# New York State Department of Transportation

## Rural ITS Toolbox and Deployment Plan for Regions 2, 6, 7 and 9

# ITS Toolbox for Rural and Small Urban Areas

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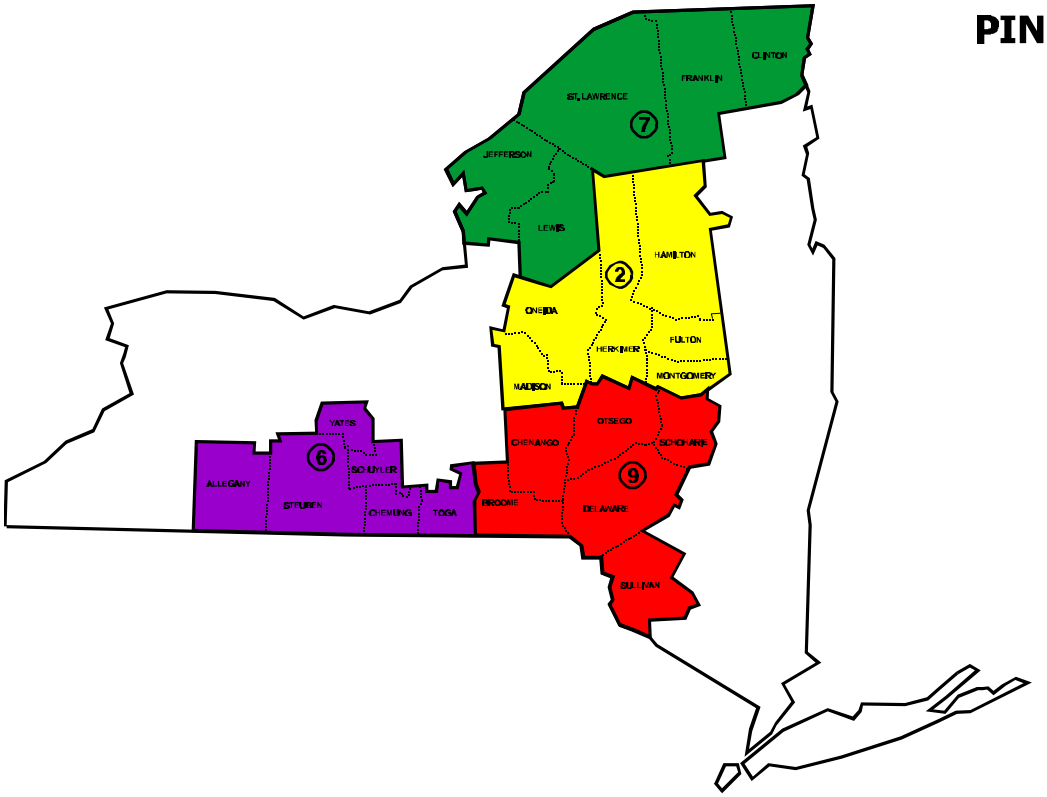


**December 1998**

**Castle Rock**
**Black & Veatch**

**Small Urban and Rural ITS "Toolbox"**

As a part of the Small Urban and Rural ITS Study it conducted in 4 of its more rural regions, the New York State Department of Transportation has developed a compendium of systems, devices and strategies that can enhance safety, provide information, and make public transportation available to non-drivers in the small urban and rural areas throughout the State. This compendium is called the "Small Urban and Rural ITS Toolbox".

The "Toolbox" contains 30 unique "tools" which fit into one of eight ITS categories, including Incident Detection, Traffic Management, Safety, Road/Weather Information systems, Detection/MAYDAY Services, Transit, Traveler/Tourism Information, and Planning/Outreach. Through 43 real life examples, systems and approaches are described which can be used to address a variety of needs and issues facing the Department and the traveling public.

In the case of this document, the needs and issues were identified through a series of workshops which were held in each of the 4 participating Regions. These workshops were attended by a broad range of internal and external stakeholders, who each brought their unique perspectives to the table. The result is a defined list of state-of-the-art technologies currently available and appropriate for deployment to address mobility, capacity, information and safety problems and needs in the small urban and rural areas of New York State.

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# INTRODUCTION

## INTELLIGENT TRANSPORTATION

***Intelligent Transportation Systems***, or ***ITS***, represent a diverse range of systems and services that build on recent advances and emerging technologies in the fields of information processing, communications, control, and electronics. Joining these systems to our transportation network will save lives, save time, and save money.

It all sounds rather futuristic, doesn't it? But the exciting thing about ITS is that real systems, products and services are already at work in our country.

The early development and deployment of ITS took place in the nation's largest metropolitan areas, where the technologies and systems have been seen to have an impact on growing urban traffic congestion. However, it is in the smaller urban areas and rural communities that ITS is now being viewed as having the potential for substantial impact.

The great thing about ITS in a small urban or rural setting is that it is developing in direct response to the users' needs. Ask a rural resident or transportation professional what they want from ITS and this is what you'll hear:

- ***Safety is a priority...*** Almost two-thirds of the nation's fatal crashes occur on rural roads. Even if the crash is not fatal there are further concerns for rural travelers, in that emergency response can take almost twice as long in rural areas. Emergency medical providers talk of the "golden hour," where care delivered within the first sixty minutes after a crash can often mean the difference between life and death.

  For this reason we are seeing the development of Mayday systems all across the country. These devices, installed in your car and linked to a dispatch center via GPS, can immediately notify authorities if a crash occurs and pinpoint the exact location of the vehicle, saving critical minutes in the emergency response. Today Ford and GM are offering these devices on their new vehicles, while state transportation departments, public safety agencies, and emergency response and emergency medical groups, like the Mayo Clinic, are working together to ensure the necessary infrastructure and institutional arrangements are in place.

- ***Information is essential...*** Both travelers and the operators of the transportation system tell us that they need better, more accurate, and more up-to-date information about conditions and situations on the roadway network. This information allows public agencies to respond more efficiently and effectively to problems as they occur, and allows the driver to be aware of, and therefore much better prepared for, what lies ahead on their journey.

  But what is it they want to know? Well, they'd like to know about construction activities, planned special events, or incidents, that may create congestion or require detours.

However, overwhelmingly, they want to know about weather and road conditions, and for that reason the federal government is currently sponsoring a major ITS development known as *FORETELL*. This program is building upon substantial investments by the National Weather Service in modernizing their forecasting systems, together with the increasing network of road/weather information sensors being deployed by state transportation agencies to support their winter maintenance activities. *FORETELL* will create a system that will provide accurate, location-specific weather information that will be disseminated to travelers and system operators in various forms and through a variety of media.

- ***The tourist is king...*** With more than $470 billion in annual revenues, the travel and tourism industry is the nation's third largest industry in terms of retail sales, and one of the largest employers. State governments will spend around $480 million this year on travel and tourism promotion. Attracting the recreational traveler by making it easy for them to reach and access tourist sites and their associated facilities creates a point of connection between transportation system providers, and economic development and tourism groups.

  Again the federal transportation department is actively encouraging this partnership by piloting two ITS pilot programs, one in the Grand Canyon National Park, the other in Branson, Missouri, to deploy travel and recreational information systems. These systems are intended to make recreational travelers fully aware of options for reaching their destination; their choices of hotels, restaurants, and tourist sites; the traffic and roadway conditions that they will encounter; and their choices of alternative routes or sites to see along the way. All of this information should be available in real-time and at locations, like rest stops and gas stations that they will be using on their trip.

- ***Make public transportation available to non-drivers...*** To many elderly and disabled citizens living in rural areas, access to some form of public transportation becomes a fundamental quality of life issue. If an individual is no longer able to drive, living in a remote, rural community, with the consequent challenges in reaching the doctor's office or to go shopping, is a necessity not simply an option. A lifetime on the family farm for example, should not have to be traded for a condo in the city.

  ITS is looking at means to enhance the availability and efficiency of all forms of public transportation. In rural Pennsylvania, a mobility manager system is under development that will serve as a one-stop broker of public transportation services utilizing the resources of the transit agency, health and human service agencies, and various volunteer organizations. This system will provide demand responsive transportation to senior citizens by implementing a shared dispatching system, vehicle tracking capabilities, and two-way communications between the dispatcher and the driver.

It's easy to see that ITS is already making a positive impact on the lives of individuals and groups in many sectors of society. The challenge that lies ahead is the broadening of that constituency.

Successful ITS deployments are clearly cutting across organizational and jurisdictional boundaries; creating and leveraging new public-public and public-private partnerships.

## THIS STUDY

This study is being performed for Regions 2, 6, 7, and 9 of the New York State Department of Transportation (NYSDOT). The area covered by these four Regions is illustrated in Figure 1.

The study has the following principal objectives:

- to develop an ITS Toolbox for small urban/rural areas in New York State;
- to develop an ITS Strategic Deployment Plan/Direction for Regions having small urban/rural areas; and
- to provide ITS technical services for Region 2.

The ITS Toolbox consists of a defined list of state-of-the-art technologies currently available and appropriate for deployment to address mobility, capacity, information and safety problems and needs in small urban/rural areas of New York State. The Toolbox was developed in consultation with Advisory Committees established in each of the four Regions for this project. Since ITS, by its nature, is a function that crosses organizational and jurisdictional boundaries, these Advisory Committees comprise representatives from a broad range of groups and agencies and provide a diverse set of interests and perspectives. The participation of the Advisory Committees is fundamental to the success of this study.

Beyond the ITS Toolbox, the Strategic Deployment Plan will rank a range of transportation mobility, capacity, information, and safety problems and needs to be addressed in Region 2. The plan will rank the problems and needs by implementation time frames of short-, medium- and long-term solutions. Strategic Direction documents will be developed for each of Regions 6, 7, and 9. These will be similar to the Strategic Deployment Plan for Region 2, but at a more conceptual level. The Strategic Deployment Plan and the Strategic Directions will be developed in consultation with the appropriate Advisory Committee in each Region.

Technical assistance associated with all phases of the implementation of five pilot ITS deployment initiatives for various counties in Region 2 will also be provided. These initiatives will focus on ITS deployments currently needed in the Region, as identified in the Strategic Deployment Plan. However, as envisioned, many of these applications will eventually be deployed in rural, and small and large urban areas throughout the state.

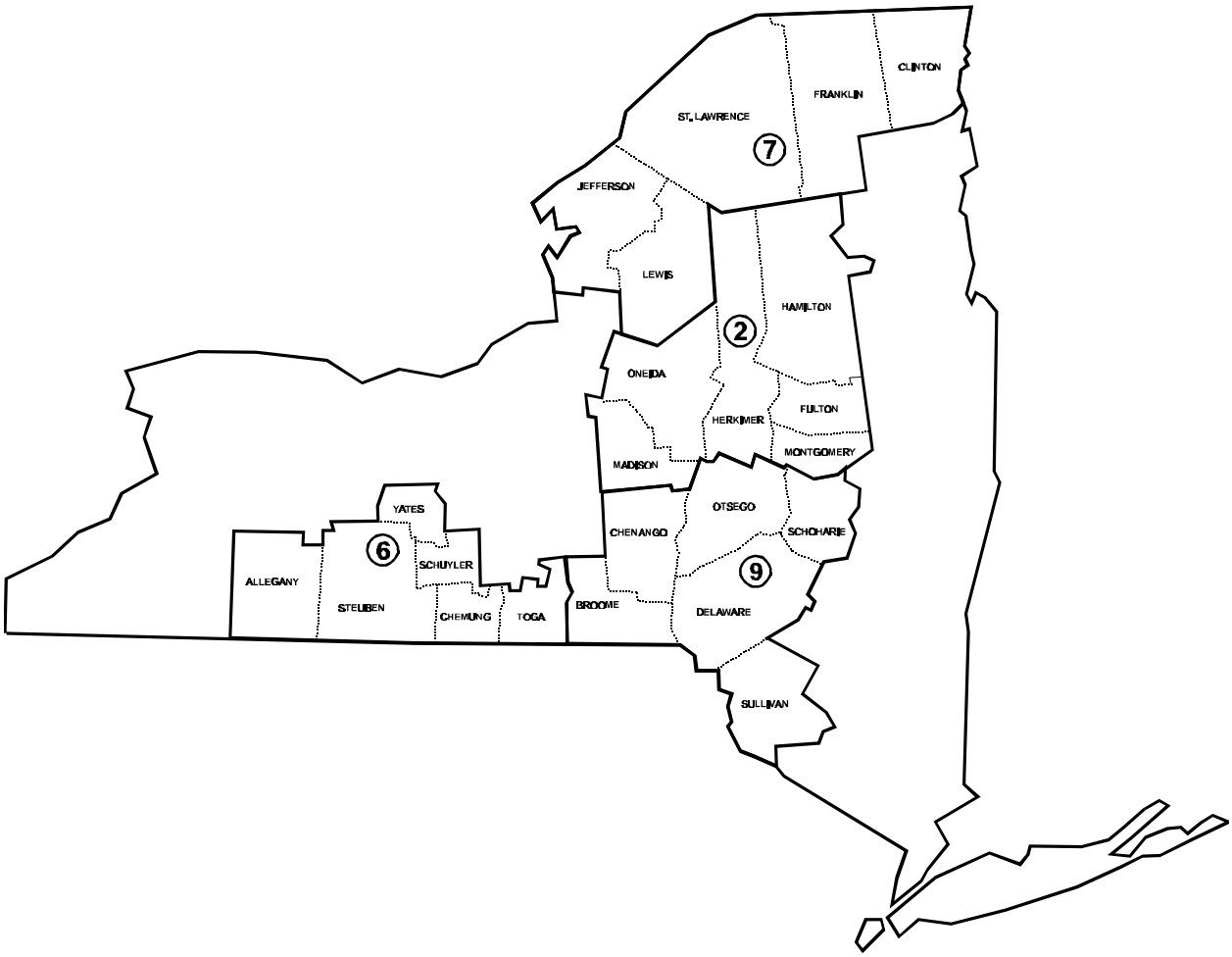


Figure 1. New York State Department of Transportation
Regions 2, 6, 7 and 9

## SUMMARY OF NEEDS AND APPROACHES

The Summary of Needs and Approaches report presented the results of discussions at the initial meeting of the Advisory Committees in each of the four Regions, as supplemented by a second meeting with the Advisory Committee in Region 2. Within the body of the report, the ideas and discussion generated by the participants through a brainstorming approach in each category is presented as follows:

- Needs - these represent the participants' views on the types of problems that could be addressed in each Region;

- Opportunities and approaches - based on the ITS briefing given to each Advisory Committee at their initial meeting, or the participants' own experience, these represent preliminary thoughts on the types of ITS systems or technologies that could be utilized to address the identified problems;

- Issues - these represent challenges or barriers that may exist to the successful deployment of ITS applications in the Regions; and

- Additional potential stakeholders - these represented the participants' thoughts on additional stakeholders who should be involved in this study. It should be noted that many of the individual groups or the broader categories identified did indeed participate in the Advisory Committees in other Regions. A complete list of participants from the meetings held to date is included in Appendix A.

The material presented in the report was utilized by the consultant team to prepare the ITS Toolbox, and also to begin outlining the format and content of the Strategic Deployment Plan/Directions.

## NEW YORK RURAL ITS TOOLBOX

This document describes the New York Rural ITS Toolbox, a combination of 30 unique tools that address the needs identified through workshops held in NYSDOT Regions 2, 6, 7 and 9 in New York State. Each tool is identified as fitting into one of eight ITS areas:

- Incident Detection/Notification
- Traffic Management
- Safety
- Road/Weather Information Systems
- Detection/Mayday Services
- Transit
- Traveler/Tourist Information
- Planning/Outreach

The tools were determined based upon the Summary of Needs and Approaches draft report. Each of the four New York State regions defined their needs, opportunities and approaches, and issues for

three broad applications: Tourism/Traveler Information; Traffic/Transit Management; and Safety. The 30 tools were identified to address the needs, opportunities and approaches or issues identified.

In the development of this toolbox one point has become very clear. Notwithstanding the use of the term "intelligent transportation," the tools fall into one of two broad categories: those that should clearly be initiated and led by a transportation agency, and those with which lead responsibility will likely be taken by a non-transportation agency (e.g., applications more focused on emergency medical response, or tourism and economic development). This document seeks to provide a distinction between the tools in these two categories.

The structure of the toolbox is as follows:

**Name of Tool**

**Issue/Problem/Need Addressed** - Determined from the Summary of Needs Approaches Draft Report, July 14, 1998

**Tool Description** - Includes a general description of the technology, overall goal of the tool, alternative technology uses, interoperability, scalability and the maturity status of the technology.

**Real-World Examples** - Describes the functionality and characteristics of existing implementations of this tool.

**Benefits and Opportunities** - Includes a summary table of direct and indirect benefits to travelers, the community and public sector. There is also an explanation of qualitative and quantitative benefits, and other opportunities for additional applications.

**Proposed Implementation** - A list of the basic steps that are necessary to implement the tool. The time frame associated with each step will be determined on an individual project basis.

**Institutional Issues** - Includes the organization structure, likely participants, potential users, staffing needs and commitment, and liability issues related to the tool.

It is anticipated that funding to implement the tools described in this document could come from a variety of sources. ITS activities may receive federal funding through the specific ITS Act in TEA-21 (*Title 5, Subtitle C - Intelligent Transportation Systems*). However, ITS is now also eligible for most forms of regular federal-aid highway and transit funds (e.g., National Highway System, Surface Transportation Program, Congestion Mitigation and Air Quality Improvement Program).

Other sources of federal transportation funds that may be available include a variety of grant programs authorized under TEA-21 (e.g., Access to Jobs grants associated with the Welfare to Work program), or funding appropriated for Congressionally-designated projects.

Beyond federal funds, projects may utilize state transportation funds, or may seek to establish public-private partnerships to draw in financial or other support from the private sector. Outside of the transportation arena it is expected that other sources of funding exist at the federal, state or local level. An important aspect of the planning tasks that follow the development of this toolbox will be to expand the understanding of the opportunities for using these non-transportation funds.

A summary table documenting the contribution of each tool to the overall rural ITS infrastructure follows this page. Seven Critical Program Areas (CPAs) have been identified by FHWA for rural ITS. The Commercial Vehicle Operations (CVO) CPA has not been included since CVO issues are not covered by these tools.

# Contribution to Overall Rural ITS Infrastructure

| Tools | FHWA Critical Program Areas: Traveler Safety and Security | Emergency Services | Tourism and Traveler Information Services | Public Traveler and Mobility Services | Infrastructure Operations and Maintenance | Fleet Operations and Maintenance |
|---|---|---|---|---|---|---|
| **1. Incident Detection/Notification** | | | | | | |
| Information/Data Clearinghouse | X | X | X | X | X | X |
| Integrated Communication System | X | X | X | X | X | X |
| **2. Traffic Management** | | | | | | |
| Automated Lane Indication | X | | | X | X | |
| CCTV for Incident Detection | X | X | X | | | |
| GIS Traffic Analysis | X | | X | | X | |
| Integrated Signal System | X | | | | X | |
| Low-Cost Route Diversion System | X | X | X | | | |
| Variable Message Signs | X | | X | | X | |
| Vehicles as Traffic Probes | X | | X | X | X | X |
| **3. Safety** | | | | | | |
| Speed Warning System | X | X | | | X | |
| Smart Workzone System | X | | | | X | |
| Automated Visibility Warning System | X | | | | X | |
| Animal Warning System | X | X | | | X | |
| Portable Speed Warning System | X | X | | | X | |
| Dynamic In-Vehicle Alert System | X | X | | | X | X |
| **4. Road/Weather Information Systems** | | | | | | |
| RWIS | X | X | X | | X | X |
| Smart Plows/Agency Vehicle Monitoring | X | X | | X | | X |
| Automated Anti- /De-Icing Capabilities | X | X | | | X | X |
| **5. Detection/Mayday Services** | | | | | | |
| Mayday System | X | X | X | X | | |
| **6. Transit** | | | | | | |
| Coordinate Rural Transit Service | | | | X | | |

| Tools | FHWA Critical Program Areas: Traveler Safety and Security | Emergency Services | Tourism and Traveler Information Services | Public Traveler and Mobility Services | Infrastructure Operations and Maintenance | Fleet Operations and Maintenance |
|---|---|---|---|---|---|---|
| **7. Traveler/Tourist Information** | | | | | | |
| Highway Advisory Radio | X | | X | | | |
| Traveler Information using Phones | | | X | X | | |
| Interactive Kiosks | | | X | X | | |
| Traveler Information on the Internet | | | X | X | | |
| TIS via Personal Communication Devices | | | X | X | | |
| Traffic Cable TV Channel | | | X | X | | |
| **8. Planning, Outreach and Delivery** | | | | | | |
| Integrated ITS Planning | X | X | X | X | X | X |
| Interagency ITS Coordinating Council | X | X | X | X | X | X |
| ITS Public Outreach and Education | X | X | X | X | | |

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# INCIDENT DETECTION/NOTIFICATION

**Information/Data Clearinghouse**

**Integrated Communication System**

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# TOOL: INFORMATION/DATA CLEARINGHOUSE

**NEEDS:** Stakeholders indicated that technology enhancements should be used in the following systems and services:

- Dissemination of special event, tourist, weather, parking, road conditions/closures/detour/workzone location, and recreational activities information
- Enhanced multimodal information (i.e,. transit, bikeways, trails, train, carpool)
- Coordinated information sharing within the regions among international, state, and local agencies (i.e., NYSDOT, state police, Canada).
- Centralized communications center for coordination of activities (notification system to public agencies and travelers alike), with co-location of police, transit and other agencies.
- Distribution of non-emergency 911 calls to a more appropriate source
- Improved information dissemination to law enforcement officials via in-vehicle laptops
- Serve the commercial community with information related to restaurants, lodging, etc.

**DESCRIPTION:**

An Information/Data Clearinghouse would provide NYSDOT with a valuable, statewide information network that can be utilized by authorized users across a variety of adjoining municipalities to view and enter transportation activities throughout the state. An integrated clearinghouse system would allow efficient incident response, congestion management, and accident wrap-up with communications between emergency service providers (state and local highway patrol/police, international transportation officials, ambulance services, fire, helicopter, and others) occurring electronically. A system that has multiple inputs from public and private industry allows for a comprehensive information network for travelers to reference. By including lodging, restaurant, and local community activities information with road, weather and other traveler information, a sustainable traveler information system can be developed, attracting potential partners and funding from a variety of organizations.

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Arizona Statewide Traffic Operations Center (TOC)**

**Goal:** To serve as the statewide information collection and dissemination resource.

**Technical Approach:** The Arizona Statewide Freeway Management System (FMS) is housed in the Phoenix TOC. The FMS serves as a data information clearinghouse for metropolitan jurisdictions and for agencies throughout the state via "virtual TOCs." The FMS collects information from mainline detection, ramp metering, CCTV monitoring, traffic interchange signals, a drainage monitoring system, VMS, and a communications system. Jurisdictions are able to communicate among themselves on this statewide system, sharing information that assists in event, incident, congestion, and other traffic management scenarios. The FMS encompasses the following components: a

simulcast radio system; the I-10 deck tunnel monitoring system including lighting, fans, fire detection and cameras; and elk alert sign control. The FMS is controlled by a network of computer systems and communication systems located at the TOC where a team of operators staff a control room 24 hours a day, 7 days a week. They are in constant contact with responsible rescue and response agencies and state highway maintenance and construction forces statewide in order to provide motorists with safe and efficient driving conditions.

With the extensive computer network purchased for the FMS, ADOT has the capability of bringing more systems into the TOC at very little extra cost. Systems throughout the state can be controlled directly from the TOC, and the network has the potential to be utilized by other agencies to simply collect and disseminate data to users at remote locations.

**Current Status:** The Arizona FMS is operating 24 hours a day, 7 days a week.

**Location:** The web page (www.azfms.com) provides general information and can be accessed worldwide.

**Agencies Involved:** ADOT and FHWA.

**Cost information:** $1.3 million annually to handle all operations.

**Key Contact:** Tim Wolfe, Assistant State Engineer, 1-602-255-6622 (tim@azfms.com) or Glenn Jonas, Senior Systems Engineering, 1-602-255-6587 (glenn@azfms.com)

**Timeline:** The Arizona FMS maintains ongoing operations, with phased implementation of added field devices throughout the state continually occurring.

**BENEFITS AND OPPORTUNITIES:**

- Reduce response time to incident
- Provide detours or advanced traveler information for rerouting and congestion management
- Improved planning and coordination.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Determine stakeholders and solicit input to define the needs for an information/data clearinghouse resource.

***Step Two:*** Create Technical Advisory Committee (TAC) to develop a scope and project overview for the creation of an Information/Data Clearinghouse that can be utilized as a statewide resource tool. The TAC's responsibilities would include determining

who the customer is; what information should be collected; and who should have access to the information.

***Step Three:*** Determine potential public and private partners and facilitate dialogue and committee development to guide process.

***Step Four:*** Develop the Information/Data Clearinghouse specifications: equipment needs, funding sources and availability, and define all the activities that will be offered as part of the Clearinghouse service package (i.e., 911 non-emergency call support, road closure and workzone information).

***Step Five:*** Issue a Request for Proposals for vendors and participating partners to create an Information/Data Clearinghouse. A survey of the latest technologies and soliciting partner ideas will assist in the development of a state-of-the-art clearinghouse database that allows multiple, simultaneous site usage, information updating and dissemination, and high-speed interconnects for the most efficient and effective dissemination methods.

**INSTITUTIONAL:**

The deployment of an Information/Data Clearinghouse requires hardware and software operations and maintenance as well as consistent communications with other participating partners (public and private) to continually make sure all needs are being met and that organizational changes are reflected in the philosophy of the clearinghouse information dissemination. The system must be designed such that it minimizes the burden on the agencies entering data.

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# TOOL: INTEGRATED COMMUNICATION SYSTEM

**NEEDS:** Regions expressed interest in the following interagency communications:

- Improved coordination among emergency response providers
- Coordination of road closures, construction, and detour information
- Dedicated communications network linking all emergency management service providers, transportation agencies and transportation service providers
- Coordination of special events between NYSDOT and state police
- Improved information dissemination to other counties, agencies, and personnel
- Utilization of AVL to better manage agency vehicles.

**DESCRIPTION:**

Linking city, county and state agencies will ensure a seamless flow of information among them. This will permit the effective management of congestion and incidents, and improve emergency response times. Furthermore, an integrated communication system will enable a coordinated clearinghouse for road closures, construction information and incident information.

**REAL-WORD EXAMPLE:**

***Real-World Example* - Minnesota Advanced Rural Transportation Information and Coordination (ARTIC)**

**Goal:** Improve the response time to accidents and emergencies for police, fire and rescue.

**Technical Approach:** The ARTIC project is part of the Minnesota statewide ITS program, Guidestar. The project is being conducted in an area of rural Minnesota characterized by harsh winters, a sparse and aging population, and scattered and inefficient transportation resource use. ARTIC coordinates the communications system of several public agencies (highway, state patrol, and transit) by establishing a centralized communication site. Road condition and real-time vehicle status and schedule information will be provided through ARTIC. An alternative means of emergency communications will be evaluated to determine the best systems for the environment.

**Current Status:** Communications center operational since December 1996

**Location:** Seven-county Arrowhead Region in northeastern Minnesota, covering approximately 18,223 square miles.

**Agencies Involved:** M/DOT, State Patrol, transit

**Cost Information:** $1.8 million, $1.5 million spent

**Key Contact:** Dick Maddern, ARTIC Project Manager, (218) 749-7793

**Timeline:** Operational

**BENEFITS/OPPORTUNITIES:**

- Improved and more reliable traveler and traffic information
- Improved response times of emergency vehicles to emergency situations
- Optimization of emergency, enforcement and transit vehicles
- Favorable public perception of DOT and enforcement agencies.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Determine the need of an integrated communication system

***Step Two:*** Determine which agency communication capabilities will be integrated

***Step Three:*** Identify the location of a communication center

***Step Four:*** Identify funding sources

***Step Five:*** Integrate communication.

**INSTITUTIONAL:**

An integrated communications system will benefit all agencies involved. In order to develop this integrated system, various agencies would have to develop understandings where they would share systems (or access to systems). This typically requires interagency agreements. Benefits for both the general public and the participating agencies would be experienced by this integration. In many cases roadway incidents require action on the part of police, maintenance, and emergency personnel (fire or medical) or any combination thereof. An integrated system would facilitate near-instantaneous response from all involved agencies.

**REFERENCES:**

Technology in Rural Transportation "Simple Solutions," FHWA, Publication No. FHWA-RD-108, October 1997.

# TRAFFIC MANAGEMENT


**Low-Cost Route Diversion System**

**Variable Message Signs**

**Closed Circuit Television for Incident Detection**

**Automated Lane Indication**

**Geographic Information Systems for Traffic Analysis**

**Integrated Signal System**

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# TOOL: LOW-COST ROUTE DIVERSION SYSTEM

**NEEDS:** A low-cost route diversion system was indicated as a tool specifically desired within the toolbox.

**DESCRIPTION:**

The low-cost route diversion system concept uses static guide signs and route markers to define permanent alternates to primary routes with recurrent problems. Typically this is not an advanced system, but the static signs can be supplemented with highway advisory radio (HAR), road weather information systems (RWIS), or other advanced technologies to enhance their effectiveness in affecting driver behavior.

**REAL-WORLD EXAMPLE:**

***Real-World Example - VDOT Hampton Roads Traveler Information***

**Goal:** To effectively redirect traffic during typically congested tourists seasons.

**Technical Approach:** Hampton Roads has a number of predefined alternate routes to heavily-traveled tourist routes. Each alternate route is assigned a distinctly colored identifier (e.g., triangle, square, circle, diamond). Frequent diversion confirmation is given along the route by placing the appropriate colored symbols on existing static signs and the end of the diversion route. In addition, Hampton Roads also utilizes HAR and flashing lights to indicate when the alternate route is recommended.

**Location:** Virginia Beach/Hampton Roads, Virginia. This technique is used during summer to divert tourist traffic around the Hampton Roads area. A large portion of traffic entering the Virginia Beach area during warmer months of the year has a final destination of North Carolina.

**Agencies Involved:** Virginia Department of Transportation's Suffolk District

**Cost Information:** Not available.

**Key Contact:** Mr. Stephanie Hanshaw, (757) 925-1504

**Timeline:** The system is operational and used heavily between Memorial Day and Labor Day each summer.

**BENEFITS/OPPORTUNITIES:**

- Low cost and effective route diversion tool
- Minimal maintenance requirements

- Easily utilized by visitors

This tool can be combined with almost any number of advanced techniques, including: VMS, flashing lights, in-vehicle navigation devices, HAR, and centrally controlled and integrated RWIS. This tool is intended to address one tourism congestion problem and, when combined with other advanced traveler information systems can be an effective means to address other road problems and congestion issues, such as inclement weather, accidents and special events.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Identify need and funding.

***Step Two:*** Similar to Incident Management programs, identify alternate routes that bypass recurring problem spots.

***Step Three:*** Select a color and symbol to identify the route.

***Step Four:*** To deploy this technique and achieve the desired results, an effective public information and education program is needed. Placing educational roadside signs which identify the symbol and the desired motorist behavior has also aided in re-routing traffic around problem areas.

***Step Five:*** Maintenance of this tool is the same as that of other static signs. The maintenance for other advanced techniques, if combined with the static signs, is as required for that technology.

**INSTITUTIONAL:**

A low-cost route diversion system has few, if any, institutional issues. Liability with such a system is low. A maintenance plan will need to be implemented to ensure all of the permanent signs are in-place, especially during the peak season, so motorists do not get lost.

**REFERENCES:**

"Rural Applications of Advanced Traveler Information Systems, Recommended Actions," FHWA publication number FHWA-RD-97-042

# TOOL: VARIABLE MESSAGE SIGNS

**NEEDS:** Throughout the state, stakeholders stated a need to provide traffic information through variable message signs (VMS).

**DESCRIPTION:**

VMS allow for flexibility in message content and are capable of providing dynamic information to motorists regarding a variety of conditions, including:

- Congestion
- Diversion
- Transit operations
- General guidance information
- Maintenance and construction work site information
- Roadway status
- Special events
- Parking availability
- Speed warning
- Snow and ice warnings.

VMS can be fixed or portable, depending on the use. Current technology for displaying text on VMS includes: bulbs, flip disk, light-emitting diode, fiber optics, or a hybrid system. VMS are typically combined with flashing yellow lights to catch the drivers' attention. A combination of permanent VMS and portable VMS can be used. The permanent VMS would be installed on routes that are prone to traffic congestion and back-ups and for special events to relay information about parking conditions. The portable VMS would be used for workzones, construction repair vehicles, road closures and special event information.

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Portable VMS - Dane County, Wisconsin**

**Goal:** To notify the traveling public of upcoming or existing construction and maintenance activities.

**Technical Approach:** Dane County, Wisconsin has deployed trailer-mounted, mobile VMS that can be controlled remotely via cellular telephone. There is no fixed message set for the VMS - any appropriate text message can be programmed for display. The VMS are portable and are utilized at either end of a construction, maintenance, or road closure zone, or an accident site. Two VMS, comprising one advisory system, have been in use since 1994. The signs are powered by diesel engines, although they can also be powered by electricity if this is available nearby. A telephone call to the VMS changes the message being displayed. There is no fixed message set for the VMS; any appropriate text message can be programmed for display.

**Current Status:** Two VMS, comprising one workzone advisory system, have been in use for two years.

**Location/Geographic Scope:** Dane County, Wisconsin. The mobile VMS serve the entire Dane County, Wisconsin area, which is approximately 1,200 square miles. The two signs are used only at the beginning and end of workzones.

**Agencies Involved:** Dane County

**Cost Information:** The National Highway Transportation Safety Administration provided funding for one unit and Dane County purchased the other unit out of its annual equipment budget. Dane County has experienced no unexpected costs in the deployment, operation or maintenance of the mobile VMS. The County would like to expand the program to include more VMS purchases for stationary sites in high-volume travel areas. These new units would be used for event information, incident management, and construction zone notification. Currently, Dane County competes against Capital Improvement Projects in the state DOT's budget for FHWA funds to expand this program. Costs included:

Deployment - $26,000 per mobile sign, in 1994 dollars
Operation - $4,200 per year per sign
Maintenance - $1,500 per year per sign

**Key Contact:** John Norwell, Dane County, (608) 266-4011

**Timeline:** Currently, the county is competing against Capital Improvement Projects in the state DOT's budget for FHWA funds to expand this program.

**BENEFITS/OPPORTUNITIES:**

- Increased safety at dangerous curve downgrades
- Less costs incurred in making repairs to crash locations
- Less costs incurred in repairs or insurance through avoiding accidents
- Less costs incurred in repairs, insurance, and loss of shipments through avoiding accidents
- Favorable public perception of safety improvement schemes.

VMS can be combined with other ITS technologies to create a more integrated system for traffic and traveler information dissemination. Areas include:

***ATIS:*** Information available on the Internet, one-stop shopping for special events/transportation information; public safety announcements; post telephone number for more information.

***Workzone safety measures:*** Use portable VMS, have police cruiser on site during workzone activities with lights on and flashing.

***Advanced parking systems:*** Most effective in contained parking facilities. On-street parking is more difficult to coordinate using ITS. Link to ATIS and or special event portable VMS.

***Special event planning:*** Involve ITS technologies for traffic management, pre-trip information provision, parking, facilities locations, etc.

***Incident management programs:*** Address flood situations, especially in flood-prone areas. Link to ATIS.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Determine where VMS will be used including routes and information to be displayed.

***Step Two:*** Depending on the funds available, prioritize the installation between the number of portable and permanent VMS to be purchased.

***Step Three:*** Prioritize the installation of permanent VMS on identified routes.

***Step Four:*** Identify vendors of VMS and research and identify the capabilities of each.

***Step Five:*** Purchase VMS and install.

**INSTITUTIONAL:**

VMS are a mature technology that are currently used by numerous DOT agencies throughout the U.S. DOTs in metropolitan areas use portable and permanent VMS extensively for traveler and traffic information dissemination. Users of permanent VMS will be the DOTs who install them. Portable VMS have a wider user base including DOT, police and special events. Operating a VMS is rather simple and requires minimal staffing needs. Liability issues associated with VMS are low as long as the portable VMS do not create a diversion to drivers and messages displayed are correct and concise.

**REFERENCES:**

"Assessment of ITS Technologies, COMPARE," I-95 Northeast Consultants, February, 1995.

Technology in Rural Transportation "Simple Solutions," Federal Highway Administration, publication number FHWA-RD-97-108, October 1997.

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# TOOL: CLOSED CIRCUIT TELEVISION (CCTV) FOR DETECTION

**NEEDS:** CCTV should provide the following services:

- Emergency services with incident detection capabilities
- Collision notification system
- Sensor technology to detect accidents in known high-incident locations, and communicate to appropriate agencies (i.e., emergency management, motoring public).

**DESCRIPTION:**

CCTV technology used in combination with communications to viewing facilities allow monitoring staff to accomplish numerous activities such as incident detection and verification, weather and roadway conditions monitoring, VMS message verification, and event management. CCTV images can be sent back through wireless communication to an information clearinghouse via cellular digital packet data (CDPD) and cellular telephone signals.

Wireless communication using CCTV has been used successfully in ambulances, allowing physicians at the destination medical center to view patients prior to their arrival, improving advice during transport and allowing better preparation at the receiving facility. However, other wireless communication applications are available. CCTV is proven effective in providing efficient response to incidents when a visual verification is made, and deploying the appropriate emergency personnel (fire, police, ambulance).

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Arizona Freeway Management System (FMS)**

**Goal:** To detect and verify weather/roadway conditions, VMS message verification, and incidents utilizing CCTV technology

**Technical Approach:** The statewide FMS in the metro-Phoenix area has 29 CCTV cameras mounted approximately 55 feet above the ground as part of phase 1 of the FMS deployment plan. Upon detection of an incident or other disruption to the flow of traffic, the operators in the Traffic Operation Center have the ability to verify VMS messages, monitor road and weather conditions, and locate incidents using one or two of the nearest cameras and zoom in to better view the situation. In the case of incident detection, the operator will then confirm the existence and location of the incident and proceed to get the traffic moving again as safely and efficiently as possible through the use of ramp meters, VMS, simulcast radio and by notifying the appropriate authorities to clear the incident.

In the rural setting, the Arizona Department of Transportation (ADOT) is planning CCTV installations at rest areas, major traffic interchanges, and ports-of-entry, when possible utilizing

hardwired communications links directly to the server. The purpose of the rural CCTV program is to:

- Detect/verify incidents
- Provide real-time images of roadway conditions
- Consistently monitor traffic conditions
- Verify messages on VMS
- Determine real-time weather conditions
- Security

Criteria for CCTV installation include:

- Locations where more than 10 accidents occur per year within a one-mile radius
- Locations where major multiple traffic tie ups/congestion occur
- Rest areas
- Ports-of-entry open 24 hours

**Current Status:** The rural program for CCTV installation is scheduled to occur over a multi-year timeframe, with lessons learned and various CCTV specifications tested to determine differentiation between component requirements in extreme weather conditions and customized features necessary for particular locations throughout the state.

**Agencies involved:** ADOT. The Statewide Plan for Intelligent Transportation Infrastructure is led by the ADOT Transportation Technology Group, with other ADOT Divisions and Districts working closely.

**Cost Information:** Equipment specifications are currently being developed; the following are estimates:

$36,000 per CCTV unit 15 frames/second (specifically one that can deal with freeze/thaw/heat)
$10,500 per installation
$2,000/month dedicated telephone line
$100/month dial-up cost (will depend on how often camera will be viewed)
Trenching installation will depend on where final CCTV is located.

Installation locations are being implemented at sites that have standard PC technology and wireline modems. Update frequency will dictate the best method for communications with dial-up lines being least costly. However, if long distance calling is required, other alternatives need to be explored such as commercial ISDN services (if data rates exceed modem capabilities it may be more costly), microwave, cellular, data services (CDPD, RAM, ARDIS), or a statewide communications network.

**Key Contact:** John Harper, ADOT Project Manager, (520) 779-7570

**Estimated Cost:** Statewide CCTV rural implementation has $546,000 programmed for 11 identified rural CCTV sites.

**Timeline:** This multi-phased statewide deployment of intelligent transportation infrastructure has CCTV installation programmed over a 10-year timeframe.

**BENEFITS AND OPPORTUNITIES:**

- Allow quick confirmation of incidents
- Reduce response time to incident
- Provide detail on an incident so that the appropriate emergency response team is deployed
- Provide emergency services with incident detection capabilities
- Provide collision notification system
- Provide increased detection capabilities at known accident locations.

**PROPOSED IMPLEMENTATION:**

Installation of CCTV can be integrated into a comprehensive Incident Management Plan. An incident management initiative would require multi-agency coordination and the development of partnerships with emergency management agencies, reducing any one agencies' investment in infrastructure, including CCTV, that has broad benefits.

***Step One***: Assemble a Technical Advisory Committee to determine incident management approach to CCTV applications. Determine site criteria for CCTV installation (i.e., communications transmission availability) and provide oversight to a broad program of multi-jurisdictional coordination.

***Step Two:*** Review existing and planned incident management systems that utilize CCTV with special attention to performance measures (i.e., incident detection and verification, incident response, incident site management, incident clearance, and broadcast of incident alerts to motorists).

***Step Three:*** Compile specifications for the issuance of an RFP for CCTV provider.

***Step Four:*** Install CCTV at sites recommended through the criteria evaluation process

***Step Five:*** Monitor the CCTV network for performance. Share the CCTV data streams with local jurisdictions to build inter-agency coordination on incident response.

***Step Six:*** Evaluate initial installation sites for system improvements and for statewide deployment as appropriate.

**INSTITUTIONAL:**

The deployment of a CCTV system locally or region-wide requires operations and maintenance of equipment, and a working knowledge of the technology. Personnel can be located in-house or the work can be contracted out. To make best use of the technology, a multi-agency, multi-jurisdictional approach to sharing data and responding to incidents is required.

**REFERENCES:**

ADOT Statewide Plan: Intelligent Transportation Infrastructure, Transportation Technology Group, February, 1997.

# TOOL: AUTOMATED LANE INDICATION

**NEEDS:** Improve safety through technology enhancements for driving conditions during foggy and white-out conditions.

**DESCRIPTION:**

New York State has numerous mountainous rural areas where poor visibility, caused by fog and white-outs, create unsafe driving conditions. During these events, drivers are unable to tell where the edges of the roadway are. Using fog lights and high-beam lights installed on the vehicle does not always allow for improved driving conditions, and sometimes worsens the driver's view of the road. The utilization of in-pavement lights, such as those used on runways at airports, will ensure the definition of the roadway edges and thereby allow drivers to stay on the roadway and within their lane. The installed in-pavement lights have a projection above the pavement of only 2", allowing snow-plow blades to pass over the fixture, and do not hinder bicyclists. The fixture is 8" in diameter and is set in an underground canister of galvanized steel. The fixtures are able to withstand a dynamic load of 11 tons and routinely handle rollover by Boeing 747s when used on airport runways. The fixtures are able to display up to three separate colors in a range of angles, wide to narrow.

**REAL-WORD EXAMPLES**:

***Real-World Example* - Europe, Disneyland, Virginia Department of Transportation**

**Goal:** Improve the safety of drivers during low-visibility conditions, improve the safety of pedestrians in crosswalks, improve demarcation of lanes in complicated intersections.

**Technical Approach:** The lights have been used for many years on airport runways but have now been applied to lane demarcation, crosswalks, round-abouts (Europe) and intermodal facilities. Disneyland uses the lights for parking control. The Virginia Department of Transportation has used the in-pavement lights in conjunction with low-visibility weather sensors. In this system, the lights are activated when visibility reaches certain thresholds on mountain passes along Interstate 64 near Charlottesville.

**Location:** Europe, California, Virginia, Maryland

**Cost:** Fixtures - $525.00
Spare lamps - $15.00
Electrical installation (per six fixtures) - $3,000 - $5,000
Operational and Maintenance - $

**Contact:** Kyle J. Owens, Flight Light, Inc., (916) 394-2800

**BENEFITS/OPPORTUNITIES:**

- Improved visibility of the roadway edges
- Less accidents on curvy and dangerous rural roads
- Less costs in making repairs to crash locations and incident management
- Less costs incurred in repairs or insurance through avoiding accidents.

Automated lane indicators have been used extensively in Europe on round-abouts (traffic circles) and at intermodal facilities. In the United States, however, this technology has not been heavily utilized. Primarily, foreign municipalities have used in-pavement lights on crosswalks to give drivers another indication that pedestrians are present. Other areas of opportunity for lane indicators include:

**Railroad Crossing** - Installing a series of in-pavement lights before at-grade railroad crossings. The lights would emit a red beacon that is triggered by the presence of a train some distance away from the crossing. Currently, there are numerous at-grade crossings with only a stop sign to indicate the driver to stop before proceeding. In-pavement lights would be a dynamic instrument to warn drivers of the presence of a train.

**Recreational Trails** - In-pavement lights could be utilized for recreational trails where light needs to be present for trail indication.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Decide whether an automated lane indication system would be stand-alone or used in conjunction with another system such as a speed warning system.

***Step Two:*** Determine where an automated lane indication system would benefit motorists the most. This would include winding roads on mountains, or roads that have numerous accidents due to excessive speed and/or poor visibility areas.

***Step Three:*** Prioritize the locations for installation.

***Step Four:*** Procure in-pavement lights and speed detection system

***Step Five:*** Install and evaluate.

**INSTITUTIONAL:**

Speed warning system have been used for a number of years on dangerous roads, intersections and interchange ramps to warn drivers of their potentially dangerous speed. Users of these systems include any motorist traveling at excessive speeds. An automated warning system could be used to augment and enhance the system by indicating the roadway edges. The liability associated with an automated warning system would be small. Installing and evaluating a test system will ensure the system operates properly and meets the criteria set forth by the DOT or enforcement agency.

Maintenance issues will include ensuring that the visibility sensors are working properly and that the in-pavement lights are operating.

**REFERENCES:**

In-Pave Lights, Urban Transportation Monitor, Lawley Publications, December 19, 1997, page 1.

Flight Light, Inc., Sales Brochures**.**

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# TOOL: GEOGRAPHIC INFORMATION SYSTEMS FOR TRAFFIC ANALYSIS

**NEEDS:** Stakeholders want to utilize geographic information systems (GIS) to plan and analyze transportation networks, both roads and transit. Also, they would like to integrate automatic vehicle location with GIS to better manage maintenance, transit and emergency vehicles.

**DESCRIPTION:**

GIS is a computer-based tool for visualizing, mapping, analyzing, and processing data that have a geographic component. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps. These abilities distinguish GIS from other information systems and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies. GIS can be used to integrate mapping analysis into decision support for network planning and analysis, vehicle tracking and routing, inventory tracking, and route planning and analysis. GIS combined with AVL can be utilized to track vehicles visually, plan their routes and to signal an alert if vehicles go off schedule. In this application, GIS can also be used to view historical actual routes taken.

**REAL-WORD EXAMPLE:**

***Real-World Example* - SMART-TRAC**

**Goal:** Reduce congestion in the once rural region of Oakland County, Michigan by utilizing ITS components and a GIS-based transportation information management system.

**Technical Approach:** SMART-TRAC utilizes a combined advanced traffic management system and advanced traveler information system to alleviate congestion on Oakland's arterial roads. Phase II of the system implemented a GIS-based transportation information management system developed to integrate field legacy systems for arterial management, traffic control, and video detection. The components of the system and real-time information from the field are continuously updated and displayed on maps in the Traffic Control Center using ArcView GIS. The system is accessed by external agencies for real-time incident and congestion reporting and is an excellent planning tool for incident management and traffic control throughout the area. In Phase III, the FAST-TRAC GIS will be integrated with a freeway management system used by Michigan DOT to maintain information on the State's southeastern highways.

**Current Status:** System is operational and under evaluation

**Location:** Arterial highways in Oakland County, Michigan.

**Agencies Involved:** Michigan DOT, Odetics

**Cost Information:** Phase II $21 million, Phase III $15 million (includes traffic signals controllers)

**Key Contact:** Michigan DOT, (248) 483-5100

**Timeline:** Operational, under evaluation by University of Michigan

***Real-World Example* - Grade-Crossing GIS Database in Nebraska**

**Goal:** The goal of this application is to efficiently determine where safety-related improvements should be made to roadways and at railroad grade crossing sites.

**Technical Approach:** A video log of track-side and roadway characteristics at grade crossings and a log of the numbers of vehicles and trains per day at crossings is being created. The mileposts on rural roads assist in identifying, tracking, and documenting specific areas that need maintenance through the use of a GIS database, coupled with a video log of the number of grade crossings.

This system utilizes an in-vehicle video camera to document on film roadway and trackside conditions for early detection and examination of possible problem areas. The video camera is mounted to facilitate filming fifty feet ahead of the vehicle, and automatically records to disk for downloading onto a database. Multiple users access the database for various purposes including traffic counts, railroad crossing measures (i.e., crossings per day) and projections. Users that access the information include the legal department, statistical analysis specialists, general administration, infrastructure inventory personnel, and maintenance districts. Eight transportation districts throughout the state currently use the database.

**Current Status:** The Nebraska DOT started using video in 1975.

**Location:** The system is expanding and will be applied statewide.

**Agencies Involved:** Nebraska Department of Roads.

**Cost Information:** The current budget for the video log is $125,000.

**Key Contact:** Dick Gingrick, GIS, Nebraska Department of Roads (402) 479-4550

**Timeline:** This project is ongoing. As this project progresses, its technology is being applied throughout the Department of Roads.

**BENEFITS/OPPORTUNITIES:**

- Better analysis of road network to prioritize congested or dangerous areas for road improvements
- Improved analysis tool to prioritize funding for certain areas
- Improved fleet management

**PROPOSED IMPLEMENTATION:**

***Step One:*** Identify what type of data need to be collected, stored and analyzed

***Step Two:*** Determine if development should be in-house or external

***Step Three:*** Research the multiple vendors offering GIS software

***Step Four:*** Identify areas of connectivity with other systems or components

***Step Five:*** Ensure computers and networks are capable of running GIS software

***Step Six:*** Install and/or integrate with other systems and components.

**INSTITUTIONAL:**

GIS software can be used for a wide range of situations, from static network analysis to dynamic, real-time tracking of vehicles. Any organization utilizing GIS will recognize the benefits it has to offer soon after the software is installed. GIS software is mature and is readily used by numerous public and private agencies. Liability issues associated with GIS are few, if any. GIS software can be difficult to install, setup, and maintain, requiring adequately-trained personnel. To ensure the maximum utilization of the GIS software, a information technology position should be created, at least on a part-time basis, to maintain the GIS software.

**REFERENCES:**

Technology in Rural Transportation "Simple Solutions," FHWA, Publication No. FHWA-RD-108, October 1997.

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# TOOL: INTEGRATED SIGNAL SYSTEM

**NEEDS:** Develop an interconnected traffic signal system which would modify signal timings based on demand and/or special events. The system also needs to allow signal timings to be changed remotely and for real-time traffic data to be collected.

**DESCRIPTION:**

Many signals in operation today are controlled by time-of-day cycle timing. This is where the amount of time given to any particular direction is changed based upon a preprogrammed timing plan entered into the signal's memory. In order to change the cycle pattern, someone has to go out to the signal and manually change it. Today, integrated signal systems have been successfully installed throughout the U.S. An integrated signal system allows an agency to coordinate surface street traffic flow along a roadway by controlling the signal timing at individual signal controllers. Data collected through surveillance components can be analyzed and signal timings automatically changed.

**REAL-WORD EXAMPLE:**

The example described below is based on type 170 intersection controllers, while NYSDOT regions are currently using type 179. However, it is illustrative of an application that could be used in New York.

***Real-World Example* - Interagency Signal Master System**

**Goal:** To improve the operations of local traffic signal systems and to increase the options for interagency signal control.

**Technical Approach:** A microcomputer-based traffic signal control system has been developed which interfaces type 170 intersection controllers. The system, which operates in a Windows environment and can monitor over 10,000 intersections, can store up to 15 years of data on a single optical disk. The system can transmit data simultaneously over a variety of communications media including voice grade telephone lines, fiber optic cable, and cellular, packet, and spread spectrum radio. The system can also automatically page a standby technician to report intersection and equipment failures. Technicians can then access the main computer with a notebook computer via cellular phone. The system is able to monitor the signals of multiple agencies, such as city, county, and state systems.

**Current Status:** In 1993, a DOS version of the system was initially implemented, which was followed by a Windows version. The system is scheduled to be upgraded to Windows NT in November, 1996. 280 intersections are currently covered by the system, and an additional 220 intersections are due to be added to the system in the near future.

**Location/Geographic Scope:** The system is being used to operate intersections in Colorado Springs, Colorado.

**Agencies Involved:** City of Colorado Springs, Traffic Engineering Department.

**Cost Information:** The system cost approximately $500,000 to develop and implement. The installation of new traffic signals and controllers was additional.

**Key Contact:** John Merritt, Principal Traffic Engineer, City of Colorado Springs., (719) 578-6663

**Timeline:** The system will soon be implemented in Boulder and Loveland, Colorado.

**BENEFITS/OPPORTUNITIES:**

- Decreased travel time
- Capabilities to handle and manage special events better and remote-control of signals
- Improved air quality due to less stop-and-go actions and idle time

In many municipalities, traffic management centers utilize the traffic signals as traffic sensors to collect information on congestion and traffic volume for incident detection, traffic information dissemination and analysis later.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Identify which areas need traffic signal coordination through modeling and analysis

***Step Two:*** Identify other areas of connectivity

***Step Three:*** Research other integrated signal system currently operational

***Step Four:*** Determine the location for a traffic management center from which to operate the signal system

***Step Five:*** Procure any hardware and software

***Step Six:*** Install and evaluate.

**INSTITUTIONAL:**

Integrated signal systems may require the participation of all counties, cities and towns in the area where the integrated signal system will be implemented. Without the participation of all municipalities, the system may not be as effective. There is little liability associated with a integrated signal system providing proper fail-safe mechanisms are implemented.

**REFERENCES:**

Undefeated by Traffic, Traffic Technology International, August/September 1997, page 85

Technology in Rural Transportation "Simple Solutions," FHWA, Publication No. FHWA-RD-108, October 1997.

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# TOOL: VEHICLES AS TRAFFIC PROBES

**NEEDS:** Use vehicles as traffic probes for the collection of traffic information such as incidents, accident locations, travel times and traffic congestion areas.

**DESCRIPTION:**

Vehicles acting as traffic probes allow for the collection of accurate data on current traffic conditions. The system utilizes transponders that are placed in vehicles and transponder readers that are placed on the roadway. The reader sites are set up on predetermined roadways or areas where congestion is a known problem, or portable units can be constructed for special events and for work zones to determine travel times. The reader reads the transponder and sends the tag identification to a computer where the information is analyzed. Traffic incidents are automatically identified through an incident detection algorithm. The algorithm determines the probability of an incident when transponder-equipped vehicles detected at an upstream reader site are not detected at the downstream site within the expected arrival time. Communication between the reader and tag is through a radio frequency (RF) and between the reader and computer through a land-line wire, including fiber optics, coaxial, and phone.

**REAL-WORD EXAMPLE:**

***Real-World Example* - TRANSMIT**

**Goal:** Collect accurate and timely traffic data about current road conditions through non-intrusive means.

**Technical Approach:** The TRANSMIT system uses transponders issued as part of the EZ Pass electronic toll-collection systems. TRANSMIT has installed a number of readers along specified roadways with the capability of identifying the vehicles equipped with transponders at periodic intervals.

**Current Status:** Operational. Due to extreme success of system, it will be expanded.

**Location:** New York, New Jersey and Connecticut Tri-State area. Garden State Parkway, I-87/287, Spraln Brook Parkway, Hutchingson Parkway, I-95, I-278, Route 440

**Agencies Involved:** TRANSCOM, New York/New Jersey/Connecticut transportation agencies

**Cost Information:** Phase I:$2.3 million. Phase II: $1.2 million

**Key Contact:** Tom Batz, TRANSCOM, (201) 963-4033

**Timeline:** Operational

**BENEFITS/OPPORTUNITIES:**

- Improved and more accurate traveler information
- Better and improved data source for traffic information dissemination and analysis
- Traffic information.

**PROPOSED IMPLEMENTATION:**

Proposed areas for implementation include those where transponder penetration is high enough or are prevalent; otherwise, transponders will have to be issued at a cost of up to $25 each.

**INSTITUTIONAL:**

Institutional issues include significant privacy concerns. Using vehicles equipped with transponders as probes is very beneficial for traffic monitoring purposes as well as incident detection. Today, ITS Privacy Principles stipulate that the transponders used as probes would be assigned a random number and that random number would be used for traffic probe purposes. The actual transponder ID would remain private. This prevents any entity from tracking any individual user. In order for probe applications to be useful, the number of transponder-equipped vehicles would have to attain a certain system specific threshold.

**REFERENCES:**

TRANSMIT: An Advanced Traffic Management System

# SAFETY


**Speed Warning System**

**Smart Workzone System**

**Automated Visibility Warning System**

**Animal Warning System**

**Portable Speed Warning System**

**Dynamic In-Vehicle Alert System**

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# TOOL: SPEED WARNING SYSTEM

**NEEDS:** Use speed warning systems for traffic approaching at high- volume intersections, work zones and accident locations.

**DESCRIPTION:**

Informing drivers, based upon weather conditions, road geometry and their vehicle speed, will enable them to reduce their speed and maintain control of their vehicle. In addition to warning drivers they are driving too fast, the speed warning systems can also vary the posted speed based upon algorithms defined by the DOT. Typical speed warning systems can be composed of radar gun technology, an automatic vehicle classification (AVC) system and a weigh-in-motion (WIM) system, and a VMS to communicate to the driver. The AVC and WIM technologies are primarily used for commercial vehicle operations. Some systems merely inform the driver of the recommended speed for prevailing roadway conditions (fog, construction, congestion, etc.) and the driver's actual speed. Other systems run an algorithm to determine the recommended speed for the particular vehicle's characteristic (loaded or empty truck, etc.) and the vehicle's actual speed. Speed warning systems are not necessarily infrastructure intensive, can require minimal permanent equipment installation and can be set up as a completely mobile system.

**REAL-WORD EXAMPLES:**

***Real-World Example* - Truck Speed Warning System**

**Goal:** To improve safety by lowering the speed of trucks on steep grades with a history of severe run-away truck accidents.

**Technical Approach:** A radar gun is installed to determine the speed of trucks approaching the curve. If a speeding truck is detected, a variable message sign is activated which reads "YOU ARE SPEEDING AT [xx] M.P.H. 45 M.P.H. CURVE AHEAD." The maximum design speed for the curve was 43 mph due to limited sight distance. Speed tests were performed before and after the installation of the sign. Prior to installation the 85th percentile of truck speed was 66 mph. Following installation this reduced to 48 mph.

**Current Status:** The system has been in place and operational since September, 1996.

**Location:** The curve, which is on a down gradient and which tightens from seven to five degrees midway, is on I-70 in Glenwood Canyon, Colorado.

**Agencies Involved:** Colorado DOT

**Cost information:** The cost of the system is estimated at between $25,000 and $30,000.

**Key Contact:** Jim Nall, CDOT, (970) 248-7213

**Timeline:** CDOT plans to leave the system permanently installed. At present there are no plans to implement the system in additional locations.

***Real-World Example* - Travel Aid on Snoqualmie Pass**

**Goal:** Improve safety and reduce the hundreds of accidents that occur every winter on Snoqualmie Pass east of Seattle by using dynamic speed limits.

**Technical Approach:** The new dynamic speed limit capability will use information from a number of sources to set a safe speed over the Snoqualmie Pass. Wide aperture radar will track vehicle speeds. Six weather stations will monitor temperature, humidity, precipitation, wind and specific road surface conditions. This information will be gathered and transmitted by packet radio and microwave transmission to the control center on the top of the mountain. Travel Aid will then calculate safe speeds that are confirmed by WSDOT staff and transmitted to travelers via nine variable message signs.

**Current Status:** Travel Aid was operational through the winter of 1997-1998. Results and evaluations are not yet available.

**Location:** Travel Aid covers a 40-mile stretch of Interstate 90. WSDOT has also added pass condition information to its website.

**Agencies Involved:** WSDOT, University of Washington, PB Farradyne, Traffic Master, Engineering Research Associates, Surface Systems Inc.

**Cost Information:** $5,000,000 for the design and installation of Travel Aid.

**Key Contact:** SmarTrek, http://www.smartrek.org, Pete Briglia (206) 543-3331

**Timeline:** Operational for one winter. Initial feedback was that it is a success and will continue to be utilized.

**BENEFITS/OPPORTUNITIES:**

- Increase safety at dangerous curves where road conditions limit safe speed
- Increase safety at dangerous curve downgrades
- Less costs incurred in making repairs to crash locations
- Less costs incurred in repairs or insurance through avoiding accidents
- Less costs incurred in repairs, insurance and loss of shipments through avoiding accidents
- Favorable public perceptions of safety improvement schemes

- Reduced incident management costs.

Speed warning systems will help increase the safety of roadways during inclement conditions by warning drivers that they are driving too fast or changing the posted speed limits. Vehicles traveling too fast for conditions, particularly on curves or long downslopes, increase their risk of being involved in an accident.

The signs in place for the speed warning system could also be used to communicate additional types of information to drivers. Additional communications links and sensor systems would need to be installed to enhance current systems. If multipurpose VMS, and other sensor technologies were utilized, information provided could include:

- Warnings about construction or maintenance occurring ahead.
- Temporary speed advisories and warnings due to construction activities or severe weather conditions.
- Snow chains usage advice.
- Advice on the status of mountain passes in winter weather conditions.
- Traveler information, including diversion advice.
- Warnings of hazardous roadway or weather conditions.
- Vehicle width, height or weight restrictions ahead.

Interconnection of signs to a regional traffic management or traveler information center may provide maximum flexibility in the messages which could be displayed. Should additional types of information be displayed on the speed warning signs, rules would need to be established for determining how and when a speed warning message should override a more general informational message.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Determine the project scope (stand-alone system or a more broad traveler information tool).

***Step Two:*** Investigate locations involving accident "black spots" where excessive speed has been identified as a major factor in causing accidents; pick sites.

***Step Three:*** Assess vehicle speeds approaching the chosen locations to determine placement of radar gun and sign positioning to allow proper driver response time

***Step Four:*** Depending on what conditions the sign will provide warnings for, the message wording to be displayed should be determined.

***Step Five:*** The appropriate combinations of radar systems and warning signs should then be specified and procured.

***Step Six:*** Procure radar systems and warning signs.

***Step Seven:*** Evaluate frequent driver reactions to determine necessity of changing messages for driver acknowledgment.

**INSTITUTIONAL:**

Care should be taken to ensure that speed readings displayed on the warning signs are consistently accurate, as readings that differ from the speedometer readings in vehicles will negatively impact the credibility of the system. As was described in step eight, periodic testing should be undertaken to ensure that drivers are continuing to alter their speeds in response to the warnings. In cases where the speeds are not just recommended but are actually enforceable, the enforcement agencies should be involved.

**REFERENCES:**

SmarTrek, http://www.smartrek.org

Technology in Rural Transportation "Simple Solutions," FHWA, Publication No. FHWA-RD-108, October 1997.

# TOOL: SMART WORKZONE SYSTEM

**NEEDS:** Provide a smart workzone system to aid the traveling public and enhance job site safety. Some of the types of needs identified include:

- Enhanced workzone safety and management measures
- Advanced utilization of technology for workzone areas (lighting, traffic controls, mobile maintenance equipment, VMS, flashing lights, signing, vehicle speed displays)
- Increased workzone visibility (advanced detection and warning systems, advanced notice to the public via ATIS)

**DESCRIPTION:**

Smart workzones are becoming more common, with an increased safety emphasis for both on-site field personnel and the motoring public. Smart workzones include the use of technologies such as:

- Stationary and mobile VMS announcing detours or "construction ahead with possible delays";
- Speed display signs to make the driver aware of their actual approach speed;
- HAR to facilitate communications within the worksite area among project manager and site supervisors; and
- Connection to an advanced traveler information system (ATIS), with a website to provide travelers pre-trip information about preferred routes and potential delays, relieve congestion and also provide early incident detection with advanced detour notification capabilities.

The smart workzone can be utilized as a portable traffic operations center (PTOC), communicating with the closest NYSDOT Region office or to a "virtual" transportation operation center (VTOC), which could be as simple as a desktop personal computer at a maintenance facility. Each Region is aware of construction and maintenance operations in their area, with communications links to the construction site, up-to-date information can be keyed into an ATIS for all travelers, enforcement personnel and others to preview and make appropriate travel decisions.

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Duluth/St. Cloud Area Transportation Operations Center**

**Goal:** To attain efficient and effective transportation management.

**Technical Approach:** The Duluth, St. Cloud, and Southwest and West Central Minnesota Transit Link Systems are pooling their resources to provide an optimized, safe and efficient transportation management system. To meet their objectives, Virtual Transportation Operations Centers (VTOC) is the answer, with low-cost, mobile capabilities for work site construction and maintenance activities. The VTOC is capable of communicating with VMS, transit, CCTV, signal systems, and variable

speed limit signs coordinating a number of smart workzones simultaneously. The smart workzones will also use technologies to manage traffic such as: tunnel sensors, ramp queuing systems, non-intrusive detectors, remote communications for isolated signals, and onboard bus transmitters.

**Current Status:** Mn/DOT issued an RFP for Partners and has assembled the project team. Design and implementation are ongoing.

**Location:** The area around Duluth, and St. Cloud, Minnesota.

**Agencies Involved:** Mn/DOT, Central Minnesota Transit Link System

**Cost Information:** The contract is a public/private partnership with contributions made by all participating parties.

**Key Contact:** Mike Sobolewski, Castle Rock Consultants, 612-686-6321; Steve Bahler, Mn/DOT 612-215-0409

**Estimated Cost:** $4.8 million

**Timeline:** Ongoing

**BENEFITS AND OPPORTUNITIES:**

- Increased safety for field personnel and travelers
- Enhanced information dissemination for on-site activities via HAR or to a VTOC for input of real-time detours and closure information broadcast on radio, television, and an ATIS
- Effective, efficient traffic management techniques that improve the public's perception of workzone management.

Opportunities for a smart workzone system include a linkage of RWIS, and variable speed limit technologies to make travelers aware of the appropriate speed limit via VMS given existing road conditions

**PROPOSED IMPLEMENTATION:**

***Step One:*** Develop a project team to compile a list of potential technologies and concepts desired from a smart workzone concept.

***Step Two:*** Issue an RFP for Partners to determine interested industry vendors, and gain funding participation.

***Step Three:*** Determine whether the expertise required to establish and maintain a smart workzone and/or VTOC service is available within the NYSDOT organization, or whether it would be cost-effective to acquire this expertise for in-house or contract out.

***Step Four:*** Working with private partners, develop an implementation and logistic plan for managing smart workzone activities.

***Step Five:*** This last step involves ongoing operation and maintenance of the smart workzone network and related integrated services. It may be that once the system is fully functional, routine overview could be performed in-house, only calling upon vendor or private partner support services to assist with major redesign efforts. As part of this step, the agency should request and analyze user feedback to ensure that the users' needs, both field personnel and travelers, continue to be met by the service.

**INSTITUTIONAL:**

The deployment of an integrated smart workzone and possible VTOC network requires project management for oversight on continued communications among Regions even after the initial implementation has occurred. Further, operations and maintenance for upkeep of the smart workzone equipment will be required. This equipment is mobile and can be utilized by several regions, however it may require a centralized database to document equipment upgrades, and preventative maintenance schedules.

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# TOOL: AUTOMATED VISIBILITY WARNING SYSTEM

**NEEDS:** Stakeholders need the capability to detect fog and white-out conditions in order to post advisories to motorists through variable message signs (VMS) or other information dissemination means (HAR, Internet, kiosks) and to improve roadway conditions by turning on in-pavement lights defining the roadway edges.

**DESCRIPTION:**

Weather sensors have been utilized for a number of years to detect adverse weather conditions. One application of the weather sensors are to detect inclement weather conditions and warn drivers before they drive into the affected areas. Automated visibility warning systems use weather sensors to detect reduced visibility conditions (heavy rains, white-out) and then trigger a permanent or portable VMS with a message indicating the adverse driving conditions. In addition to triggering messages on VMS signs, the sensors could also trigger in-pavement lights to turn on or for information to be sent to a traffic management center for dissemination through traveler information systems.

**REAL-WORD EXAMPLES:**

***Real-World Example* - Georgia I-75 Fog Sensors**

**Goal:** To improve traveler safety through areas subject to severe low-visibility conditions through the use of advanced warning messages and speed advisories.

**Technical Approach:** This system monitors visibility conditions as well as traffic patterns along a five-mile segment of roadway. When either type of condition or a combination of both reaches a series of predetermined thresholds, alerts are automatically posted at VMS located upstream from the site. These messages notify travelers of conditions ahead and provide speed advisories. At the same time, DOT and law enforcement personnel are notified of conditions at the site to aid decisions regarding road closures and identification of alternative routes.

**Current Status:** The system is currently fully deployed and operational. Testing has been underway since 1995 and is scheduled to be completed in 1998.

**Location:** This system is located along I-75 in southern Georgia. Due to the limited range of the visibility sensors, deployment activities tend to occur only on a site-specific basis. However, multiple sensors can be linked together to monitor conditions along a designated corridor.

**Agencies Involved:** The project is being led by Georgia DOT and Georgia Tech University.

**Cost Information:** No information is currently available on the system development and deployment costs.

**Key Contact:** Gary Gimmestad, Georgia Tech University. (404) 894-3419

**Timeline:** The system comprises mainly off-the-shelf technology, such as visibility sensors and VMS. Thus, similar systems could be assembled with little lead-in time. Additional site deployments have already been identified in Georgia.

***Real-World Example* - Visibility Sensors on I-64 in Virginia**

**Goal:** Ensure the safety of travelers on I-64 over Afton Mountain near the intersection of I-81.

**Technical Approach:** The VDOT has installed a weather sensor to detect low visibility conditions on I-64. The sensors are set up on either side of the road. One sensor sends a light to the other. When the intensity of the light reaches a certain threshold, the system triggers a number of in-pavement lights to turn on defining the edges of the I-64 roadway.

**Current Status:** The system has been operational for a number of years and currently used on a regular basis.

**Location:** Interstate 64 on Afton Mountain near the intersection of Interstate 81.

**Agencies Involved:** VDOT

**Cost Information:** Not available

**Key Contact:** Kevin Barron, VDOT, (804) 786-1278

**Timeline:** Not available

**BENEFITS/OPPORTUNITIES:**

- Improved safety on roads prone to white-out or foggy conditions
- Decrease in accidents on roadway
- Decrease in major accidents involving a pile-up of cars and trucks due to fog or white-out
- Favorable public perception of safety improvement schemes

**PROPOSED IMPLEMENTATION:**

***Step One:*** Determine and prioritize places where roads are prone to white-out or foggy conditions.

***Step Two:*** Research alternative sensors used to determine low-visibility conditions.

***Step Three:*** Procure automated visibility warning system components.

***Step Four:*** Install and evaluate.

**INSTITUTIONAL:**

The greatest benefit of utilizing this technology is the potential to decrease the risk of accidents to all motorists traveling these sensor-equipped roads. An automated visibility warning system requires little maintenance. The system would need to be checked periodically to ensure the sensors are calibrated and working properly. The liability associated with them, if they did not detect a white-out or foggy conditions, could be high.

**REFERENCES:**

Technology in Rural Transportation "Simple Solutions," FHWA, Publication No. FHWA-RD-108, October 1997.

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# TOOL: ANIMAL WARNING SYSTEM

**NEEDS:** Develop a system or device to prevent car-deer collisions in areas prone to animal accidents.

**DESCRIPTION:**

Animal/vehicle collisions are becoming more frequent. These crashes cause damage to the animal as well as the vehicles, and frequently result in the death of the animal and/or persons. Traditional solutions have included fencing and other barriers, deer whistles, providing grade separation between vehicles and animals crossing the corridor, roadside improvements, vegetation and biological management to control the feeding of animals within the corridor, and modifying driver behavior. However, there is the potential that technological solutions can prevent or reduce the number of animal/vehicle collisions.

Two potential technologies that hold promise for detecting the presence of animals in the roadway rights-of-way are microwave and infrared sensor (Macro-LIDAR) technologies. The first ITS approach to animal-vehicle crashes is a dynamic real-time signing system using an appropriate sensor technology to detect the presence of animals crossing into the rights-of-way, then activating an upstream flashing signal that warns travelers of the animal danger. The second ITS approach is an animal/vehicle collision avoidance system. This system combines either microwave or infrared sensing technology to form an electronic "beacon system" fence to detect the presence of an object. The sensors will then relay this detection signal to an upstream warning device (either a light emitting diode (LED) technology, dynamic/active signing, or a hybrid technology).

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Greater Yellowstone Rural ITS Priority Corridor Project**

Currently, there are no technology-based projects for animal/vehicle collision avoidance. However, Yellowstone National Park is studying two ITS-based solutions: Dynamic Real-Time Signing System and Animal/Vehicle Collision Avoidance Systems. The Dynamic Real-Time Signing System will utilize an appropriate sensor technology to detect the presence of animals crossing into the rights-of-way. The system then activates an upstream flashing signal that warns travelers of the animal danger. This system will be deployed in areas where documented migration routes exist and where there is a history of animal/vehicle crashes. This system will provide benefits through utilizing existing technology and information displays that will not violate the rural driver's expectancy.

The Animal/Vehicle Collision Avoidance Systems will utilize either microwave or infrared sensing technology to form an electronic Abeacon System fence. The Abeacon System fence will consist of sensing technology designed to be adaptable to existing roadway delineation posts. The sensing technology will detect the presence of an object as it enters predefined limits determined by the detection fence. The sensors will then relay this detection signal to an upstream warning device to advise the traveler of the animal presence. The warning device will either be LED technology,

dynamic/active signing, or a hybrid technology. After a specified amount of time with no presence sensed within the detection limits, the warning device is deactivated.

**BENEFITS/OPPORTUNITIES:**

- Decreased incidents of animal/vehicle accidents
- Reduced property damage costs
- Decreased human deaths
- Decreased animal deaths.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Establish funding to address concentrated animal/vehicle accident areas

***Step Two:*** Determine concentrated animal/vehicle accident areas and identify critical transportation corridors for animal/vehicle accidents

***Step Three:*** Identify and focus on acceptable solutions/ technology alternatives

***Step Four:*** Establish specifications, design methods, installation standards, and a maintenance program for solution technologies

***Step Five:*** Confirm funding source(s).

**INSTITUTIONAL:**

Currently, animal warning systems are only being studied and liability issues associated with such a technology have not been identified. Potential users will include municipalities that have a high rate of animal/vehicle accidents.

**REFERENCES:**

"Animal-Vehicle Countermeasures: An Intelligent Solution," paper presented at ITS America Annual Meeting, Detroit, May 1998, Matt Ulberg and Steve Albert, Western Transportation Institute, Montana State University-Bozeman.

# TOOL: PORTABLE SPEED WARNING SYSTEM

**NEEDS:** Utilize a speed warning system that can be moved from site to site to deter speeders on various roads.

**DESCRIPTION:**

Police departments throughout the US are using portable speed warning systems to slow drivers on roads. Portable speed warning systems use a two-digit variable message sign, radar gun, computer, and generator to run the system. In most cases, the system is taken to a site that has seen a high number of speeders or is requested by community residents. Portable speed warning systems operate off of solar power and require minimal operations and maintenance work. The unit is placed in the general direction of on-coming traffic with the radar gun mounted inside the unit. The system determines a vehicles speed with the radar gun and displays the current speed, in real-time, and also stores the speeds in a computer for further analysis.

Recently, portable speed warning systems have been developed that will determine a vehicles speed, take a picture of the vehicles license plate, and then issue a citation if the vehicle is speeding in excess of a certain threshold.

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Leesburg SMART**

**Goal:** Slow drivers in residential areas.

**Technical Approach:** SMART, Speed Monitoring Awareness Radar Trailer, utilizes a KR10SP microwave radar gun that is installed within the trailer housing. Also installed is a palm-top PC and speed display. The system has the capability to determines the speed of a passing vehicle and to display and/or store the speed in the palm-top PC.

The Leesburg Police Department uses SMART in three different operations:

1. Speed Awareness - The system displays the speed and records the speeds on the palm-top PC for further analysis.
2. Speed Monitoring - The display is turned off and the system records the speeds on the palm-top PC for further analysis.
3. Enforcement - The system displays the speed, records the speeds on the palm-top PC, and an officer is on-site to issues speed violations.

**Current Status:** SMART is operational and is used on a daily basis.

**Location:** SMART is setup on various streets throughout the Town of Leesburg. Residents may call the Leesburg Police Department to request SMART be set up on their street.

**Agencies Involved:** Leesburg Police Department

**Cost information:** $15,000 for each trailer

**Contact:** Ofc. Bruce Wolf, Leesburg Police Department, 65 Plaza St. NE, Leesburg, VA 20176, (703) 771-4503.

**BENEFITS/OPPORTUNITIES:**

- Community residents see the system as pro-active
- Reduce speed of vehicles
- Data collection device

**PROPOSED IMPLEMENTATION:**

***Step One:*** Determine and prioritize possible lactations for speed warning systems.

***Step Two:*** Obtain funding for speed warning system.

***Step Three:*** Purchase speed warning systems.

**INSTITUTIONAL:**

Many jurisdictions are currently using speed warning systems to deter speeders. This type of speed warning system has minimal institutional issues. In fact, most communities welcome the units in their neighborhoods. The portable speed warning system will need to be calibrated on a regular basis and when in operation not cause a hindrance to traffic.

# TOOL: DYNAMIC IN-VEHICLE ALERT SYSTEM

**NEEDS:** A number of agencies indicated the need for a dynamic system to warn drivers if emergency vehicles are present or they are within a work zone. The system would need to be readily available within vehicles and have a relatively low infrastructure cost.

**DESCRIPTION:**

A dynamic in-vehicle alert system utilizes a piece of the radio spectrum, the K band, to send warnings to drivers. A transmitter is installed on official vehicles, such as ambulances, emergency vehicles, construction vehicles, and fire and rescue vehicles that sends out a signal which is picked up by a receiver. The receiver is a radar detector, used extensively in 49 states (radar detectors are illegal to use in the Commonwealth of Virginia), that has been enhanced with the capability to receive emergency warnings. The transmitters have the capability to send out a variety of signals that can be interpreted by the receiver to display various messages to the driver. The transmitter warns drivers of fast approaching emergency vehicles, emergency vehicles that are stopped along the roadside, construction zones, snow plows, railroad crossings, school buses, etc. The dynamic in-vehicle alert system is not limited to vehicle-to-vehicle communication. Transmitters can be integrated with other technologies, such as visibility warning systems and animal warning systems, to warn drivers of these potential hazards.

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Safety Alert Traffic Warning System**

**Goal:** Increase roadway safety and reduce accidents by providing early warning of oncoming high-speed emergency vehicles and trains as well as stationary roadside hazards.

**Technical Approach:** Cobra Electronics' Safety Alert System utilizes a transmitter and receiver. The transmitter is activated when the emergency lights on an ambulance, police vehicle or fire truck are turned on. The transmitter sends out a signal that is received by the receiver, which is a standard radar detector that has been enhanced to interpret the various signals. The receiver then presents the information, depending on the type of unit, either visually through a series of lights or via an LCD.

**Current Status:** 2,000 Safety Alert transmitters are currently in use in all 50 states. Cobra is looking to further promotes its use throughout the US and Canada.

**Location:** US

**Agencies Involved:** Cobra Electronics designed, builds and markets the system.

**Cost Information**: Transmitter $349. Intelligent Radar Detector $69 to $249.

**Key Contact:** Jackie Zanfardino, Marketing Director, Cobra Electronics (773) 804-6244

**Timeline:** N/A

**BENEFITS AND OPPORTUNITIES:**

- A dynamic in-vehicle safety alert system uses an infrastructure that is currently in place and that does not require the installation of expensive communications systems
- The infrastructure that is needed is extremely inexpensive compared to other ITS projects
- The system provides adequate information in a small package
- The system can be combined to provide more than notification of vehicles on the highway.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Determine the information that needs to be disseminated to drivers

***Step Two:*** Determine the number of transmitters that will need to be installed in various vehicles

***Step Three:*** Conduct a marketing program to inform drivers of the new system

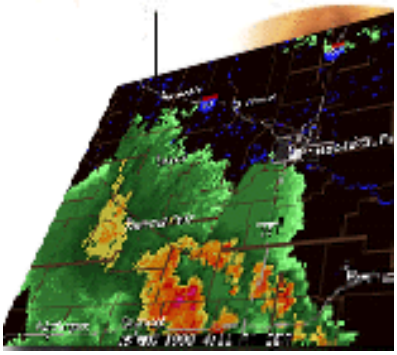
***Step Four:*** Install a portion of the transmitters and determine the usefulness of the system

***Step Five:*** Based upon the findings, install the entire system.

**INSTITUTIONAL:**

A dynamic in-vehicle alert system, in this configuration, is a simple and inexpensive way to inform drivers of situations on the highway that they need to pay attention to. The underlying infrastructure uses a transmitter purchased by the agency and a reader unit purchased by the user. Both are inexpensive and readily available. Installation of the transmitters is simple, requiring a connection to the vehicle's emergency lights and to the battery for power. Maintenance is minimal and is confined to the transmitters. The receivers are maintained by the driver.

# ROAD/WEATHER INFORMATION SYSTEMS



## RWIS

### Smart Plows/Agency Vehicle Monitoring

### Automated Anti-/De-Icing Capabilities

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# TOOL: ROAD/WEATHER INFORMATION SYSTEMS (RWIS)

**NEEDS:** Stakeholders want a road/weather information notification system that provides the following:

- Information on road and weather conditions
- Early notifications to alert authorities and travelers of inclement weather (i.e. black ice, flash flooding, snow chain requirements, fog)
- Access to the most recent weather predictions

**DESCRIPTION:**

RWIS allows for greater knowledge by operations and maintenance personnel of real-time existing conditions at remote locations. RWIS components include:

- Remote sensors that can measure precipitation, temperature, wind speed, and humidity
- Communications that can transmit weather and roadway data to regional and central hubs
- Decision support systems that allow DOT personnel to respond to field conditions.

The incorporation of RWIS data with National Weather Service information, weather modeling capabilities and other environmental data sources allows the DOT to be better prepared for all types of extreme weather conditions. RWIS can be utilized in conjunction with traveler information systems, and variable speed limit technologies to provide current information to travelers doing pre-trip planning and via VMS en-route.

**REAL-WORLD EXAMPLES:**

***Real-World Example* - Aurora Consortium**

**Goal:** To bring together the knowledge and skills of public agency RWIS stakeholders and experts with the aim of performing collaborative research and development, and to learn from each other's experiences in implementing and operating RWIS technologies.

**Technical Approach:** Aurora is a consortium of organizations contributing their expertise in RWIS applications for information sharing and technology development. The application of road and weather information to the transportation system is a global concern, with members attending Aurora meetings from several countries. Since its initial conception, Aurora has embarked on several key initiatives. Each reflects the member agencies' overall interests and, taken together, represent a varied and balanced program. Projects currently underway within Aurora include:

- Expert systems for decision support
- RWIS communications standards
- Automated low visibility detection
- Adaptation of the Local Climatological Model

- Institutional issues committee
- Standardized weather and road condition information presentation.

In 1999, additional projects are being launched in the following categories:

- Meso-scale numerical modeling for road transportation information systems
- Standardized testing methodology
- SICOP leverage opportunities.

**Current Status:** Ongoing project development.

**Location:** Aurora projects, field tests and demonstrations are occurring globally.

**Agencies Involved:** Current members and participants in Aurora include: Environment Canada; Iowa DOT; Minnesota DOT; Ontario Ministry of Transportation; South Dakota DOT; and Swedish National Road Administration.

Aurora also works closely with research organizations teamed with member agencies, including the University of North Dakota (UND), and the University of Gothenberg in Sweden. Agencies who participate as observers include NYSDOT, North Dakota DOT, and the US National Oceanic and Atmospheric Administration Forecast Systems Laboratory. The US Federal Highway Administration (FHWA) also supports Aurora as an observer. Both national and regional FHWA personnel provide input to the program.

**Cost Information:** Aurora utilizes Federal-aid research and development funds without state matching, using 100 percent SP&R funding.

**Contact:** Mark Wikelius, Chair, Aurora Executive Board, Mn/DOT, (612) 296-1103.

**Estimated Cost:** Determined on a project by project basis.

**Timeline:** Ongoing.

***Real-World Example* - FORTELL**

**Goal:** Create a self-sustaining road and weather information system fully integrated within a wider basket of ITS services, enhancing safety and facilitating travel throughout North America.

**Technical Approach:** Utilize state-of-the-art National Weather Service data sources, models and technical/human resources to provide basic nowcasts and forecasts and linking this energy balance

models for pavement condition forecasting, greater detail for weather and road condition information than is currently available.

**Current Status:** System is currently concentrating on the Upper Mississippi Valley region. User needs definition and initial system architecture work has been completed. System development is nearing completion with the system anticipated to begin testing and operations during the winter of 1998-99.

**Location:** Upper Mississippi Valley, with expansion to a continent-wide system within 5 years.

**Agencies Involved:** Iowa DOT, Missouri DOT, Wisconsin DOT, Illinois DOT, Minnesota DOT, FHWA, National Weather Service, Forecasts Systems Lab, National Center for Atmospheric Research, Castle Rock Services.

**Cost Information:** $4.45 million using funds and in-kind matches from federal, state and private participants.

**Contact:** John Whited, Iowa DOT, (515) 239-1411 and Peter Davies, Castle Rock Services, (303) 444-4344

**PROPOSED IMPLEMENTATION:**

***Step One:*** Develop a statewide TAC that includes the NYSDOT Aurora representative for technology transfer from the Aurora consortium to the TAC.

***Step Two:*** Determine RWIS needs in New York and best possible test sites for the aspects of RWIS that are of highest priority.

***Step Three:*** Issue an RFP for Partners to determine private industry interest and to solicit extra innovative funding sources.

***Step Four:*** Outline strategic plan for test sites and schedule TAC meetings for routine updates on project status.

***Step Five:*** Document test results and publish findings. For outreach purposes, submit RWIS white paper for publication and potential speaking engagements at national and international ITS meetings.

***Step Six:*** Develop international relationships for information sharing across all state borders and with Canada.

**INSTITUTIONAL:**

RWIS project deployment requires significant training to enable effective usage of the system and equipment maintenance. Agencies must also decide how much of the RWIS information should be made available to the public in real-time.

# TOOL: SMART PLOWS/AGENCY VEHICLE MONITORING

**NEEDS:** Much of rural New York receives varying amounts of snow and ice during the winter months. Identifying the necessary amounts of chemicals to apply to the road surface is difficult from a central location since conditions will vary throughout the regions. Transferring the road condition monitoring to the truck that is in the field can ensure that the proper amount of chemical is applied.

**DESCRIPTION:**

ITS can be used to assist with monitoring agency vehicles during maintenance activities and with monitoring the activities that occur on the vehicle (e.g., determining the amount of chemicals applied to each lane; ensuring that the amount of chemicals applied is appropriate to the road surface conditions; and determining the location of each vehicle in real-time). Smart Plows can be equipped with location technologies, vehicle status monitoring (plow up/down, rate of chemical application) and communicated back to a central management point. Additionally, vehicle-mounted sensors can detect the conditions of the road surface, and apply the appropriate amount of chemicals or sand to treat the condition of the roadway.

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Advanced Technologies Highway Maintenance Vehicle**

**Goal:** The vision for the highway maintenance concept vehicle is to improve the level of service of snow and ice control based on collection and application of better highway, vehicle, and materials distribution information through the use of advanced technologies.

**Technical Approach:** Research is underway supported through a consortium of three snowbelt states: Iowa, Michigan and Minnesota. The research solutions are focused in four areas: pavement surface snow and ice control (plowing and de-icing), fleet utilization (AVL and communications), on-vehicle materials management (combining roadway surface information with onboard inventory systems), and equipment management (onboard engine diagnostics).

The project is broken into three phases. The first phase focused on describing the desirable functions of a concept maintenance vehicle and evaluating its feasibility. Phase II will include the development, operation, and evaluation of prototype winter maintenance vehicles. Phase III is envisioned to be a comprehensive fleet evaluation of prototype winter maintenance vehicles.

**Current Status:** Phase I is complete. Three concept vehicles have been defined, established, and assembled for Phase II, operations. Phase II is underway. 1996/97 was spent developing the concept vehicles for Phase II. Due to an unseasonably warm winter in 1997/98, Phase II of the evaluation of vehicles has been delayed. Phase III operations and fleet evaluation is hoped to be concluded after the winter of 1998/99.

**Location:** Prototype vehicles are being tested in each of the three member states, Iowa, Michigan, and Minnesota.

**Agencies Involved:** Initial membership in this consortium: State Departments of Transportation for Iowa, Michigan, and Minnesota; and the Iowa State University Center for Transportation Research and Education. Other public sector participants and observers include FHWA, other state transportation departments, public works agencies, and representatives of local government agencies. Potential private sector participants: vehicle manufacturers, vehicle component manufacturers, onboard vehicle tracking and communications manufacturers, and technology manufacturers and integrators.

**Cost Information:** Per-state costs range from approximately $200,000 to $225,000. The final budgeted costs for three states is approximately $650,000.

**Key Contacts:** Duane Smith, Center for Transportation Research and Education, Iowa State University (515) 294-8103

**Timeline:** Phase I was completed successfully. Phase II funding was secured for three concept vehicles and the vehicles were developed. Phase II testing is still underway.

**BENEFITS/OPPORTUNITIES:**

Benefits include:

- Improved motorists and operator safety.
- Allows equipment operations and fleet managers to make more informed and cost-effective decisions.
- Better facilitation of the management of vehicle maintenance tasks.
- Reduced snow and ice control costs.
- Current road surface conditions available at control center.
- Better able to respond to customer inquiries.
- Improved customer service.
- Provides continuous visibility of fleet operations.
- Reduces vehicle life-cycle cost.
- Better management of de-icing and anti-icing materials.
- Provides better control of maintenance labor.

Combining AVL technologies with route optimization software can assist with appropriate and uniform plowing practices and allow real-time modification of routes to meet current demands and priorities. Also, AVL technologies can be used throughout the year on maintenance vehicles. This will assist with scheduling work load and in determining the location of the appropriate vehicles to promptly respond to customers' requests for action.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Identify and secure funding

***Step Two:*** Document need by area or region of the state.

***Step Three:*** Prioritize deployment of Smart Plows where need is greatest. This can be in areas where chemical and sand usage is greatest, where replowing is often necessary, and areas with known variations in road conditions, necessitating different levels of application.

***Step Four:*** Procure the Smart Plow technologies or vehicles equipped with the technologies.

***Step Five:*** Train the maintenance crew on use and maintenance of the vehicles.

**INSTITUTIONAL:**

Increasing the complexity of the technologies installed on maintenance vehicles will require additional maintenance capabilities. Additional institutional issues may arise where winter maintenance activities utilize contractors. Liability issues associated with winter maintenance remain relatively unchanged unless use of technology results in noncoverage of dangerous conditions that would have otherwise been covered.

**REFERENCES:**

Virginia Department of Transportation, Northern Virginia District Automated Vehicle Locations System Pilot Project, Ronald P. Minor, 1998.

Advanced Technologies Highway Maintenance Vehicle, Smithson et al; presented at Rural ITS National Conference, September, 1995.

Concept Highway Maintenance Vehicle Final Report: Phase One, Smite, Simondynes, and Monsere, Center for Transportation Research and Education, March 1997.

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# TOOL: AUTOMATED ANTI-/DE-ICING CAPABILITIES

**NEEDS:** Stakeholders indicated a need for automated ice detection and de-icing capabilities at remote locations such as bridges and known icy areas.

**DESCRIPTION:**

Rural areas, especially in the north and midwest, face the daunting task of ensuring that heavily traveled roadways are safe to drive on. Further adding to this is the large geographic scope in which many DOT agencies operate. Also, bridges, including overpasses, underpasses, and exit lanes, tend to freeze faster than the heavily-traveled mainline sections of the roadway without structures. Trying to get snowploughs with de-icing chemicals to certain locations may take hours. The ability to remotely monitor and activate de-icing equipment would benefit both motorists and the DOT through improved safety and reductions in maintenance costs. An automatic de-icing system would add to this, by not requiring a person to continually monitor numerous locations during inclement weather. The road/weather sensors could activate the de-icing system utilizing de-icing chemicals and/or roadway heating technology before actual ice development. The automated de-icing system would be integrated with traffic management centers located throughout the areas. The system would have the capability to be installed at various locations as funding became available or hazardous areas were identified.

**REAL-WORD EXAMPLES:**

***Real-World Example - Utah DOT De-Icing Project I-215***

**Goal:** The goal of this NCHRP-Idea project is to enable remote application of anti- and de-icing fluids to an underpass.

**Technical Approach:** This system uses a variety of atmospheric and pavement sensors to detect when anti- and de-icing fluids should be applied to an underpass. The application is performed automatically when required using spray equipment mounted on the bridge parapet above. The system reports to maintenance personnel when fluids have been applied. Maintenance personnel can call into the system using cell-phones to override the sensors and activate the fluid application. It is also possible to call into the system to monitor its current status and to obtain readings from the sensors.

**Current Status:** The hardware was installed in the fall of 1996 for system pilot testing during the 1996-1997 winter season.

**Location:** The system is being tested on an underpass on I-215 in Utah.

**Agencies Involved:** Utah DOT Maintenance Planning Region 2, FHWA, University of Utah

**Cost Information:** The cost of the system hardware is between $20,000 and $25,000.

**Key Contact:** Doug Anderson, UDOT Research. (801) 965-4377

**Timeline:** This one-year project was completed in mid-1997. Plans for implementation will be based on the results available at that time.

***Real-World Example* - Oklahoma Turnpike Authority (I-44 Bridge)**

**Goal:** The goal of this project is to fit a newly re-decked bridge with technology that heats the structure at the appropriate time utilizing ground source heat. This system ties into their existing weather and monitoring forecast system.

**Technical Approach:** This bridge deck heating system will tie into Oklahoma's current weather monitoring and forecast system. The current system consists of 114 statewide monitoring stations which transmit data such as temperature, humidity, wind speed and direction to a central location. These data, accompanied by National Weather Forecasts, are fed into software which decides when to activate the bridge heating system. Warm air from the ground is pumped from more than 100 bore holes, each at approximately 200 feet deep. This heat is transferred to a heat absorbing liquid and circulated through a system of tubes embedded in the bridge deck.

**Current Status:** Construction on this structure took place in 1997.

**Location:** The system is being tested on a bridge on Interstate 44 near Chickasha.

**Agencies Involved:** Oklahoma Turnpike, Oklahoma State University, Oklahoma Department of Transportation.

**Cost Information:** The cost of the heating system is $200,000.

**Key Contact:** Not available

**Timeline:** Not available

**BENEFITS/OPPORTUNITIES:**

- Reduced icy conditions provide greater control of vehicle resulting in less risk of accident
- Improved safety around dangerous grade-separate interchanges
- Reduce the number of accidents on icy portions of roadway
- Ability to monitor and remotely apply de-icing chemicals
- Ability to apply de-icing chemicals before ice forms

- Decreased number of incidents to tie-up roadway, decreasing travel time
- Greater number of rescue and emergency personnel available
- Reduce cost by eliminating necessity for maintenance personnel to visually inspect road conditions during cold/icy conditions

Automated de-icing equipment has the potential to be extremely useful in remote areas which are difficult to reach, or are a long way from the nearest maintenance depot. In 1960s, electric heating elements were used but did not perform well. Wyoming has used ground source heating with success but ceased for economic reasons. Texas Department of Transportation installed a similar system on twin bridges in the Amarillo district in the summer of 1996 and one year later was very happy with the $900,000 system.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Determine the feasibility of installing an automated de-icing system.

***Step Two:*** Determine the locations where automated de-icing equipment would be needed

***Step Three:*** Prioritize the locations determined in step two.

***Step Four:*** Install automated de-icing equipment at one location for beta testing to prove effectiveness of system

***Step Five:*** Schedule a controlled installation of equipment at predetermined locations

***Step Six:*** Integrate automated de-icing equipment with traffic management center to receive data on road conditions

**INSTITUTIONAL:**

NYSDOT would likely install automated de-icing equipment based on analysis of hazardous interchanges. The system would be administered through a regional DOT office, controlled through a traffic management center and maintained within a local maintenance office. Override capabilities would be installed to allow DOT personnel apply de-icing chemicals even though the sensors do not detect any icing at the time. There are some liability issues associated with the automated de-icing technologies, including that of DOT personnel not physically inspecting a site to determine if ice is present. Instead, the DOT personnel will rely on the sensors which may fail, malfunction or provide incorrect information.

**REFERENCES:**

Technology in Rural Transportation “Simple Solutions,” FHWA, Publication No. FHWA-RD-108, October 1997.

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# DETECTION / MAYDAY SERVICES

**Mayday System**

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# TOOL: MAYDAY SYSTEM

**NEEDS:** Provide an emergency notification that will provide the following:

- Reduced accident response time in remote areas
- Advanced ability to utilize AVL and GIS to locate wireless callers
- Enhanced emergency management through integration of technologies and coordination among emergency service providers.

**DESCRIPTION:**

Mayday refers to systems that can notify a response center in case of breakdown or accident, often utilizing GPS location technology to automatically identify the location of the vehicle. The Mayday system utilizes wireless communications from vehicle to call center and units and can be activated manually or automatically. An enhanced Mayday system can detect and transmit crash information to a call center who in turn contact the appropriate response organization (fire, ambulance, police) and provides them with vehicle location data.

Response providers find themselves constantly battling the "golden hour" of time that is the target for delivering victims to proper hospital facilities. Essentially, three time factors are relevant:

1. The time it takes stranded or injured travelers to establish communications with a public service answering point, and relay a request for help.
2. The time it takes dispatchers and response personnel to learn the location, nature of injuries, and number of victims involved, either from the motorist involved or from other means.
3. The time it takes for response personnel to reach the motorist with the proper equipment (i.e., able to treat and transport all victims appropriately).

Emergency response times associated with these three time factors average 52.4 minutes in rural environments, and 34.9 minutes in urban environments. Responding to severe accidents within one hour can significantly reduce fatalities.

**REAL-WORLD EXAMPLES:**

***Real-World Example* - the Multi-jurisdictional Mayday (MJM) Committee**

**Goal:** MJM was formed to link a number of geographically separate, and technologically different Mayday operational tests.

**Technical Approach:** In 1995, under the ENTERPRISE MJM committee banner, the foundation was set for a public-public partnership that initially linked Mayday operational tests occurring in the states of Washington, Colorado, Minnesota and New York. MJM membership has since grown to

include FHWA, NHTSA, the I-95 Corridor Coalition Mayday Study Group and the Dutch Ministry of Transport, Rijkswaterstaat.

The MJM committee took on the task of defining a common set of Mayday functional requirements. MJM has served as a public sector "voice" at Mayday architecture and standards meetings, and as a liaison between the public sector and the numerous private sector/commercialized Mayday systems.

MJM was formed to educate public agencies interested in the Mayday concept, and allow vendors of Mayday products and services to hear feedback from such agencies. MJM has developed a clear understanding of the needs of various Mayday clients. It has defined a comprehensive set of functional requirements for Mayday products and services, and has helped surface concerns dealing with Mayday product and service liability and marketing.

MJM has provided various organizations with direct hands-on Mayday experiences through interaction and information exchange with public agencies and private companies performing Mayday tests and/or offering Mayday products and services. Additionally, MJM has provided the opportunity for several partners to participate in the development and completion of various group objectives, including:

- Influencing the scope and objectives of future Mayday activities, and raising the awareness of others through outreach
- Contributing to the evolution of Mayday activities by providing input to standards and architecture development processes
- Shaping future private sector efforts based on public-initiated project experience.

**Current Status:** Ongoing

**Location:** Throughout member states.

**Agencies Involved:** ENTERPRISE, MJM Committee members, with the lead provided by the Mn/DOT.

**Cost Information:** $30,000/annually

**Key Contact:** Ginny Crowson, Project Manager, Mn/DOT, (612) 282-2115

**Timeline:** 1995 to date.

***Real-World Example* - Colorado Department of Transportation Mayday Project**

**Goal:** To implement and evaluate a low-cost personal security system that allows users to request roadside assistance via an automated system that provides the responding party with detailed information on location and type of assistance required; and to identify the necessary structure, responsibilities and service levels of a traveler assistance center necessary to commercially operate such a system, and to hand over the operational test system to such center at the conclusion of the project.

**Technical Approach:** The federally-funded Colorado Mayday Project was headed by the ENTERPRISE group, and managed by the Colorado DOT. The Colorado Mayday project incorporated communications between a Mayday control center and in-vehicle devices to provide a safe motoring experience. The two-way communications link can transmit request information to the control center and receive confirmation messages from the control center. The Mayday control center receives all the emergency assistance requests originating from the in-vehicle units. The requests are processed identifying the vehicle location and type of assistance required. The control center routes the request to the appropriate response agency and notifies the motorist of the action taken and the anticipated response time. The in-vehicle unit houses the TIDGET low-cost location device which provides the GPS data from which the vehicle position can be derived; the button box used to operate the system and request assistance; and the interface equipment used to control the communications system.

The results of this operational test demonstrated that the technical capabilities exist to communicate location and vehicle identification data from vehicles to primary answering points. The project has documented results in the following areas:

- Creating the organizational infrastructure needed to coordinate the Mayday-related activities of many agencies, both public and private
- Defining a system architecture that incorporated standard communications links between Mayday control centers and vehicles
- Marketability of Mayday products and services based on consumer reaction to reliability, availability and product cost.

**Current Status:** Preparing final report

**Location:** Throughout Colorado.

**Agencies Involved:** The Colorado Mayday project was headed by the ENTERPRISE group, whose members included eight states - including Colorado - one Canadian province, Transport Canada and the Dutch Ministry of Transport. The Colorado State Patrol also participated as a public sector partner. Private sector partners included Navsys, ESRI, CellularOne, Inc. and Castle Rock Consultants.

**Cost Information:** Not available

**Key Contact:** Neil Lacey, ITS System Implementation Specialist, (303) 757-9971

**Estimated Cost:** $3 million, with an 80% match of federal funds

**Timeline:** December 1994 to date (currently preparing final report)

***Real-World Example* - Minnesota Mayday Plus**

**Goal:** To implement a system that will evolve into scalable deployment; and identify and resolve institutional issues that surround Mayday implementation.

**Technical Approach:** In 1995, Mn/DOT conceptualized and later evaluated its Mayday Plus project through a unique public-private effort to develop and test an emergency response infrastructure throughout 11 counties in southeastern Minnesota. Project goals are to:

- Enrich information made available to emergency service providers so as to reduce the time taken to reach emergency situations
- Explore innovative public-private financial operations for self-sustaining operation
- To promote expansion of the Mayday Plus automated accident location and collision severity notification system beyond the 11-county test area.

Mayday Plus integrates global positioning, in-vehicle sensors, digital and cellular phone technology. Minnesota Guidestar's development of the Mayday Plus emergency notification and response system is currently being implemented in the Rochester, Minnesota area. Once implemented, this system will offer stranded motorists in the southeast corner of Minnesota a lifeline to the Minnesota State Patrol dispatch center.

**Current Status:** The project is being evaluated on the following areas: the level of need for and effectiveness of the infrastructure developed through Mayday Plus. As part of this, market research is also being conducted with travelers, commercial trucking, law enforcement and medical communities to measure their reaction to, knowledge of, and preparedness for Mayday systems.

**Location:** In and around Rochester, MN.

**Agencies Involved:** This project brings together several agencies who have a stake in Mayday interests in the form of a public/private partnership. These are: Mn/DOT, Minnesota State Patrol MSP, Mayo Clinic, Gold Cross Ambulance, and Calspan SRL Corporation. This project provided considerable insight into the needs of medical response agencies and law enforcement response agencies as they relate to Mayday. Secondary partners include the American Automobile and

Trucking Associations, Cellular 2000, Ford Rescue and General Motors, and satellite communications and technology companies.

**Cost Information:** Not available

**Key Contact:** Ginny Crowson, Project Manager, (612) 282-2115

**Estimated Cost:** $2.5 million

**Timeline:** 1996 to date.

**BENEFITS AND OPPORTUNITIES:**

- Identification of location of traveler in need of assistance
- Communication of crash information to emergency response providers to enable most appropriate response team and equipment
- Reduced fatalities
- Reduced incident impacts
- More efficient use of emergency response resources.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Develop a TAC of stakeholders in emergency management, state agencies, and the DOT. During the first meeting the TAC can review the proposed method for identifying the existing and future needs for Mayday systems operated by NYSDOT, and for determining specific project expectations.

***Step Two:*** Conduct a survey of highway users and emergency service providers. Develop an understanding of the needs, responsibilities and coordination issues of the user communities where the Mayday system is proposed to be deployed, in order to ensure that any Mayday application that results improves the situation for all parties involved.

***Step Three:*** Review Mayday experiences of other DOTs and Departments of Public Safety in order to document approaches and options for the NYSDOT rural deployment of a Mayday system. Nationwide Mayday-related activities will be documented, as well as the local situations that surround each project.

***Step Four:*** Review of available and emerging technologies likely to have an impact on Mayday deployment with a state-of-the-art summary of technology options.

***Step Five:*** Coordinate the results garnered from previous steps and integrate with existing NYSDOT ITS planning initiatives. By considering all ITS deployments throughout the state, Mayday implementations can be prioritized for specific areas that would

benefit most initially, with a phased-in approach for statewide roll-out of a comprehensive and seamless Mayday system.

***Step Six:*** Incorporate lessons learned from previous Mayday initiatives in New York and build on their successes through the development of a Mayday Pilot Implementation Plan

**INSTITUTIONAL:**

The State has the opportunity to provide a leadership role by initiating and facilitating multi-agency coordination and promoting participation by public and private emergency response organizations.

# TRANSIT


## Coordinated Rural Transit Service

## Automatic Vehicle Location on Agency Vehicles

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# TOOL: COORDINATED RURAL TRANSIT SERVICE

**NEEDS:** Stakeholders had concern about providing transit services for their rural communities. In addition, there is a need to provide a coordinated transit service with a central dispatching area.

**DESCRIPTION:**

The purpose of most advanced public transportation systems (APTS) in rural areas is to increase the mobility of the residents within the area. Rural public transportation systems can take many forms and involve many or a few advanced technologies. Types of APTS range from a paratransit or demand-responsive system to a fully-coordinated public transportation system that incorporates both fixed route as well as paratransit and combines the services with APTS technologies. Technologies that may be applied to rural transit systems may include:

**Demand-Responsive Transit Services:** These systems currently predominate in rural areas. Demand-responsive only systems typically have more vehicles than fixed-route only systems.

**Automatic Vehicle Location:** AVL systems measure real-time positions of vehicles using onboard computers, electronic tags and a positioning system (such as global positioning system, sign post, or dead-reckoning) and relay the information to a central location.

**Transit Operations Software:** Automates, streamlines, and integrates many transit functions and modes, including computer-aided dispatch, service monitoring, route planning, and supervisory control and data acquisition.

**Geographic Information System:** GIS is a computerized database management system in which databases are related to one another using a common set of location coordinates. GIS is used to display fleet and route data on a display map.

**Traveler Information:** When applied to rural transit, traveler information can take many forms, including pre-trip information, in-vehicle information, and in-terminal/wayside information.

**REAL-WORLD EXAMPLES:**

***Real-World Example* - ARTIC Transit AVL**

**Goal:** Minnesota's ARTIC project uses AVL technologies to allow a rural transit system to provide, among other things, real-time location and communications with buses.

**Technical Approach:** Through cooperative effort among agencies, the system tries to eliminate gaps or duplications in the communications systems, while enabling computerized reservation and scheduling services, improved response times to highway emergencies, and the combination of decentralized dispatch centers. Minnesota's ARTIC project has several different elements of AVL,

including real-time location and communications with buses. It can be used to locate buses, as well as reporting schedule adherence information, communications with buses via text messages, and tracks system efficiency.

**Location:** Virginia, Minnesota. 18,000 square miles; 3,000 miles of roadways. The area is almost exclusively rural, and has a high percentage of transit dependent citizens. Annual totals: Arrowhead Transit (3 yr. Avg - 1994, 95, 96) = 366,072 and the City of Virginia Dial-A-Ride (3 yr. avg. - 1994, 95, 96) = 58,060.

**Agencies Involved:** Arrowhead Transit, Mn/DOT, City of Virginia Dial-A-Ride, Minnesota State Patrol

**Cost Information:** The expected lifecycle of the Virginia system is more than five years for all components anticipated. The cost of the entire project was $1.542 M dollars with the FHWA providing $903,000 through ITS field operational test program funding. The majority of the remaining costs are being covered through Mn/DOT (Office of Transit and the Office of Advance Transportation Systems), with the cost breakdown as follows: Minnesota Guidestar, $265,000; Office of Transit, $125,000; Operations (in-kind salaries), $50,000; and Mn/DOT District 1, $150,000. The private sector (US West) is contributing: $17,000 in equipment and $32,000 in-kind salaries.

Design/Development: $500,000

Deployment: $15,000 per vehicle, $50,000 for training and system acceptance

At the commencement of the project, Mn/DOT felt they could get one vendor to do the entire project, but the major vendors responded that this would not be possible with the available funding of $1.5 M. The solution was to separate the costs out into three categories: radio / communications; transit reservation and scheduling; and AVL/mobile data display terminal. They realized a cost savings of about $100,000 by involving the Mn/DOT communications department in leading the radio/communications aspect of the system.

The agencies have built the cost of continuing the program into their current budgets. The operational test began in the fall of 1997 and will run for one year. Through ARTIC, the agencies have been able to consolidate three reservation centers and eliminate a staff position. The cost savings have resulted in the efficiencies created from implementation of the new technologies.

**Key Contact:** Dick Maddern, ITS Coordinator, (218) 749-7798 ext. 3804.

## *Real-World Example* - Multi-Service Provider Dynamic Dispatching System

**Goal:** To combine the separate transportation operations of a variety of providers in order to provide a more cost-effective and higher level of service to users.

**Technical Approach:** Various agencies, including a child development center, a counseling service, two senior centers, a youth home, and a nursing home originally combined their individual vehicle fleets and operations to form a single transit organization. A central dispatching center was created to handle requests for transportation from the clients of all these agencies. The center uses the "Rides Unlimited" dispatching system. The organization has 12 vehicles, and AVL equipment is fitted to all but two of these vehicles.

**Current Status:** The system has been operational for over six years. At the present time, the center now provides dispatching services for approximately 20 agencies.

**Location:** The Sweetwater County Transit Authority serves the rural county of Sweetwater, Wyoming. The county is roughly the size of Vermont, (over 10,000 square miles.)

**Agencies Involved:** Sweetwater County Transit Authority, Wyoming.

**Cost Information:** The system used in Sweetwater County originally cost around $15,000 for software supporting three workstations. The authority now runs seven workstations. The computers required to run the software are 486 PCs with upgraded memory. Various other comparable systems are on the market for around $10,000 to $15,000. However, the transit authority stressed that their biggest single cost was in training operators to utilize the software. They invested in a total of six weeks of on-site training and start-up support at a cost of approximately $15,000. Subsequent technical support is performed remotely by a technician dialing into the system via the PCAnywhere program at a cost of approximately $200 per PC. The operations and maintenance requires one technician 500 hours per year.

**Key Contact:** Cindy Johnson, Sweetwater County Transit Authority. (307) 382-7827

**Timeline:** The Transit Authority hopes to install a communications backbone and also to equip all vehicles with mobile data terminals in order to log rides and streamline payment for services using magnetic stripe cards. They also intend to increase provision of same-day service. At present around 14 percent of trips are provided on the same day they are requested.

**BENEFITS/OPPORTUNITIES:**

- Increased mobility and access to community services and businesses for seniors, younger travelers, and any citizens without access to a vehicle
- Increased sales and enlarged service area
- Decreased operating costs and increased efficiency of mobility services
- Improved quality of life and vitality in rural towns and communities.

Cellular technology could be utilized to accomplish the same results, however, constant communication with the driver regarding location could be distracting and expensive. Also, vans or

small buses that regularly travel into specific neighborhoods could also perform deliveries for local businesses.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Assess rural area's transportation service needs. Determine which transportation service providers or agencies might benefit from a coordinated public transportation service. Determine available funding or funding sources. Determine if there are any approvals that need to be in place to advance the proposed program.

***Step Two:*** Investigate the appropriate manner with which to meet the needs of the rural area. This may involve software procurement and/or issuing a RFP for professional services.

***Step Three:*** Move forward on meeting the needs of the rural area: secure funding and any approvals necessary; procure software; contract for professional services; and continue research.

**INSTITUTIONAL:**

This type of multi-agency system may be most effective in areas with a large elderly population, communities in which health care providers are long distances away from the majority of residents, or communities with numerous active agencies providing some form of ride assistance to non-driving members. A high level of cooperation and coordination among mobility service providers will be required for such a system to be a success.

**REFERENCES:**

Rural Public Transportation Technologies: User Needs and Applications, Prepared for FHWA and Federal Transit Administration by TransCore, 1998.

Technology in Rural Transportation "Simple Solutions," FHWA publication number FHWA-RD-97-108, October 1997.

Intelligent Transportation Infrastructure, US Department of Transportation publication number FHWA-JPO-96-0022.

Advanced Public Transportation Systems: The State of the Art Update '98, Federal Transit Administration publication number FTA-MA-26-7007-98-1.

# TOOL: AUTOMATIC VEHICLE LOCATION ON AGENCY VEHICLES

**NEEDS:** Utilize automatic vehicle location (AVL) technologies to track the location of agency vehicles, including snow plows, transit, maintenance, and police vehicles, in real-time.

**DESCRIPTION:**

The majority of AVL technologies use the GPS to pinpoint the location of various vehicles equipped with a GPS receiver. GPS is a free service provided by the US Government, which allows the use of a constellation of 24 satellites in orbit 10,900 miles above the earth. Vehicles with GPS receivers have their position determined by a space/time triangulation of three or more of the 24 satellites. AVL also incorporates a wireless communications system to communicate the vehicle location back to the control center. Some options for this communications link are the state's existing radio frequency system, cellular communications, cellular digital packet data (CDPD), or satellite communications. The goal of implementing AVL on agency vehicles is to track vehicle locations to incident sites for fleet management, for special applications such as salting and snow plowing, and to provide communications, both voice and data, between agency vehicles and dispatch centers. Combined with GIS software or mapping database, and road weather information systems, this technology can ensure the most cost-effective use of resources and deploy snow plows and de-icing materials to those areas most critically in need.

AVL has been utilized heavily in the commercial vehicle industry in fleet management and the US Government uses GPS regularly for the deployment of ships, airplanes and missiles. It should be noted that, in order to protect GPS from being used against the US, the US Government builds a degradation into the signal, resulting in less accurate location. However, depending upon the accuracy needed, agencies can also use differential GPS (DGPS) to gain extremely accurate locations for additional ongoing fees. Finally, in theory, the US Government can turn off the GPS signals at any time. The AVL system could also be used as traffic probes for improved traffic management and traffic information dissemination.

**REAL-WORD EXAMPLES:**

***Real-World Example* - Minnesota Advanced Rural Transportation Information and Coordination (ARTIC)**

**Goal:** To locate vehicles for improved fleet management of agency vehicles. The AVL component of ARTIC is part of the overall goal to coordinate and integrate the communication between various public agencies.

**Technical Approach:** GPS equipment is installed on fleet vehicles to allow for quick location identification and deployment. ARTIC also uses mobile data terminals (MDTs) for the ability to send data between the vehicle and dispatching center for increased communication capabilities.

**Current Status:** AVL and MDT are functional on 15 Mn/DOT vehicles, 4 Minnesota State Police vehicles, and 15 transit buses. An interface has been developed between the MDTs and the sand spreader control on the plow trucks to demonstrate downloading of spreader information to the communications center. The transit component is currently on hold.

**Location:** Minnesota District 8

**Agencies Involved:** MSP, Mn/DOT, Arrowhead Transit and City of Virginia

**Cost Information:** Total budget $1.8M; expenditures to date $1.5M. GPS equipment is currently available from multiple suppliers with costs ranging from $300 to $40,000.

**Key Contact:** Dick Maddern, District 8 Virginia, (218) 749-7793 ext. 3804, richard.maddern@dot.state.mn.us

**Timeline:** The operational test started in October 1997 and will run through September of 1998.

***Real-World Example* - VDOT Smart Plow**

**Goal:** To allow snowplow managers to better manage snow removal.

**Technical Approach:** Smart Plows utilize ITS technologies to detect snow vehicle's locations, detect the conditions of the road surface, and apply the appropriate amount of chemicals or sand to treat the condition of the roadway. In addition, they aid in the overall management and performance of snow removal and ice control maintenance operations.

The benefits anticipated from this system include:

- Continuous location of snowplow fleet operations
- Ability to identify vehicles with abnormal behavior
- Increase safety for the vehicle operator
- Ability to detect and minimize waste and fraud
- Ability to capture statistical data
- Improved communications efficiency.

**Current Status:** The AVL equipment has been installed on 80 vehicles. However, due to the mild winter Northern Virginia saw in 1998, no snow removal was necessary and thus the technologies could not be used nor evaluated. The system will be tested during the 1999 winter.

**Location:** Northern Virginia consisting of Arlington, Fairfax, Loudoun and Prince William Counties.

**Agencies Involved:** Virginia DOT

**Cost Information:** $850,000 est.

**Key Contact:** Kevin Barron, VDOT, (804) 786-1278

**Timeline:** August 1997 through July 1998. Due to limited snow removal during the mild 1998 winter season, the operational test will be extended to July 1999.

**BENEFITS/OPPORTUNITIES:**

- Better removal of snow from the roadway resulting in faster incident response and reduction in delays
- Improved safety on roadways during inclement weather. Quicker dispatching of emergency vehicles
- Ability to monitor agency vehicles in real-time. Optimize the dispatching of agency vehicles for numerous operations
- Reduction in travel time delays and increased supply of traffic information
- Favorable public perception of DOT.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Determine the extent of utilizing AVL
Enforcement vehicles
Emergency vehicles
Maintenance vehicles
Transit vehicles
Other agency vehicles

***Step Two:*** Identify what capabilities the system must have
Real-time tracking
Communication - data and voice
Determine if separate communication systems needed for data and text
Determine best method of communications (radio frequency, cellular, cellular digital packet data, satellite, etc.
Collecting and maintaining database of vehicle data
On-board monitoring

***Step Three:*** Identify other areas of connectivity

***Step Four:*** Research existing systems to enable utilization of proven software where possible. Using existing applications will greatly reduce the cost of installing a system.

***Step Five:*** Identify a partner to integrate the AVL system.

***Step Six:*** Install and evaluate.

**INSTITUTIONAL:**

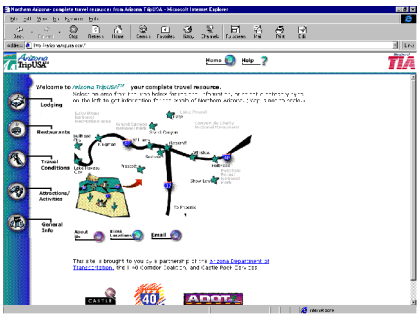
Implementing an AVL system will require at least one full-time agency person dedicated to the project as the system is designed and integrated. Likely participants include DOTs, police agencies, and transit. If other vehicles, such as police vehicles, are equipped, there may be issues pertaining to data access as well as vehicle whereabouts. As more agencies choose to participate, costs can be decreased as they are absorbed by more parties; however, greater coordination between these participating agencies will be necessary. The need to anticipate and identify institutional issues between multiple agencies may also arise as participation increases. There are very few liability issues with AVL.

**REFERENCES:**

Traffic Technology International, August/September 1997, Page 14.

Virginia Department of Transportation Northern Virginia District, Automated Vehicle Location System Pilot Project, December 1997**.**

# TRAVELER/TOURIST INFORMATION


**Highway Advisory Radio**

**Traveler Information using Telephones**

**Interactive Kiosks**

**Traveler Information on the Internet**

**Traveler Information using Personal Communication Devices**

**Traffic Cable TV Channel**

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# TOOL: HIGHWAY ADVISORY RADIO (HAR)

**NEEDS:** Stakeholders want the ability to disseminate traveler information, including emergency notices and work-zone information, through HAR. Also, there is a need for either a region or statewide HAR or dedicated highway advisory frequency. The information to be disseminated includes:

- Special event and parking
- Road closures and detours
- Inclement weather conditions
- Alternative routes in known congested areas
- Trail information.

**DESCRIPTION:**

HAR systems have been used by many DOTs throughout the US and have provided valuable information to system users. Many HAR systems use recorded information on traffic conditions and tourist-related activities to users in a limited geographical area over AM and FM frequency; new recordings are made when conditions change sufficiently. Some systems provide the capability to remotely switch between alternative messages. These systems are best deployed to meet the needs of users in tourist or work-zone areas where the information provided is more predictable and requires less interface on behalf of the operating agency. Information signs alerting users to the service should provide for identifying whether the service is operational. As with VMS, users can become desensitized to the medium if information is not kept up to date or incorrect information is broadcast. HAR systems can be deployed in the near-term to meet the needs for work-zone and tourist-related information. In the medium-term, enhanced HAR systems are possible that link together several successive HAR towers in order to deliver a continuous message to travelers as they traverse through the ranges of several HAR towers. The primary advantage of HAR is that it reaches travelers using a device they already have in their vehicle: the radio. Most HAR stations broadcast at 10 watts or less, meaning their effective range is no more than a few miles. HAR can be on both AM and FM stations set aside for information, such as 87.9 FM or 530 AM.

**REAL-WORD EXAMPLES:**

The examples provided here describe both a basic application of HAR, and a more challenging partnership approach. This latter example may not currently be feasible in New York, however it serves as a good illustration of the types of future opportunity that may emerge.

***Real-World Example* - Washington State Highway Advisory Radio System**

**Goal:** Disseminate traffic information and emergency information.

**Technical Approach:** The State of Washington uses HAR to inform motorists of various traffic problems. The broadcast stations are used in temporary situations, such as road construction, and

in permanent locations, such as in advance of mountain passes. The low-power Washington HAR system usually transmits three to five miles depending on terrain. All HAR stations must be licensed through the FCC, however, most DOTs have a statewide license to cover all HAR stations.

Designs are off-the-shelf from various vendors depending on the requirements. Mobile units are portable and packaged according to specifications. They are not truck-mounted, but portable FEMA-box contained units that can be quickly deployed at the roadside. Washington uses the portable stations for work-zones. Complex HAR stations with remote text to voice recognition require more detailed site adaptation design.

**Current Status:** Over 100 permanent HAR sites have been installed. WSDOT currently has 12 portable HAR units available for various projects.

**Location:** Washington State

**Agencies Involved:** WSDOT

**Cost Information:** Not available.

**Key Contact:** WSDOT

**Timeline:** Installed over a number of years.

***Real-World Example* - Florida Traveler Information Network**

**Goal:** Provide emergency alerts and traveler information to Florida travelers through a cost effective public/private partnership.

**Technical Approach:** TIRN Broadcasting has contracted with Florida DOT to provide traveler information to Florida travelers in exchange for right-of-way access to erect large signs that say "Traveler Information Radio" and the particular radio frequency of the affiliate in the area. Under the partnership, Florida DOT gets one minute for every ten-minute segment to report traffic incidents, lane closures, work-zones, etc. During natural disasters and emergencies, Florida DOT has the authority to take over TIRN Broadcasting to disseminate emergency traveler information. TIRN Broadcasting is allowed to erect a total of 4,600 signs along Florida highways and sell four minutes of each ten-minute segment as commercials. The broadcasting will be similar to CNN Headline News where information is given at pre-determined times - traffic information at quarter-past, tourist information at half-past. Also, of the ten-minute block, four minutes will be local information and six minutes will be statewide information. TIRN Broadcasting will recoup their costs through selling the advertising space.

**Current Status:** A total of 19 commercial radio stations blanket the state of Florida. Two stations are operational in Orlando and Brevard County. Currently, 2,120 of the 4,600 signs have been installed. The operational test will last 18 months (until mid-1999).

**Location:** All limited access highways in the state of Florida

**Agencies Involved:** Florida DOT, TIRN Broadcasting

**Cost Information:** The Florida TIRN will be paid for entirely through private-sector funds. Commercial spots will cost $25 for 30 seconds and $45 for 60 seconds. Florida DOT does not control the cost of commercial spots.

**Key Contact:** Dick Kane, Florida DOT (850) 414-4590; Joe Gettys, TIRN Broadcasting (407) 481-0551

**Timeline:** August 1997 through August 1999

**BENEFITS/OPPORTUNITIES:**

- Easy access to statewide traveler information
- Promotion of community events and attractions
- Provide reliable traveler information to the most number of people with minimal cost
- Favorable public perception of DOT.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Identify areas in need of traveler information.

***Step Two:*** Determine what type of information needs to be disseminated.

***Step Three:*** Research the possibilities of a public/private partnership

***Step Four:*** Install and evaluate

**INSTITUTIONAL:**

HAR is a relatively simple technology to deploy in a cost-effective manner. HAR is easy to maintain and has few, if any, liability issues. However, to ensure the usefulness of HAR, the information disseminated must be timely and accurate.

**REFERENCES:**

Montana Department of Transportation, Draft ITS Strategic Plan, July 2, 1998.

ITS Online, HAR of Steroids, July 22, 1998, http://www.itsonline.com.

# TOOL: TRAVELER INFORMATION USING TELEPHONES

**NEEDS:** Disseminate traveler and traffic information that can be accessed by the greatest number of individuals and provide timely and accurate traffic and tourist information.

**DESCRIPTION:**

Increasingly detailed and up-to-the-minute information is becoming available concerning road and weather conditions. This tool provides a means of disseminating this information to a wide audience at a low cost. Road and weather condition information, and other types of traveler information can be received from a telephone, either voice or regular fax machine. Voice messages could be recorded on an agency's voice mail announcement allowing end users of the system to call up and listen to the announcement. An automated system can allow users to select the location and information they are interested in. High quality text-to-speech systems are now available which can convert data directly into high-quality human-sounding voice announcements. Information can also be faxed either on demand, according to a predefined schedule, or on a flexible basis to alert users of changing conditions. Information may be specific to the needs of the receiver or may be general in nature. In order to take advantage of this dissemination source, a system or procedures must be in place to collect data at a central location. These approaches could build upon activities already underway in New York. For example, NYSDOT Region 9 currently posts a telephone number to access road information.

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Colorado DOT Weather By Fax**

**Goal:** To provide weather and road condition information to a wide range of users in a cost-effective manner.

**Technical Approach:** Current weather and road condition information and short-term forecasts are faxed to a list of approximately 200 user agencies, including freight haulage companies, ports of entry, visitor centers, ski areas, radio stations and television networks. The information, which is around two pages in length, is usually faxed out once a day in the summer months and approximately four or five times a day during the winter. In addition to these regular bulletins, supplementary faxes are also sent to warn of unusual or particularly severe conditions, such as avalanches, the opening and closing of passes, or to advise travelers to put on or remove snow-chains. The information is collated using a variety of sources including CDOT's 88 weather stations installed around the state, a NOAA terminal situated at the Traffic Operations Center, the Colorado State Patrol, and verbal reports from ports of entry personnel.

**Current Status:** The information used to be sent out from the Traffic Operations Center itself, using a series of six fax machines using pre-programmed broadcast lists. Given the number of recipients and the frequency of faxes, especially in winter, this system was very labor-intensive. Recently, CDOT contracted with a consultant and telecommunications company to provide fax services. The

information is faxed from a CDOT PC to the service provider, from where information is broadcast virtually simultaneously to all recipients. Users receive the information between three and nine minutes from the time of receipt at the service provider.

**Location:** Agencies throughout the state of Colorado receive the information. In addition, agencies along the I-70 and I-80 corridors into Wyoming and Utah are also provided with the information.

**Agencies Involved:** The system is operated by the CDOT Traffic Operations Center. The fax services are provided by Expedite through the IdealDial service provider.

**Cost Information:** IdealDial charged CDOT $250 for the set-up fee. As CDOT uses IdealDial for other services a discount was applicable. In addition to the set-up fee, a fee of 25¢ a minute for fax transmission is charged. CDOT estimates that this can be equated to 25¢ a page. The costs for transmission also vary by volume of transmissions and would decrease significantly for greater quantities of information.

**Key Contact:** Michele Kayen, Colorado DOT Traffic Operation Center, (303) 239-5808.

**Timeline:** The current system has been in operation since the beginning of December, 1996. So far, the system has proved to be a vast improvement over the previous method due to the increased speed with which information is transmitted to the users. In addition, TOC staff time can be better utilized, now that CDOT personnel do not fax the information themselves. No staff positions have been lost as a result of the fax automation.

**Timeline:** CDOT plans to work with the telecommunications service provider to customize the system to better meet their needs. Additional features CDOT requires are as follows:

- More detailed transmission reports providing details of failed transmissions in a more timely manner so faxes can be sent to these recipients manually by CDOT.
- More flexibility to stop the fax run partway through if new information is received.
- One rather than two retries if a fax number cannot be reached at first in order to speed up the overall process.

**BENEFITS/OPPORTUNITIES:**

- Travelers are better informed about conditions on the roadways before embarking on trips, without requesting information
- Fleet operators are more informed about the road conditions and can plan dispatching accordingly
- Agencies can provide services at a low-cost
- Improved safety and efficiency on the roadways
- Greater client confidence in adherence to delivery schedules

- Improved public perceptions of value provided by public agencies.

Other means of disseminating general traveler information, or specific road/weather condition information, on a low-cost basis using equipment that many users already have access to could include:

- Electronic mail (e-mail) could be used to disseminate information to anyone with access to an e-mail account. E-mail could also allow for transfer of data files, pictures, written text or audio.
- Voice messages could be recorded and sent out over commercial voice messaging systems.
- Internet information services.
- On-demand directions to and from specific locations.
- Traffic and road condition reports tailored to a specific route, either for a regular commute or for a less frequent trip, such as a vacation or traveling to relatives for holidays.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Determine the amount, type and availability of data to be collected and delivered.

***Step Two:*** Determine whether or not to charge users for the information provided.

***Step Three:*** Install system and operate system.

***Step Four:*** Acquire user feedback to improve system.

**INSTITUTIONAL:**

When creating a telephone information system, the potential of public/private partnerships should be looked at. Also, the availability of timely and accurate traffic and traveler data will be essential to ensure the success of the system.

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# TOOL: INTERACTIVE KIOSKS

**NEEDS:** Provide traveler information to customers. Some of the types of information needs identified include:

- Special event and parking
- Tourist (i.e., hotel accommodations, restaurants, recreational activities, local event calendars)
- Road (directions, closures, detours, snow plow routes) and weather conditions (snow and ice removal)
- Transit schedules
- Corridor-wide information, including the international border with Canada.

**DESCRIPTION:**

Interactive kiosks provide users with real-time information via databases and touch screen monitors, keyboard entry or other interface medium. Kiosks can use Internet technology and web pages to display real-time information or a proprietary display and communications system. The kiosks are traditionally located at tourist areas, rest stops or activity centers in rural areas. Interactive kiosks, based on web technology, can allow business employers, transit riders and other users to access the road construction and weather information currently available on NYSDOT's web page and future applications. Interactive kiosks provide a cost effective, near-term ITS deployment. The interactive kiosk network system is scalable in that units can be added or subtracted from the system without disruption. This technology is in the deployment stage.

A kiosk may access traveler information for an entire region, as well as local advertising and information of local interest. Travelers may also have the ability to print maps and coupons. Information feeds to a kiosk may include links to the National Weather Service, Road/Weather Information Systems (RWIS), and a statewide database of construction workzones, closures, and detours.

Selecting the correct sites for kiosk placement can be critical to successful deployment. Optimal locations have a significant amount of walk-through traffic such as rest stops, visitor centers, and DOT license renewal divisions. Live on-screen maps can show other kiosk sites so the traveler knows where the information is available throughout the state.

**REAL-WORLD EXAMPLES:**

***Real-World Example* - Arizona Trip USA, Northern Arizona Traveler Information Website**

**Goal:** To develop a self-sustainable traveler information system of interactive kiosks and an Internet presence that includes links to road/weather information, and local area attractions.

**Technical Approach:** Many rural communities already had web sites and new web sites were developed for organizations (hotels, restaurants) that wanted to be linked and have a presence on the Northern Arizona traveler resource site. To promote self-sustainability of the kiosk the private sector partners provide network advertisements, other web development services, and printed coupons for use at sites along the corridor. The web site provides information about road closures and restrictions, local weather, and has links to restaurants, hotels, and tourist attractions. The traveler information is provided free of charge. The kiosks also allows users, for a fee, to send and receive e-mail, search America Online or the Internet, and work on documents in Microsoft Word or Excel. The traveler information is accumulated from a statewide information clearinghouse where ADOT Districts input construction work zones, road/lane closures, detours, and up-to-the-minute incident information. Other inputs into the system include data from New Mexico, Utah, Nevada, California, the National Weather Service and the State Department of Public Safety.

**Current Status:** The Arizona TripUSA web site has been operational since May 1998 and can be accessed at http://www.arizona.tripusa.com. The site is routinely updated with features.

**Location:** The pages provide information about Northern Arizona along the I-40 corridor. The site can be accessed internationally.

**Agencies Involved:** The Arizona TripUSA web site was designed and created by Castle Rock Consultants in partnership with ADOT.

**Cost Information:** The site is supported by businesses interested in having a link to the site and through software development services. The total costs for site development and public outreach were $200,000. Kiosks are installed and maintained at no charge to the host location (i.e., hotel, restaurant, train station, airport, visitor center), with phone lines, information service provider links and kiosk station installation provided by private partners. The key to kiosk location is self-sustainability; it must receive enough users for both the free traveler information, and the user fee Internet access area.

**Key Contact:** Sharon Hansen, Castle Rock Services, (602) 971-2194, hansen@crc-corp.com, J.R. Romley, ADOT Project Manager, (602) 255-7908.

**Timeline:** The interactive kiosk and Internet website are operational.

***Real-World Example* - City of Galena, Illinois, and City of Decorah, Iowa, Websites**

**Goal:** To disseminate information about local area attractions to potential visitors and new residents, including, for example, local food and lodging information.

**Technical Approach:** Various small cities have developed web sites to promote local attractions and to provide tourist and traveler information to visitors. The City of Galena, Illinois, web site

provides information on restaurants and local historic and natural attractions. The page includes information on how to get to Galena and where to park, as well as information on historic sites and architecture, music and drama, Mississippi river boat cruises and casinos, shopping, outdoor recreation, and guided tours. The Chamber of Commerce of the city of Decorah, in northeast Iowa, has produced a web site that provides information about local weather, businesses, organizations, churches, parks, city offices, and a list of local restaurants and hotels.

**Current Status:** The Galena web site has been operational since August 1995, and can be accessed at http://www.promotion.com/galena. The Decorah web site is currently on-line at http://www.salamander.com/~decorah/. Both are regularly updated.

**Location:** The pages provide information about Galena and Jo Daviess County and the City of Decorah and its environs. They can be accessed from around the world.

**Agencies Involved:** The Galena/Jo Daviess County Convention & Visitors Bureau site was designed and created by Anne Holmes & Associates. The Decorah Chamber of Commerce also contracted with a service provider to create its site.

**Cost Information:** The City of Galena funds the site by charging a small fee for each business that is promoted on the site. Decorah's site cost just over $2,000 to design, and costs $100 a month to maintain, funded by the Chamber of Commerce.

**Contact:** For the Galena site, Stephen Holmes, Anne Holmes & Associates, 1-800-HOLMES-3. For the Decorah site, Richelle Holsen-Jeremiah, Decorah Chamber of Commerce, 1-800-4NE-IOWA.

**Timeline:** Several new features are scheduled to be available at the Galena site in January, 1999. These include more maps and photographs of Galena and the surrounding area. Features will be added to enable the Convention & Visitors Bureau to update information themselves. In addition, a database search function will be added. This will enable the user to enter a range of dates and types of events of interest to them which will then be displayed.

**BENEFITS AND OPPORTUNITIES:**

- Free, easy access to information at any time of the day, week or year.
- Stimulates local economies, bringing tourist revenue into a city or region, and promoting local businesses to residents
- Cost effective supplement to existing tourism information services
- Available method to disseminate collected information
- Sites often have links to neighboring cities / regions providing easy access to a wide range of information sources
- Traffic/congestion management when travelers re-route around workzones. Increased workzone safety due to less congestion.

- Promotes local transit, traveler services, and parking facilities.

Various options exist for increasing the sophistication of services offered via the Internet, including:

- Traveler/tourist information tailored to a specific route, such as a planned or potential vacation route. Users could enter an origin and destination within a state or region and be offered a variety of attractions and activities, accommodations, and restaurant options within a specified distance of their main route. Again, by diversifying the kiosk locations in both public (i.e., DOT Regions, visitor centers, airports) and private (hotels, large corporations) sites will attract all types of users to the public information.
- Traveler/tourist information tailored to the needs of specific travelers, such as their budget, whether they are looking for a children-oriented vacation, or any special interests or mobility needs they may have.
- Reservation facilities could be offered to travelers enabling them to remotely book and pay for accommodations, special events, excursions, restaurants, for example. On-line booking capabilities will broaden the audience the kiosk will serve to include persons needed to make hotel reservations, and transit/paratransit ride reservations.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Agencies should define the type and the level of detail of information that will be provided to users. This is likely to be impacted by the resources that are available to establish and maintain the service and whether local businesses will be charged to be promoted through the service.

***Step Two:*** Depending on the findings of the previous step, the agency should determine whether the expertise required to establish and maintain the service is available within their organization, or whether it would be cost-effective to acquire this expertise in-house. If so, the agency could proceed to Step Four.

***Step Three:*** If the agency does not have the resources to develop the Internet service in-house, or prefers to hire a specialist to create the site, it then needs to identify and contract with an appropriate service provider.

***Step Four:*** Working with the Internet service provider, if applicable, the agency should design, implement and test their service based on the findings of Step Two. In order to ensure maximum visibility and use of the system, the agency should ensure that links to neighboring, regional, or state sites are created wherever possible.

***Step Five:*** This last task involves ongoing operation and maintenance of the interactive kiosk network and Internet service. It may be that once the system is fully functional, routine updating of information could be performed in-house, only calling upon professional Internet services to assist with major redesign efforts. As part of this step, the agency should request and analyze user feedback to ensure that the users' needs continue to be met by the service.

**INSTITUTIONAL:**

The agency should consider existing services which are offered by neighboring cities or regions, as there may be usability benefits from designing a service which is structurally and visually coherent with other services, while not infringing copyright or intellectual property rights.

It is likely that such an Internet service would supplement a parallel telephone-based traveler information service. If this is not the case, the agency should consider supplying a help-line for users who experience difficulties with the service, or for users who would prefer to deal with an operator when needing additional information or assistance.

When deciding to deliver an Internet information service, the agency should be sure not to underestimate the effort required to maintain the service and keep all information current. If the site is not maintained adequately, the service and the agency could lose credibility with users.

The deployment of an interactive kiosk network requires operations and maintenance for upkeep at on-site locations (i.e., software upgrades that cannot occur over a network system and routine equipment checks). To maintain a network system one individual, either public or private partner, or contracted provider can provide for the field maintenance. Appropriate agreement must be in place to support public private partnerships if they are to be used.

**REFERENCES:**

Technology in Rural Transportation "Simple Solutions," FHWA, Publication No. FHWA-RD-108, October 1997.

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# TOOL: TRAVELER INFORMATION ON THE INTERNET

**NEEDS:** Disseminate traveler and traffic information that can be accessed by the greatest number of individuals and provide timely and accurate traffic and tourist information.

**DESCRIPTION:**

More and more agencies are providing some form of traveler or tourist information on Internet web sites. These agencies include states, cities, counties, Chambers of Commerce, and private organizations, for example, associations of innkeepers. Not only is this type of service relatively inexpensive to provide and maintain from the agency perspective, it is also available at very low cost to the end user, assuming they have access to a PC, modem, and the necessary software. Information provided varies widely and can range from general information concerning a state or region, through to detailed information such as specific accommodations, restaurants and parking facilities.

**REAL-WORLD EXAMPLE:**

***Real-World Example* - City of Galena, Illinois, and City of Decorah, Iowa, Web Sites**

**Goal:** To disseminate information about local area attractions to potential visitors and new residents, including, for example, local food and lodging information.

**Technical Approach:** Various small cities have developed web sites to promote local attractions and to provide tourist and traveler information to visitors. The City of Galena, Illinois, web site provides information on restaurants and local historic and natural attractions. The page includes information on how to get to Galena and where to park, as well as information on historic sites and architecture, music and drama, Mississippi river boat cruises and casinos, shopping, outdoor recreation, and guided tours. The Chamber of Commerce of the city of Decorah, in northeast Iowa, has produced a web site that provides information about local weather, businesses, organizations, churches, parks, city offices, and a list of local restaurants and hotels.

**Current Status:** The Galena web site has been operational since August 1995, and can be accessed at http://www.promotion.com/galena. The Decorah web site is currently on-line at http://www.salamander.com/~decorah/. Both are regularly updated.

**Location:** The pages provide information about Galena and Jo Daviess County and the City of Decorah and its environs. They can be accessed from around the world.

**Agencies Involved:** The Galena/Jo Daviess County Convention & Visitors Bureau site was designed and created by Anne Holmes & Associates. The Decorah Chamber of Commerce also contracted with a service provider to create its site.

**Cost Information:** The City of Galena funds the site by charging a small fee for each business that is promoted on the site. Decorah's site cost just over $2,000 to design, and costs $1,000 a month to maintain, funded by the Chamber of Commerce.

**Key Contact:** For the Galena site, Stephen Holmes, Anne Holmes & Associates, 1-800-HOLMES-3. For the Decorah site, Richelle Holsen-Jeremiah, Decorah Chamber of Commerce, 1-800-4NE-IOWA.

**Timeline:** Several new features are scheduled to be available at the Galena site in January, 1999. These include more maps and photographs of Galena and the surrounding area. Features will be added to enable the Convention & Visitors Bureau to update information themselves. In addition, a database search function will be added. This will enable the user to enter a range of dates and types of events of interest to them which will then be displayed.

**BENEFITS/OPPORTUNITIES**:

- Inexpensive, easy access to information
- Stimulates local economies, bringing tourist revenue into a city or region, and promoting local businesses to residents
- Cost effective supplement to existing tourism and information dissemination services
- Sites often have links to neighboring cities/regions providing easy access to a wide range of information sources
- Promotes local transit, traveler services, and parking facilities.

Various options exist for increasing the sophistication of services offered via the Internet, including:

- Information kiosks installed either at rest areas or other locations within the area of interest, or at other regions' tourism offices, including the travelers' home city or state. Information kiosks could also be provided at travel agencies, airports, car rental locations, and transit hubs.
- Traveler/tourist information tailored to a specific route, such as a planned or potential vacation route. Users could enter an origin and destination within a state or region and be offered a variety of attractions and activities, accommodations, and restaurant options within a specified distance of their main route.
- Traveler/tourist information tailored to the needs of specific travelers, such as their budget, whether they are looking for a children-oriented vacation, or any special interests or mobility needs they may have.
- Reservation facilities could be offered to travelers enabling them to remotely book and pay for accommodations, special events, excursions, and restaurants, for example.

Additional information types could also be provided, if the information is readily available at reasonable cost and if any required inter-agency agreements can be reached, to offer the following information:

- Forecast road and weather condition information.
- Information on construction and maintenance activities likely to affect the traveler on their specified route.

As travelers would mainly consult the Internet information service prior to departing on their trip or vacation, it is likely that real-time weather information and congestion/incident information would not be appropriate due to their time-sensitivity.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Define the type and level of detail of information that will be provided to users.

***Step Two:*** Develop a policy for advertising. For example, will local businesses be charged to be promoted through the service?

***Step Three:*** Identify other areas to link with to ensure maximum visibility in neighboring regions, states and cities.

***Step Four:*** Implement system and ensure the ongoing and up-to-date operations and maintenance of the Internet service.

***Step Five:*** Request and analyze user feedback.

**INSTITUTIONAL:**

When deciding to deliver an Internet information service, the agency should be sure not to underestimate the effort required to maintain the service and keep all information current. If the site is not maintained adequately, the service and the agency could lose credibility with users. Public-private partnerships may be considered to help minimize the public sector maintenance costs.

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# TOOL: TRAVELER INFORMATION USING PERSONAL COMMUNICATION DEVICES

**NEEDS:** Disseminate timely and accurate traffic and traveler information.

**DESCRIPTION:**

Personal communication devices (PCDs) are small, portable, wireless devices for sending and/or receiving information. PCDs usually consist of a handheld computer device such as an organizer or palm top computer combined with some form of wireless communications. PCDs have varying degrees of processing capabilities depending on the design and the model. PCDs have been used for a number of functions, including: navigation, pre-trip information, traveler advisories, and emergency services. Pagers and cellular phones are the best examples, and the most widely used PCDs. Other handheld devices include AT&T's EO, Apple Computer's Newton, Palm Tops, Hewlett Packard has several, and Motorola and GTE both have personal digital communicators.

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Houston's TranStar Smart Commuter**

**Goal:** The overall goal of the field operational test is to determine if commuters will modify their travel mode and plans when they have easy access to transit and real-time traffic condition information.

**Technical Approach:** Fastline provided PCD-based software as one means of disseminating information to the commuters on the corridor. TranStar's field operational test installed and operated a Commuter Information Delivery System (CIDS) at the TranStar facility. The CIDS will receive real-time traffic information from the TranStar Integrated Transportation Management System and format it for distribution to the travelers. The information distribution to the handheld computer will be provided through a wireless FM subcarrier broadcasted channel. The participants will be provided a Sony Magic Link Personal Intelligent Communicator to receive and display the transit and real-time traffic information. Fastline created the client application software for the handheld communicator with integration to the FM subcarrier receiver. Access to the dynamic traffic information and connection through the integrated landline is provided for two-way communication between the PCD and the remote CIDS server for updated transit information and user survey feedback.

**Location:** This project focuses on the Houston I 45 North corridor with emphasis on commuters residing in the outlying corridor areas who regularly travel to their workplace in downtown Houston.

**Agencies Involved:** The Field Operational Test is sponsored by the coordinated and cooperative effort of TxDOT, METRO, the City of Houston, Harris County, and others. Funding is provided by TxDOT, METRO, FHWA and FTA. Local evaluation will be performed by the Texas Transportation Institute.

**Cost Information:** Not available

**Contact:** Not available

**Timeline:** Not available

**BENEFITS/OPPORTUNITIES:**

- Better informed decision-making by travelers
- Potential to avoid incidents and congestion; therefore reducing emissions, reducing the possibility for secondary collisions, reducing delay, etc.
- Increased safety when used as a navigational aid and/or communication device
- Increased emergency response and shorter emergency response time due to automated location notification
- Potential for appropriate emergency responses.

PCDs can be combined with any number of ITS technologies to expand their usefulness. As a stand alone technology they can contain traditional pre-trip navigation information and information that is commonly referred to as "yellow-pages" information.

**PROPOSED IMPLEMENTATION:**

***Step One:*** Determine the amount, type and availability of data to be collected and delivered.

***Step Two:*** Determine whether or not to charge users for the information provided.

***Step Three:*** Install system and operate system.

***Step Four:*** Acquire user feedback to improve system.

**INSTITUTIONAL:**

When developing an integrated traffic and traveler information dissemination system, the potential of public/private partnerships should be looked at. Also, the availability of timely and accurate traffic and traveler data will be essential to ensure the success of the system. Liability issues will include ownership of data collected and disseminated.

**REFERENCES:**

Rural Applications of Advanced Traveler Information Systems: User Needs and Technology Assessment, FHWA publication number FHWA-RD-97-034.

Fastline website, located at www.fastline.com

# TOOL: TRAFFIC CABLE TV CHANNEL

**NEEDS:** Provide traveler information and traffic conditions through a dedicated cable TV channel. The channel would disseminate the following information:

- Special events
- Tourist hotel accommodations, restaurants, recreational activities, local event calendars
- Road closures, construction, detours
- Weather conditions
- Transit
- Traffic.

The cable TV channel would be geared towards resort areas and the more urban of the rural areas

**DESCRIPTION:**

Disseminating traveler and traffic information to the most number of viewers with minimal infrastructure costs is important to ensure a traveler information system is a success. One hurdle that ITS has is installing the necessary, and sometimes expensive, infrastructure systems required for them to operate. Currently, a vast majority of the population own at least one television and many of these people subscribe to some sort of cable television, either land- or satellite- based. Providing traveler and traffic information through a dedicated traffic channel can reach a great number of people. The infrastructure needed will include a television studio and production facilities. The traveler and traffic cable TV channel can be set up to provide any type of information from traffic, transit and weather, to information about snow conditions at ski resorts and special events.

**REAL-WORD EXAMPLE:**

***Real-World Example* - SmartTraveler TV**

**Goal:** Provide traffic information to the Washington D.C. metropolitan area through a cable TV channel.

**Technical Approach:** SmartTraveler TV operates four hours a day, from 5:30am to 9:30am in a news wheel format. The show airs in five-minute blocks. The first four minutes provide traffic, transit and weather information. The last minute is for commercials. The channel is event driven; if there is a specific accident the show will focus on providing traffic information related to that. SmartTraveler also utilizes Internet and phone technologies to disseminate traffic information from collection components. The traffic cable TV channel is just one component of the overall Washington Traveler Information System.

**Current Status:** SmartTraveler TV is currently operational on one cable system in Fairfax County, Virginia. There are plans to expand the service to other cable systems in the area.

**Location:** The studios are located in Washington, D.C. The traffic channel disseminates information for the entire Washington, D.C. metropolitan area which includes Montgomery and Prince William Counties in Maryland; Washington, D.C.; Arlington, Fairfax, Loudoun, and Prince William Counties in Virginia; Fairfax City; and the City of Alexandria.

**Agencies Involved:** SmartRoute Systems, SmartTraveler, Fairfax County, Prince William County, Prince George's County, Montgomery County, Loudoun County

**Cost Information:** The cable TV channel gets all traffic information from the existing SmartTraveler system. Costs for the cable channel included construction of a studio and five individuals to run the studio.

**Key Contact:** Steve Kuciemba, SmartTraveler, (202) 554-7700

**Timeline:** Operational February 9, 1998. Expand system to other counties in late 1998 and 1999.

**BENEFITS/OPPORTUNITIES:**

- Can reduce travel times
- Can make intelligent mode choice decisions
- Overall reduction in congestion (system wide)
- Reduction in road rage accidents and emergency response due to decreased congestion
- Reduction in road rage due to congestion Reduction in pollution levels due to decreased congestion
- Better informed traveling public can improve overall transportation system which can lead to economic growth

**PROPOSED IMPLEMENTATION:**

***Step One:*** Creation of a traffic cable channel will require a new or existing data clearinghouse for traveler and traffic information collected

***Step Two:*** Determine the feasibility of creating a public/private partnership for operating the channel

**INSTITUTIONAL:**

A traffic and traveler information cable TV channel will be another avenue in which to disseminate trip information to motorists and tourists. Creating a traffic cable TV channel will require effort by a lot of individuals on both the public and private side. Also, the channel will require a number of

people to operate and maintain it depending on the number of hours it runs. Good sources of real-time information are also required to make the channel useful. The liability associated with such a product is low. Already traveler and traffic information is disseminated to the public through other means. An option to reduce costs would be to enter into public/private partnership arrangements. The channel could provide traffic information and private sector could provide event information or traveler services information.

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# PLANNING, OUTREACH AND DELIVERY

## Integrated ITS Planning

## ITS Public Outreach, Education and Delivery

## Interagency ITS Coordinating Council

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# TOOL: INTEGRATED ITS PLANNING

**NEEDS:** Stakeholders want to integrate ITS planning activities to better implement ITS components. Currently, there is limited communication and joint-development of ITS components. All of the regions would like to see an integrated plan for the deployment of rural ITS applications. Specifically, the needs include:

- Integration of existing and planned weather information sources with road weather information system deployments to better manage NYSDOT maintenance crews/response.
- Implementation of some form of traffic management and traffic control in the region
- Identification of specific projects and any associated partnerships that may be necessary to successfully deploy them
- Development of an improved incident management plan
- Improvement of the existing and the set up of new institutional relationships (public-public partnerships)

**DESCRIPTION:**

Planning is important to any type of project. Planning allows agencies to identify their needs, the needs of the public and prioritization of projects. In ITS, there are numerous applications available for deployment. However, all of these applications must be deployed in a sensible manner. For example, creating a traffic information dissemination system without having a traffic information collection system in place is worthless. Therefore, taking the time to create a plan of action, short-medium- and long-term will identify the components that need to be installed, and ensure that the most important components are installed first and installed in a sensible order.

**REAL-WORLD EXAMPLES:**

***Real-World Example* - Montana Statewide ITS Strategic Plan**

**Goal:** Assess Montana's statewide transportation needs, then develop a document to identify a full range of technologies available to meet those needs. The Statewide ITS Plan will identify the framework for the development of an ITS Program in the State of Montana.

**Technical Approach:** The planning study followed a typical EDP planning approach:

- Develop an ITS program vision, mission, goals, and objectives
- Identify stakeholders
- Assess Montana transportation needs and definition of ITS program services
- Review and analyze applicable technologies and existing communications infrastructure for potential solution to meet transportation needs requirements

- Evaluate fiscal considerations, identify potential funding sources, and recommend appropriate funding strategies
- Integrate the project development process with the MDT Capital Improvement Program
- Develop the appropriate ITS structure within MDT.
- Review statutory and policy considerations involving ITS technologies and implementation.

**Current Status:** Successfully completed and delivered.

**Location:** Entire state.

**Agencies Involved:** Montana DOT, FHWA, Department of Commerce, Billings Public Works, Fergus County Council on Aging, Missoula Public Works, Helena-A-Ride, and Disaster & Emergency Services Division of MDMA

**Cost Information:** Budget to complete the year-long planning study was $200,000.

**Contact:** Dennis Holt, Montana DOT

**Timeline:** Plans were developed for short-, medium- and long-term deployments. The planning study took approximately 12 months to complete.

***Real-World Example* - Florida Rural ITS Needs**

**Goal:** Focusing on seasonal traffic, Florida aimed at identifying means to assure effective and safe operations of the rural highway system in Florida, to manage traffic and incidents, provide route choice guidance, and provide information regarding vehicle services.

**Technical Approach:** An ITS architectural model was developed as part of this study for rural highways. Assessing Florida's rural highway needs, combined with rural highway characteristics, Florida then identified appropriate ITS technologies to address those needs.

**Current Status:** The study has been completed and Florida has begun the process (identified in the study) of deploying recommended technologies.

**Location:** The State of Florida, where approximately 65,000 miles of highway are considered rural (out of approximately 113,000 total miles.)

**Agencies Involved:** Florida DOT, University of South Florida

**Cost Information:** Not available.

**Contact:** Jesus Gomez, Center for Urban Transportation Research, USF (813) 974-9766; and J. John Lu, PhD, PE, Dept. Of Civil and Environmental Engineering, USF (813) 974-5817

**Timeline:** Not available.

**BENEFITS/OPPORTUNITIES:**

- An organized and coordinated approach to implementing ITS throughout a region.
- While funding may only permit deployment of one system or just a few at a time, with effective ITS planning, all of the systems will ultimately fit together into an integrated ITS platform in a region.
- Coordination of traffic management and traffic control in the region.
- Reduction of duplication of effort.
- Coordination among transportation service providers throughout a region.
- Maximize benefits from each deployment.

**PROPOSED IMPLEMENTATION:**

Methods of providing an ITS plan include:

- Federal Early Deployment Plans and Strategic Deployment Plans for ITS (if possible)
- Major Investment Studies that may occur with larger projects throughout a region
- A portion of all project funding can be set aside (from every project) to be used for ITS planning.
- MPOs, TPAs and other planning organizations can agree to incorporate ITS into all traditional transportation plans.

**INSTITUTIONAL:**

It is a challenge to obtain funding solely for ITS planning, especially given the limited federal, state and local planning budgets. Nonetheless, ITS planning is a critical element when setting forth to use ITS technologies. Also, ITS benefits have been historically hard to quantify when compared to traditional solutions. ITS is more widely deployed, and as ITS benefits are measured it then becomes easier to justify the expense of ITS in planning processes. The ability to measure the potential success of an ITS tool (in planning studies) is becoming easier to determine; now that ITS deployments are increasing, the cost-benefit information is more readily available. The traditional planning processes are long-term, however, ITS is unpredictable more than a couple of years into the future given the rate at which technological developments are occurring.

**REFERENCES:**

Tools for Planning ITS Deployment, Thomas B. Reed, presented at the Rural ITS Conference, October, 1996.

An ITS Architectural Model for Rural Highways, Gomez and Lu, presented at the Rural ITS Conference, 1996.

# TOOL: ITS PUBLIC OUTREACH, EDUCATION AND DELIVERY

**ISSUE:** Technology outreach and education needs to provide the following services:

- An outreach program to educate the public on ITS benefits
- A training and education program on ITS.

**DESCRIPTION:**

Education of key DOT agency personnel and the public on ITS technologies, applications, and issues is essential to efficient ITS planning and deployment. Effective education can take place either by workshops or interviews.

Outreach programs defining ITS benefits will increase the potential for success and early identification of champions to support and move ITS initiatives forward. Outreach activities may include identifying the key personnel in the community and in each public agency (Chamber of Commerce, emergency service providers, town council) that may affect and/or benefit from ITS. Workshops and interviews can focus on the benefits to be expected from ITS and what will be expected at the local level. Outreach materials can take the form of informational brochures handed out at the international border, large corporations, public meetings, tourist locations, and other public sites that have high volumes of travelers. Educational forums can be made part of any DOT public interaction. These forums can be utilized to provide materials and allow for an on-site expert to answer the public's questions about ITS. The desired result of an educational opportunity will be to generate enthusiasm, buy-in, and the necessary commitment to successfully deploy ITS throughout the state.

Inreach activities would be conducted with in-house DOT personnel, and address the need for coordination and an understanding of challenges within a single agency where institutional issues may exist. Inreach can be provided via in-house communications mediums such as agency newsletters, bulletin boards or other means. By providing early inreach and education within key agencies, many pertinent issues may be addressed early in the project planning process. Education allows for coalition building between agencies and allows agencies the opportunity for information exchange. Critical mass is garnered when politicians, local jurisdictions, and active civic groups have a general understanding of ITS and how it will improve their traveling experience.

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Arizona Freeway Management System (FMS) Website**

**Goal:** To disseminate information and develop a web site that provides educational outreach.

**Technical Approach:** The website (www.azfms.com) developed as part of the ADOT FMS disseminates technical information gathered throughout the state on road and weather conditions, but also serves as an information dissemination tool to provide educational definitions of what a ramp meter, CCTV, VMS, and loop detectors are. With pictures of the ITS equipment, and benefits of the

system components described, the general public can understand the DOT's investment in transportation infrastructure technology. The website also allows for interactive outreach communications with an e-mail comment page that serves to answer individual inquires. Some responses, when deemed applicable to a large audience, are posted on the Frequently Asked Questions page. The following is a response to an inquiry about the use of the CCTV along the right-of-way: "These cameras do not have the capability nor are they intended to be used for traffic enforcement purposes. These are not surveillance cameras. They are intended solely as a tool for incident management."

**Current Status:** Ongoing

**Location:** The website is updated at the Phoenix, Arizona location, but has a global presence on the world wide web.

**Agencies Involved:** ADOT manages the website

**Cost Information:** $30,000

**Key Contact:** Glenn Jonas, ADOT, (602) 255-6587, Ed Jankovsky, FMS Webmaster (602) 255-7948.

**Timeline:** The site is continually updated with the latest Internet applications for ease in displaying graphics, downloading CCTV images and viewing other information.

**BENEFITS AND OPPORTUNITIES:**

Benefits of a communications plan or other outreach and educational strategy include:

- Greater understanding and thus support for ITS investments
- Through outreach, potential partners can be identified, opening up the possibilities to greater ITS integration and public/public, public/private funding participation
- Enhanced opinion and perception of the DOT for incorporating smart, efficient technology for advanced traffic management, and increased safety purposes.

**PROPOSED IMPLEMENTATION:**

ITS has evolved from concept developments, research studies, proof-of-concept pilot tests, and operational tests, through to deployment of some mature technologies. Now that ITS is starting to be introduced in the field, perhaps the biggest challenge is no longer technical in nature, but rather it lies in communicating to those people involved in or affected by ITS the capabilities and benefits these technologies offer.

***Step 1:*** Develop a communications plan for the NYSDOT ITS Program

***Step 2:*** Determine audience and stakeholders

***Step 3:*** Create a positive name and visual identification for overall ITS program

***Step 4:*** Develop mediums for dissemination of ITS educational information

***Step 5:*** Maximize information and outreach opportunities provided by transportation events by having pamphlets, posters or other materials available for handout or display of early successes.

***Step 6:*** Develop and enhance ITS website

***Step 7:*** Heighten and maintain media coverage of ITS program

**INSTITUTIONAL:**

The development of an ITS public outreach and education program requires DOT and public relations personnel to work closely on creating a vision, and organizing stakeholder meetings to obtain critical data in developing a communications plan that will meet both the general public and internal NYSDOT needs for disseminating information and developing buy-in to the ITS program.

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# TOOL: INTERAGENCY ITS COORDINATING COUNCIL

**NEEDS:** The stakeholders indicated a need to coordinate and plan ITS programs, projects and activities among agencies, cities and counties.

**DESCRIPTION:**

An interagency coordinating council is the human side to the research, development and deployment of ITS. For public agencies, jurisdictional boundaries define their limits of operation and maintenance. However, for the transportation user, jurisdictional boundaries are irrelevant to their needs for comprehensive transportation services from origin to destination. The traveler simply needs a smooth, seamless trip regardless of the number of agencies involved. The interagency coordinating council attempts to create a seamless trip from origin to destination. Typically, the coordinating council is a cooperative effort that is formalized by Memorandum of Understanding. While the council does not typically have any legal control, it is an excellent avenue to guide and direct ITS deployment.

**REAL-WORLD EXAMPLE:**

***Real-World Example* - Niagara International Transportation Technology Coalition (NITTEC)**

**Goal:** Improve regional and international transportation mobility, promote economic competitiveness and minimize adverse environmental and incidental effects related to the regional transportation system

**Technical Approach:** NITTEC signed a Memorandum of Understanding on September 22, 1995. To guide the organization, NITTEC has established an Executive Council, Regional Transportation Coordination and Management Council (RTCMC) and three subcommittees: Technical and Operations, Transportation Operations Center and Administrative/Business.

**Current Status:** The RTCMC has been meeting on a bimonthly basis to provide overall guidance on the program, policy and financial decisions of NITTEC. The RTCMC has proven to be invaluable in the development of the ITS Strategic Plan for the region. They have also provided comments and information on important projects such as the New York State Thruway's VMS and CCTV project, Casino Niagara and Intelligent Transportation Border Crossing System project at the Peace Bridge.

**Location:** Niagara region of the US and Canada

**Agencies Involved:** Consortium of 14 area transportation system agencies.

**Cost Information:** Funds are provided by the local agencies.

**Key Contact:** Dean Gustafson, (716) 847-3973

**Timeline:** 1998 and 1999 - Continue to improve the traffic operations center, expand coverage of tourist information radio, develop alternate means of dissemination of information to clients.

**BENEFITS AND OPPORTUNITIES:**

- Regional entity focusing efforts toward common goals
- Increased ability to apply and receive grant monies from state and federal agencies
- Opportunity to congregate all interested parties in a common place

**PROPOSED IMPLEMENTATION:**

***Step One*:** Define a tentative list of member agencies and groups

***Step Two:*** Determine the focus of the group, create a mission and vision, develop a Memorandum of Understanding

***Step Three:*** Create a steering group and focused subcommittees to direct the research, development, and deployment of ITS projects.

**INSTITUTIONAL:**

Coordinating councils are commonplace among most public agencies today. Their size and complexity is diverse. Starting a new coordinating council will involve ensuring that the correct representatives attend and become involved with the council. Depending on the agencies involved, seed funding may come from federal, state or local governments.

**ON-LINE BIBLIOGRAPHY**

ITS Cooperative Deployment Network (ICDN): Provides comprehensive on-line information about Rural ITS activities. Provides a link to the ARTS compendium. http://www.nawgits.com

ITS America: ITS America's Rural ITS section. Provides current government happenings regarding Rural ITS. Also has a number of reports available for purchase and download. http://www.itsa.org/rural/

US DOT: US DOT's Rural ITS homepage. Provides links to other Rural ITS areas on the Internet. Also has the ability to search through a number of databases of Rural ITS documents. http://www.its.dot.gov/rural/

Seattle MDI: Homepage for the Seattle Model Deployment Initiative. A number of the real-world examples came from the Seattle MDI. Provides current information about Seattle's Rural ITS activities along with real-time traffic information. http://www.smarttrek.org

Turner-Fairbanks Highway Research: Home page for TFHR center in McLean, VA. Provides current information on Rural ITS research efforts throughout the US. http://www.tfhrc.gov/its/newarts.htm

INFORM (Simple Solutions): On-line report developed for the Federal Highway Administration. This site offers the ability to look up and search for various ITS solutions. http://inform.enterprise.prog.org

Western Transportation Institute: Homepage for WTI research into Rural ITS technologies. http://www.coe.montana.edu/wti/wti.htm

Rural ITS: Clearinghouse of Rural ITS information. http://www.ruralits.org

SmarTraveler: Provides real-time web-based traffic information for several East Coast cities. http://www.smartraveler.com

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