights expand. Within the justice community, privacy policies are rapidly evolving to accommodate concerns that arise when law enforcement prosecution, defense courts, corrections, probation, and parole agencies share information with affiliated agencies such as transportation, education, health, and social services. The U.S. Department of Justice's Office of Justice Programs has launched an Integrated Justice Privacy Initiative to develop tools for assisting state and local officials to design information systems that respect privacy rights. As this Guidebook went to press, a working paper entitled "Privacy Design Principles for an Integrated Justice System" had been recently developed. The working paper is intended to serve as a framework for designing information systems. Copies of the working paper are available from the Office of Justice Programs, Office of the General Counsel, at (202) 616-3258.

As a practical matter, information systems shared between justice agencies and affiliated agencies will include a "firewall" to ensure that neither private information, nor information that might affect the success of a criminal investigation or prosecution, will not be released outside the justice system. For example, the new Intercad communications network in Southern California will link all city and county transportation, law enforcement, and EMS agencies in the region. Intercad will integrate the computer-aided dispatch (CAD) systems of the fire/EMS and law enforcement agencies and traffic incident management systems region-wide. Any incidents reported through the regional transportation management system will immediately post to the entire public safety/EMS CAD system. On the other hand, calls coming into the law enforcement agencies and EMS will first be coded to integrate whether the information should stay within the secure public safety communications network, or bridge the firewall to broadcast to EMS and transportation agencies as well.

Many Americans are concerned about government use of surveillance photography, fearing violation of privacy rights. If your community is considering the use of surveillance cameras for safety or law enforcement purposes—or even exclusively for traffic management—carefully plan coordination of legislative and judicial issues and combine them with a proactive public information effort.

Know your community and what it will accept. Many communities that are very concerned about traffic safety and crime will support photographic enforcement eagerly. In other places, distrust of government outweighs such concerns, and even traffic surveillance cameras could generate more controversy than they are worth.

Conduct a thorough public information campaign to explain the purpose of the cameras before they are installed. This is a good idea even if the cameras are being used only to survey traffic volume and have no enforcement purpose whatsoever.

To encourage public acceptance of photo enforcement, consider limited application or phased introduction. For example, many jurisdictions issue warnings rather than tickets to red light runners and speeders caught on camera. In these jurisdictions, public information offices emphasize that the program is being introduced more for safety than for enforcement purposes. Other jurisdictions use a phased approach, introducing photo enforcement as a pilot project with a specific start and end date. This gives the jurisdiction the opportunity to gauge public response and to develop success stories that can be used to address concerns and build public support.

Introduce enabling legislation well in advance of law enforcement applications such as photographing red light runners, speeders, and aggressive drivers.

Early in the planning process, involve judges who will be called upon to deal with motorists appealing tickets resulting from being caught on a surveillance camera.

Keep the news media informed.

Media relations is an important component of successful project implementation. The goals should be to make sure the public understands how investment in new technologies benefits the community, and to manage expectations and prevent unfair negative publicity about any initial problems.

Some tactics:

Develop a public information plan that includes a timetable for media events and press releases.

Develop a public information kit that includes different types of information about the project, including:

- Benefits to the average citizen
- A backgrounder explaining the technology used, in language that reporters and the public can understand
- Success stories from other jurisdictions, including lessons learned from any early experiences

PHOTO ENFORCEMENT OF TRAFFIC LAWS: A LEGISLATIVE EXAMPLE

Photographing red light runners, speeders, and aggressive drivers can raise privacy issues. It is wise to introduce enabling legislation in advance of law enforcement applications of new technology involving photography, and to conduct a proactive public information campaign to make people aware of the provisions of the law. For example, state legislation in Maryland includes the following elements:

- **A maximum fine of $100**
- **The vehicle owner is responsible for providing proof of who was driving if they appeal as not responsible for the incident**
- **No points are held against the licensed driver**
- **Information is not sent to insurance companies**
- **Failure to pay can result in non-renewal of drivers license**
- **The program must be a police function**
- **The citation must be reviewed/approved by an employee of the police department (not necessarily a sworn officer)**

For more information about photo enforcement issues, see *Is Photo Enforcement for You: A White Paper for Public Officials*, Public Technology, Inc., Washington, D.C., 1999.

Appendix A

SAMPLE MEMORANDA OF UNDERSTANDING

SAMPLE MEMORANDA OF UNDERSTANDING

MEMORANDUM OF UNDERSTANDING (MOU)

1.0 PURPOSE

This Memorandum of Understanding (MOU) is entered into jointly by the following eight (8) entities: Agencies of the State of Florida including the Florida Department of Transportation Districts 4 and 6, and the Florida Department of Transportation Turnpike District; the Metropolitan Planning Organization (MPO) for the Miami Urbanized Area; the Miami-Dade County for its Public Works, Transit, Aviation, Seaport, and Information Technology Departments; the Broward County Metropolitan Planning Organization; the Broward County, for its Public Works, Aviation, Seaport and Transit Departments; the Metropolitan Planning Organization of Palm Beach County; the Palm Beach County for its Engineering and Public Works Department, Airport Department and Surface Transportation Department; the Tri-County Commuter Rail Authority (Tri-Rail); and the Miami-Dade Expressway Authority (MDX).

The above public sector transportation agencies in Miami-Dade, Broward and Palm Beach Counties (hereafter these public sector transportation agencies are called PARTNERS and the aforementioned counties will be called the Tri-County Region) are interested in providing uniform, multimodal, real-time traveler and traffic information in the Tri-County Region in a cost-effective manner under the SUNGUIDE Program. SUNGUIDE is a regionally coordinated program for the Tri-County Region to link Intelligent Transportation System (ITS) projects in Southeast Florida and encourage their development. SUNGUIDE is South Florida's ITS program. On behalf of the PARTNERS, the Florida Department of Transportation (hereafter called the DEPARTMENT) is requesting public-private partnership proposals for providing services known as the Advanced Traveler Information System (ATIS).

The purpose of this MOU is to coordinate and document, each agency's respective role and responsibilities in implementing actions related to the procurement entitled *Advanced Traveler Information System (ATIS) Services for Miami-Dade, Broward and Palm Beach Counties* (ITN-DOT-99/2000-6001-DS). It is further required to ensure full compliance with the statutory requirements of the Transportation Equity Act for the 21st Century (TEA-21), the TEA-21 ITS Deployment Program and ITS Integration Component as well as related statutes, regulations and orders, and other Federal and State laws, regulations, policies, and procedures related to the development of this service procurement. This agreement will continue after completion of ATIS deployment and through future service and future coordination among the DEPARTMENT and all participating PARTNERS. Continued coordination will be necessary to eliminate deployment scheduling conflicts and minimize delays to the public. Future coordination may lead to the development of additional MOU's or JPA's among the various PARTNERS and federal agencies.

2.0 BACKGROUND

The DEPARTMENT conducted a feasibility study on using ITS technologies to minimize urban congestion problems in South Florida. The study, completed in 1994, recommended that transportation agencies in the urban Tri-County Region establish a program for coordinated deployment and operation of an ITS. Such a regionally coordinated program would be a more cost-effective means of man-

aging traffic congestion, improving air quality, reducing driver frustration and increasing traffic safety rather than fragmented actions by Partners. This program was named the Southeast Florida Intelligent Corridor System (SE. Fl. ICS). The SUNGUIDE program is a broad-based successor of the Intelligent Corridor System (ICS) Program which retains the goals, concepts and vision of its predecessor.

The SUNGUIDE Program emphasizes that ITS deployment in the Tri-County Region should take advantage of already planned projects and systematically adds an ITS infrastructure layer to compliment the surface transportation network. The regional ITS would then be nurtured to grow into a seamless, multimodal system providing 22 of 29 ITS user services supported by the National Architecture (USDOT, 1996). The ATIS, an important component of the ITS user service groups, would facilitate mode and route choice and lead to an efficient utilization of the regional transportation system by the PARTNERS.

The PARTNERS have initiated a number of projects over the last few years that will serve as the foundation of the ultimate ITS infrastructure. While some of these projects will initially function as discrete elements, they will ultimately be integrated into a regional subsystem. The infrastructure of today includes freeway service patrols, Automated Vehicle Location (AVL) systems used in conjunction with service patrols and transit systems, transit information data bases, Geographic Information Systems (GIS), discrete (public agency owned and leased) fiber optic and wireless communications systems, transit and ITS operations centers, emergency and dispatch management centers, closed-circuit television cameras for traffic monitoring, dynamic message signs and trailblazers, traffic detectors, AVI systems, Highway Advisory Radio (HAR), advanced traffic signal systems, computer hardware and software, and, dedicated personnel. These resources may or may not be feasibly utilized by the PRIVATE PARTNER in conjunction with the collection, analysis, and dissemination of an advanced traveler information system. The PARTNERS, however, recognize that the infrastructure that exists today is not sufficient for providing dependable, up-to-date traveler information covering the Tri-County Region.

Preliminary coordinating meetings leading to the PARTNERS' joint-effort to deploy ATIS services have taken place at local and regional forums. Since these proposed improvements are impacted by, and dependent on, one another, the decision was made to combine the several separate multimodal and multiagency transportation efforts into one. The FDOT Districts 4, 6, and 8, determined that the FDOT District 6 should be the State agency to lead this ATIS effort. The PARTNERS will further participate as active members of an ATIS Project Steering Committee. The ATIS Project Steering Committee, moderated by the Department, will be a forum for information, discussion and exchange of ideas. The DEPARTMENT will coordinate through the PRIVATE PARTNER periodic reports and will solicit input from the PARTNERS, establishing a true partnership effort and to effectively communicate concerns to the public-private partnership services provider on behalf of the PARTNERS.

3.0 ROLES OF THE PARTIES

a. The FDOT District 6 is designated as the lead State agency with the aforementioned State, County, regional and local PARTNERS.

b. Because the proposals may involve funding, concurrence, or permitting actions from several of the PARTNERS, each PARTNER will be responsible for identifying the issues that must be addressed in the process to

satisfy its respective statutory requirements . Each of the signatories to this MOU will be responsible for the following:

(1) FDOT District 6 will be responsible for coordination and review of the necessary actions to support the deployment of services. Once services are deployed, FDOT District 6 will be responsible for normal service operations according to the requirements of the existing contract. The FDOT District 6 will also coordinate the project with federal agencies and with other nonfederal agencies with jurisdiction and will be responsible for day-to-day routine coordination with the PARTNERS.

(2) FDOT District 4 will coordinate and provide technical assistance for all issues related to advancing ATIS services within their jurisdiction and provide general support for ATIS deployment and operations.

(3) Turnpike District will coordinate and provide technical assistance for all issues related to advancing ATIS services within their jurisdiction and provide general support for ATIS deployment and operations.

(4) Tri-Rail will coordinate and provide technical assistance for all issues related to advancing ATIS services within their jurisdiction and provide general support for ATIS deployment and operations.

(5) MDX will coordinate and provide technical assistance for all issues related to advancing ATIS services within their jurisdiction and provide general support for ATIS deployment and operations.

(6) MPOs will assist the DEPARTMENT in coordinating the ATIS through the metropolitan planning process and provide an effective link between County agencies and the other PARTNERS.

(7) County Agencies in Tri-County region will review and evaluate the locations plans submitted for approval of any new or existing installation needed in conjunction with the deployment of ATIS, with the understanding that the County agencies' impact will be minimized at all cost and disruption of the current services they provide will not occur.

c. The FDOT District 6 will be responsible for the coordination and oversight of appropriate actions necessary for technical analysis, and for coordinating preparation of any documents, including, but not limited to agency and public involvement, notifications, and coordination with affected agencies and the public. FDOT District 6 will also coordinate with the MPO's in each County, and through the MPOs with County agencies, any relevant issue that has the potential of having an impact on any of the PARTNERS at County levels in the Tri-County region.

d. The resulting ATIS public-private partnership agreement will be made available to the public per the provisions of Chapter 119, Florida Statues.

e. Each party to this MOU will designate a contact person who has the authority to speak for and represent that agency. The contact person will be available, upon adequate notice, to attend and participate in coordination meetings or otherwise provide timely input into the preparation, coordination, and review of the ATIS deployment and operational process. Requests and input solicitation will be forwarded as soon as possible to the appropriate contact person(s) to allow for a timely review and comment period.

f. The following is a list of key responsibilities of the PARTNERS towards the PRIVATE PARTNER, per scope of services that all PARTNERS shall abide by.

(1) Provide resources to the PRIVATE PARTNER as appropriate for the agreed upon deliverables

(2) Operate and maintain their ITS systems and provide at no cost. The information collected through other non-ITS means may similarly be provided to the extent possible

(3) Make available to the PRIVATE PARTNER, at no cost, other relevant resources such as data and information systems to the extent achievable for use in the proposed service

(4) Provide access to public right-of-way and structures

(5) Share, with the PRIVATE PARTNER, their knowledge of local conditions relevant to the service to the extent possible

(6) Provide full and open communication with the PRIVATE PARTNER

4.0 CONCLUSION

In signing this MOU, the undersigned understand and accept the roles and responsibilities assigned to each of the parties. Each of the parties agrees to pursue maximum cooperation and communication to ensure that the project fully complies with applicable federal, state and county requirements and results in a minimum duplication of effort.

Appendix B

RECOMMENDED PRACTICES FOR RESOURCE SHARING/JOINT OPERATIONS/INTEGRATION

RECOMMENDED PRACTICE 8.0
RESOURCE SHARING / JOINT OPERATION / INTERGRATION

Key Recommendation 8.1: To ensure proper O&M, close coordination with all involved agencies/disciplines should start in the early planning stages (ITS Regional Strategic Plan and ITS Strategic System Plan) and continue throughout every phase of the project.

To achieve this level of close coordination, consider the following:

- Include some form of resource sharing and joint operations. Many successful systems do.
- Gain consensus, ownership and support for resource sharing and joint operations, involving all affected agencies/disciplines (i.e., engineers, planners, police, fire, emergency management, etc.) in the ITS planning and design process.
- Maintain close coordination throughout all phases of the project.
- Implement inter-agency traffic management teams, incident response teams, and regional steering committees to provide input along the way.
- Consider co-locating joint operations physically or through communication links (i.e., telephone lines, faxes, high-speed modem, fiber optic, etc.).

Recommended Practice 8.1.1: Identify individual operational needs before assessing operational commonalties.

- Identify operational requirements for each individual agency or discipline involved. After they have been established, mutual operational needs should be assessed. For example, in the case of a vehicle crash on a highway, individual agencies such as law enforcement, EMS and DOT have different missions/needs to satisfy incident clearance.

Recommended Practice 8.1.2: Establish and adopt mission statements, goals, objectives, and the benefits of joint operations at the outset by participating agencies.

- Build trust and understanding between agencies by looking for opportunities and mechanisms.
- Establish mission statements.
  - Mission statements establish the overall direction of the project, preserve the thinking of founders in designing the system, and ensure that when players change, the goals are maintained.
- Develop inter-agency coalitions with specific purposes to address common issues.
  - This should be done gradually to be non-threatening.
  - When coalitions with clearly defined goals exist, participation will develop naturally among interested partners.
  - Informal working groups with little or no authority allow each agency to maintain access to shared resources while maintaining their autonomy.
  - Partners working with "turf controllers" must be flexible.

- By giving a little to start a relationship, and building the relationship at a manageable rate, a strong resource-sharing venture can be established.

- Develop as many win-win situations as possible such that the overall benefit is maximized.
  - Be careful not to monopolize the decision making process. Incentives should be identified and developed to encourage resource sharing.
  - Successful operations in one phase can help to overcome difficulties that may occur in other phases.

Recommended Practice 8.1.3: Use a resource sharing approach that identifies champions from the start.

- Remember that champions provide enthusiasm and long-term drive to make joint O&M work.

Key Recommendation 8.2: Look for opportunities to share information and resources with other agencies, regional ITS programs and public/private transportation related organizations.

- Sharing resource data, incident information and traffic flow data can facilitate overall transportation in a region.
- Networking computer and information systems covering roadways, transit, and emergency operations enables the effective planning, implementation, operation, and coordination of the traffic management activities between various agencies located at different nodes of a network on a real-time basis.

Recommended Practice 8.2.1: Metropolitan regions or states should share the use of any wide area telecommunications backbone as an ITS "information superhighway" inclusive of multiple agencies.

- An overwhelming cost in deploying ITS field devices is communications. Considerable savings regionally may be realized through a common communications backbone, such as a wide area network.

Recommended Practice 8.2.2: A shared communication system should be considered to allow for coordinated traffic signal systems and other devices across multiple jurisdictions.

- Traffic signals should be coordinated via a common communications system. Joint operations and resource sharing should be considered to maximize the efficiency of traffic control systems.

Recommended Practice 8.2.3: O&M user groups involved with joint operations and resource sharing should be established to review or debrief operations on a regular basis.

- Taking a positive team building approach will complement and enhance everyone's performance such that overall performance is improved. Understanding the capabilities and constraints of each agency or discipline will lead to better response.

Recommended Practice 8.2.4: Agencies should identify short-term resource sharing opportunities.

- Identify all resource sharing opportunities (e.g. staffing, equipment, standards, operations, etc.). Name a champion within each agency. Review and update this list of opportunities on a regular basis.

Key Recommendation 8.3: Agencies should look for opportunities for joint operations.

Joint operations can involve sharing responsibilities in operating and maintaining devices, systems and facilities. Joint operation can also result in reduced staffing requirements, increased operations, and reduced costs.

Recommended Practice 8.3.1: Provide transportation agencies or disciplines with access to CCTVs, shared images, and control cameras.

- Sharing the control of video data across agencies provides greater functional capabilities for each agency without incurring duplicate infrastructure costs. The system can initially be established as "view only" with a later transition to multiple command and control (pan, tilt, and zoom).
- In accordance with the practices of the operating agency, careful consideration should be given to determine what camera images will be shared with other agencies (i.e., law enforcement, media, information service providers, etc.)

Recommended Practice 8.3.2: For agencies involved with traffic management, the capability to allow operation of fixed or portable Dynamic Message Signs (DMS) by other agency staff or disciplines should be provided per the protocols pre-established by the operating agency.

- With the approval of the owning agency, provide the opportunity for other agencies to activate CMS signs, even if that agency is not the owner of the signs.

Key Recommendation 8.4: The integration of systems should be based on the need to share information among agencies to manage the regional transportation network and improve the operational efficiency of any one system or particular agency.

The concept of integration should be addressed in varying degrees in the ITS Regional Strategic Plan.

Recommended Practice 8.4.1: Advancing or automating the interfaces between shared systems should be based on the ability of the affiliated agencies to improve the efficiency of system operations, the provision of services or the capability to provide for multi-agency control of systems.

- The need for additional resources in support of transportation operations and management should be:
  - The basis on which information and data is shared between agencies.
  - The basis for enhancing existing or developing new interfaces.

- Integration should be achieved incrementally or through an evolutionary process and should strive to transition from the existing state of information sharing to systems with capabilities to automate the transfer of data between agencies and potentially provide the ability to share control of systems or components.

Recommended Practice 8.4.2: All interfaces should be designed and developed using an "open" architecture design utilizing non-proprietary protocols.

- When developing interfaces between field devices or various systems, agencies should strive to implement control software, operating systems, databases and communication protocols that will easily merge or integrate with other computer system operating environments.
- This approach should allow for and facilitate future modular replacements, upgrades of individual component capabilities and upgrades in technologies without adversely impacting other existing components. The national ITS Architecture standard was developed based on this concept. Therefore, complying with the National ITS Architecture is strongly recommended.

Appendix C | GLOSSARY

GLOSSARY

Often the barriers to cooperative planning of integrated systems are due to the variety of technical terms used in different communities, including the transportation and public safety sectors. This glossary defines terms as they are used in this guidebook.

Automated Collision Notification (ACN)

ACN systems transmit information on collision severity to assist responders in determining what type of help to send and where to transport the injured.

Automatic Vehicle Location (AVL)

AVL systems relay information on vehicle location back to a base, where an operator can see the location of the vehicle on a computer screen displaying an electronic map. Current AVL systems use satellite GPS technology, but in the future may use other location technologies.

Band

A range of radio frequencies.

Bandwidth

The range of frequencies that a signal occupies. A signal that travels over one frequency has a narrow bandwidth. A signal that travels over a larger number of frequencies has a broad bandwidth.

Cellular telephone

A mobile and portable radio telephone service that uses network- based stations or cells. In the United States, the service is offered in the 800-MHz band by competing licensees in each market. Elsewhere in the world it is offered at 800 MHz and other bands under a variety of commercial arrangements.

Channel

An electronic communications path that can carry a signal. Some wireless vendors divide the spread-spectrum bandwidth into several channels to separate wireless networks.

Closed circuit video surveillance cameras

Video cameras which are placed along roads or sidewalks to observe real-time traffic, or to allow law enforcement agencies to monitor red-light runners, aggressive drivers, or criminal activity. These cameras can remain stationary or be rotated through remote control. Cameras mounted on airplanes or helicopters can also provide live transmission using downlinks to traffic management or public safety operations centers.

Computer-Aided Dispatch (CAD)

CAD, one of the earliest uses of communications technology in public safety, is at the core of Enhanced-911 (E-911) systems. With E-911, when a caller dials an emergency number (911) from a hardwired telephone, the address of the caller pops up on the dispatcher's screen. (Where GIS systems have been integrated with the CAD, a location map also will appear.) The CAD system will identify and prioritize available responders and notify them. Where the rescue vehicles are equipped with GPS and mobile communications, the system can track their actual location at the time of the call and provide direct in-vehicle dispatch, making the dispatch operation quicker and more efficient.

Downlink

The radio path from a satellite to an Earth station.

Electromagnetic Spectrum
Spectrum refers to the array of channels available for communications transmissions. These channels are a finite natural resource; they cannot be created or discovered. Almost all local, state, and federal public safety communications occur by radio and use spectrum. The scarcity of radio spectrum results in congestion and interference, limiting the ability of public safety personnel to communicate.

Geographic Information Systems (GIS)
GIS systems are electronic maps that can be combined with informational data bases to represent information graphically such as the location of recent high crime activity, sites of frequent crashes, the location of police, fire, medical, or hazmat equipment, or the homes of people on life-support equipment.

Global Positioning Systems (GPS)
Satellite systems that allow users on the ground to pinpoint their location of the Earth's surface.

Information Integration
Information integration occurs when agencies contribute data to a common database for use by multiple agencies and individuals. It is more complex than information sharing, which is simply a transfer of information from one individual or agency to another. The advent of computerization has sparked a revolution in information management, integration of data, and the potential to share this information more effectively across agency and jurisdictional borders.

Information Technology (IT)
IT refers to the vast array of electronic communications technology, including computers, television, radio, and telephone. All these communications technologies depend on transmitting, manipulating, and controlling signals of various frequencies within the electromagnetic spectrum.

Intelligent Transportation Systems (ITS)
ITS systems include a range of new technologies applied to a transportation network to improve the safety and efficiency of operations. ITS systems include information processing, communications, control, and electronics technologies.

Interoperability
The capability of a communications technology to operate with the receiving equipment and networks of other manufacturers and licensees.

Mayday systems
Mayday systems automatically contact a privately-operated call center when the motorist presses a button, or when an airbag deploys. Call center operators contact emergency responders. At present, Mayday systems relay calls using cell phones and provide location information through AVL or ACN systems. In the future, the cell phones themselves may provide location, speed, and direction information. In areas lacking cellular phone service, Mayday systems don't work.

Real Time
Real time describes information transmits immediately upon collection.

Sensors
Sensors can measure pavement temperature, air temperature, precipitation, and other weather conditions, or the volume and weight of traffic, and relay the information to traffic management centers. Traffic engineers can use the real-time information on traffic and road conditions to adjust traffic signals and variable message signs, or to deploy snowplows, traffic control, or roadside assistance. The information also is provided to the public and the media.

Smart Passes
A smart pass allows a vehicle to pass through toll booths at normal speeds. An electronic tag with a unique identification code affixed to the car's windshield records a debit on a prepaid or monthly account.

Traffic Management Centers (TMCs)
TMCs, also called Traffic Operations Centers (TOCs), monitor real-time information obtained from various components of an Intelligent Transportation System. Transportation and public safety agencies can share real-time information to improve incident response time and coordination, adjust traffic controls, and keep motorists informed of traffic and weather conditions.

Traffic Signal Priority or Preemption Systems

Signal priority systems read signals emitted from transponders in approaching emergency vehicles to give them green-light priority through the intersection.

Transponder

This piece of equipment emits a radio signal that allows a vehicle to be tracked by vehicle location systems, and allows emergency vehicles to be sensed by traffic signals and given priority to move through intersections.

Uplink

The radio path from an Earth station to a satellite.

Variable message signs

Variable message signs display current information on traffic and emergency conditions for travelers. The messages inform motorists about incidents or dangerous conditions and alternate routes, and encourage safe driving.

Wired Communication

Wired communication refers to hardwired telephone lines or cable used for voice or data transmission.

Wireless Communication

Wireless communication transmitted by broadcast signal (AM radio, shortwave radio, FM radio and broadcast television) cellular (or mobile wireless) telephone, terrestrial microwave voice/video, data communication, and communications satellites are examples of wireless communication.

Wireless Enhanced 911 (E-911)

Wireless E-911 enables emergency dispatchers to identify the location of callers using wireless telephones. Many localities across the nation are currently upgrading their 911 centers for wireless E-911 capability.

Appendix D | RESOURCES

RESOURCES

Associations and Coalitions

American Association of State Highway and Transportation Officials
www.aashto.org
AASHTO is the major national organization for state transportation officials.

American College of Emergency Physicians
www.acep.org
ACEP has a working group to define the information that the medical community needs to receive from Automatic Collision Notification (ACN) systems.

Association of Public Safety Communications International
www.apcointl.org
APCO tracks all issues related to public safety communications.

ComCARE Alliance
www.comcare.org
The ComCARE Alliance is a national coalition of more than 50 organizations including nurses, physicians, emergency medical technicians, 911 directors, wireless companies, public safety and health officials, law enforcement groups, automobile companies, consumer organizations, and others working to encourage the deployment of wireless communications networks and technologies that will more efficiently connect the mobile public to emergency agencies.

Intelligent Transportation Society of America (ITS America)
www.itsa.org
ITS America's mission is to promote public/private partnerships to coordinate development and deployment of intelligent transportation systems. ITS America is currently exploring how to expand system architecture to more effectively integrate public safety applications and cell phones as location probes/traffic monitors. ITS America's Public Safety Committee is setting up an action plan for improving relationships between ITS and public safety communities. ITS America also offers training courses on ITS standards.

International Association of Chiefs of Police
www.theiacp.org
IACP's forthcoming publication, An Information Integration Planning Model, provides guidance on how to improve information sharing and integration. It is based on the information integration experience of five selected states. IACP also has published *A Comparative Analysis of Statewide Criminal Justice Sharing Systems.*

National Emergency Number Association
www.nena.org
NENA's mission is to promote a universal emergency number system. Wireless E-911 is one of its current major issues.

National Mayday Readiness Initiative
www.nmri.net
The National Mayday Readiness Initiative (NMRI) is a public/private partnership to encourage seamless integration between private Mayday service providers and the nation's public 911, EMS, and emergency response networks.

Public Technology, Inc.
www.pti.org
Public Technology, Inc. (PTI) is the nonprofit technology organization for all cities and counties in the United States. Three primary local government associations—the National League of Cities, the National Association of Counties, and the International City/County Management Association—provide PTI with its policy direction, while a select group of city and county members conduct applied R&D and technology transfer functions. This guidebook began with input from PTI's Public Safety and Transportation Task Forces.

Society of Automotive Engineers (SAE)
www.sae.org
SAE has a committee on Public Safety Standards working on standards for in-vehicle messaging to determine the priority and format of messages to public service answering points (PSAPs).

RESOURCES

Federal Government

U.S. Department of Commerce
National Telecommunications and Information Administration (NTIA)
Technology Opportunities Program (TOP)
www.ntia.doc.gov
TOP gives grants for model projects demonstrating innovative uses of network technology.

U.S. Department of Justice
Office of Justice Programs
Bureau of Justice Assistance
Local Law Enforcement Block Grants Program (LLEBG)
www.iir.com/grants
The LLEBG Program is the major source of DOJ funding for new technology deployment.

Office of Justice Programs Office for State and Local Domestic Preparedness Support
www.ojp.usdoj.gov/osldps
This office offers funding for disaster preparedness equipment purchases.

Office of the General Counsel
202-616-3258
AskOGC@ojp.usdoj.gov
The Integrated Justice Privacy Initiative is developing tools to assist state and local officials in designing information systems that will respect privacy rights. As this guidebook went to press, a working paper entitled *Privacy Design Principles for an Integrated Justice System* had recently been developed. The working paper is intended to serve as a framework for designing information systems.

U.S. Department of Transportation Federal Highway Administration
ITS Joint Program Office
Intelligent Vehicle Initiative
www.its.dot.gov
The ITS Joint Program Office is the office within the Federal Highway Administration that oversees Intelligent Transportation System programs. Through the new Intelligent Vehicle Initiative (IVI), the Department of Transportation hopes to reduce crashes by helping drivers avoid hazardous mistakes. IVI aims to accelerate the development and commercialization of vehicle-based driver assistance products that will warn drivers of dangerous situations, recommend actions, and even assume partial control of vehicles to avoid collisions. This program concentrates on in-vehicle safety equipment, in contrast to the FHWA's ITS Public Safety Program, which focuses on improving the interoperability of public safety and transportation agency operations.

Federal Highway Administration
ITS Joint Program Office
ITS Public Safety Program
www.nawgits.com/jpo/pubsafety
The FHWA's Public Safety Program is a new initiative launched in 2000 to increase transportation safety and efficiency by enabling more effective police, fire, and emergency operations. The key goal is to deploy interoperable procedures and technologies for public safety and transportation agency operations.

Public Safety Wireless Network
www.pswn.gov
A joint initiative of the Department of Justice and the Department of the Treasury focuses attention on the issue of interoperability and spectrum demands at the federal, state, and local levels.

RESOURCES

Publications

Center for Technology in Government, University at Albany, SUNY: *And Justice for All: Designing Your Business Case for Integrating Justice Information*, Albany, NY, 2000. Provides excellent guidance on how to develop a strategic plan. It's available for download from http: www.ctg.albany.edu/resources.

Public Safety Wireless Network: Public Safety and Radio Spectrum Guide. A 6-page brochure explaining radio spectrum issues.

Public Technology, Inc.: *GIS: The Next Management Tool*, Washington, DC 1997. A 69-page guidebook to geographic information systems.

Public Technology, Inc.: *Roads Less Traveled: Intelligent Transportation Systems for Sustainable Communities*, Washington, DC, 1998. A 78-page guidebook produced with funding from the transportation Partners Program of the U.S. Environmental Protection Agency.

Public Technology, Inc.: *Smart Moves: A Decision-Maker's Guide to the Intelligent Transportation Infrastructure*, Washington, DC, 1996. A 62-page book on building a better community using intelligent transportation systems.

Public Technology, Inc.: *Traveling with Success*, Washington, DC, 1995. A 55-page collection of case studies showing how local governments use ITS. Funded under a cooperative agreement with the Federal Highway Administration.

Public Technology, Inc.: *Is Photo Enforcement for You: A White Paper for Public Officials,* Washington, DC, 1999.

U.S. Department of Transportation FHWA Intelligent Transportation Systems Joint Program Office: *ITS Benefits: 1999 Update, Washington, DC, 1999. Report No. FHWA-OP-99-012*. A 76-page report summarizing information about measured and predicted impacts of ITS services. Available for download from www.its.fhwa.dot.gov/cyberdocs/welcome.htm as EDL document number 8323.

U.S. Department of Transportation FHWA Intelligent Transportation Systems Joint Program Office also publishes:

- Benefits brochures which discuss how ITS technologies have benefited specific areas
- Crosscutting studies presenting current data from related ITS applications
- Case studies providing in-depth coverage of ITS applications in specific projects
- Technical reports including results from various field operation tests
- Implementation guides that assist project staff in the technical details of implementing ITS

For a current listing of available documents, visit the Web site at www.its.dot.gov

U.S. Department of Transportation FHWA Intelligent Transportation Systems Joint Program Office: *Developing Intelligent Transportation Systems Using the National ITS Architecture: An Executive Edition for Senior Transportation Managers.* Washington, DC. February 1998. Report No. FHWA-JPO-98-025. Practical guidance for deploying ITS.

U.S. General Services Administration, Office of Intergovernmental Solutions, Office of Government-wide Policy: *Innovative Funding Approaches for Information Technology Initiatives: Federal, State and Local Government Experiences*, Washington, DC, January 1998. Download the document from http://policyworks.gov/org/main/mg/intergov. Click on "Reports and Publications."