Technology Based Transportation Solutions

Model Deployment Initiative

The Model Deployment Initiative

Technology Based Transportation Solutions

Federal Highway Administration

In Autumn 1996, former Secretary of Transportation Federico Pena announced that Phoenix, San Antonio, Seattle and the New York City metropolitan areas were chosen to showcase deployments of intelligent transportation systems (ITS). The program, called the Model Deployment Initiative, marks a significant step in intelligent transportation infrastructure (ITI) across the United States. The Model Deployment Initiative calls for public and private sector partners to develop and integrate intelligent transportation systems technology to reduce travel times, improve emergency response and provide travel information to the public.

Traffic in the United States has increased 30 percent in the past ten years and the number of cars on the road is projected to increase by 50 percent in the next decade. Congestion causes Americans to lose two billion hours a year tied up in trafffic. The same congestion costs businesses $40 billion each year as they transport goods. Intelligent Transportation System tools offer promise to address the nation's traffic problems using, for example, advanced communication technology to identify traffic incidents, quickly respond and alert the public to delays.

Intelligent transportation systems offer a dramatic shift in our thinking about how we use and manage our nation's transportation systems. The potential is great. For example, for the cost of approximately eight miles of urban freeway or about $300 million, a metropolitan area the size of Washington D.C. could start from scratch to completely implement an intelligent transportation infrastructure. Most urban areas already have some elements in place, so actual implementation costs would be significantly less.

But, as is the case with any emerging technology, pieces of systems have evolved independently. We are now challenged to integrate these pieces to fully realize the potential of ITS, so that the whole can become greater than the sum of its parts.

The Model Deployment Initiative provides real-life examples of technology's potential in metropolitan areas across the country. Investments from public and private sector partners will integrate existing ITS elements in the four sites as part of a national showcase.

The model deployment sites will illustrate how technology can improve transportation in metropolitan areas. A hard-nosed evaluation of the model deployment projects in Phoenix, San Antonio, Seattle and the New York City metropolitan area will document lessons learned. Other metropolitan areas can apply evaluation results to guide their efforts to integrate technology into their regional transportation systems.

MDI will integrate transportation by linking existing systems that monitor transportation. Technology will allow transportation agencies to share real-time information on congestion and other problems effecting the overall system. Each of the four MDI sites address the challenges of developing an Intelligent Transportation Infrastructure in different ways but are ultimately focused on the common vision of more efficient transportation systems and better transportation information so that all system users can make smarter choices about how to use and manage our transportation systems.

MDI PROJECT COMPONENTS

Transit Management

Advanced vehicle location systems on transit vehicles improve their on-time performance and provide real-time information on bus schedule status.

Freeway Management

Real-time information highlights problem areas for transportation agencies to notify response teams and divert traffic.

Traffic Signal Control

Real-time traffic information can enhance signal timing to better manage traffic demands.

Railroad Grade Crossings

Automated safety systems warn drivers of crossing hazards and provide advance notice of approaching trains.

Emergency Management Services

Emergency vehicles respond more efficiently by avoiding traffic problems.

Incident Management

Surveillance systems help local agencies respond to incidents rapidly and effectively.

Electronic Toll Collection

Electronic readers keep traffic flowing at toll plazas and reduce operating costs for toll agencies.

Electronic Fare Payment

Smart Card technology reduces costs and is convenient to travelers because one card can be used for parking and transit.

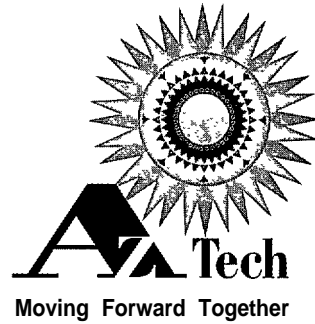### Regional Multimodal Traveler Information

Real-time information enables the public to make informed transportation choices.
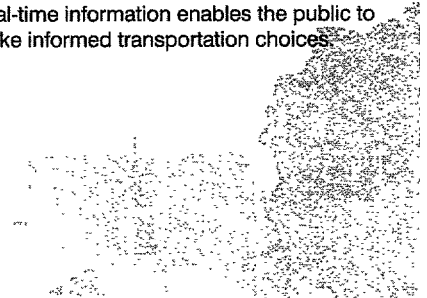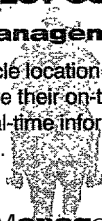
Create a regional intermodal transportation system through public and private partnerships for advanced technology and information sharing

Phoenix
Metropolitan Area

AZTech
Moving Forward Together

Tactics
Integrating transportation
Enhancing traffic management
Improving transit
Informing travelers

Once a small town in the heart of Arizona's Sonoran desert, nearly 3 million people now live in 23 communities that make up the 'I/alley of the Sun." Widespread residential and industrial expansion has increased demand on the Valley's transportation system. Transportation agencies are responding by widening surface streets, building new freeways and seeking additional ways to improve traffic conditions.

AZTech is a new partnership of public agencies and private companies administering a $7.5 million federal grant of a $35.5 million program. AZTech is deploying technology to reduce travel time and costs, improve traveler safety and air quality; thereby improving the overall quality of life. AZTech's selection for model deployment of ITS provides a national showcase for using technology to address transportation problems.

Integrating Transportation

Traffic centers for the state, county, local cities, transit and emergency services are connected to monitor traffic conditions. AZTech is using advanced communication technology to link these traffic centers to coordinate traffic signals and manage traffic incidents. When an accident shuts down part of a freeway or surface street, the traffic centers notify emergency response teams and ease congestion by diverting traffic to other routes.

A network of road sensors, electronic signs, cameras, computers, communication equipment and people provide the backbone for a regional intelligent transportation system (ITS). Advanced technology on 42 miles of freeway in the Phoenix metropolitan area detect congestion, identify incidents, notify response teams of accidents and suggest alternate routes for drivers.

Enhancing Traffic Management

AZTech is implementing technology to improve traffic conditions on 150 miles of eight major surface streets that cross jurisdictional boundaries. Referred to as "smart corridors" they serve as alternate routes when accidents or heavy delays force traffic to exit freeways. Traffic sensors and upgraded traffic signals allow cities to better handle increased traffic levels. Electronic signs alert drivers to delays, suggest alternate routes and divert traffic between smart corridors and freeways.

Improving Transit

As part of the model deployment, global positioning systems will locate over 85 buses as they travel their routes. Dispatchers will be updated on traffic conditions and route status to determine if buses are on schedule. Electronic messages at transit centers and bus shelters will inform riders of real time bus location. Kiosks at transit centers will provide riders with information on bus routes, schedules, traffic conditions. and tourist **attractions**.

Informing Travelers

AZTech is developing a regional traveler information system to provide up-to-the-minute traffic information on accidents, delays, bus routes and schedules. It will be one of the first privatized traveler information systems in the country. Several companies are partnering with AZTech to offer traffic information through a variety of products and services in the Phoenix metropolitan area.

Personalized traffic reports on pagers can warn drivers of traffic problems along their commute. Kiosks will provide traffic updates and tourist information at malls, business centers and other locations in the Valley. Travelers can view current traffic conditions on cable television and the internet in the comfort of their own home or office.

Navigation systems in cars will help residents and visitors travel the Valley by providing turn-by-turn directions, highlighting points of interest and showing drivers their current location. The in-vehicle system also gives drivers traffic updates and selects alternate routes to avoid delays.

Summary

AZTech' s efforts will culminate when the technology comes on-line during the spring of 1998. Better traveler information, more accurate transit operations and integrated transportation systems will improve the commute for the millions of residents and visitors traveling the Valley of the Sun. As a model deployment site, the Phoenix metropolitan area will provide a real-life showcase of how technology can improve overall quality of life and set a world wide standard of excellence for transportation systems deployment.
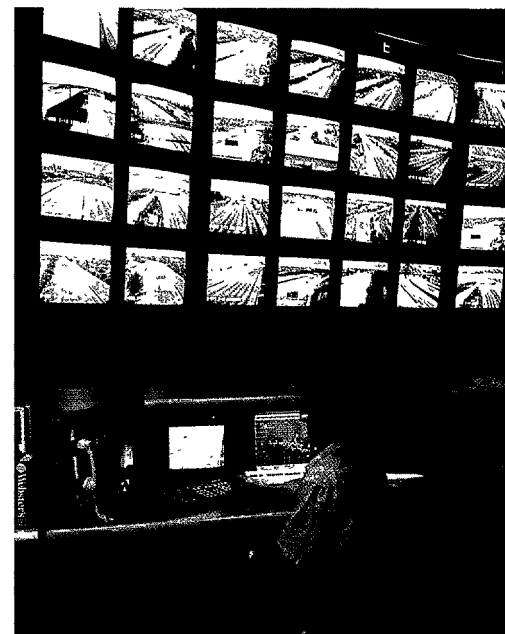
Arizona DOT's Traffic Operations Center models ITS technology deployment.

New York

TRANSCOM

The New York/New Jersey/Connecticut MDI is centered in an area with the highest population density, most complex transportation network, and most active public transportation system in the United States. The region includes New York City, Long Island, the Lower Hudson Valley, South West Connecticut, Northern New Jersey, and Central New Jersey. Over one hundred different transportation service providers operate and maintain the region's transportation network.

Because congestion is a daily fact of life here, travelers are offered numerous transportation mode choices. But so many systems can easily lead to confusion when traveling in the three-state region. Questions like, "What is the best route to take?" can have different answers, depending on which mode is selected – subway, bus or automobile. The answers to most questions depend on the time of day and the direction of travel. How can a traveler avoid the frustration of contacting every agency to determine schedules, routes, and connections when traveling from Point A to Point B?

Enter the NY/NJ/CT Metropolitan MDI project, offering region-wide, real-time transportation information. It brings together regional architecture, a basic "free" information package, personalized (fee-based) transportation information, and a transit trip itinerary planning system. The target date for a functional NY/NJ/CT MDI is late 1997, with full deployment by June 1998.

The $40 million NY/NJ/CT Metropolitan MDI is funded by local public and private partners and the MDI Program. Public sector responsibilities are coordinated through TRANSCOM, a coalition of fourteen highway, transit, and public safety agencies. Private sector activities are coordinated through

Lockheed Martin Federal Systems. Additional participants will be selected through a competitive process.

Key Program Elements

TRANSCOM's **Regional Architecture** ensures coordination and integration of advanced transportation management and information system (such as TRANSMIT, E-ZPASS, and INFORM) that are being implemented by the 14 member agencies. It will also enable the dissemination of real-time information from these systems.

MDI contributes transit data interfaces to the TRANSCOM Regional Architecture. Supplemental information from the private partner will be collected through tools such as CCTV cameras, helicopters and probe information and combined with the Regional Architecture data to produce an **MDI database**, operated and maintained at TRANSCOM Traveler Information Center (TIC) by private sector partner, SmartRoute Systems. This TIC database is the foundation of all traveler information dissemination for the MDI project.

MDI will also refine TRANSCOM's current incident, special event, and construction information to make it more understandable in a "basic" **free service information package** provided to TRANSCOM member agencies, pager network participants, and the public through the internet, traffic reporting services, and an automated telephone system.

Under Lockheed Martin's leadership, a subscription based, personalized **Multimodal**

Traveler Information System (MTIS) will be targeted to commuters, who will receive customized incident, special event or construction activity messages via telephone, email, internet, fax or pager.

The **Transit Trip Itinerary Planning System** is aimed at providing rate, schedule, and real-time transit information free of charge through the telephone and an internet system. The internet system will be integrated with kiosk systems throughout the region as part of another project.

Summary

The integrated traveler information system throughout the NY/NJ/CT Metropolitan Region will make access to travel information easy and more readilyavailable (even customized!), and make each agency's participation as easy as possible. Accomplishing these objectives will be challenging, particularly within the aggressive time frame of the- MDL The NY/NJ/CT MDI Team welcomes this challenge.

San Antonio
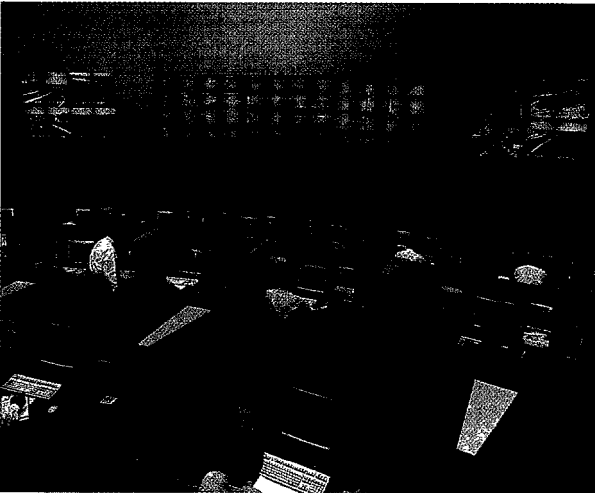
TRANSGUIDE

TECHNOLOGY IN MOTION

and real-time traffic information are distributed to the local media via a low power television station.

Going where your imagination takes you has just become easier. . . thanks to several new TransGuide technologies being implemented this year. TransGuide, an Intelligent Transportation System, was designed by the San Antonio District of the Texas Department of Transportation. TransGuide increases highway safety and efficiency by notifying drivers ahead of time of incidents along the highway.   .

Project History

The system went on line in July 1995 along 26 miles of highway in San Antonio and will eventually cover 191 miles of freeways. The system is already demonstrating a 15 percent decrease in the number of overall traffic accidents and a 20 percent-decrease in the emergency response time (Texas Transportation institute before and after study, based dn the 26 miles currently operational). TransGuide has successfully warned drivers in advance of seasonal freeway conditions such as flooding on frontage roads, ice on bridges and mainlanes,and Ozone Action days. Partners in the TransGuide project include TxDOT, the Cii of San Antonio police/fire/EMS/traffic) and VIA Metropolitan Transit.

TransGuide utilizes fiber optics, sehsors, and video cameras to detect changes in traffic flows and alert operators in the TransGuide Operations Center Changes are made to the lane control signals and information is displayed on overhead variable message signs within 15 seconds. Operators use remote cameras to identify the-type of incident and dispatch the appropriate help within two minutes.

TransGuide was the first system of its kind to respond to traffic incidents with preprogrammed scenarios - a process adapted from NASA's space program. Live trafficvideo

Model Deployment Initiative

The $13.5 million Model Deployment Initiative project in San Antonio includes the following programs:

The **Emergency Medical Services (EMS) Management System** will permit two-way video teleconferencing between emergency medical personnel in a hospital and paramedics in an ambulance in route to the hospital. Video cameras, microphones, monitors and computers will be placed inside ambulances and at hospitals. LifeLink will transfer vital statistics data from the ambulance to the hospital Trauma center physicians will be able to determine the types of injuries involved in an incident and route patients to the appropriate facilities. This is the first time traffic management system-capabilities have been used in this capacity.

Interactive touch screen traveler information kiosks will be placed at key points in the city as part of the **Traveler Information Kiosk** program. At the touch of a screen, travelers in the Alamo City will be able to access real-time traffic information, bus and airport information, weather reports and points of interest (such as tourist spots and restaurant locations).

In-Vehicle Navigation Units will provide drivers with real-time traffic conditions and incident information, vehicle location, and information on regional points of interest. After a driver enters a desired destination, the navigational unit will calculate bne of three selected routes:

- the quickest

- the simplest (fewest turns)

- the route with the least number of freeways

The navigational unit will communicate the routes and other information using a map-and-guide display and voice prompting.

Sensor tags will be placed inside the windshields of vehicles as part of the **Automated Vehicle Identification** program. The sensors will transmit an identification code to antennas placed over the traffic flow to determine real-time travel speeds in the city.

The **Real-time Area wide Travel Database** is a database of all travel speeds in San Antonio based upon TransGuide traffic data, reports of traffic accidents from the San Antonio Police Department database, lane closure information, advanced vehicle identification, GPS and theoretical data. The information will be used for the in-vehicle navigation, kiosk, and LPTV programs.

The **Railroad Grade Crossing Safety System** will alert drivers to potential railroad operations delays near freeway exits. Doppler radar speed sensors will detect the presence and characteristics of trains operating in affected areas. Motorists will be notified ahead of time about the time and duration of train delays.

Summary

Southwest Research institute was awarded an $8.5 million contract as systems integrator for the Model Deployment Initiative in San Antonio. The program will play a key role in helping TransGuide maintain its objectives to reduce congestion and enhance emergency care response time.

Smart Trek

Smart Trek *partner. Microsoft, has* introduced *"Sidewalk, " an on-line entertainment guide with real-time and customized traffic* information*and travel times for alternate routes.*

The Puget Sound region's stunning natural beauty, culture and civic spirit feed a thriving economic community-its growth driven by aerospace, technology, and burgeoning international trade. Puget Sound's population is projected to increase 50 percent by the year 2020-with most of this growth outside Seattle, the region's largest city. This growth has put particular strain on thk region's transportation infrastructure-the region's current tax base cannot accommodate its forecasted transportation capacity needs.

Smart Trek, the Puget Sound area's $13.7 million Model Deployment Initiative demonstration project, is poised to increase 'the performance and efficiency of the area's roadways and transportation systems to meet growth demands. Under the MDI Project, 25 Northwest public agencies and private companies are directing 25 projects designed to build upon the region's significant investment in ITS infrastructure.

Transportation management and traveler information systems in the Puget Sound region have increased in capability since the first closed circuit TV cameras were installed on Seattle freeways in the 1960' s. Smart Trek will integrate many of the ITS elements now in place, adding new systems as necessary to provide real time information about the status of arterials and highways, transit-vehicles, and ferry traffic. Traffic and transit information will be sent to pagers, laptops and desktop computers. The specific locations of buses will be shown on video monitors at bus stops, kiosks and hand-held personal digital assistants. Multi-modal traveler information wilt be designed so visitors can make intelligent choices about how to link bus and ferry or other transit connections with ease and confidence.
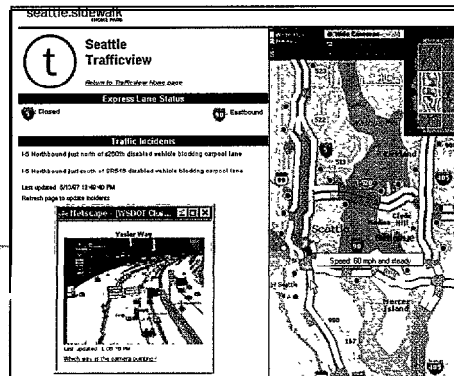
Managing Traffic

The systems to manage freeway and arterial traffic will greatly expand under Smart Trek, gathering congestion and accident information from north Seattle to Tacoma, from the Ferry System to Bellevue. Smart Trek will integrate arterial-and highway data so traffic control systems-can adjust to different congestion levels while providing local control to each jurisdiction. Congestion on airport approach roads and queues at select ferry terminals will be monitored and broadcast to travelers through a variety of radio channels, variable message signs, and within terminal areas.

Managing Transit

Wouldn't you like to know whether your bus is going to be on time before you leave t o catch it? Smart Trek will provide this information over the internet at major transit centers, and at kisoks in the Puget Sound region* Real time transit arrival information will be available on desktop or laptop computers, along with route, schedule ridematch and trip planning information. To make the trip more convenient, a single smart card is in design for transit and parking use. The "rechargable" card will deduct payments as it is used at pre-determined increments, similar in concept to a bank debit card. While not a part of Smart Trek, many Smart Trek components are being designed with the smart fare card in mind.

Shortening Emergency Response

The advantage of wireless technology-mobility-has made it impossible to locate wireless 9-1-1 calls until now. Smart Trek will introduce an enhanced 9-1-1 system that supports the introduction of Mayday devices from two companies. These devices send location information to response centers, helping speed emergency response time and save lives. Smart Trek will also install Global Positioning System equipment in incident response vehicles to monitor their location and assist with dispatching

Information You Can Use

Everyone wants good traffic Information, but, some of it can be vague, untimely, or unreliable. Smart Trek technologies offer real time information that is easier to understand and use. Smart Trek partner, Microsoft, has introduced the "Sidewalk," on-line entertainment guide with real-time and customized traffic information and travel times for alternate routes. Other web applications, including updated traffic flow maps, and a variety of hand-held or in-vehicle systems are planned to translate traffic and transit information into usable messages. A cable television program that provides up to the minute glimpses of key travel corridors along with average speeds is now under development, Expanded use of variable-message signs and Highway Advisory Radio systems will help complete a system of information sources available throughout the region.

Ultimately. Smart Trek will help travelers make informed choices as they plan and make trips in the Seattle region. It will also improve traffic and transit management systems to increase the safety and efficient usage of roads and transit In the long run it will help the Puget Sound area plan intelligently and realistically for the next 20 years of growth and prosperity.

Fast Facts

1. The United States has 60,000 buses for public transit. Approximately 11,000 now or will soon have AVL devices that enable control centers to ascertain their location, monitor their movement, and adjust schedules.
   – U.S. Department of Transportation

2. A highway accident increases the risk of an additional accident by 6 times, according to a study of accident statistics on several California highways and expressways. Cities that monitor roads are able to remove stalled vehicles 50 percent faster. An incident-management system that costs $600,000 to operate can generate $1.4 million in benefits annually.
   – U.S. Department of Transportation

3. Freeway management systems: shrink travel time by 20 - 48 percent; increase travel speed by 16 - 62 percent; and increase freeway capacity by 17 - 25 percent.
   – U.S. Department of Transportation

4. Electronic fare-payment systems: increase fare collection 3 - 30 percent; and slash data-collection costs by $1.5 million - $5 million.
   – U.S. Department of Transportation

5. Traffic-signal systems: decrease travel time by 8 - 15 percent increase travel speed by 14 - 22 percent; and shorten travel delays by 17 - 37 percent.
   – U.S. Department of Transportation

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ITS: Merging the Transportation and Communications Revolutions

Intelligent Transportation systems, or ITS, applies scientific and engineering advances in communications, computer and information systems to surface transportation.

Over the past several years, government-sponsored research and testing has refined these earlier advances into ITS applications. And this has set the stage for delivering the benefits of ITS to the public. Thousands of businesses, from Fortune 500 companies to entrepreneurs, all across the nation are supporting this important step by offering an increasing number of products and services.

Now when they travel, Americans use or benefit from: in-vehicle mayday and navigation systems, real-time traffic information delivered on the Internet, road-weather information systems, electronic toll collection, computer-aided dispatch systems for transit vehicles, sensors at highway/rail crossings and variable message signs along the highways.

Simply put, ITS helps people access real-time information on transportation conditions then make the right decisions, whether you are a transportation engineer managing a far-reaching traffic signal system, a commuter deciding on the least-congested route home or a bus driver keeping the bus on schedule.

Already more than 400 ITS projects are under way in communities throughout the United States. "The four Model Deployment Initiative sites already are showing there is a bridge from earlier research to practical applications that people can experience today. Their efforts to integrate ITS technologies will point the way for other cities and areas hoping to realize the important benefits of ITS," said ITS America President James Costantino.

For further ITS-related information, see
Access ITS America, http://www.itsa.org.

This brochure is a collaborative effort of the Federal Highway Administration and the four regions selected by the United States Department of transportation to showcase integrated intelligent transportation solutions. Technical assistance from ITS America has been greatly appreciated.

These projects will lay the ground work for further investment in technology based transportation solutions, and demonstrate the benefits of intelligent transportation infrastructure to national and local decision-makers, and the t4aveling public.

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