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Intelligent Transportation Systems Update

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Introduction

Advances in technology offer the transportation sector many new innovations that promise increased safety, more efficient traffic flow, streamlined services and the ability to integrate many systems that now operate independently. Intelligent transportation systems (ITS) combine computer and wireless technologies to achieve these purposes and represent the next step in the future of transportation. The programs have been growing, with a national level effort to establish an integrated ITS infrastructure and to develop intelligent vehicles.

ITS programs can be categorized into sets of user services. These areas address different transportation needs. *Traveler management systems* assist drivers as they plan commutes, help relieve congestion on the highways and provide information to emergency personnel who are responding to incidents. *Public transportation services* help streamline transit, allow transit companies to identify where the vehicles are in the system and offer safety to passengers. *Electronic payment systems* use computer technology to make payment simple and automatic. These include “smart cards” that carry a dollar value and can be swiped through a scanner to pay for transportation and retail services. Many of the ITS systems collect transportation data that can be archived and used to analyze traffic and travel. Commercial vehicle services make truck transport more efficient and cost effective. Advanced vehicle safety systems promise high-tech ways to avoid collisions.

State legislatures play an important role in ITS implementation. In many cases, states need to remove legal barriers to ITS projects. Legislatures also can provide funding to ensure that

Contents

<i>Introduction</i>	1
<i>TEA-21 Provisions</i>	2
<i>Other State Action</i>	7
<i>Conclusion</i>	8
<i>References</i>	9

ITS Technology Helps Road Emergency Response

A truck hit a pedestrian bridge in Baltimore, Maryland knocking the bridge down onto the I-695 loop road and stopping traffic in both directions. Observers at the statewide Coordinated Highways Action Response Team (CHART) traffic operations management center witnessed the event on camera and immediately reported the problem to emergency officials, the media and highway advisory radio stations. CHART is a partnership between the Maryland State Police and the Maryland Department of Transportation. The quick response helped alleviate a devastating traffic incident on a busy highway. Overall data shows that average incident response is 35 percent better when CHART is involved.

sufficient resources are available to invest in ITS development. Policymakers will need to explore how technology can become a part of infrastructure and produce an overall savings in transportation costs—not only in government costs in construction and maintenance of highways, but also for consumers who save time, wear and tear on vehicles and reduce vehicle miles traveled.

This report provides an overview of the national ITS efforts initiated through the 1998 Transportation Equity Act for the 21st Century (TEA-21). It highlights several ITS projects in both urban and rural areas and discusses legislative activity on the topic.

Intelligent Transportation Systems User Services

Travel and Traffic Management

- Pre-trip travel information
- En route driver information
- Route guidance
- Ride matching and reservations
- Traveler services
- Traffic control
- Incident management
- Travel demand management
- Emissions testing
- Highway-rail crossings

Public Transportation Management

- En route transit information
- Personalized public transit
- Public travel security

Electronic Payment

- Electronic payment services/smart cards

Information Management

- Archived data

Commercial Vehicle Operations

- Commercial vehicle electronic clearance
- Automated roadside safety inspections
- On-board safety monitoring
- Commercial vehicle administrative processes
- Hazardous material incident response
- Commercial fleet management

Advanced Vehicle Safety Systems

- Longitudinal collision avoidance
- Lateral collision avoidance
- Intersection collision avoidance
- Vision enhancement for collision avoidance
- Safety readiness
- Pre-crash restraint deployment
- Automated vehicle operation

Emergency Management

- Emergency notification and personal security
- Emergency vehicle management

TEA-21 Provisions

TEA-21 provided funding for deployment, research and development of ITS projects. As part of the deployment efforts, TEA-21 created a two-part program. The goal of the first component is to increase the integration and interoperability of ITS systems in urban and rural areas. In other words, the systems will be designed to talk and listen to each other so that, as new items are added, they can become part of the larger network. The second goal included the commercial vehicle infrastructure program to improve the safety and productivity of commercial vehicles and reduce costs of regulatory requirements.

ITS Integration

To ensure that resources are used most efficiently, ITS system components need to be linked and integrated so they can “talk and listen” to one another. To help achieve this compatibility, the U.S. Department of Transportation (DOT) developed the National ITS architecture to serve as a framework for guiding

deployment of integrated ITS systems and services. Recently, the DOT issued policies that require that regions that deploy ITS using Highway Trust Fund money develop a

regional ITS architecture using the National ITS architecture as a resource to guide their regional ITS deployment.

When ITS first emerged on the market, communities often used an individual technology to provide one particular service. As ITS grew more sophisticated, however, communities linked technologies and applications so that individual systems could provide many services. This linking—or integration—of systems and services requires good cooperative planning, i.e., a regional architecture.

Regional architectures allow diverse electronic systems and applications to be tied together providing a unified framework for an ITS strategy. Regional ITS architectures also allow ITS programs to be added in phases that reflect each area's needs and available funding.

Today, these links between ITS technologies and applications, collectively known as “architectures,” integrate more than 30 types of services across the country and play a vital role in the national transportation network. Architectures allow diverse electronic systems and applications to be tied together, providing a unified framework for an ITS strategy. Architectures also allow ITS programs to be added in phases that reflect each area's needs and available funding.

Greater compatibility between ITS systems, either within a particular jurisdiction or among many jurisdictions, helps ITS work more efficiently or allows a cohesive, long-range vision. The architecture can show the complete travel picture, including possible traffic management and public transit options, and help provide better and more up-to-date information. The National ITS architecture seeks to coordinate efforts among traffic, transit, police, fire and rescue agencies to improve overall management of a transportation network.

The U.S. Department of Transportation oversees the funding awarded to states for ITS integration projects to ensure compliance with the requirements of TEA-21. The projects also must provide matching funding, which encourages localities to develop partnerships with the private sector.

Although institutional and technical problems may make integration more difficult than implementing individual ITS services, the benefits are many. For example, the Houston, Texas, TranStar program oversees the planning, design, operations and maintenance of transportation operations and emergency management in the metropolitan area. The program

SmartTrip Card Smooths the Way

A local transit authority in Washington, D.C. instituted the SmartTrip program, through which where consumers can buy a fare card pass and use it for both parking and the Metro fares. Travelers pass the card over the readers on the Metro turnstiles and parking lot kiosks to pay all fares and fees.

ITS Integration Program Criteria

- Contribute to national deployment goals and objectives.
- Demonstrate a strong commitment to stakeholder cooperation and partnering.
- Encourage and leverage private sector involvement and financial commitment.
- Demonstrate conformity to national ITS architecture.
- Demonstrate inclusion in stateside or metropolitan transportation planning processes.
- Ensure long-term operation and maintenance without continued reliance on federal ITS funds.
- Demonstrate that personnel have the necessary skills for effective operations.
- Mitigate adverse effects on bicycle and pedestrian transportation and safety.
- Meet other goals or economic development criteria for rural areas.

The trucking industry and federal, state and local governments are using ITS technologies to streamline commercial vehicle operations, reduce congestion and improve travel.

integrates freeway management using cameras, ramp meters, variable message signs and a regional computerized traffic signal system. From the TranStar center, freeway traffic flow can be observed through video links. Message signs along the highway can be changed from the control center to reflect the traffic patterns and give motorists up-to-date information. In the event of a freeway problem, occupancy requirements in the HOV lanes can be lifted to allow more cars in those lanes and ease congestion from the incident. Emergency response also originates from the center, and rapid management of road incidents helps reduce related congestion. These integrated services have reduced delays for motorists, resulting in millions of dollars in savings annually.

Commercial Vehicle Program

Each year, trucks and commercial motor carriers travel more than 152 billion miles on America's roads. As demands on the nation's highways and the need for more efficient movement of goods increase, the trucking industry and federal, state and local governments are using ITS technologies to streamline commercial vehicle operations, reduce congestion and improve travel. TEA-21 established the goal of deploying the Commercial Vehicle Information Systems and Networks (CVISN) in the majority of the states by 2003. The Federal Highway Administration (FHWA) hopes to have between 22 and 35 states deployed CVISN by 2005. CVISN's goal is to establish a nationwide infrastructure for data exchange for commercial vehicles that are traveling in interstate commerce.

Several programs already improve motor carrier operations through automated inspections; "one stop" registration, permitting and taxing systems; administrative information clearinghouses; electronic clearance; on-board safety monitors; hazardous materials incident response systems; and freight mobility services that allow carriers to obtain real-time traffic information.

For example, the PrePass system allows states to check motor carrier credentials and weight at highway speeds without stopping the vehicles at inspection stations. As the truck passes over automatic sensors built into the highway, the sensors weigh the vehicle and transmit data to a roadside computer, which verifies that state-required credentials are in order. Because the vehicles are checked in motion, carriers do not lose time stopping at weigh stations, and trucks entering and exiting the highways do not endanger other motorists. The automated systems are spreading across major interstate corridors. Similar systems—the Multi-Jurisdictional Automated Preclearance System (MAPS) and Advantage CVO—have discussed making their technology compatible with each other for more efficiency.

A study of truck drivers in Illinois indicated that the automatic vehicle identification and the weigh-in-motion systems proved successful. The majority of the drivers said that time was an important factor in their schedules. Eighty-four percent of the drivers surveyed said that the systems reduce trip delay, and 91 percent felt the technologies reduce the hazards of merging at weigh stations.

Another technology being developed for motor carriers through the Federal Highway Administration is the Safety and Fitness Electronic Records (SAFER) computer system. It will provide interstate carrier, vehicle and driver information to enforcement agencies, commercial carriers, insurers and other interested parties.

The system will make available, through linked databases, motor carrier safety fitness ratings, inspections, accident history and other information. SAFER promises to reduce the number of inspections of the same vehicle over a given time period, improve vehicle safety and make motor carrier operation more efficient.

Electronic information clearinghouses, operated for two interstate registration and fuel tax collection programs known as the International Registration Plan (IRP) and the International Fuel Tax Agreement (IFTA), facilitate the exchange of information among participating jurisdictions and help expedite paperwork and payments for both programs. The clearinghouses store and distribute IRP and IFTA data from participating jurisdictions. States can use the clearinghouses to check that a carrier's permits are up to date and to prevent fraud.

The Commercial Vehicle Information Systems Network uses computer software systems to integrate safety information, vehicle credentials and tax data technologies. CVISN connects technologies such as PrePass, SAFER, and the IRP and IFTA clearinghouses, with the ultimate goal of creating a "paperless truck."

One concern raised about electronically linking commercial vehicle technologies and information is privacy. A great deal of information about carriers will be available on these systems, and efforts are under way to make sure the proper protections are provided. The Washington Legislature specifically addressed this issue in a bill passed in 1999. It states: Any information obtained by governmental agencies that is collected by the use of a motor carrier intelligent transportation system or any comparable information equipment attached to a truck, tractor, or trailer is confidential and not subject to public disclosure under this chapter. However, the information may be given to other governmental agencies or the owners of the truck, tractor, or trailer from which the information is obtained.

The law protects the privacy of the driver, while providing necessary information to the proper authorities.

Traveler Information

A key service of ITS includes traveler information. Specialized phone lines, kiosks, radio broadcasts and Web Sites offer up-to-the-minute information about traffic congestion, road conditions and transit schedules. Travelers can access the information and make travel

ITS Serves Commercial Vehicles

In at least 21 states, electronic vehicle weight and paperwork clearance systems cut the time trucks spend at weigh stations. It is estimated that the growing use of transponders in commercial vehicles will decrease the cost of verifying paperwork at weigh stations by up to \$8.6 million per year per state.

A key service of ITS includes traveler information.

Travelers Can Access Information

A Seattle traffic management Web Site offers commuters information about highway and public transit conditions, including how long the wait is for the next car ferry across Puget Sound. In San Francisco and Atlanta, the Traffic Check television service shows real-time traffic information on maps, along with narration about traffic incidents and their locations.

decisions—for example, what route to use in rush hour traffic—before they become stuck on the road.

To facilitate traveler access to local information, the Federal Communications Commission recently approved a three-digit information number to be used across the country. It will eventually

replace the more than 300 different phone numbers now in existence for this service. The 511 number works much like the 911 emergency number. When callers dial the three digits, they will automatically access local-area traveler information resources. Initially, the number will apply only to surface transportation and cannot be used for airline information.

The federal government provides the framework for the system, however implementation and decisions on its use will be made locally. Use is not mandated. The number will be assigned only to public transportation agencies, but a private company may operate the system for the agency. Federal funding is available to set up the system; however, states and local governments need to consider many implementation issues. In some states, a regulatory agency may already have been granted jurisdiction over N11 numbers. If this is the case, agency requirements must be met.

Because the traveler information covers an array of topics—including traffic information and transit, commuter rail and weather conditions—involved agencies will need to cooperate. Regional coordination within calling areas is necessary. The Federal Highway Administration (FHWA) suggests that a single point of contact be designated so that one agency takes the lead. Decisions also will need to be made about who pays for the phone call. It can be offered as a free service, or fees could be assessed. For example, customers who access the 411 directory service pay a fee per call.

Although implementation of the 511 number will occur locally, the Federal Communications Commission requires the U.S. DOT to encourage some uniformity across the country. Users of the number may expect to hear consistent types of information when they use the service in different parts of the country. The DOT, ITS America and organizations of state and local governments are initiating dialogues on this issue.

The next step will be to effectively link existing and future Advanced Traveler Information Systems (ATIS) to 511. ATIS can provide real-time information to motorists through both in-vehicle technologies and message boards. ATIS can be a key element in actively managing the transportation system, with a strong tie in to tourism and economic development.

Cincinnati recently became the first city to begin using the three-digit 511 number. The service will provide travelers with reports on traffic and road conditions, public transportation and other information. The 511 number will gradually be introduced in cities across

the country. Services are to be established in four more cities—San Francisco, Minneapolis, Phoenix and Detroit—by Oct. 1, 2001.

Rural ITS Applications

ITS initially was developed to improve traffic congestion and safety in urban areas. However, many transportation agencies and local governments have begun to realize the benefits from establishing ITS in rural areas. Most rural roads are isolated and may be infrequently traveled. Many people who travel these roads are passing through and are not familiar with the roads. Through the use of ITS, these roads can become safer both for those traveling through and for those who live in the area.

Even though rural roads are infrequently traveled—less than 40 percent of total vehicle miles traveled each year—about 60 percent of traffic fatalities occur on these roads. Average response time for emergency service personnel in rural areas is about double that for the same response in an urban area. Through the use of an automated collision notification (ACN) system, emergency response times can be dramatically reduced. The system, which is located on the vehicle, automatically triggers a call to emergency and rescue personnel. The use of global positioning systems to pinpoint the exact location of the crash, making it easier to dispatch emergency and rescue personnel.

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Other technological possibilities in rural areas are available through the federal government advanced rural transportation systems (ARTS). ARTS can help transit agencies and local governments make travel safer and easier on rural roads. One example of ARTS technology is road sensors that can detect weather conditions and pavement conditions along remote roads. The use of these sensors with variable message boards can inform motorists of current road conditions in advance, allowing them to change routes or stop driving. Sensors like these are being used in rural Indiana to help transportation authorities redesign their snowplow routes. Through the use of these sensors, Indiana transportation authorities were able to decrease the number of routes and save \$14 million in operating and equipment costs.

Other State Action

State legislatures play an important role in the implementation of intelligent transportation systems. Often, state legislatures are responsible for removing barriers to implementation through new laws and for allocating funds to state departments or agencies to fund studies or other programs that use intelligent transportation systems applications. During the 1999 and 2000 sessions some states considered budgetary amendments regarding ITS programs.

The Minnesota Legislature, through the 2000 Omnibus Transportation Appropriations Bill, passed a provision that required the Department of Transportation to study the effectiveness of ramp meters in the Twin Cities metropolitan area. The goal of the study is to

evaluate the possible traffic and safety effects associated with shutting off all 430 ramp meters currently in place in the Twin Cities. The study was conducted in response to concerns that the meters actually made congestion worse.

In order to achieve reliable data, the study focused on four freeway corridors within the Twin Cities. These freeway corridors were chosen as representatives of the entire highway system. The exact freeway corridors used in the study were not released to the public in order to maintain data integrity. The study had three main objectives: first, to determine the effect ramp metering on freeways, roads and transit operations; second, to determine public opinion and perception of the ramp meters; and third, to compare the ramp meter system in Minnesota with other regional systems across the country.

The study, due to the Legislature in February 2001, will examine before and after data. Between October 2000 and December 2000, the ramp meters were shut off completely. The study began with data collection on September 11 to acquire information before the meters were shut off. On Dec. 4, 2000, state Department of Transportation officials made recommendations and announced plans to change how the ramp meter system operates. These changes will be reflected in the February 2001 report to the Legislature. Some of the proposed changes have been applied to the system until the Legislature can decide the future of the ramps. Beginning Dec. 4, 2000, ramp meter operation has been limited to four hours per day—two hours during the morning rush hour and two hours during the afternoon rush hour. Before the study, the ramp meters operated four hours in the morning and five hours in the afternoon and evening.

NAWG

The National Associations Working Group (NAWG) for Intelligent Transportation Systems (ITS) is made up of 30 national associations of state and local officials—including NCSL—with a common interest in being informed and educated about the concepts, practices and applications of intelligent transportation systems. The group, which meets regularly, works in partnership with the U.S. Department of Transportation.

According to a poll conducted by the Minneapolis *Star Tribune*, about 70 percent of those polled favor the return on the meters, but with restrictions time is shortened for example, using only some of the meters and adjusting the meters so drivers' wait. The poll also found that, before the meters were shut off, 92 percent felt that the freeways were congested or extremely congested. After the meters were turned off, approximately 25 percent found the

freeways to be less congested, and 19 percent felt the same way about afternoon traffic. Since the ramp meters were installed to lessen congestion, some believe that the poll shows that the ramp meters were an ineffective in reducing congestion.

Conclusion

Through the use of ITS, policymakers are given an opportunity to improve transportation systems by increasing efficiency, safety and effectiveness. Lawmakers, policymakers and others are working diligently to explore the possibilities of ITS in relation to transportation infrastructure. Whether it is used to decrease congestion and commuting time or to make

a certain roadway safer, ITS can play a role. Of course, the key to an efficient transportation system is to use compatible technologies and to link these technologies into a cohesive system. For these systems to work, state governments, local governments, transit agencies and other groups must work together. The purpose of ITS is to make travel on our nation's highways safer and easier. Through a cohesive cooperative system, these goals can be achieved.

References

"Twin Cities ramp meters to be turned on, but less restrictive." *Minneapolis Star Tribune*. Dec. 4, 2000.

Blake, Laurie. "Minnesota Poll: Fewer ramp meters favored." *Minneapolis Star Tribune*. Dec. 3, 2000.

Benekohal, Rahim, et al. *Drivers Assessment of High Speed AVI/WIM System at a Weigh Station in Illinois*. Report prepared for the Illinois Department of Transportation by the Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign. January 31, 2000.

Intelligent Transportation Society of America. *Saving Lives, Time and Money Using Intelligent Transportation Systems: Opportunities for Deployment*. Washington, D.C.: ITS America, 2000.

"MnDot Kills Ramp Meters." *ITS World*. (July/August 2000), 9.

Sundeen, Matt, and Janet B. Goehring, "State Intelligent Transportation Systems in the Year 2000." *Transportation Series* (National Conference of State Legislatures) no. 13 (June 1999).

U.S. Department of Transportation, Federal Highway Administration, ITS Joint Program Office. *Intelligent Transportation Systems Benefits: 1999 Update*. FHWA-OP-99-012. Washington, D.C.: U.S. DOT, May 1999.

_____. *The TEA-21 ITS Deployment Program Interim Report 2000*. FHWA-OP-00-019. Washington, D.C.: U.S. DOT, 2000.

World Wide Web Sites

ITS America, <http://www.itsa.org>

ITS Cooperative Deployment Network, <http://www.nawgits.com/icdn.html>

National Associations Working Group for ITS, <http://www.nawgits.com/>

U. S. Department of Transportation, ITS Joint Program Office, <http://www.its.dot.gov/>

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